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ORIGINAL ARTICLE

Assessing General Public Perceptions, Attitudes, and Acceptance of AI Integration in Radiology: Identifying Barriers and Facilitators

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ABSTRACT

The integration of Artificial Intelligence (AI) in radiology represents a transformative advancement in medical diagnostics, promising enhancements in accuracy, efficiency, and speed of imaging analyses. Despite its potential, the successful adoption of AI in radiology largely depends on the perceptions, attitudes, and acceptance of the general public and healthcare professionals. This study assesses the general public's knowledge, attitudes, and acceptance of AI applications in radiology. By identifying key factors influencing public acceptance or resistance, the research seeks to inform strategies that could facilitate the successful implementation of AI in radiological practices. A quantitative research design utilized a structured online questionnaire with close-ended questions. The survey measured awareness, perceived benefits and risks, and overall acceptance of AI in radiology. Stratified sampling ensured diversity in age, gender, education, and geographic location, targeting a representative sample size of approximately 1000 respondents. Data collection was conducted over a one-month period via social media and email distributions. Descriptive and inferential statistical analyses were performed using statistical software. The survey results revealed that 39.7% of respondents were aware of AI applications in radiology, while 60.3% were not. Understanding of AI varied, with 35.7% having limited understanding and 21.1% having moderate understanding. Most (79.2%) agreed that AI can improve diagnostic accuracy, and 72.7% believed it could expedite patient care. However, concerns about job displacement (49.4%), data privacy (40.1%), and the need for human oversight (67%) were prevalent. Additionally, 62.2% of respondents expressed willingness to undergo AI-assisted procedures, provided that human radiologists review and confirm the findings. The findings emphasize the importance of enhancing public education and transparent communication about AI's capabilities and limitations

in radiology. Further research is necessary to develop effective strategies for implementing AI in healthcare settings.
KEYWORDS: *Artificial Intelligence, Radiology, Public Perception, Diagnostic Imaging, Healthcare Technology, Public Acceptance, AI Integration*

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INTRODUCTION

The advent of Artificial Intelligence (AI) in radiology signifies a transformative phase in medical diagnostics, offering unprecedented opportunities to enhance the accuracy, efficiency, and speed of imaging analyses. AI algorithms, particularly those based on deep learning, have demonstrated remarkable capabilities in detecting pathologies in imaging studies, sometimes matching or even surpassing the performance of human radiologists in specific tasks [1]. This integration of AI into radiology not only augments diagnostic processes but also redefines the role of radiologists, allowing them to focus on more complex interpretative and decision-making tasks [2].

However, the successful implementation and acceptance of AI in radiology hinge on various factors, including technological advancements, regulatory approvals, ethical considerations, and notably, the perceptions and attitudes of end-users, including healthcare professionals, patients, and the general public. Understanding the latter's viewpoints is crucial, as public acceptance can significantly influence the pace and extent of AI adoption in healthcare settings [3].

AI applications in radiology have shown potential to improve diagnostic processes. Yet, public skepticism and lack of awareness may hinder their widespread acceptance. Research indicates that radiologists and other medical professionals often show both enthusiasm and concern regarding AI integration, with knowledge gaps and job security fears being significant barriers [4]. Addressing these concerns through a quantitative assessment of public attitudes toward AI in radiology is essential to understand the collective viewpoint and effectively mitigate resistance [5].

To quantitatively assess public knowledge, attitudes, and perceptions towards AI applications in radiology and identify key factors influencing acceptance or resistance.

Research Questions

1. What is the level of awareness among the general public about AI's role in radiology?
2. What are the predominant attitudes towards the use of AI for diagnostic imaging?
3. Which factors significantly influence the public's acceptance or skepticism towards AI in radiology?

MATERIAL AND METHODS

This study employed a quantitative research design, utilizing a structured online questionnaire comprised of close-ended questions to assess public perceptions, attitudes, and acceptance of AI in radiology.

Survey Design

The questionnaire was designed with Likert scale items, yes/no questions, and multiple-choice questions to assess various aspects of public perception, including awareness, perceived benefits and risks, and overall acceptance of AI in radiology. The Likert scale items ranged from "strongly agree" to "strongly disagree," providing detailed insights into respondents' attitudes. The survey design was validated by a group of researchers specializing in AI and radiology to ensure the questions were clear, relevant, and comprehensive.

Sample

The survey targeted a broad demographic to ensure representativeness, aiming for a sample size of approximately 1000 respondents from the general public. Stratified sampling was used to ensure diversity in age, gender, education, and geographic location. This approach ensured that the sample was reflective of the general population and allowed for the analysis of subgroup differences.

The demographic categories included age groups of 18-24, 25-34, 35-44, 45-54, 55-64, and 65+ years. Gender categories included male and female. Education levels ranged from high school or lower, some college, associate degree, bachelor's degree, to graduate or professional degree. Geographic location spanned various regions across the country to capture a diverse representation.

Data Collection

Data was collected through an online survey distributed via social media platforms and email invitations. Participation was voluntary, with an informed consent process integrated into the survey introduction to ensure respondents were aware of the study's purpose and their rights. The survey remained open for responses for a period of one month, allowing ample time for participation.

Data Analysis

Data from the completed questionnaires were analyzed using statistical software. Descriptive statistics provided an overview of general perceptions and attitudes, including frequencies and percentages for categorical variables and means and standard deviations for continuous variables. Inferential statistics, such as chi-square tests and logistic regression, were employed to explore relationships between demographic variables and attitudes toward AI in radiology. These methods helped identify significant predictors of public acceptance or resistance to AI integration.

