The Impact of Radiation on Workers in the Health Sector

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Abstracts

The study aimed to know the extent of the impact of radiation on workers in the health sector, and the extent of the impact of radiation on the technical and medical staff and other employees. A questionnaire was conducted via a questionnaire via the Google Drive program on most health practitioners and male and female health professionals working in health facilities, whether health centers or hospitals, 950 questionnaires were distributed, and responses were obtained from 940 people from the cities of Mecca and eastern region, Ras Tanura and Al-Baha.

Keywords: the impact, radiation, workers, health sector.

1. Introduction

Radiology is a branch of medicine that uses medical imaging techniques with the aim of establishing the appropriate diagnosis and sometimes treatment. At the beginning of the emergence of this science, it was limited to the use of devices that emit X-rays in imaging techniques. Nowadays, this science has expanded to include other devices such as ultrasound, axial tomography, and magnetic resonance imaging (1). Radiology began with the discovery of X-rays by German scientist Wilhelm Röntgen in 1895, and Röntgen won the Nobel Prize in Physics in 1905. In the first decades of the discovery of radiology, you had not realized the dangers of radiation exposure to technicians and doctors, as many of the first people who worked with radiology had various cancers of the skin, bone, and thyroid gland, in addition to cataracts and leukemia. While at the present time, all radiologists are monitored continuously and monthly. Radiology has many applications in various specialties, especially in the field of diagnostic medicine, in which doctors use different types of radiation, as its properties can be used to supplement the necessary examinations to make a complete diagnosis of the patient's condition. The radiologist works on diagnostic or therapeutic radiology devices, through which

they contribute to the diagnosis of various diseases, and are also used in the treatment of some types, such as tumors and cancers. The radiologist works on the following equipment: X-ray machine, computed tomography, M.R.I., Cobalt 60 device, Gamma Camera, and Ultrasound device. The aforementioned diagnostic radiology has many uses, including X-ray imaging of an injured body is used to see if there are scratches, fractures, or twists in the bones as a result of the injury. Therefore, this type of imaging is very useful for doctors in determining the exact location and treatment of the injury. Ultrasound imaging also helps in knowing the growth of the fetus. CT scans are used to determine if there is a cerebral hemorrhage or stroke. Radiation has harmful effects, including swelling of the skin and symptoms of the stomach and intestines. These symptoms may be direct and occur to the patient, and there are indirect symptoms, meaning that they do not appear in the person exposed to them, but for generations that come from his loins later, perhaps his grandchildren or even his great-grandchildren and after them, such as genetic mutations, a congenital defect in the fetus, deformities, and sometimes causes the death of the fetus-when the reproductive cells are exposed to radiation - such as what happened in Japan. These symptoms and diseases will not occur as soon as a person is exposed to radiation once or was exposed to it for long periods of time, but they are general harms, but one must be careful not to overexposure to them, especially cells Sensitive skin such as the eyes and throat, as well as the genitals, and the pregnant woman should inform the doctor before writing x-rays for her, because there is a possibility that the fetus will be affected, especially during the first months. In order to protect from radiation, each radiology department has special clothes made of lead to avoid exposure to organs that are not desirable to be photographed, and the accompanying person must also wear them in the event that he requests that he hold a person who takes rays for him, as well as the doors, walls, ceilings, and perhaps the floor coated with a material that prevents radiation from leaking outside the department, and stand far away About two meters away from the source is enough, and do not stand in front of the source. (2). The physical effects are seen in the irradiated person, the radiation injuries that lead to ill health in the irradiated individual himself, the major physical effects include the induction of cancer, leukemia, and cataracts, and these are not transmitted to future generations, while the genetic effects are not seen in the irradiated person but are transmitted to future generations, the physical mutation Mutations do not result in subsequent generations, the effects of radiation on cells, affecting the nucleus, cytoplasm, or the entire cell, damage to the nucleus affects the nucleus in the chromosomes that it contains DNA, and leads to cell division, mitotic activity, where cells divide with a high frequency or suffer from many divisions, which are more sensitive to radiation, the cells that are more sensitive to radiation are small lymphocytes, cells that are resistant to radiation, bone cells, muscles, nerves, As for the effects of radiation on tissue and organs, radiation affects sensitive cells such as lymphatic tissue, bone marrow, testicles and intestines. As for the radiation-resistant tissues, they are the salivary glands, kidneys, and liver. Sensitive organs that are exposed during dental radiography in the head and neck area are the skin, thyroid glands, and lenses. The two eyes and bone marrow (3). Recently, workers are exposed to several hazards in the workplace. These hazards can affect several systems in the human body (4). In this respect, many hazards are affecting the blood components of the workers (5), and one of these hazards is ionizing radiation. In fact, an X-ray is a form of ionizing radiation (6) There are two recent studies conducted by the International Atomic Energy Agency that showed that workers and doctors are exposed to the highest rate of significant radiation risks of

