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ORIGINAL ARTICLE

ASSESSMENT OF KNOWLEDGE OF RADIOLOGISTS ABOUT ARTIFICIAL INTELLIGENCE IN DIAGNOSTIC RADIOLOGY

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ABSTRACT

Background: Artificial intelligence (AI) has recently been widely used in clinical settings to assist in medical diagnosis and improve patient outcomes. AI has been utilized in diverse imaging techniques, such as CT, MRI, and mammography, to enhance image processing and improve diagnostic accuracy. Our study aimed to explore the knowledge of radiologist of Peshawar about artificial intelligence and assess their attitude towards AI in diagnostic radiology.

Materials & Methods: A cross-sectional study was conducted in the main hospitals of Peshawar from 8th August 2024 to 8th November 2024. An online questionnaire was designed using Google Form software to assess the knowledge of AI in diagnostic radiology of three groups: (i) first- to fourth-year trainees in radiology programs; (ii) Radiologists and Radiology fellows; and (iii) Radiology consultants. About 200 radiologists are currently working in different hospitals in Peshawar. Estimating the anticipated frequency of participation to be 50% and an absolute precision of 5% sample size of 130 was calculated. 130 responses were completed. Statistical analysis was done using SPSS software.

Results: A total of 130 Radiologists completed the questionnaire. About 32% were consultant radiologists, 11% were radiology fellows, and 58% were radiology residents. Twenty (20) % of the radiologists were currently using AI software, of which 13 were from government hospitals and 5 from private hospitals. 56.9% had a positive attitude towards the integration of AI in radiology. A significant association was found between current position (resident, radiology fellow, or consultant) and attitude toward AI integration ($\chi^2 = 14.884$, $p = 0.005$). Significant associations were found between perceived benefits and both current position ($\chi^2 = 14.392$, $p = 0.026$) and place of work ($\chi^2 = 29.667$, $p = 0.003$). Both current position ($\chi^2 = 21.177$, $p = 0.007$) and place of work ($\chi^2 = 39.835$, $p = 0.001$) showed significant associations with perceived challenges.

Conclusion: Radiologists in Peshawar are positive about integrating AI into diagnostic imaging; however, there is a lack of use of AI in imaging. Several barriers need to be addressed for its successful integration.

KEY WORDS: Artificial intelligence; Diagnostic radiology; Medical imaging; Machine learning.

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INTRODUCTION

The evolution of imaging technologies in radiology has markedly increased the number of images generated, thus presenting radiologists with the challenge of accurately and timely interpreting extensive datasets while urgent and emergency cases add to the work burden, compelling radiologists to balance rapid assessments with accurate diagnoses. As a result, many radiologists experience mental strain and burnout, which can affect their ability to make effective decisions.[1] AI provides practical solutions to these workflow challenges. AI, with its advanced algorithms and machine-learning models, holds promise in aiding radiologists by improving image analysis, reconstruction, and detection of abnormalities.[2-5] Artificial intelligence technology enhances imaging analysis[6,7], automates imaging processes such as enhancement[8], identifies important findings, optimizes worklists[9], and even makes clinical predictions.[10] Ra-

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diologists demonstrate variations in interpreting image features.[11] Consequently, AI-driven methods have the potential to standardize imaging and reporting by automating the identification of abnormalities while prioritizing the most critical studies and images.[12]

As the complexity and workload in diagnostic imaging progress to rise, innovative solutions are necessary to support radiologists. AI can also be beneficial to radiographers in improving patient scanning and image processing. For instance, AI can improve scan selection and optimization of scan protocol, thus reduce unsuitable imaging cases and ensure patient safety. AI can help radiographers optimize the positioning of patients, optimize the amount of contrast agent needed, streamline acquisition times, and ultimately contribute to enhanced image quality and minimize radiation exposure. Additionally, AI can aid in the production of structured radiological reports.[13]

Furthermore, AI can enable the automated detection of emergency conditions-including pneumothorax, hemorrhage, kidney stones, and foreign substances, which assist radiologists by accelerating the diagnostic process and enhancing accuracy.[14] AI tools also aid in diagnosing stroke on Computed tomography, which can be of assistance not only in the radiology reporting room but also in the emergency department.[15]

Despite these capabilities, successful AI integration depends on user acceptance and understanding. Misconceptions about AI's role may lead to resistance, anxiety about job security. This study aimed to assess current knowledge of radiologists about the application of AI in radiology and evaluate radiologists' perception of the impact of AI in radiology practice. It is essential to understand the knowledge of radiologists about AI for developing effective training programs and implementation strategies that ensure AI serves as a supportive tool rather than a source of professional concern.

