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An Evaluation for a Population in the Middle East for General Awareness of the Benefits and Hazards of Different Types of Radiation

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Authors' contributions

This work was carried out in collaboration between all authors. Author BZS designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors EMB and BZS managed the literature searches, analyses of the study performed the spectroscopy analysis and author JAK managed the experimental process and author SEM identified the species of plant. All authors read and approved the final manuscript.

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ABSTRACT

Many people lack awareness and good knowledge about radiation and its uses in medicine as it has been figured out that significant segments of the public society have a wrong idea and abnormal fear from unwarranted irradiation. For these reasons, a population in the Middle East was surveyed by means of a short questionnaire that was designed to assess the level of general knowledge of radiation and focus on the most important reasons behind their fear from dealing with radiation in order to improve their point of view about medical diagnostic and therapeutic radiology alike. The questionnaire is built upon the foundations and rules of scientific court as it was divided into two essential specialized classifications to describe different criteria, apart from other personal

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questions, and survey the objectives of the questionnaire to a specific sample. This questionnaire was distributed among native Arabic-speaking people only in the Arab world at the age of 18 years old at least. Finally, the sample was collected randomly as the percentage of females was 74% while the percentage of males was about 26% and then applied the appropriate statistical analyses to compare the results.

The findings of the study showed that there is a variation in the concept of radiation and its effects in the population that was surveyed. It was mostly 80% with the conviction that the concept of radiation is related directly to the medical diagnosis only. As for the radiation risks, 70% of them thought that radiation damages diverse depending on the type of radiation and the nature of which was not anticipated at the beginning of the study. On the other hand, the results of the evaluation and the study of how knowledge of the types and uses of radiation in medicine showed that 85% has good knowledge in the following areas: X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound (US), while 15% of them only has a good knowledge in the following areas: Fluoroscopy and Angiography.

Despite these results, 80% of people are reluctant to allow their families to study or work in the field of radiology as most of them fear from the exposure to radiation or handling with it in order to avoid any future genetic mutations to their children themselves or other diseases including cancer.

In conclusion, the outcome of this survey underscores the need for awareness and knowledge in most areas of radiation sciences and its applications as well as making them aware of the consequences. To achieve this, there must be some training and educational workshops to the public in order to make them aware of the various areas of radiology, uses, and methods of prevention; in addition to relentless visits to the centers & institutions specialized in the areas of radiation sciences.

Keywords: Radiation awareness; radiation knowledge; effects; ionizing radiation.

1. INTRODUCTION

The Sun is the natural source of radiation and energy that travel through space to reach earth, and these are classified into radiation, which in turn caused the damage, in particular to living tissue. The ionizing radiation is dangerous to high levels of energy. Therefore, we must be cautious and try to control the amount of exposure to radiation. Humans cannot sense the presence of radiation, but we can detect and measure exposure by monitoring tools easily [1].

Humans receive both external exposure from radioactive material in the environment and cosmic radiation from the outer space where the normal dose throughout the world of human is about 2.4 mSv in a year [2]. The normal background exposure in Europe ranges from less than 2mSv per annum in the United Kingdom to more than 7mSv a year in Finland [3].

On the other hand, the radon is the biggest natural background radiation source present in the atmosphere, and is a radioactive gas that emanates from the ground. The concentrations have been found 500 times higher than the world average in buildings in Scandinavia, United States, Iran and the Czech Republic [4]. This gas is classified as a cause of lung cancer beside of smoking in the United States, where it is counting about 15,000 to 22,000 deaths annually [5].

Many people have no knowledge or awareness about natural radiation or how to use it medically. Those people believe that what affects their health and upset them is radiation used in medical terms only and being exposed to radiological tests. However, they are also exposed to the natural environment on daily basis. Therefore, many people have abnormal fear of unwarranted (radio phobia) such as Japanese living the radio-phobia after Fukushima.

Many scientists and investigators studied some statistical cases that are related to understanding and perception of the concept of radiation. A study of 160 cases of cancer was made to assess their awareness and understanding of diagnostic and therapeutic radiology. Results showed that approximately 92% of them have good knowledge in relation to diagnostic radiology, and those patients had more information on radiotherapy in comparison to healthy ones [6].

