

“Knowledge and Awareness of Artificial Intelligence and its Use in Radiology Among Radiology Workers in Southern Region Hospitals”

BY:

- 1 -Ali Omar Hassan Alshahri**
- 2-Ali Mohammed siddiq mujayri**
- 3 -Abdulgader muteeb faten Alanezi**
- 4 -Ali Saeed mohammed Alqahtani**
- 5 -Naji saidan musayfir alharthi**
- 6- Mater salman Alqahtani**

Abstract:

We would like to extend our sincere thanks to us beloved parents who were the source of our inspiration and strength, who gave us all their giving and their continuous moral, spiritual, emotional and financial support for us whatever we say and do we will not fulfill their full right so thank you until the pens dry and the newspapers are full.

Keywords: Artificial intelligent; AI medical imaging; AI inradiology; awareness; knowledge.

Background:

Artificial Intelligence (AI) is a general term that implies the use of a computer to model intelligent behavior with minimal human intervention, was officially born in 1956, The radiology community has played a leading role in propelling medicine into its digital age and now has the opportunity to become a leader in exploring medical applications of AI. The tens of millions of radiology reports and billions of images now archived in digital form exemplify the concept of “big data” and constitute the required substrate for AI research, one of the most promising areas of health innovation is the application of artificial intelligence (AI) in medical imaging Indeed. Theres antisyndicate that workers in radiology departments have basic knowledge of artificial intelligence. There is a need for more training to increase the applications of radiology workers in this field.

Aims:

The aim of this study is to measure the level knowledge and awareness so artificial intelligence (AI) and its use in among radiology staff. ethod:

This questionnaire-based cross-sectional study was conducted among thera diology staff in all southern regions of Saudi Arabia, an electronic questionnaire was distributed to gather information assessing knowledge and perceptions concernin g the radiology staff about AI.

Result:

In this study, we used a questionnaire that was distributed in different regions in the south of the Kingdom of Saudi Arabia and was filled out by 191 individuals working in the radiology department, 59% males and 41% females, and the educational qualification of most of them was a bachelor's degree (80%). This study found that 58% of the radiology team have a background in artificial intelligence. It was also found that most of the participants (71%) believe that the entry of artificial intelligence into the field of radiology is important and has great benefit, that the entry of artificial intelligence will enhance safety procedures and reduce radiation risks. It has been noticed that the majority of participants (86%) believe that the introduction of artificial intelligence will reduce the workload on radiology department among employees.

Chapter one Introduction

1.1 Introduction:

Artificial Intelligence (AI) is a general term that implies the use of a computer to model intelligent behavior with minimal human intervention, was officially born in 1956 (1). Medical practice is changing as more sophisticated machine learning and artificial intelligence (AI) techniques become available. When combined with the rapid advances in computer processing, these AI-based solutions have improved the accuracy and effectiveness of diagnosis and treatment in a variety of specializations (2).

Deep learning and other artificial intelligence (AI) approaches have made significant progress in image identification problems. Convolutional neural networks and variation auto encoders are just two of the methods used in medical image analysis (3). In order to improve patient outcomes at a reduced cost, adding value involves learning new things and extracting more and better information from imaging exams. Creating more effective work procedures and raising employee happiness are two examples of creating value for radiology personnel. This approach aims to identify a variety of scientific, cultural, educational, and ethical challenges that need to be addressed and to assist construct a framework for developing methods to explore the possibilities of AI in radiology, without getting into a discussion of AI technology per se. There are three key domains that dominate AI that automates a part of the workflow for radiologic imaging. Operational AI seeks to enhance the provision of healthcare by identifying critical parameters that

influence patient scheduling and other areas (4). These promising developments in image acquisition and reconstruction have been shown in imaging devices and the workflow for radiologic imaging. By identifying certain discoveries, acquiring quantitative measurements, or generating AI-driven reports, diagnostic AI seeks to support the interpretation of clinical pictures (5). The goal of predictive AI is to predict future events like the onset, course, and response to therapy of a disease (6). Applications of artificial intelligence (AI) in radiography have grown dramatically during the past ten years. While artificial intelligence (AI) is being used in many healthcare domains, its application to the emergency department (ED) as a tool for the emergency radiology team has significant promise for reducing some of the day-to-day issues (7). A large number of medical professionals concurred that AI has improved their field. However, the area of radiology has not braced AI very widely. Along with the increased interest in and uses of AI in medical imaging, radiology staff members are becoming more concerned about the possible disruption to radiological practice. Many radiology staff members worry that AI will result in fewer jobs related to medical imaging. Therefore, in order to identify future demands for successful implementation, it is necessary to understand the current views and expected behavior of radiology experts toward the integration of AI into medical imaging. Numerous studies have been carried out to investigate the views and applications of AI technology among radiology practitioners. Numerous medical professionals concurred that AI has improved their field. Therefore, in order to identify future requirements for effective deployment, it is necessary to understand the current views and expected behavior of radiology experts toward the integration of AI into medical imaging (11).

1.2 Aim and Objective

1.2.1 Aim: The aim of this study is to measure the level of knowledge and awareness of artificial intelligence (AI) and its use among radiology staff.

1.2.2 Objective:

-Measuring the level of knowledge and awareness of artificial intelligence (AI) among radiology staff.

