

Knowledge and Attitude towards Ionizing Radiation among Patients Attending the King Khalid Hospital Najran, Saudi Arabia

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Abstract

Background/Aims: The aim of this study was to evaluate and assess the knowledge and attitude to dose and associated risks caused by Ionizing Radiation (IR) procedures among patients. **Methods:** This was a cross-sectional study involving 375 consecutive patients, conducted over a period of 4 months from at the radiology unit of King Khalid Hospital in Najran for IR procedures using self-administered questionnaires that was developed and distributed with consents and instructions to the participants. **Results:** About three-quarter (60%) of the patients reported not being worried to undergo radiological tests. The same proportion of the patients also would not have radiological tests if they can tolerate the disease. About half (50%) of the respondents stated that they would not be satisfied if no further radiological tests were required and 52% did not think that radiological procedures can cause hazards and side effects to the body. Also, over half (53%) of the patients reported not knowing that radiological tests can cause cancer; 48% would not repeat the radiological tests within six months; and about 69% did not know the importance of Radiology for diagnosis. **Conclusion:** There is relatively low knowledge and awareness of the risks associated with Ionizing Radiation among patients in the study population. Therefore, there is a need for educating the public and not only medical personnel, about radiation exposure and associated risks.

Keywords

Knowledge, Attitude, Ionizing, Radiation

1. Introduction

With the broad usage of X-ray, the protection of staff is becoming of high importance. The complexity of medical procedures creates the need for education and training in radiation safety especially during procedures as well as for the wearing of protective gears or tools to help prevent the risks associated with radiation [1].

Ionizing Radiation (IR) is a non-invasive procedure being used to diagnose diseases, guide surgical procedures and it helps the treating physicians to assess and plan their therapeutic interventions through the use of different modalities such as X-ray, CT Scan and Mammography.

Wong *et al.* in their study assessing the knowledge and practice of radiological imaging among local physicians, radiologists and interns, reported that the perception was unsatisfactory and could imply a tendency to misuse radiation which could have deleterious effects [2].

Willoughby *et al.* in a study carried out in England also revealed that participants have an estimated lifetime risk of cancer associated with radiological tests and had evaluated the underestimation of risk of procedures under radiation especially in the primary care [3].

The populations most affected by Ionizing Radiation during procedures are the staff, the patients, and the general public. The doses are easily measured by Dosimetry mainly for the staff and the general public but for patients, it is not realistically possible to measure the dose directly [4]. The practice of untrained clinicians in radiological safety or Radiobiology uncovered the potential for injury. Thus, patient education on radiological safety can lead to protection from injury and future risk of cancer [5].

Specialists such as cardiologists, vascular surgeons, gastroenterologists, etc., are aware of the risks of the ionizing radiation specifically when performing an intravascular surgery. During such a procedure, both the specialists and the patients are at risk of ionizing radiation hence, monitoring the exposure is of high necessity [6].

Some medical procedures demand higher doses of radiation that are determined by various parameters on patient doses. The staff usage of Dosimetry has helped in determining the level of the exposure. A Previous study by Miller *et al.* showed [7] significant clinical radiation dose to the patient during most procedures.

Although several parallel studies have been published, there is a paucity of literature in this area of research in the Kingdom of Saudi Arabia, in particular Najran province where health education among the populace is rather low. However, there are a few studies in the rest of Arab nations. One of such studies showed that only 6.1% of the respondents were able to identify the As Low As Reasonably Achievable (ALARA) principle and as much as 98.2% did not know that there was no safe dose limit according to international recommendations. [8].

The aim of the study was to assess patients' knowledge and attitude of ionizing radiation among patients.

2. Materials and Methods

This was a cross-sectional study design, which involved three hundred seventy-five (375) consecutive patients attending the Medical Diagnostic Imaging (DMI) Department at King Khalid Hospital in Najran Province, Kingdom of Saudi Arabia for ionization radiological procedures. Ethical approval was obtained from the College of Public Health and Health Informatics Ethics Committee Ethics King Khalid Hospital, Najran. Written informed consent was obtained from each study participant prior to enrolment after duly explaining the objectives of the study.