changes in the eye lenses as a result of staying near X-rays and within the field of interventional radiology for several hours every day, as it was more prevalent among workers in the field of interventional radiology, and diseases heart, and nurses working in cardiac catheterization laboratories, compared to the control group, through the implemented preventive measures, and the personal protective measures followed (7). There is a study entitled (the effects of radiation on hematological parameters of the technicians in x-ray department of different hospitals in Benghazi-Libya) Based on results, the exposure to x-ray radiation causes adverse effects on hematologic parameters of the workers in radiology departments. In this context, there was a significant correlation between exposure to X-ray and its effects on WBC, MCV and MCHC. In addition, there was a decrease in NEU, HCT, PLT and HCT Counts of exposed workers are also increasing in MCHC and LYM. Moreover, lack of personal protection (8).

2. Material and Methods:

This study was started in (the cities of Mecca and eastern region, Ras Tanura and Al-Baha in Saudi Arabia), begin writing the research and then recording the questionnaire, and the study ended with data collection in July 2024. The researcher used the descriptive analytical approach that uses a quantitative or qualitative description of the social phenomenon (the impact of radiation on workers in the health sector). This kind of study is characterized by analysis, reason, objectivity, and reality, as it is concerned with individuals and societies, as it studies the variables and their effects on the health of the individual, society(9), and consumer, the spread of diseases and their relationship to demographic variables such as age, gender, nationality, and marital status. Status, occupation, and use the Excel 2010 Office suite histogram to arrange the results using frequency tables Percentages (10).

3. Results and Discussion:

A questionnaire is a remarkable and helpful tool for collecting a huge amount of data, however, researchers were not able to personally interview participants on the online survey, due to social distancing regulations at the time to prevent infection between participants and researchers. the only answered the questionnaire electronically, the questionnaire consists of closed questions of seventeen questions. The ages of the participants who answered the questionnaire were as follows:20-30 years, their percentage was 4.3%, while those from 31-40 were 52.2%, and 41-50 their percentage was 43.5%, and those between the ages of 51-60 years were 0%, while the participants were males 95.7%, and females 4.3%, while as for the nationalities of the participants, they were all Saudis. As for the professions of the participants in the questionnaire, the percentage of nursing was 47.6%, the percentage of the technical secretary profession was 23.8%, the radiology profession was 23.8%, and the pharmacy profession was only 4.8%. When moving to the responses of the participants, we find that the first question was about: Do you conduct the required radiological examinations for patients in the light of the work procedures manual in the health facility? The participants answered yes 100%. As for the second question, do you prepare the patient appropriately (introduce him yourself and take his data)? The answer was also 100% yes. As for the third question, do you help the patient before and during the x-

ray? 95.7% yes and 4.3% no, As for the fourth question, do you know the best way to deal with all types of radiation according to the safety procedures followed in the health facility? Of those who answered yes, 91.3% and 8.7% answered no, the fifth question: Do you prepare radiographic films after completing the imaging work and compare them after acidification to estimate their validity in terms of imaging and acidification agents? 87% said yes and 13% said no, while the sixth question was about do you show the healthy radiological films after acidification to the doctor in charge to read them and write the final report? 91.3% said yes and 8.7% said no. As for the seventh question, do you report on a continuous basis about any malfunctioning x-ray machine you have in the department? 95.7% answered yes and 4.3% answered no. The eighth question is about Are you committed to the periodic maintenance schedule for all radiology in the department? 82.6% answered yes, while 17.4% said no. The ninth question: Have you noticed any leakage of any X-ray equipment you have in the department? If the answer is yes? Answer the following question? 21.7% answered yes, while 78.3% said no. Question 10: Did you inform your line manager formally or verbally about this leakage of the device in the department? 40% answered yes, while 60% answered no. The eleventh question is: Do other departments know about this X-ray leakage in the department in order to take precautions for the safety of other employees and visitors in the health facility? The answer is equal to 50% yes and 50% no. The twelfth question is, is there a procedure followed in such cases? 95.2% answered yes and 4.8% answered. As for the thirteenth question, do you take your radiology card for examination periodically? 95.7% answered yes and 4.3% answered no. The fourteenth question: Did you have symptoms of illness as a result of your exposure to radiation in the health facility? 17.4% of the participants answered yes, while 82.6% did not. The fifteenth question is about Do you know the global safety goals (patient safety)? 87% yes and 13% said no. The sixteenth question is whether the health facility management applies hypotheses (disasters and crises) on how to act in the event of radiation leakage (devices) in the health facility (for employees in general)? In the health facility? If the answer is yes? Answer the following question? 68.2% answered yes, while 31.8% said no. Through the study, it was found that the employees participating in the health facility had a rate of 91.3% of their work performance, as evidenced by their lack of exposure to radiation at a rate of 17.4% because the radiation measurement card for each employee was empty at a rate of 95.7% of it, and that they maintain periodic maintenance of radiology devices at a high rate of 82.6%. Periodic, and follow-up of radiation safety procedures with patients with a high rate of 95.7%, and their keenness (radiology department) made them inform all employees (other departments) in the facility of the presence of radiation leakage of 91.3%, and that the facility is keen and committed to making hypotheses (crises and disasters) for the radiology department periodically and repeatedly by 68.2%. (table.no.1) (Figure no.1)