A questionnaire in a true/false mode was designed; where the study was conducted on 500 patients to evaluate the patients' knowledge about CT, MRI, US [7]. The study found out that about 50% of them do not have sufficient knowledge about the examination applicable to them, while 57.9% out of them, undergoing MRI, are aware of this. In fact, 52.1% of the patients knew they had turned to CT and about half of them 45.5% knew they turned to US. The study showed that there is a great ignorance of people about radioactive medical tests provided to them, and they have no ability to distinguish between different areas of radiology.

Similarly, it has been assessing the knowledge of physicians about allowed radiation doses and their awareness of it. The doctors who have been selected randomly from various disciplines were requested to answer the special questionnaire devised for this purpose [8]. The survey assessed the awareness among the physician to radiation doses and risks arising from them. As a result, the study showed that there is an urgent need to educate concerned doctors about the ionizing radiation, which is directly related to medical imaging, and provide them with education and intensive courses to increase their understanding and awareness about the dangers of ionizing radiation and methods of prevention. The difference between our study and the previous one is to address the awareness of the medical and non-medical people in terms of radiology areas.

In order to study the extent of awareness of medical students and interns about ionizing radiation and the accompanying exposure due to working in the areas of diagnostic radiology, an assessment has been made to improve medical education [9]. The result was surprising, as the 25% respondents were wrong in their answers as they believed that ultrasound and magnetic resonance imaging are ionizing radiation emitters. The study showed that there is a distinct lack of awareness about ionizing radiation generated from diagnostic medical devices among senior medical students and interns that lead us to the conclusion that medical personnel must undergo intensive education and awareness.

Based on the above, the aim of our study is to assess the awareness and knowledge of the public regarding radiation (diagnosis and treatment); through conducting a statistical study that includes most social classes of workers and non-workers in the medical field, and then comparing the study on gender and other factors based on the questionnaire.

Other objectives of this study are:

1. Clarifying the most common reasons that would make people feel afraid of radiation.
2. Assessing people's opinions and ideas about radiology and its affiliates and their consent to deal with or not.
3. Assessing the awareness and knowledge of medical specialists and other people in relation to the different modalities of radiology.
4. Assessing the public awareness off male (non-medical/medical) specialists with regard to mammography.

Based on this study and its results, the full report will be applied to the Ministry of health and King Abdulaziz University to support and develop awareness campaigns in various facilities such as shopping malls, schools, hospitals and others.

2. METHODOLOGY

In order to achieve the objectives of the study, the descriptive analytical method was followed, which is defined as the way in dealing with events and phenomena is available for study and measurement as it is without human intervention in the process and the researcher can interact with them, describe and analyze. The illustrative analytical method tries to compare, interpret and evaluate, hoping to reach meaningful generalizations and increasing the stock of knowledge on the captioned subject.

In this study, the use of two sources of information was applied. First, the secondary sources including books, international references related to journals, articles, reports and previous research on the subject of the study, and any other references that could enrich the systematic study. The reliance on incidental sources would help to identify the foundations of sound scientific methods and writing studies, as well as taking the general perception about the latest developments that have taken place and occurred in the study area. Second, the primary sources that include analytical aspects of the subject have been used to collect original data by building a proper questionnaire as an essential tool for research and was specially designed for this purpose, and then downloaded and analyzed using the statistical software available, with a

view to the semantics of value indicators supporting the topic of study.

The study population was divided into two main components: the medical workers, and non-medical workers for both genders. Then, a special questionnaire was prepared as follows:

1. Creating a primary questionnaire including all data and information that need to be used.
2. Testing the appropriateness of the questionnaire to start the data collection.
3. Viewing the questionnaire to a group of arbitrators that, in turn, provide advice, guidance, and modification and enable us to make the appropriate changes.
4. Distributing about 5029 questionnaires and collecting them after being filled.

- The questionnaire of the study consists of two main components:

I. Personal data: Gender, Education, Occupation, Area of study/work, which is significant when analyzing the answers wanted.
II. The eight questions covering the following aspects:

1. What is the concept of radiation?
2. Identify the extent of public knowledge regarding radiology devices used in diagnostic or therapeutic.
3. The Damage resulting from radiation exposure has the same impact or not?
4. What is the relationship between diagnostic radiology and infertility or cancer?
5. The general conviction of the radiology, and no objection to allow relatives or acquaintances to study or work in this field.
6. The level of rejection or approval of working in the areas of radiology.
7. Is there any relationship between pregnancy and diagnostic radiology?
8. What does fear of radiation mean to you?