The study was conducted over a period of 4 months at the Medical Imaging Department of King Khalid Hospital (500 beds capacity) in Najran, which is situated at the southern part of the Kingdom of Saudi Arabia. Najran province has a population of about (350,000) with an annual birth rate of (7500).

A Self-administered survey questionnaire that aims to assess the patients' knowledge and attitudes toward the risks of radiation was developed. The questionnaires were written both in Arabic and English languages (**Appendix 1**). Responses were recorded based on 5 items in the Likert scale: "Strongly disagree, Disagree, Neutral, Agree and Strongly agree" and were randomly distributed by the Picture Archiving and Communication System (PACS).

The sample size was calculated based on one month patients' visits that equal (6500) patients with marginal error (5%), confidence interval level (95%), and respondent distribution (50%). The required sample size was 363. In order to account for attrition, this was increased by 12 to give a total sample of 375. The questionnaires were randomly selected using the randomization table for the Radiology reception at King Khalid Hospital. A self-addressed envelope with number was included to facilitate the easy return of the paper copy while a dedicated address was available for the return of the questionnaire for those who chose to complete it.

The validity of research questionnaire was determined by conceptual approach which was based on literature review reference. The questionnaires were tested prior to the study on fifty patients so as to help standardize for readability, reliability and validity, in order to gain an adequate set of questions to capture what the research has intended to capture. The questionnaires were administered by the surveyor face to face and individually with a small group of participants (10% of the sample size) to help determine the accuracy, the language and the legibility of the survey. Thirty-three of the participants were approached in order to adjust the questionnaires according to their comments.

The data was analysed using the Statistical Package for Social Sciences (SPSS) version 22.0. Descriptive statistical analysis was performed to examine the frequencies and percentages of questionnaire responses on knowledge and attitudes

about the radiation.

3. Results

The study had a 100% response rate. **Table 1** shows the distribution of study participants according to socio-demographic information. A total of 375 patients, 221 (58.9%) males and 154 (41.1%) females who required Ionizing Radiation procedures participated in the study after meeting the inclusion criteria. There were more male participants constituting about two-thirds of the study sample. The patients' ages ranged from 17 - 82 years with a total mean of 29.58 ± 10.09 years. The modal age group was the young adults with a total number of 191 participants, constituting 51.1% of the study sample. There was however, no

Table 1. Distribution of study participants according to socio-demographic information.

Variable	Male N (%)	Female N (%)	Total N (%)
Age(years)			
Teenager (After puberty but <19 years)	16 (4.3)	20 (5.3)	36 (9.6)
Young adult (19 - <25 years)	111 (29.7)	80 (21.4)	191 (51.1)
Adult (25 - <40 years)	53 (14.2)	40 (10.7)	93 (24.9)
Middle-age (40 - 60 years)	34 (9.1)	13 (3.5)	47 (12.6)
Elderly (>60 years)	6 (1.6)	1 (0.3)	7 (1.9)
Total	220 (58.8)	154 (41.2)	374 (100.0)
Marital status			
Single	112 (29.9)	75 (20.0)	187 (49.9)
Married	109 (29.1)	79 (21.1)	188 (50.1)
Total	221 (58.9)	154 (41.1)	375 (100.0)
Nationality			
Saudi	185 (49.3)	132 (35.2)	317 (84.5)
Non-Saudi	36 (9.6)	22 (5.9)	58 (15.5)
Total	221 (58.9)	154 (41.1)	375 (100)
Work status			
Employed	140 (37.3)	48 (12.8)	188 (50.1)
Unemployed	77 (20.5)	103 (27.5)	180 (48.0)
Invalid	4 (1.0)	3 (0.8)	7 (1.8)
Total	221 (58.9)	154 (41.1)	375 (100.0)
Educational Level			
Elementary	12 (3.2)	9 (2.4)	21 (5.6)
Primary	17 (4.5)	13 (3.5)	30 (8.0)
Secondary	84 (22.4)	80 (21.3)	164 (43.7)
Tertiary	107 (28.5)	46 (12.3)	153 (40.8)
Never been to school	1 (0.3)	6 (1.6)	7 (1.9)
Total	221 (58.9)	154 (41.1)	375 (100.0)

significant gender difference.