-Measuring and assessing the knowledge and awareness of radiology workers about radiology applications of AI.

- The possibility of applying artificial intelligence applications in radiology departments and its advantages as well as disadvantages.
- Knowing the uses of artificial intelligence available in radiology departments in the region.

. Hypothesis:

- The staff in the Radiology Department have a general background in artificial intelligence.
- Themajorityofemployeesdo not have knowledge of artificial intelligence in the radiology department.
- We think that Radio lology department staff do not use artificial intelligence applications in their work. -Most of the team working in the radiology department believe that artificial intelligence will have a negative impact on their work.
- Workers in the radiology department fear losing their skills in light of the presence of artificial intelligence.
- Technologists believe that the use of artificial intelligence will replace them and jobs in general will decrease.
- In our research, we believe that workers in the radiology department have a backgrounding artificial intelligence in general and in radiology in particular
- The entry of artificial intelligence into the field of radiology will speed up appointments, reduce radiation risks, and enhance safety procedures.

Chapter two

Literature review

2.1 Background

Deep learning and other artificial intelligence (AI) approaches have made significant progress in image identification problems. Convolutional neural

networks and variational auto encoders are just two of the many methods used in medical image analysis, and these methods are evolving swiftly. In the past, radiologists have used medical experts with training to visually evaluate medical images in order to detect, characterize, and monitor disease. Artificial intelligence system search are characterized by their ability to automatically recognize complex patterns in picture data and to provide a quantitative estimate of radioactive qualities rather than a qualitative one. Medical practice is changing as more sophisticated machine learning and artificial intelligence (AI) techniques become available. When combined with the rapid advances in computer processing, these AI-based solutions have improved the accuracy and effectiveness of diagnosis and treatment in a variety of specializations (3).

2.2 Artificial intelligence

Artificial Intelligence (AI) is a general term that implies the use of a computer to model intelligent behavior with minimal human intervention, was officially born in 1956. The term is applicable to a broad range of items in medicine such as robotics, medical diagnosis, medical statistics, and human biology. Defined as a trans-disciplinary approach, cybernetics aims to control of any system using technology that explores system regulation, structure, and constraints, most notably mechanical, physical, biological, and social (1).

2.3 Artificial intelligence in medicine and radiology in general

2.3.1 As more advanced artificial intelligence (AI) machine learning techniques emerge; medical practice is altering. These AI-based systems have increased the precision and efficacy of diagnosis and treatment across a range of specialties, especially when coupled with the quick advancements in computer processing (2).

2.3.2 Image recognition tasks have seen considerable advancements in artificial intelligence (AI) techniques, particularly deep learning. Medical image analysis uses a variety of techniques that range from convolutional neural networks to variational autoencoders, and these techniques are developing quickly. Radiologists have historically used trained medical professionals to visually assess medical pictures to identify, describe, and track disease. The automatic recognition of intricate patterns in image data and the provision of quantitative rather than qualitative assessment of radioactive properties are characteristics of artificial intelligence systems (3).

2.4 Artificial Intelligence (AI) in Radiology

The radiology community has played a leading role in propelling medicine into its digital age and now has the opportunity to become a leader in exploring medical applications of AI. The tens of millions of radiology reports and billions of images now archived in digital form exemplify the concept of “big data” and constitute the required substrate for AI research.

The fundamental question is whether AI applications in radiology can add value. Adding value includes the discovery of new knowledge and extraction of more and better information from imaging examinations to achieve better outcomes for patients at lower costs. For radiology staff, adding value includes establishment of more efficient work processes and improved job satisfaction. The goal of this perspective is to help create a framework apart from a discussion of AI technology per se for developing strategies to explore the potential of AI in radiology and to identify a number of scientific, cultural, educational, and ethical issues that need to be addressed. For AI that automates aspects of their radiologic imaging workflow, three major domains predominate. Operational AI aims to improve health care delivery, from optimizing patient scheduling to identifying key metrics that contribute to delays, processing overloads, and safety events (4). Application Artificial intelligence (AI) in Radiology

This progress was enabled by the ability of AI to model complex multivariate data with accurate and robust machine learning (ML). In radiology, the most promising advances have been demonstrated in their radiologic imaging workflow and in imaging devices as a means to improve image acquisition and reconstruction. Diagnostic AI aims to assist in interpreting clinical images by detecting specific findings, obtaining quantitative measures, or producing AI-driven reports (5). Predictive AI aims to forecast future outcomes such as disease occurrence, relapse, progression, and treatment response.

(6). Artificial intelligence (AI) applications in radiology have been rising exponentially in the last decade. Although AI has found usage in various areas of healthcare, its utilization in the emergency department (ED) as a tool for emergency radiology team shows great promise towards easing some of the challenges faced daily. In addition to interpretive applications, AI assists with many of the non-interpretive tasks that are encountered every day by emergency radiology team. These include, but are not limited to, protocoling,

image equality control and work flow prioritization. AI continues to face challenges such as physician up take or costs, but is a long-term investment that shows great potential to relieve many difficulties faced by emergency radiology team and ultimately improve patient outcomes. Diagnostic imaging is essential for diagnosing and managing a variety of patient presentations. Frequently in the emergency department (ED), imaging is required and a rapid interpretation is demanded to aid in the acute management of a critically ill patient. As the utility of imaging has increased, and technology advances, it places a larger burden on emergency radiology team to produce accurate reports in a timely manner, especially in urgent situations (7). The concept to AI has been in continuo use volution because of the development and interactions between the different systems that compose it. In the context to f medical activity, AI means the develop ment and use of algorithms and software technique use that can interpret medical data, in order to learn from them, dapt and improve their performance through this experience, and thus helping increase patient safety and reducing the direct workload of professionals (8).