The authenticated questionnaire by the arbitrators is the one designed to measure the criteria being presented in the questionnaire data and questions. It was the group of arbitrators (four staff) in King Abdulaziz University and a member of King Abdulaziz University Hospital. It has been responsive to the views of arbitrators and the work required some deletions, modifications, and additions in the proposals submitted. Thus, the questionnaire came out in its semi final format and applied to the sample of 50 exploratory questionnaires. However, some adjustments have been made, and the final questionnaire was produced and then distributed to the community to complete the study.

3. RESULTS AND DISCUSSION

The percentage of females and males of the total studied cases was 74% and 26% for all medical and non-medical fields as shown in Fig. 1. It was clearly found that the non-medical females have a higher percentage 56% than the others do; while the medical males have a lower percentage 6%.

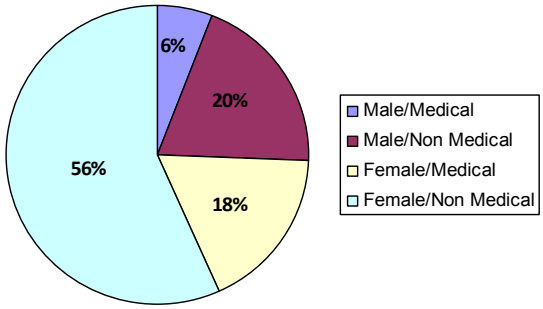


Fig. 1. The percentage of medical and non medical cases

In general, there are many concepts of radiation as it includes the concept of diagnosis, treatment and the risks of radiation exposure. Therefore, the concept was studied and evaluated through this question: what does the concept of radiation mean from your point of view? Moreover, is it related to the concept of diagnosis, treatment or risks arising from it?

The respondent had a freedom of choice for more than one answer to reflect the correct and careful thoughts. As a result, most of them believed that the radiation is related to medical diagnosis as shown in Fig. 2. It is shown that the concept of radiation as a medical diagnosis was 85% and 87% for both males and females of non-medical fields, respectively, while the proportion of radiation believed it is associated with treatment and severity of convergent rate of about 4 – 16% only. It was found that the highest proportion (~30%) goes to male Medical people in whom they believe that radiation concept is related to risk and treatment. In fact, it was obviously noticed that people and society do lack

the awareness about the concept of radiation as most of them are confined in their perception of radiation medical diagnosis.

Due to the threats posed by radiation, hard work in that area should be obtained seriously, and all the necessary precautions should be taken. In fact, it has been assessed that types of radiology, being dealt with, do not have the same impact on people. The public were given the following question to identify and assess the danger: Do you think that there is a similarity in radiation dangers and impacts regardless of its source and the device uses?

As per Fig. 3, it is shown that the majority of females (medical ~85% and non-medical ~74%) think that there are differences between the radiation risk and its impact on humans as well as non-medical male ~61% who do so. The erotic surprise, that a significant proportion of males (medical ~68%) believes that the radiation has the same risks and biological ethers. Based on the given results, it is recommended that further education and special courses for male's professional in the medical field are needed due to the lack of awareness in respect to the risks of radiation.

Areas of radiology are widespread and divided into several categories such as: X-ray imaging (general conventional X-ray, angiography, fluoroscopy and CT), magnetic resonance imaging (MRI), ultrasound (US), nuclear medicine imaging techniques and radiotherapy.

Many people or their relatives do undergo some diagnostic procedures using one of the above-mentioned devices and technologies. To assess the awareness and understanding of these people to radiology departments and also understanding of the use of those techniques in medicine, whether for diagnosis or treatment, there was a built in question in the given questionnaire asking them to choose more than one answer if necessary such as: Have you heard about one of the following devices or techniques before?

It is shown in Fig. 4a that awareness and understanding of people constitute a significant proportion in relation to X-ray, CT, US and MRI of all levels of society ranging between 73% (non-medical male in US) to 96% (medical male in CT).

In the past few years, there have been many awareness campaigns for breast cancer, and in each of these campaigns the importance of mammography and periodic inspection has been emphasized. However, it is still obvious that there is still a lack of knowledge among females in mammography and lack of knowledge about breast cancer in general as they represented 49%.