MATERIALS AND METHODS

Based on a pilot study and statistical analysis, a refined questionnaire was designed, which was reviewed by an expert panel for deployment. Three groups of radiologists were included: (i) first- to fourth-year trainees in radiology programs; (ii) radiologists and fellows; and (iii) consultants to assess whether current training programs adequately prepare future radiologists for AI integration and determine if knowledge gaps exist among practicing radiologists who trained before AI became prominent. General doctors not related to radiology were excluded from the study. Ethical approval was taken from IREB (approval no. 2037). The study was conducted in large hospitals located in different regions of Peshawar. The questionnaires were sent to radiologists in the form of links were sent by email and hard copy. Data was collected for 3 months from 8th August 2024 to 8th November 2024. About 200 radiologists are currently working in different hospitals in Peshawar. Estimating the anticipated frequency of participation to be 50% and an absolute precision of 5% sample size of 130 was calculated. 130 responses were completed.

The knowledge and perception of the study participants were assessed by twelve questions. A Likert scale from 1 to 5 was used in 2 questions, where 1 represented "strongly disagree" and 5 represented "strongly agree". The means and standard deviations were calculated for each question in the domains (Mean ± SD). One-way ANOVA was applied to compare the mean score of perception and knowledge with the current position and place of work of the participants; a P-value ≤0.01 and 0.05 was considered statistically significant for differences. A statistical analysis was performed using SPSS software.

RESULTS

A total of 130 radiologists participated in the study. 41(31.5%) of the sample were consultants, 14(10.8%) were radiology fellows, and 75 (57.7%) were radiology residents. Female participants represented most respondents (70.8%, n=92) while n=38 (39.2%) were male. Most radiologists worked in government sector hospitals (72.3%, n=94), followed by private hospitals (21.5%, n=28), with smaller representations from private clinics (2.3%, n=3), personal setups (2.3%, n=3), and unemployed radiologists (1.5%, n=2).

The study demonstrated that most participants (90.0%, n=117) were aware of artificial intelligence, while only 10%(n=13) were unfamiliar with AI. Chi-square analysis revealed no significant association between radiology residents, fellows, and consultants, and AI knowledge ($\chi^2 = 2.571$, $p = 0.277$). Similarly, place of work showed no significant relationship with AI awareness ($\chi^2 = 5.532$, $p = 0.237$). Predominantly positive attitude towards AI was seen, with 56.9% (n=74) of radiologists expressing positive views, 41.5% (n=54) expressing neutral behavior, and only 1.5% (n=2) holding a negative view. A significant association was found between current position (resident, radiology fellow, or consultant) and attitude toward AI integration ($\chi^2 = 14.884$, $p = 0.005$). Consultant radiologists expressed the most positive attitudes (75.6%, n=31), while radiology fellows had more neutral responses (78.6%, n=11). There was no significant relationship observed between the place of work of the radiologist and attitudes toward AI ($\chi^2 = 10.520$, $p = 0.230$).

A major proportion (90.8%; n=118) of participants expressed willingness to learn about AI applications related to their profession, reflecting enthusiasm for AI in practice, while only 9.2% (n=12) were not interested. Only one consultant radiologist had a decreased interest compared to 11 radiology residents ($\chi^2 = 6.326$, $p = 0.042$). Despite positive attitudes, ac-

tual use of AI software by our participants remained limited. Most participants (80.0%, n=104) reported not using AI software, 6.2% (n=8) used it seldomly, and only 13.8% (n=18) regularly used AI tools. Most participants (64.6%, n=84) stated that their current AI knowledge would not change their decision to continue as radiologists, while only 13.8% felt that their current knowledge of AI would influence their career decision, suggesting a gap between awareness and confidence in practical implementation.

Most radiology professionals recognize the importance of incorporating AI into their training and educational programs. Specifically, 35.4% rated it as moderately important, followed by 27.7% who considered it important, and 22.3% who deemed it very important. Only a small percentage, 13.1% and 1.5%, rated it as slightly important and not important, respectively. The participants identified the benefits of AI as follows: decreased workload on radiologists (32.3%, n=42), reduction in radiology report dictation errors (26.2%, n=34), fast turnaround time (23.8%, n=31), and increased diagnostic accuracy (17.7%, n=23). Significant associations were found between perceived benefits and both current position (χ^2 = 14.392, p = 0.026) and place of work (χ^2 = 29.667, p = 0.003). 90.8% of participants expressed a willingness to learn about AI applications related to their field. However, several challenges were identified that may hinder effective implementation. The most reported barrier was a lack of training and technical expertise (39.2%), followed by concerns over the high cost of AI technology (18.5%) and limited access to AI tools (18.5%). Ethical and legal issues, such as data privacy and security concerns, were reported by 13.1% of respondents, while limited research on AI applications in radiology was cited by 10.8%. Both current position (χ^2 = 21.177, p = 0.007) and place of work (χ^2 = 39.835, p = 0.001) showed significant associations with perceived challenges.