2.5 Use so artificial intelligence in radiology

Integrating artificial intelligence into radiology will help overcome the tedious, repetitive and time-consuming task of detecting relevant finding in diagnostic imaging and segmenting the detected images into smaller pieces of data. It will also help identify details that are imperceptible to the human eye (9). Artificial intelligence (AI) algorithms, especially deep learning, have made significant progress in image recognition tasks. Methods ranging from convolutional neural networks to variational auto encoders have found countless applications in medical image analysis and are advancing rapidly. In the practice of radiology, trained physicians have historically visually evaluated medical images to detect, characterize, and monitor disease. Artificial intelligence methods are characterized by automatic identification of complex patterns in image data and provide quantitative rather than qualitative assessment of radioactive properties (3). This enables better care detection or more accurate porting earlier. Another point is that AI can handle large data sets in high- dimensional space. However, we must not forget that artificial intelligence is only as good as the training samples available, and ideally the number of training samples should be enough to cover all variants. Human intelligence, on the other hand, is primarily characterized by content knowledge and the ability to find near-optimal solutions (10). The concept of

AI has been in continuous evolution because of the development and interactions between the different systems that compose it. In the context of medical activity, AI means the development and use of algorithms and software techniques that can interpret medical data, in order to learn from them, adapt and improve their performance through this experience, and thus helping increase patient safety and reducing the direct workload of professionals (8).

The exten to the impact to artificial intelligence in the radiology department

Several surveys have been conducted to exam in radiology practitioners' perceptions and use of AI technology. Many clinicians agreed that AI has a positive impact on their profession. A survey of trainees of the Royal College of Physicians and Surgeons in Canada showed that 72% of respondents perceived AI as having a positive impact on workflow and/or clinical practice and patient experience. However, AI has not been widely adopted in their a diology field. In the United States, as many as 38% of radiology trainees use AI in their practice (16). In addition to the growing interest in, and applications of, AI in medical imaging, anxiety is increasing among radiology staff about the potentially disrupting effect on radiology practice. A considerable number of radio logy personnel (42%) concerns that AI will reduce medical imaging job. Thus, it is imperative to understand the current beliefs and intended behavior of radiology professionals towards the AI integration into medical imaging in order to describe future needs for successful implementation (17). In Saudi Arabia, the levels of knowledge, experience, and use of AI have been investigated among radiology team. However, most studies lack are liable tool measuring broader dimensions of the level of AI use and perceived impact on the workflow and radiology profession. We hypothesized that the trainees in our residency program has an improper knowledge about the role of AI in the radiology workflow and profession as there is no formal education on this subject. (11).

Chapter three Methodology

This questionnaire-based cross-sectional study was conducted among radiology staff in all southern region of Saudi Arabia. The study distributed an electronic questionnaire to gather information on the participant's knowledge and perceptions concerning the radiology staff about AI.

3.1 Area of study

This field of study is to increase the awareness of technologists about the AI and its uses. To see if they have any knowledge of the AI.

3.2 Study population and sampling.

3.2.1 The population

The target population for this project are the radiology members in all of the southern region of Saudi Arabia.

3.2.2 Inclusion criteria.

A sample of radiological technologists in southern region of Saudi Arabia hospitals was selected to participants in the study.

3.2.3 Exclusion criteria.

Other medical staff. **Data collection and instrumentation.**

Data Collection was carried out using an electronic questionnaire, which was distributed to the study participants. The questionnaire was gathering information on the following:

1. Gender
2. Educational Qualification
3. Working experience
- 4- Region they are working
- 5- Years of experience
- Etc.

3.3 questionnaire

The questionnaire included closed questions to assess knowledge and awareness of artificial intelligence in radiology and concerns faced by radiology staff.

The questionnaire consisted of two sections:

3.3.1 The first section:

Required participants to provide the following demographic information: gender, educational qualification (diploma, bachelor's, master or doctoral degrees) work experience (years)