It is shown in Fig. 4a that the male and female of non-medical specialists do lack awareness and understandings regarding mammography as only 22% and 42% respectively have knowledge about this technology. On the other hand, we found that 70% of female and male medical specialists have a sufficient knowledge of this type of this diagnosis, which is not enough especially for specialized people in the medical field as they should be familiar with Mammography.

Accordingly, it is a good idea to provide awareness, education and useful courses to teach all segments of society this type of imaging technique to reduce the spread of breast cancer or to detect it on early stages in order to have the perfect opportunity to cure the cancer if the infection exists.

When we are discussing the less familiarity to the radiological modalities known for community, we are talking of course about angiography and fluoroscopy as shown in Fig. 4b.

Fluoroscopy was ranked last in terms of awareness and understanding of those modalities so that only female and male medical specialists, 28% and 45% respectively, know it while very few of non-medical people (male 7% and female 4%), know about this technique. Although a lot of people and cases that perform such diagnosis and checks using the angiography, a few people could recognize it. However, angiography is better known than fluoroscopy where about 13% and 9% of non-medical male and female respectively know angiography compared with the proportion for fluoroscopy.

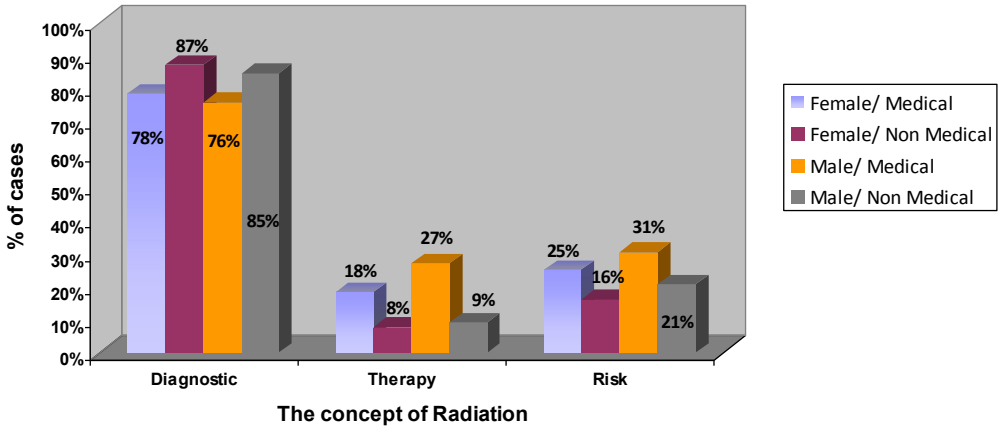


Fig. 2. The concept of radiation based on publics' opinion

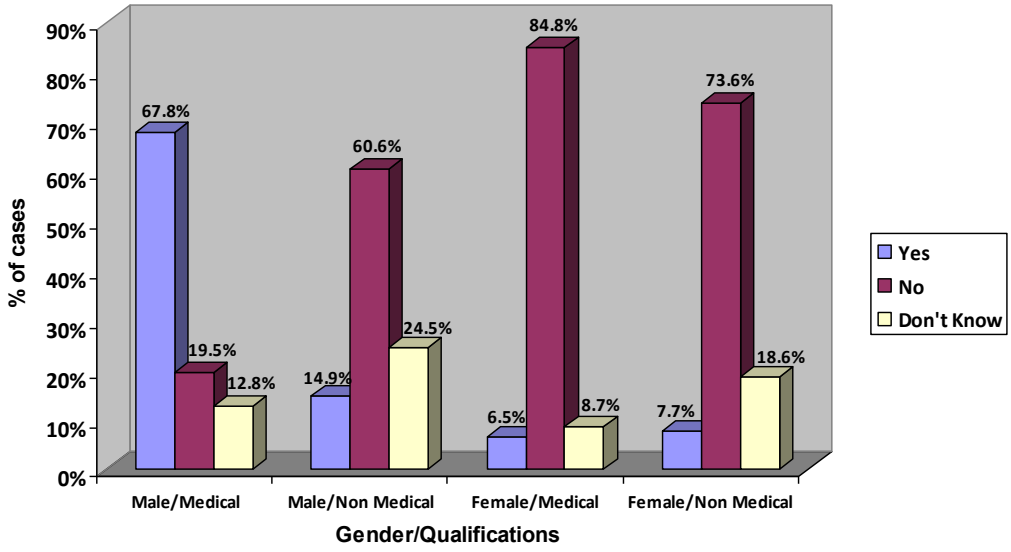


Fig. 3. Evaluating the similarity of radiation risk

All types of radiology are classified as the main source in the medical diagnosis of patients. They are also called 'The Eye of Medicine' through which professionals consider the human body with high accuracy and have the ability to assess the general state of the patient, making proper diagnosis and directing the treating physician for appropriate treatment. Certainly, any error or scanning steps lead to treatment failure and possibly increase the patient's state of health that would critically be worsening, which requires the society awareness of radiology fields.