Table.no.1: percentage of males and females

Males	Females
95.7%	4.3%

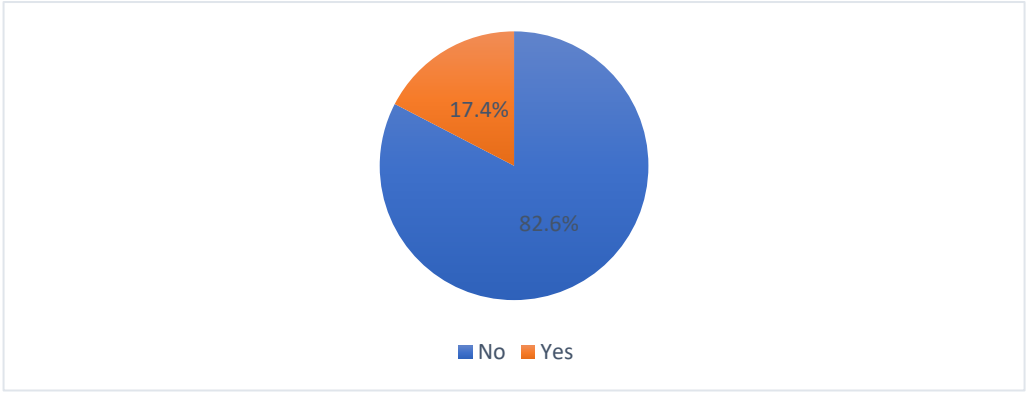

Figure no:1 The percentage of exposure by workers to radiation

4. Conclusion:

Through this study, the following was concluded: the extent of high training that the radiology staff received through their adherence to work guidelines and standards with extreme accuracy of 91.3%, their elegant treatment with patients by helping them to do x-rays for them by 100%, the percentage of their exposure to radiation or the emergence of pathological conditions on them by 17.4%.

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WORKS CITED

Schwartz, Ian (2010). Monico, Edward; "Communication and documentation of initial and final x-ray reports." Journal of Healthcare Risk Management. c. 30 p.m. 1:23 - 25. doi: 10.1002/jhrm.20039. ISSN 1074-4797.

Ibrahim Shanti. 2009 (Accessed on 20/2/2022).

Mushalh, Ammar Mahmoud, Abdel-Haq Mahmoud, Al-Haffar, Muhammad Iyad Al-Sharabi, Abeer: “Radiologic Diagnosis”, Damascus University. Syrian Arab Republic. 2016-2017 AD.

WHO, Occupational Health A manual for primary health care workers, 2001.

OSHA, 2012. Health Hazards in Construction Workbook. Available online at https://www.osha.gov/sites/default/files/2019- 03/health_hazards_workbook.pdf.

Clarke C and Dux A, chest x-rays for medical students. John wile and sons, 2011.

International atomic energy agency, Establishing Guidance Levels in X Ray Guided Medical Interventional Procedures: A Pilot Study, Safety Reports Series No. 59, IAEA, Vienna (2009)

Mohamed. Huda , Alqazzar. Hadeel, Lameen. Marwah, Denna. Isam and Younis. Mustafa Y. G. the effects of radiation on hematological parameters of the technicians in the x-ray

department of different hospitals in Benghazi-Libya, Department of Biochemistry-faculty of Medicine- University of Benghazi-Libya, World Journal of Pharmaceutical and Medical Research, www.wjpmr.com, wjpmr, 2021,7(5), 18-27.

Alserahy, Hassan Awad, et al (2008), The thinking and scientific research, Scientific Publishing Center, King Abdul-Aziz University in Jeddah, the first edition

Al Zoghbi, Muhammad and AlTalvah, Abas (2000), Statistical system understanding and analysis of statistical data, first edition, Jordon- Amman