There was an equal number of participants in terms of marital status: 49.9% were single and 50% were married with majority being Saudi nationals (85%) while only 15% were non-Saudi citizens. Also, the number of employed and unemployed patients was almost equal in number.

With regard to the educational level of the respondents, 44% were Secondary school students, followed by those from Tertiary school (41%). The primary and elementary pupils had the least number of participants being 8% and 5.6% respectively. About 7 (1.9%) of the respondents had never been to school.

- 1 missing participant data under the age section

The attitude of participants towards radiation is shown in **Table 2**. Almost two-thirds (60%) of patients did not worry during radiological procedures while 28.5% or almost one-third of them had apprehension to undergoing radiological procedures. A large proportion of the respondents (66.1%) would not undergo any radiological test if they can tolerate the disease while 21% agreed to have radiological tests even with the toleration of the disease. The other participants were indifferent to these questions.

Almost half of the patients (46%), were not pleased if no further radiological test was done while about 33% were pleased and felt that they did not need further radiological tests. However, a relatively large proportion (20.5%) was indifferent to having further investigations regardless of the diagnosis made.

While only a quarter (25.1%) of the respondents felt the tests cause hazards and side effects, about the same number were indifferent. However, over half of the participants (52.0%) disagreed to this statement.

Table 2. Attitude toward radiation.

Items	Responses		
	Disagree Frequency (%)	Neutral Frequency (%)	Agree Frequency (%)
I worry a lot during radiological test procedure	226 (60.3)	42 (11.2)	107 (28.5)
I would not do the radiological tests if I can tolerate the disease	248 (66.1)	48 (12.8)	79 (21.0)
I'm pleased with the diagnosis without needing further investigation through radiological tests.	173 (46.1)	77 (20.5)	125 (33.3)
I feel that radiology tests cause hazards and side effects	195 (52.0)	86 (22.9)	94 (25.1)
Radiologists not staying in the same room makes me feel worried about the procedures	172 (45.9)	89 (23.7)	114 (30.4)
The instruction given by the radiologist makes me feel anxious	163 (43.5)	56 (14.9)	156 (41.6)

About 46% of the respondents would not worry about the radiological procedure if the radiologist is not in the room, while about 30% of them get worried in the absence of the radiologist in the room.

Patients that do not feel anxious after instructions have been given by the radiologists were about 163 (43.5%) of the respondents whereas 156 (41.6%) of them do get anxious after instructions have been given to them. About 56 (14.9) respondents were neutral about this. This is also depicted in **Figure 1**.

Table 3 and **Figure 2** shows the knowledge of respondents towards radiation procedures. More than half of the respondents (53.1%) disagree that radiological tests can cause cancer and about a quarter of the respondents (25%) believe that radiology can cause cancer. Over a fifth (22.1%) didn't have an idea about the cancer risks associated with radiation.

Almost half of the patients (48.3%) disagreed that repeating the radiological tests within six months knowing can cause harm to the body, while equal number of the participants (25.9% each) either believed that repeating the radiological tests within that time could be deleterious to health or were neutral about it.

Those who do not know that radiation stays in their bones and tissues for longer periods correspond to 40% of the respondents while 36% of them believe that radiation stays in their bones and tissues for a longer period of time. Almost a quarter (24.3%) however, was neutral about the question.