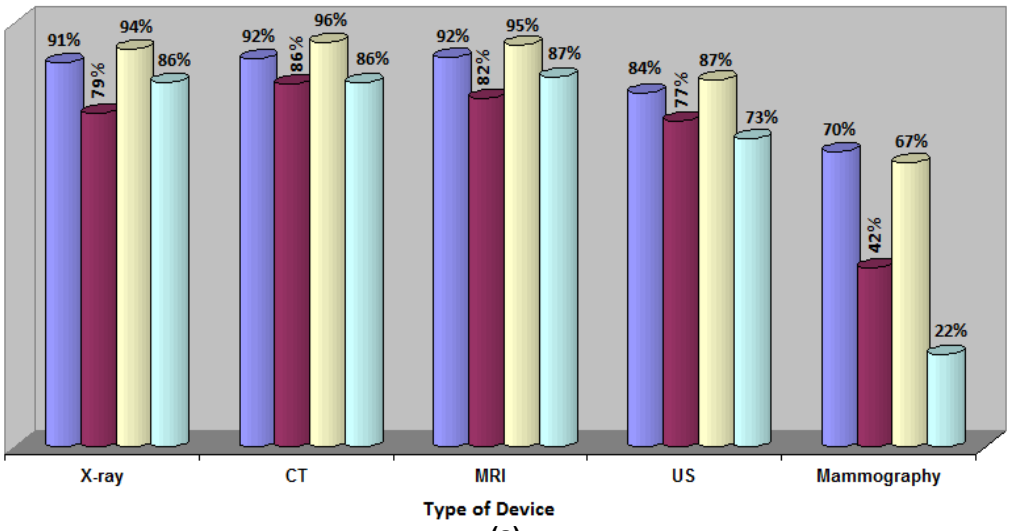
Despite the availability of awareness about the importance of diagnostic radiology reading, the idea of that rare specialist radiologists' was a local problem and has become a global problem. As a result, this would force many health sectors to attract overseas radiologists; perhaps some of them are not competent. It is necessary to have graduates in this field and qualify doctors to keep progressing and developing in the area of radiology.

In fact, the consent of people who are willing to work in the field of radiology if they are given an opportunity has been assessed based on the above lack of health centers for radiology in order to increase employee's qualification in the future. The public were asked the following question to identify and assess the command: Do

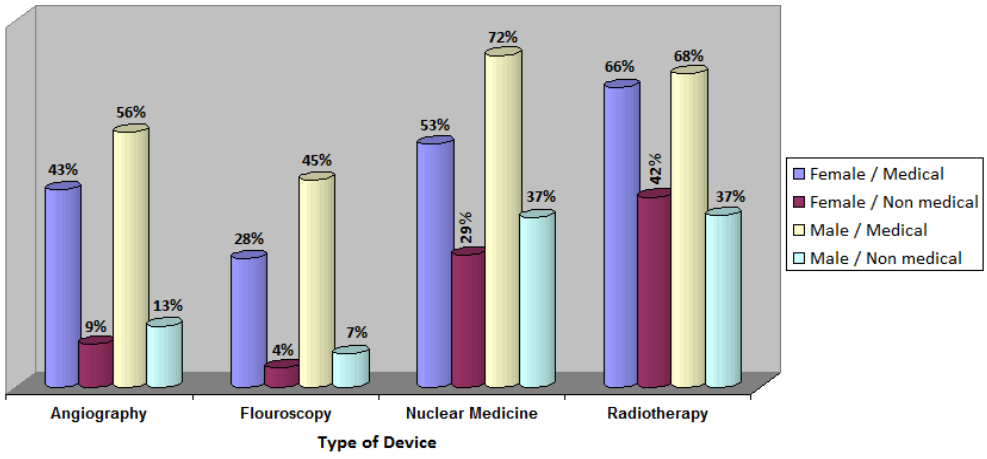
you agree to work in the field of radiology if you had the chance?