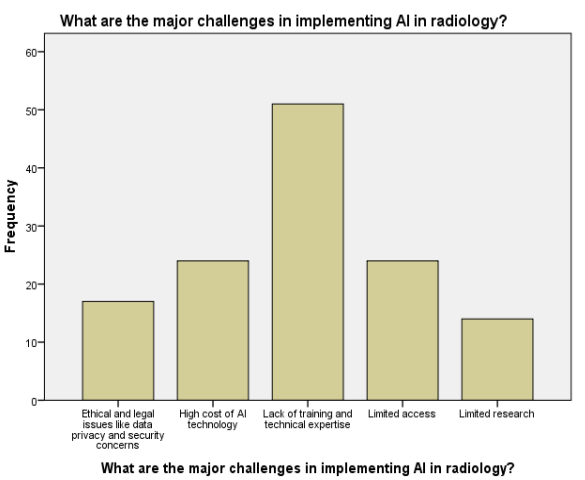

Figure 1. Major challenges in implementing AI in Radiology

DISCUSSION

The role of artificial intelligence (AI) in radiology is rapidly evolving, presenting both exciting opportunities and significant challenges for radiology professionals. This study aimed to assess the awareness, attitudes, and readiness of radiologists to adopt AI in their practices while identifying barriers to its integration. The results reveal that most radiology professionals are highly aware of AI and exhibit a strong enthusiasm for its adoption, with 90.0% of participants acknowledging their familiarity with the technology and 56.9% expressing a positive attitude toward its application in radiology. About 18% of participants are frequent users of AI. Some recent studies reported that 20.4%–72.0% of radiologists have used AI.[16,17,18,19] 90.8% of the respondents in our study expressed a willingness to learn about AI applications related to their profession, signaling a readiness to engage with emerging technologies in clinical practice. A study by Hamd et al demonstrated that 82.1% of the participants in the study were ready to learn and apply AI.[20] Botwe et al in their study have revealed that (80.8%) of Ghana radiographers are interested in using AI in diagnostic imaging, despite (64.2%) being skeptical about incorporating AI in diagnostic imaging.[21] The data suggest that there is a growing inclination and readiness among radiology professionals to apply AI in their practice. Studies conducted by Strohm et al, Huisman et al, and Coakley et al show that the radiologists affirmed the value of AI to improve diagnostic accuracy. [22,23,24]

However, despite this enthusiasm, the study also uncovered significant challenges to the effective integration of AI in radiology. The most cited barrier was the lack of training and technical expertise (39.2%), highlighting a crucial gap in radiologists' ability to use AI effectively in practice. This is consistent with other studies, such as those by Abuzaid et al., which also reported a lack of comprehensive training in AI applications among radiologists.[25] The high cost of AI technology (18.5%) and limited access to AI tools (18.5%) were also identified as major obstacles, further complicating the widespread adoption of AI in clinical settings. A review study reveals financial barriers to adopting AI tools in clinical practice as a recurring concern. [26] Another study mentioned issues with increased workloads due to AI system maintenance and data analysis. [27] These barriers reflect broader concerns in healthcare, where financial constraints and unequal access to advanced technologies can delay the integration of AI tools.

This research involved a limited number of participants, all from Peshawar-based healthcare facilities, which may restrict the broader applicability of the results. There is a possibility of bias due to inaccurate recall or socially desirable responses. Moreover, the cross-sectional nature of the study offers only a snapshot of the current knowledge

and perceptions, without accounting for possible shifts over time. Upcoming research should adopt longitudinal approaches to track shifts in AI awareness and acceptance over time. Broader studies across diverse regions can improve the generalizability of findings.

CONCLUSION

In conclusion, this study illustrates that while radiology professionals are largely open to adopting AI, several barriers need to be addressed for its successful integration. These include the need for comprehensive training programs, greater access to AI tools, and the establishment of ethical and legal guidelines for AI implementation. By addressing these challenges, healthcare organizations can ensure that radiologists are equipped with the knowledge and tools necessary to harness the full potential of AI, ultimately improving patient care and clinical outcomes.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	GW, MRK
Acquisition, Analysis or Interpretation of Data:	GW, MRK, FB, RI, SK, FN
Manuscript Writing & Approval:	GW, MRK, FB, RI, SK, FN

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.