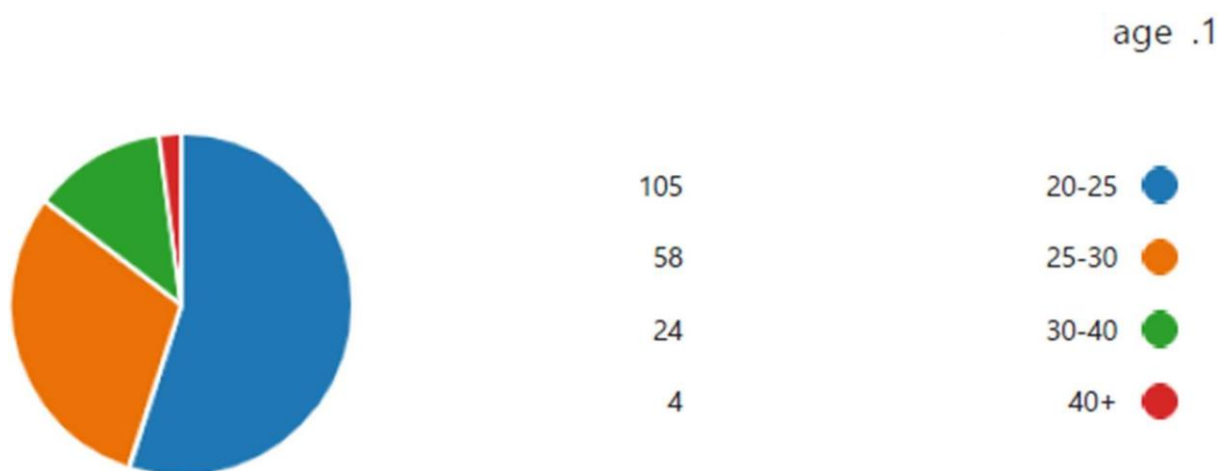
The second section:
Which consists of questions about knowledge of artificial intelligence, its uses, its impact in the field of radiology, and the radiology staff's concerns about it.

-The link distributed to the workers around the southern region in Saudi Arabia

<https://forms.office.com/r/8px5qrTj8L>

Chapter four

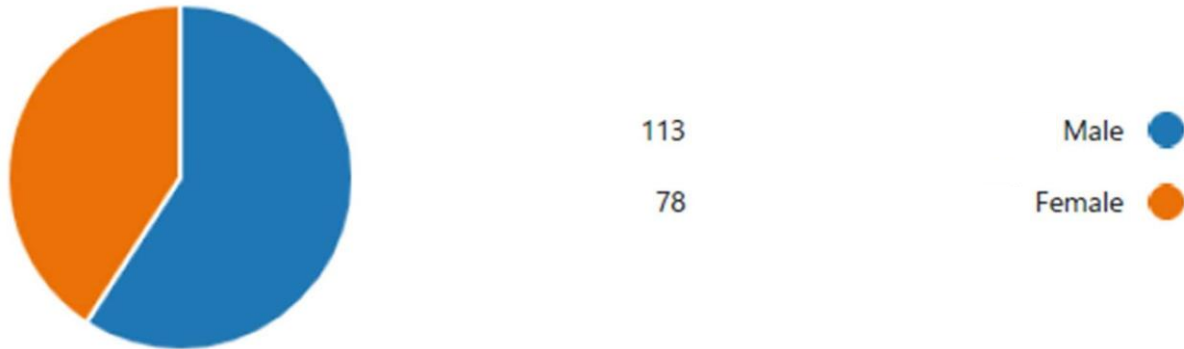
Result Most participants were between 20 and 25 years old (55%), followed by those between 25 and 30 years sold (30%), then those between 30 and 40 years sold (13%), and then those over 40 years old (2%) (Figure 1). The majority of participants were male (59%) and female (41%) (Figure2). Most of the participants were located in the Najran region (29%), followed by participants from the Asir region (27%), followed by participants from the Al-Baha region (24%), followed by participants from the Jazan region (20%) (Figure 3).



(Figure1)

Explanation of age

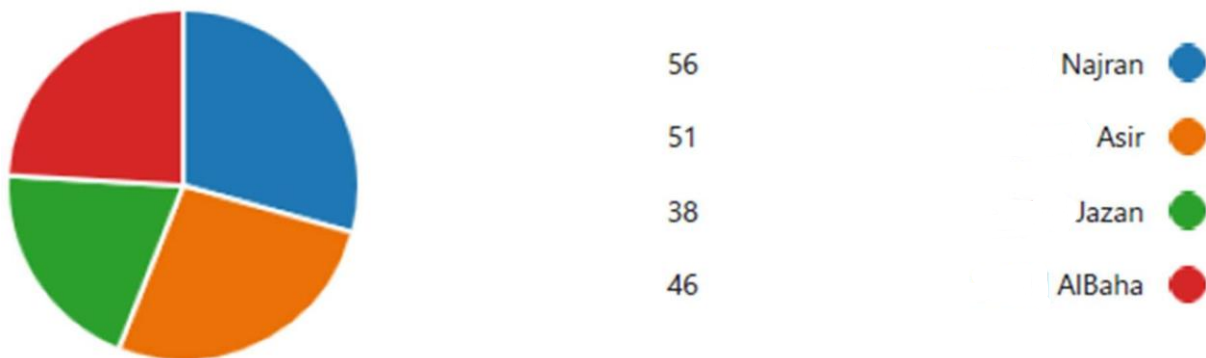
gender .2



(Fifure2).