Sixty-nine percent (69%), which represent more than two-thirds of the res-

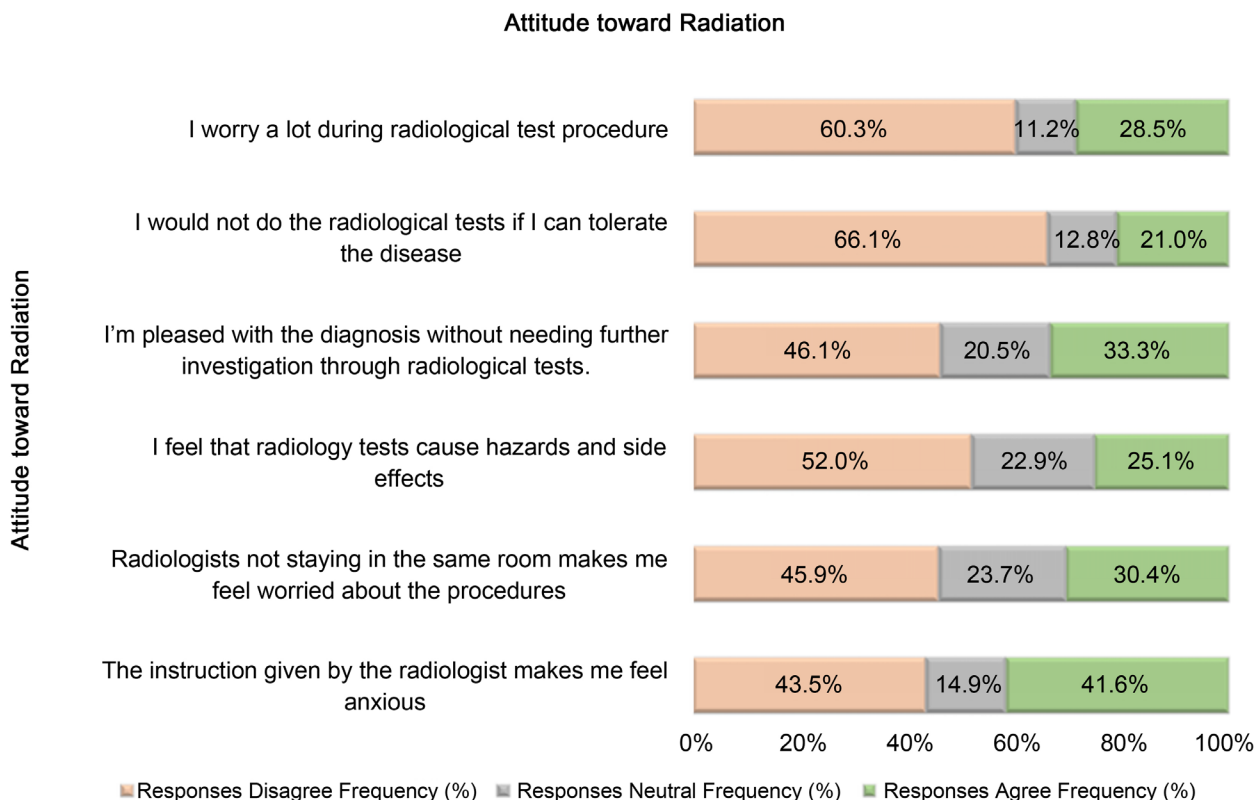
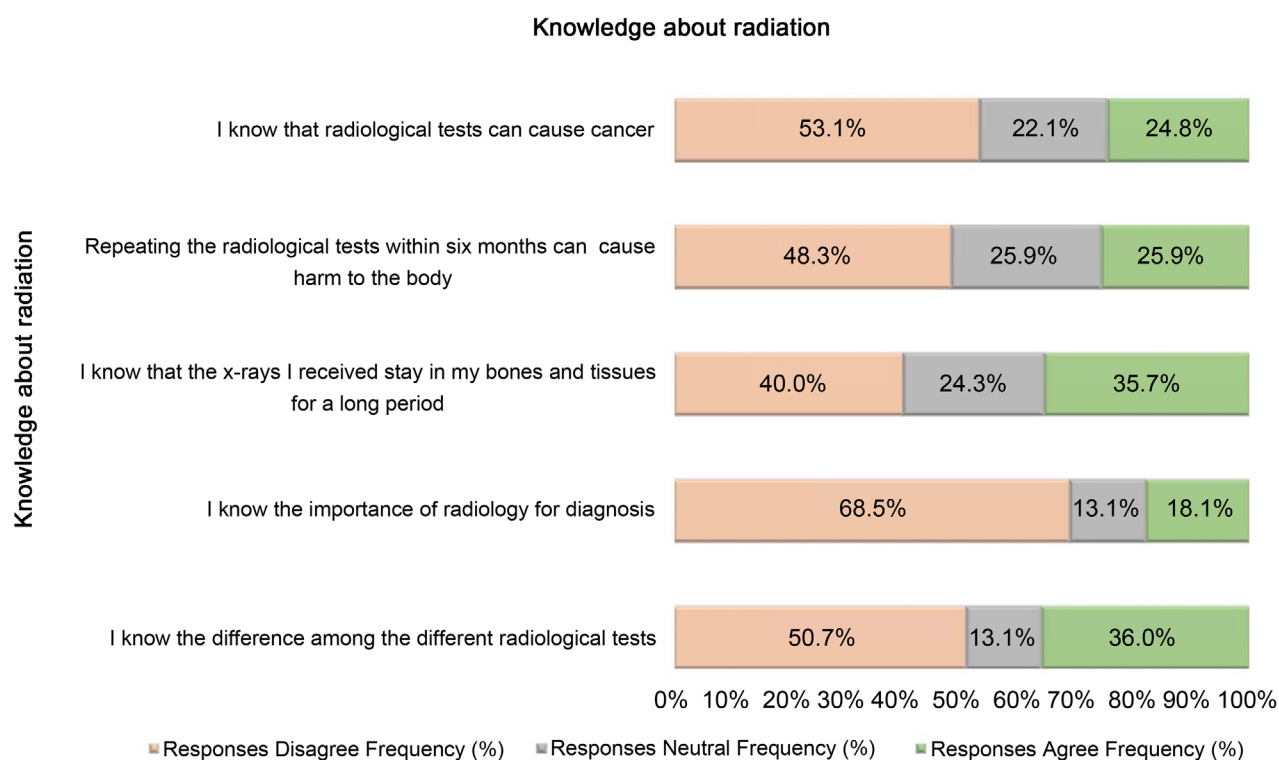