It is noticed in Fig. 5 that the medical professionals amounted to (~ 61%) do not mind working in the field of radiology. However, the rest of them (18% of male, 9% of female) have given some reasons such as a presence of other important disciplines. Others with 18% of males and 26% of females fear from the problems that radiology will cause. However, the minority of them gave a reason based on mixing with other genders and the percentage was (6% of males, 3% of females).

Likewise, it is seen from Fig. 6 that the non-medical professionals (~ 53%) do not mind working in the field of radiology while the rest of them had refused. They believed that there are serious risks arising from radiation exposure, so around 26% and 21% of female and male respectively almost refused to propose action in radiology based on that reason in which radiation is harmful. On the other hand, a few of them amounted to 11% and 10% of male and female, respectively, refused to work because of their belief that it is not the most important disciplines of specializations required in the daily life and of course these few portions are compared to people who have agreed. Similarly, a segment of respondents amounted to 21% and 26% of male and female, respectively, refused to work in the field based on religious or social considerations, traditions, customs, and being afraid of mixing up with other gender.



(a)



(b)

Fig. 4. Knowledge of radiology devices and department

The radiation damage to tissues and/or organs of the human body in a unit called Sievert (Sv) depends on the radiation dose, or absorbed dose measured in a unit called Gray (Gy). The type of damage, which is likely to result from the absorbed dose, depends on the type of radiation and the sensitivity of tissues or different organs. The public were asked the following question to identify and assess the factors that make them scared of radiation: In your point of view, what are the concerns that scare you from radiation exposure? (More than one answer might be chosen).

It is illustrated from Figs. 7 that 48% males fear infertility more than females who were only 29%. On the other hand, 47% of females fear the mutation more than males who were only 38%, whereby then on-medical field female represented 45% and 38% formal as seen in Fig. 8. These results can be interpreted due to the ability of female to become pregnant.

The result was surprising, as the medical staffs of both genders are scared of cancer more than the non-medical people, as it was about 50% to medical personnel while the rate in non-medical was about 35%. In fact, and although the result is surprising, but it was expected due to medical education of medical professionals and their awareness of the risks of radiation damage. However, it should not cause fear for them and make them concerned about cancer because there are a lot of precautions and protections in radiation fields to avoid cancer.

On the other hand, the answers in line with fear of Alopecia for both medical and non-medical people were ranging from (9% - 19%) as it is shown in Figs. 7 and 8. This indicates that some people realize that there is no radiation damage that may cause loss of hair after radiation diagnosis.

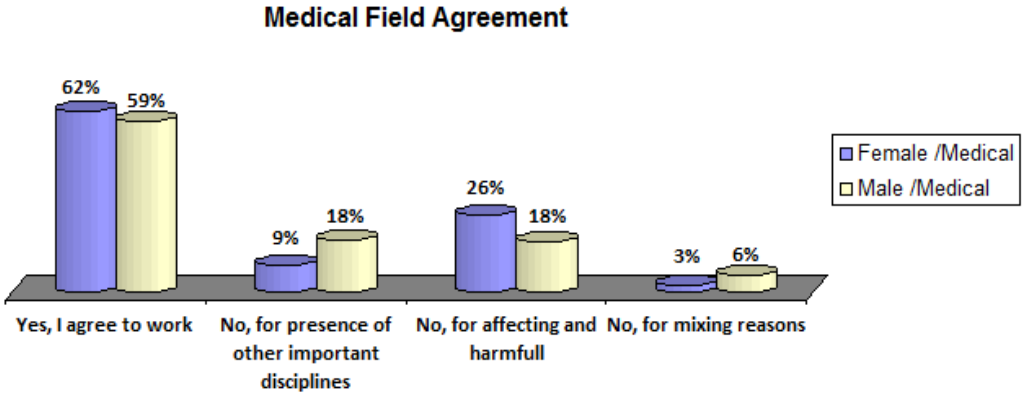


Fig. 5. Agreement of working in radiology fields for medical professional's people