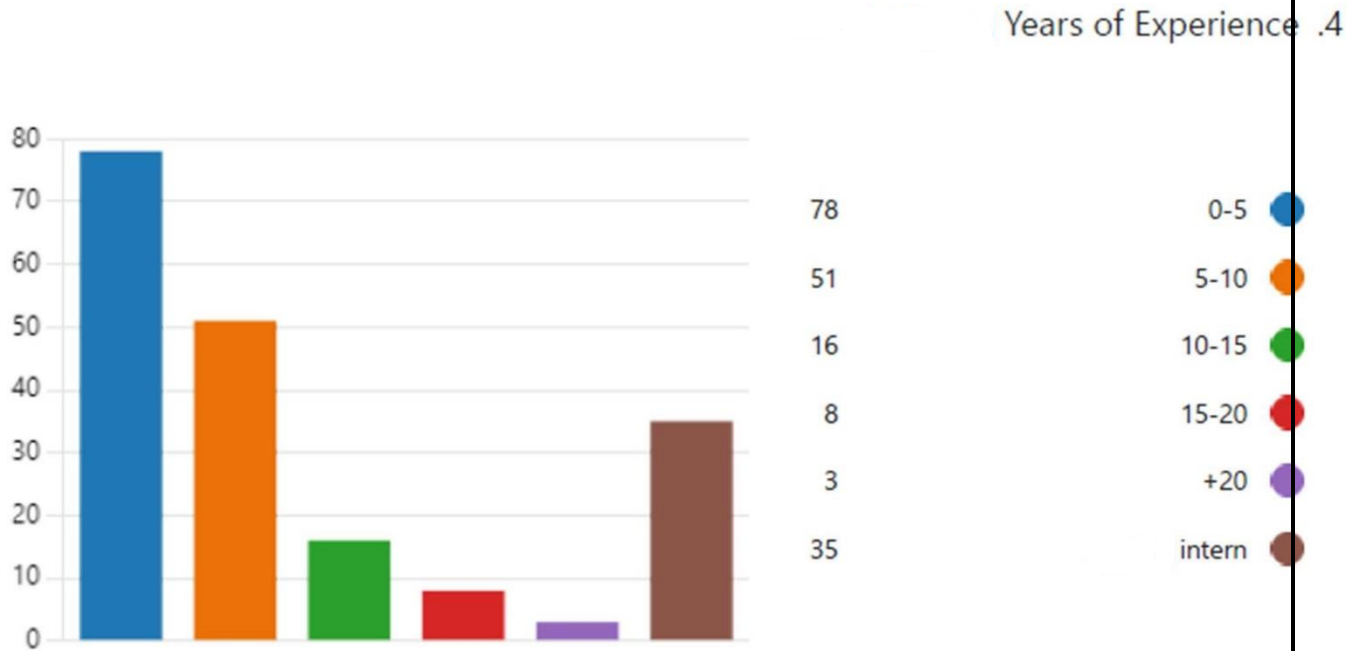
Explained the gender of participants.

Region .3



(Fifure3).

Clarifying the participants' areas



(Figure4)

Years of Experience

The figure above's how's us that most of the participant shad years of experience ranging from 0-5 (78 people), followed by those whose yearsof experience were 5-10(51people), followed by the trainee(35people), followed by those whose years of experience were 10-15. (16 people), followed by those with 15-20 years of experience(8people), followed by those with more than 20 years of experience (3 people), (Figure4).

5. What is your educational qualification .5



(Figure5)

Thee ducational qualification

Most of the participant she ldabachelor's degree(80%),then adiploma (13%),then amaster's degree(6%), and finally a Professional doctorate or doctoral in philosophy (2%), (Figure 5).

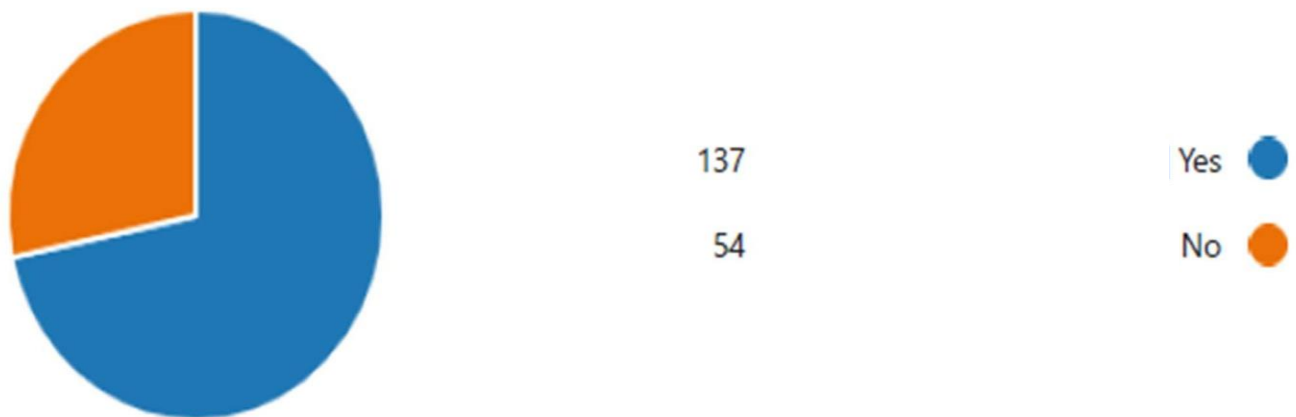
6. Do you know what (AI) means .6



(Figure6)

We found that most participants know what AI means (84%), and those who do not know (16%) (Figure 6).

Do you have a background in artificial intelligence .7



(72%), while those who do not the via back ground in artificial intelligence (28%) (Figure 7).

Do you have a background in artificial intelligence in radiology .8



(Figure8)

The majority of participants had a background in artificial intelligence in radiology (58%), while those who did not have a background in artificial intelligence in radiology (42%) (Figure 8).