Figure 1. Attitude towards radiation.

Table 3. Knowledge toward radiation.

Items	Responses		
	Disagree Frequency (%)	Neutral Frequency (%)	Agree Frequency (%)
I know that radiological tests can cause cancer	199 (53.1)	83 (22.1)	93 (24.8)
Repeating the radiological tests within six months can cause harm to the body	181 (48.3)	97 (25.9)	97 (25.9)
I know that the x-rays I received stay in my bones and tissues for a long period	150 (40.0)	91 (24.3)	134 (35.7)
I know the importance of radiology for diagnosis	257 (68.5)	49 (13.1)	68 (18.1)
I know the difference among the different radiological tests	190 (50.7)	49 (13.1)	135 (36.0)

**Figure 2.** Knowledge towards radiation.

pondents do not know the importance of Radiology for diagnosis and only 18% of them are fully aware of the importance of Radiology in the identification of diseases.

About half of the respondents (50.7%) do not know the difference among the various radiological tests but 36% or one-third of them are able to distinguish each radiological test.

4. Discussion

The use of radiation has become an essential diagnostic and therapeutic tool in modern medical practice. However, it poses some potential health risks. This in-

stitution-based cross-sectional study was designed to assess the knowledge and attitude of patients toward Ionizing Radiation (IR) and the risks associated with repeated exposure to radiation due to the misuse or exposure to high doses. According to the findings from this survey, radiation knowledge awareness is generally inadequate in patients.

As with similar studies [9] [10] [11] [12] [13], the response rate was high as respondents willingly participated. This suggests the readiness of patients to learn more about radiation use and precautions needed to be taken.

Most of the patients who participated were Saudi Nationals who belong to the teenage or young adult group (18 - 28 years old) in the Secondary and Tertiary educational levels. The disparity may be due to the fact that other Nationals do not have access to free healthcare and wouldn't attend a government-based healthcare facility. Also, the demographic data showed that the percentage of respondents in terms of employment status, gender and marital status was equal as to the risk of exposure to radiations.

4.1. Attitude toward Radiation

Our survey revealed that over half of the patients felt that radiological tests pose no hazards or side effects. As a result, only about a third worry during radiological test procedures and about a fifth of the respondents would tolerate the disease rather than have the radiological tests. This may be due to the lack of orientation and information about the diagnostic procedure that will be performed. This clearly depicts the poor awareness level of the study population.

However, almost half of the patients felt radiological tests were still necessary regardless of the clinical diagnosis made. This could be due to the fact that healthcare needs are not on a fee-for-service basis for Saudi nationals and patients wouldn't mind having all prescribed tests including radiological.