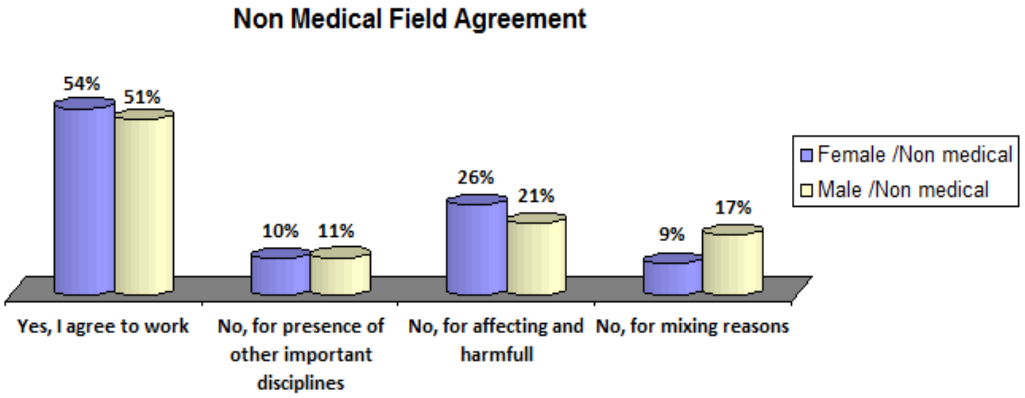


Fig. 6. Agreement of working in radiology fields for non medical people

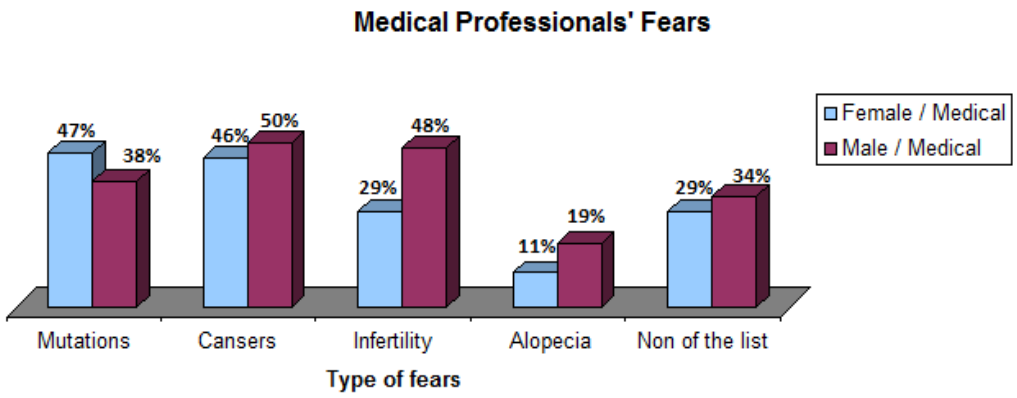


Fig. 7. Fear of radiation and factors influencing in medical professionals society

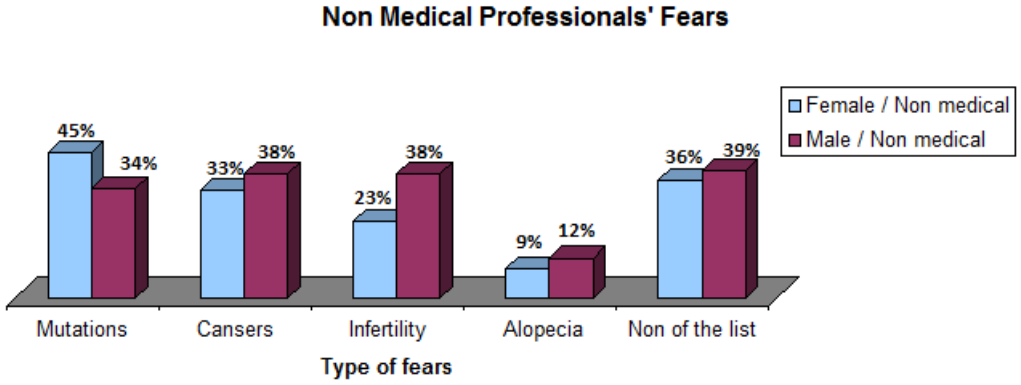


Fig. 8. Fear of radiation and factors influencing in non medical professionals society

4. CONCLUSION

The primary mission of the department of radiology at the King Abdulaziz University Hospital in Jeddah is to assist the medical staff in diagnosis and treatment. Results show that the Middle Eastern population believed that the concept of radiation is referred to diagnosis only and the minority of them is convinced that the radiation can be used for treatment too. This means that most segments of society need more education and awareness about the concept, purposes and uses of radiation.