Do you think artificial intelligence is important in radiology .9



(Figure9)

(71%) of the participants believe that artificial intelligence is important in the field of radiology, while (10%) of them do not believe that artificial intelligence is important in radiology, and (18%) do not know whether it is important or not (Figure 9).

Do you think AI has a good impact on the future of Radiology .10



(Figure10)

(74%) of the participants believe that artificial intelligence has a good impact on the future of radiology, while (11%) of them believe that artificial intelligence does not have a good impact on radiology, and (15%) do not know whether it has a good impact or not (Figure 10).

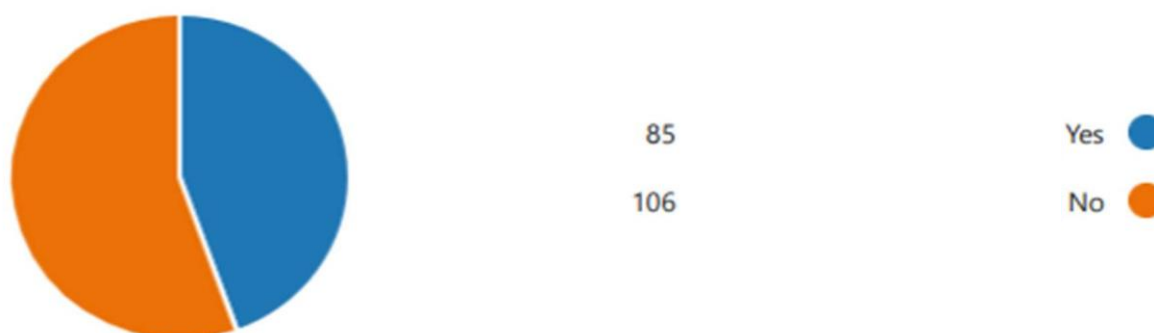
11. Are you aware of the AI applications currently used in Radiology | هل أنت على علم بتطبيقات الذكاء الاصطناعي المستخدمة حاليًا في علم الأشعة



(Figure11)

In (Figure11) we found that participants who have knowledge of artificial intelligence applications used in radiology (52%) and those who do not have knowledge (48%).

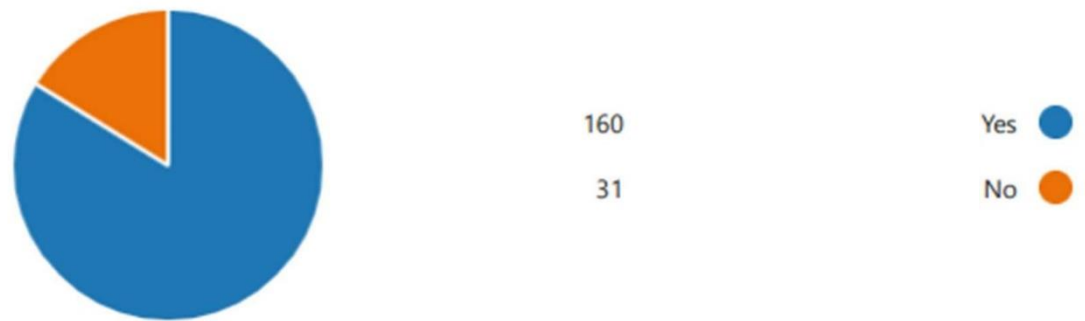
12. Do you use artificial intelligence applications in your field of radiology



(Figure12)

The figure above's how's us found that the majority of participants do not use artificial intelligence applications in their field of work (55%), and there were (45%) of them who use artificial intelligence applications in their field of work. (Figure 12).

Do you think AI will speed up appointments in the radiology department .13



(Figure13)

The figure above shows that the majority of respondents believe that AI will speed up appointments (84%) while some believe that AI will not speed up appointments (16%) (Figure 13).

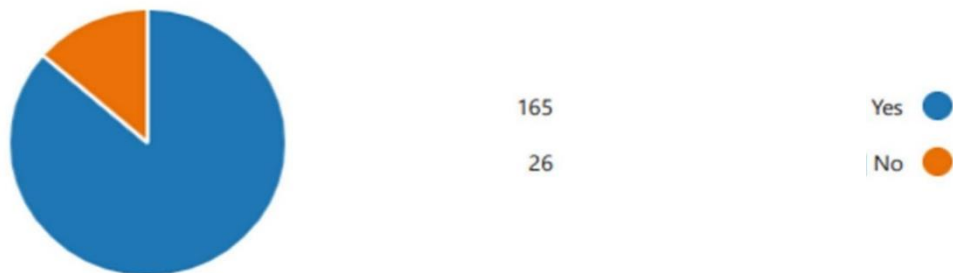
Do you think that artificial intelligence will reduce radiation risks and enhance safety measures .14



(Figure14)

In this figure many agreed that AI would help with radiation safety measures (85%), while few thought it would not help with radiation safety measures (15%) (Figure 14).

Do you think that artificial intelligence reduces the workload of radiology department employees .15



(Figure15)

We found that most participants thought that AI would help reduce workload (86%), and a few of them thought that it would not help reduce workload (Figure 15).