About a third of the participants in our study affirmed they become worried when the Radiologists leave the room during the procedures. It is imperative to give thorough education to patients and explain to them that the reason the technologist leaves the room during the exposure is that the technologist would be exposed many times a day. Also, the instructions given by the Radiologist make many of the patients anxious.

4.2. Knowledge about the Radiation

It is somewhat alarming that majority of the patients in the study population are not fully aware of the risks associated with radiation. Also, it was revealed that over half of the respondents did not know that radiological tests can cause cancer as compared to the quarter that believes they can. This still bothers on the poor awareness level of the study population. Berrington de Gonzalez in his study estimated the risk of cancer due to diagnostic x-rays in the UK and the USA as 500 and 5700 deaths per year, respectively [14]. This is even more important for children as their tissues are more radiosensitive and they have longer

lifespans [15].

In reply to questions asking if repeating the radiological tests within six months is harmful to the body, almost half (48%) of the patients disagreed while only a little of a quarter (25.9) agreed that it can be harmful. This suggests that if patients are properly oriented about the risks or dangers associated with radiation such as the incidence of cancer, they will avoid undergoing repeated such tests. Also, about 40% of those surveyed disagree that radiation stays in their bones and tissues for longer periods while only 36% of them are aware of this fact.

The most staggering finding of this study is that a large number (69%) compared to only 18% of the respondents do not know the importance of Radiology for diagnosis, which reflects on the lack of patient education in the clinics on the part of the physicians about the risks associated with radiation. However, over one-half (51%) as against 36% of the respondents can distinguish the differences among the various radiological tests, but not the risks associated with these tests.

The mass education of the public about the benefits and hazards of radiological testing in the treatment of diseases might bring more reassurance to patients and assist them in making appropriate decisions when needed. The support and proper briefing from health care providers (physicians, technicians and radiographers) prior to any radiological test influence the patients' judgment and decision toward the diagnostic imaging. This in turn signifies the level of awareness and safety practices in the hospital about the use of radiation and even the misuse or overuse of radiation that could lead to the incidence of cancer.

4.3. Limitations of the Study

Even with the achievement of the study objective, a general assumption cannot be made until a larger representation of patients in Saudi Arabia is surveyed. Also, because the sample population is from a public healthcare institution, this may not take into account the attitude and knowledge of non-nationals who attend private health facilities. However, this preliminary study is one of its kinds in the region. Therefore, a follow-up study is warranted to reveal the current situation.

5. Conclusions

Knowledge of radiation/radiological tests is poor among patients. Awareness of the benefits and risks associated with radiation should be thoroughly explained to patients who require these tests in form of pep talks in the waiting areas. Continuous education programmes should be held for personnel.

In order to achieve radiation protection in diagnosis and treatment, health personnel must ensure the effective dose, which is not harmful to the tissues and organs, is administered.

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Appendix 1: Questionnaire

Questionnaire

Study Title: Knowledge and attitude toward ionization radiation among patients attending the MDI department at King Khalid Hospital, Najran

SECTION A: Socio-demographic information

A1. What is your Gender?

Female Male

A2. How old are you? _____

A3. What is your Nationality? _____

A4. What is your marital status?

Single Married

A5. Are you employed?

Yes No

A6. What is your education level?

- Elementary
 Primary
 Secondary
 Tertiary
 Never been to School

SECTION B: Attitude toward Radiation

	Strongly disagree	disagree	Neutral	agree	Strongly agree
B1. I worry a lot during radiological tests procedure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B2. I would not do the radiological tests if I can tolerate the disease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B3. I'm pleased with the diagnosis without needing further investigation through radiological tests.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B4. I feel that radiological tests cause hazards and side effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B5. Radiologists not staying in the same room makes me feel worried about the procedures.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B6. The instructions given by the radiologist makes me feel anxious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION C: Knowledge about Radiation

	Strongly disagree	disagree	Neutral	Agree	Strongly agree
C1. I know that radiological tests can cause cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C2. Repeating the radiological tests within six months can cause harm to the body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C3. I know that the rays I received stays in my bones and tissues for long period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C4. I know the importance of radiology for diagnosis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C5- I know the difference between different radiological tests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>