The severity of radiation depends on a set of factors that include the type, quantity of energy and exposure time. Therefore, most of male medical professionals have no ideas about those facts and they thought that the radiation has the same effects and hazards regardless of its types or energies. However, they work in the medical field, but they lack the concept of radiation risk. This means that we must increase their awareness and understanding of dealing with radiation, and that harm is not equal for all devices used in the imaging or therapy.

This project evaluated the general awareness of radiation that might benefit the public. Not all radiological tests or diagnoses affect the body, for instance; Ultrasound (US) and magnetic resonance imaging (MRI) have no radiation, while X-ray has a simple radiation in most cases, but CT is most prevalent in the required medical examinations, where the concentration of radiation is relatively high, but poses no risk to health if used properly.

The study shows that most of the people have good knowledge about X-ray, CT, MRI, US, and mammography where it was expected before carrying out the study, while lack of knowledge

with respect to angiography and fluoroscopy was shown. This leads us to the conclusion that there is no such community knowledge for those tests or devices used with particularly for non-medical specialists. Accordingly, some mentoring should be done to increase awareness and knowledge of the people and others who lack the general knowledge about these devices and its uses.

The study found that most people agreed to work in radiology field especially that all disciplines are complex and need many qualified medical staffs. For example, engineers, physicists should be there for medical attention and maintenance of devices, while the technicians perform the required imaging. Next, radiologists analyze photographs, evaluate the situation, write reports and make the diagnosis. The physician receives recommendations from the radiologist on how to cure or what will be the other test required.

Obviously, all types of radiological sciences are independent and require more concentration, training and rehabilitation.

It was found that most of the medical professional people fear radiation and thought that radiations cause mutations, cancers and infertility. That is true, but with some limitations and considerations such as; type, energy and activity of radiation. On the other hand, this fear is unjustified, as there are many ways to protect ourselves from radiation and reduce its exposure, and then reduce any of those symptoms and damages.

5. LIMITATIONS

We made the study in an extremely short period of two months. Thus, the sample size was not very large and did not represent all population responses. The lack of credibility in few responses was a problem, which requires excluding them from the study sample. Also, there was a lack of support and help and lack in contributing to publish this study in some community.

6. RECOMMENDATIONS

In future, the period should be longer for larger data collection and replies. Moreover, excluding questions that could potentially have more than one answer is suggested to avoid lack of credibility. The awareness campaigns should be organized to give people more education about radiation in general.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World-nuclear.org.London: World Nuclear Association. Available:http://www.world-nuclear.org/info/Safety-and-Security/Radiation-and-Health/Radiation-and-Life
2. United Nations Scientific Committee on the Effects of Atomic Radiation. Sources and effects of ionizing radiation. New York: United Nations, USA; 2010.
3. Valeria G, Tore T, Marc De Cort, Peter Bossew. Status of the European Atlas of Natural Radiation. National Radiological Protection Board (U.K.) for the Commission of the European Communities; 1992; Ispra, Italy. Ispra, Italy: Institute for Environment and Sustainability; 1992.
4. United Nations Scientific Committee on the Effects of Atomic Radiation. Annex E: Sources-to-effects assessment for radon in homes and workplaces; effects of ionizing radiation II. New York: United Nations, USA; 2012.
5. National Cancer Institute (USA). Radon and Cancer: Questions and Answers. Available:http://www.cancer.gov/cancertopics/factsheet/Risk/radon
6. Barrie R. Cassileth, Danielle Volckmar, Robert L. Goodman. The effect of experience on radiation therapy patients' desire for information. J Rad. Oncol. Biol. Phys. 1980;6(4):493–496.
7. Rosemary A. Chesson, Graham A. McKenzie, Sandra A. Mathers. What do patients know about ultrasound, CT and MRI? Clin Radiol. 2002;57(6):477-82.
8. Soye JA, Paterson A. A survey of awareness of radiation dose among health professionals in Northern Ireland; Br. J. Radio. 2008;81(969):725-729.

9. Zhou GZ, Wong DD, Nguyen LK, Mendelson RM. Student and intern awareness of ionizing radiation exposure from common diagnostic imaging procedures. J. Med. Imag. Radia. Onco. 2010;54(1):17-23.

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