Do you think you will lose your skills in the presence of artificial intelligence .16



(Figure16)

It was noted in this figure that the number of participants were afraid of losing their skills in the presence of artificial intelligence (57%), while the

percentage of those who were not afraid of losing their skills was 43% (Figure 16).

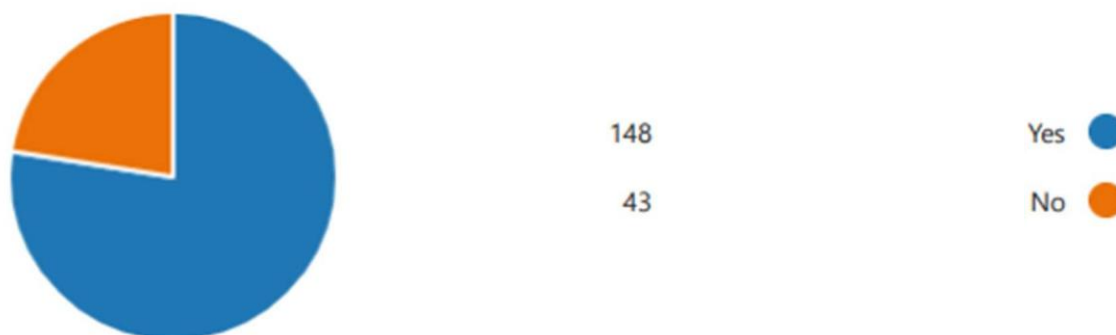
Do you have concerns about AI in your business .17



(Figure17)

Here it appears that the percentage of participants who fear artificial intelligence in their work is higher (58%), and the percentage of those who do not fear it is lower (42%) (Figure 17).

Do you think that the presence of artificial intelligence will reduce career .18 opportunities

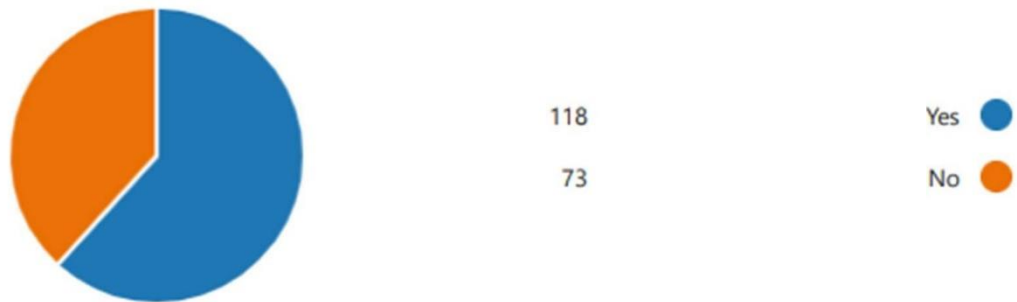


(Figure18)

A large percentage of respondents believe that AI will reduce job opportunities (77%), and a small number (23%) believe that it will not

reduce job opportunities (Figure 18).

Do you think that artificial intelligence will replace you one day .19



(Figure19)

As we see here, many respondents believe that AI will one day replace them (62%), and some respondents believe that it has not replaced them (38%) (Figure 19).

Do you want any training in artificial intelligence in radiology .20



(Figure20)

This figure shows us that participants do not have any training in AI in radiology and are willing to training it (76%), and that a few of them do not want any training in this topic (24%) (Figure 20).

Chapterfive Discussion and Conclusion

Discussion:

This study sheds light on the knowledge and awareness of artificial intelligence (AI) and its use in among radiology staff in southern hospital sin the Kingdom of Saudi Arabia, which is an important aspect given the impact to artificial intelligence on healthcare. Theres It so four study indicate that the majority of participants have a basic understanding of AI in radiology. Of the 191 participants, 110 (58%) who had heard of AI had basic knowledge of AI in radiology. This is consistent with a previous study (12). However, the results revealed that although workers in radiology departments are aware of artificial intelligence, they do not use artificial intelligence applications in their field of work, and it is possible that they work on them without knowledge or awareness of them.

However, our study indicated a more positive attitude. The trend of artificial intelligence among radiology department workers and Interns compared too their studies (13). Incomparis on with other studies, our study included all workers in radiology departments with various academic degrees, including Interns. For example, in study (14), we found that workers in radiology departments, including Interns, need more training 154 (76%) in education to increase awareness and knowledge of artificial intelligence and its applications.

There sults of this studyal so highlighted the importance of continuing education and training for workers in departments. Radiology to keep pace with the rapid development in the field of artificial intelligence.

This is especially important in SaudiArabia, where there is a need to keep up with the latest developments in technology and its practical applications in the healthcare industry (15).

It is important that those working in radiology departments have a good understanding of artificial intelligence and its limitations, as this will help them better integrate the technology into their work processes and make informed decisions about its use. The above highlights the need for continued research on this topic and the importance of increasing Awareness and knowledge among those working in radiology departments, as well as

promoting the potential benefits of artificial intelligence in the healthcare sector This can be achieved through continuing education and training, we have faced multiple limitations in our time of making the project and that is:

1- we didn't get enough time because it was 3 months.

5.1 We didn't get more than enough responses.

3-gathering information was difficult for us.

5.2 Conclusion:

Artificial intelligence (AI) is the term used to describe the use of computers and technology to simulate intelligent behavior and critical thinking comparable to a human being. One of the most promising areas so health in novation is the application of artificial intelligence (AI) in medical imaging Indeed, AI may find multiple applications, from image acquisition and processing to aided reporting, follow-up planning, data storage, data mining, and many others. Due to this wide range of applications, AI is expected to massively impact the radiology staff daily life.

This study aim of this study is to measure the level knowledge and awareness so artificial intelligence (AI) and its use in among radiology staff. The results of the study provide a comprehensive overview of the current level of knowledge and awareness of artificial intelligence in the field of radiology among those working in radiology departments. The results indicate that workers in radiology departments have basic knowledge of artificial intelligence. There is a need for more training to increase the applications of radiology workers in this field. Additionally, addressing concerns about the reliability and accuracy of AI systems will be essential in promoting broader AI adoption in radiology. It is recommended to develop initiatives to increase exposure to artificial intelligence and facilitate its integration into daily work to enhance its benefits and impact on workers in radiology and patient care departments.

References

Hamet, P., & Tremblay, J. (2017). Artificial intelligence in medicine. Metabolism, 69, S36-S40.

1- Ahuja, A. S. (2019). The impact of artificial intelligence in medicine on the future role of the physician. PeerJ, 7, e7702.

2- Hosny, A., Parmar, C., Quackenbush, J., Schwartz, L. H., & Aerts, H.

J. (2018). Artificial intelligence in radiology. Nature Reviews Cancer, 18(8), 500-510.

.4-Thrall,J.H.,Li,X.,Li,Q.,Cruz,C.,Do,S.,Dreyer,K.,&Brink,J.(2018). Artificial intelligence and machine learning in radiology: opportunities, challenges, pitfalls, and criteria for success. Journal of the American College of Radiology, 15(3), 504-508.

5- Pianykh, O. S., Langs, G., Dewey, M., Enzmann, D. R., Herold, C. J., Schoenberg, S. O., & Brink, J. A. (2020). Continuous learning AI in radiology: implementation principles and early applications. Radiology, 297(1), 6-14.

6- Zhang,B.,Shi,H.,&Wang,H.(2023).Machine Learning and AI in Cancer Prognosis, Prediction, and Treatment Selection: A Critical Approach. Journal of Multidisciplinary Healthcare, 1779-1791.

7-Katzman, B. D., van der Pol, C. B., Soyer, P., &Patlas, M. N. (2023). Artificial intelligence in emergency radiology: A review of applications and possibilities. Diagnostic and Interventional Imaging, 104(1), 6-10.

8-Barreiro-Ares, A., Morales-Santiago, A., Sendra-Portero, F., &Souto-Bayarri,M.(2023).Impactoftheriseofartificialintelligenceinradiology: whatdostudentsthink?.InternationalJournalofEnvironmentalResearch and Public Health, 20(2), 1589.

9-Sen,D.,Chakrabarti,R.,Chatterjee,S.,Grewal,D.S.,&Manrai,K.(2020). Artificial intelligence and the radiologist: the future in the Armed Forces Medical Services. BMJ Mil Health, 166(4), 254-256.

10- Sorantin,E.,Grasser,M.G.,Hemmelmayr, A.,Tschauner,S.,Hrzic,F., Weiss, V., ...&Holzinger, A. (2021). The augmented radiologist: artificial intelligence in the practice of radiology. Pediatric Radiology, 1-13.

11- Sorantin,E.,Grasser,M.G.,Hemmelmayr,A.,Tschauner,S.,Hrzic,F., Weiss, V., ...&Holzinger, A. (2021). The augmented radiologist: artificial intelligence in the practice of radiology. Pediatric Radiology, 1-13.

12-Alghamdi, S. A., &Alashban, Y. (2023). Knowledge, attitudes and practices towards artificial intelligence (AI) among radiologists in Saudi Arabia. *Journal of Radiation Research and Applied Sciences*,16(2), 100569.

13-Tajaldeh, A., &Alghamdi, S. (2020). Evaluation of radiologist's

knowledge about the Artificial Intelligence in diagnostic radiology: a survey-based study. *Acta Radiologica Open*, 9(7), 2058460120945320.

14- Waymel, Q., Badr,S.,Demondion,X.,Cotten, A., &Jacques, T.(2019). Impact of the rise of artificial intelligence in radiology: what do radiologists think?.*Diagnostic and interventional imaging*,100(6), 327-336.

15- Baig, M. A., Almuhaizea, M. A., Alshehri, J., Bazarbashi, M. S., & Al- Shagathrh, F. (2020). Urgent need for developing a framework for the governance of AIinhealthcare. In *The Importance of Health In formaticsin Public Health during a Pandemic* (pp. 253-256). IOS Press.

16- Gore, J. C. (2020). Artificial intelligence inmedical imaging. *Magnetic resonance imaging*, 68, A1-A4.

17- Mirza,A.A.,Wazgar,O.M.,Almaghrabi,A.A.,Ghandour,R.M.,Alenizi, S. A., Mirza, A. A., ...&Aljuaid, S. M. (2022). The Use of Artificial Intelligence in Medical Imaging: ANation wide Pilot Survey of Traineesin Saudi Arabia. *Clinics and Practice*, 12(6), 852-866.