Ethical Considerations

The study was conducted following strict ethical guidelines to ensure the anonymity and confidentiality of respondents. All participants provided informed consent before taking part in the survey. The research proposal was submitted for review and approval by an Institutional Review Board (IRB). This study was reviewed and approved by the Research Ethics Committee (REC) at the University of Hail on March 25, 2024, with the reference number H-2024-208.

RESULTS

Most respondents were female, accounting for 83.27% (n = 1144) of the sample, while males comprised 16.74% (n = 230). The age distribution of the respondents was predominantly young adults, with 50.00% (n = 690) aged between 18-24 years. Other age groups included 13.46% (n = 185) aged 25-34 years, 21.47% (n = 295) aged 35-44 years, 13.03% (n = 179) aged 45-54 years, 1.46% (n = 20) aged 55-64 years, and 0.36% (n = 5) aged 65 years and above.

Regarding education level, a significant portion of the respondents, 74.91% (n = 1029), were college or university graduates or current students. Additionally, 13.46% (n = 185) had some college education but no degree, 8.00% (n = 110) held a graduate or professional degree, and 3.64% (n = 50) had a high school education or lower. These demographics indicate a sample predominantly composed of young, educated females (Table 1).

Table 1: Demographics Information

Item	Frequency	Percentage
Gender		
Female	1144	83.27%
Male	230	16.74%
Age		
18-24	690	50.00%
25-34	185	13.46%
35-44	295	21.47%
45-54	179	13.03%
55-64	20	1.46%
65+	5	0.36%
Education Level		
College/University	1029	74.91%
Some college, no degree	185	13.46%
Graduate or professional degree	110	8.00%
High school or lower	50	3.64%

The study assessed the respondents' awareness and understanding of AI in radiology. Regarding awareness, 60.30% (n = 829) of respondents reported that they were unaware of AI in radiology, while 39.70% (n = 545) indicated that they were aware.

Regarding understanding, the mean score was 2.21 with a standard deviation of 1.1, indicating a general moderate understanding of AI in radiology among respondents. Specifically, 30.21% (n = 415) reported having no understanding, 35.66% (n = 490) had limited understanding, 21.11% (n = 290) had moderate understanding, 8.66% (n = 119) had good understanding, and 4.37% (n = 60) considered themselves very knowledgeable (Table 2).

Table 2: Awareness and Understanding

Awareness and Understanding of AI in Radiology	**Frequency**	**Percentage**	**Mean**	**SD**
Aware of AI in Radiology				
No	829	60.30%	-	-
Yes	545	39.70%	-	-
Understanding of AI in Radiology			2.21	1.1
No understanding	415	30.21%		
Limited understanding	490	35.66%		
Moderate understanding	290	21.11%		
Good understanding	119	8.66%		
Very knowledgeable	60	4.37%		

The study also explored respondents' attitudes and perceptions of AI in radiology.

Regarding the statement "AI can improve the accuracy of radiology diagnoses," the mean score was 1.68 with a standard deviation of 0.89. Among the respondents, 55.59% (n = 764) strongly agreed, 23.66% (n = 325) agreed, 18.92% (n = 260) were neutral, 0.36% (n = 5) disagreed, and 1.46% (n = 20) strongly disagreed. For the concern about AI replacing human radiologists, the mean score was 2.65 with a standard deviation of 1.03. Specifically, 12.30% (n = 169) were very concerned, 37.12% (n = 510) were somewhat concerned, 26.56% (n = 365) were neutral, 21.47% (n = 295) were not very concerned, and 2.55% (n = 35) were not at all concerned. In terms of confidence in AI interpreting medical images, the mean score was 2.03 with a standard deviation of 1.08. Of the respondents, 46.58% (n = 640) were very confident, 12.38% (n = 170) were somewhat confident, 34.50% (n = 474) were neutral, 4.73% (n = 65) were not very confident, and 1.82% (n = 25) were not at all confident.

Regarding the belief that AI integration leads to faster patient care, the mean score was 1.86 with a standard deviation of 1.04. In detail, 50.18% (n = 690) strongly agreed, 22.56% (n = 310) agreed, 21.76% (n = 299) were neutral, 2.19% (n = 30) disagreed, and 3.28% (n = 45) strongly disagreed (Table 3).

Table 3: Attitudes and Perceptions

Attitudes and Perceptions of AI in Radiology	**Frequency**	**Percentage**	**Mean**	**SD**
AI can improve accuracy of radiology diagnoses			1.68	0.89
Strongly agree	764	55.59%		
Agree	325	23.66%		
Neutral	260	18.92%		
Disagree	5	0.36%		
Strongly disagree	20	1.46%		
Concern about AI replacing human radiologists			2.65	1.03
Very concerned	169	12.30%		
Somewhat concerned	510	37.12%		
Neutral	365	26.56%		
Not very concerned	295	21.47%		
Not at all concerned	35	2.55%		
Confidence in AI interpreting medical images			2.03	1.08
Very confident	640	46.58%		
Somewhat confident	170	12.38%		
Neutral	474	34.50%		

Not very confident	65	4.73%		
Not at all confident	25	1.82%		
AI integration leads to faster patient care			1.86	1.04
Strongly agree	690	50.18%		
Agree	310	22.56%		
Neutral	299	21.76%		
Disagree	30	2.19%		
Strongly disagree	45	3.28%		

The study investigated respondents' acceptance and trust in AI-assisted radiology procedures. The willingness to undergo AI-assisted imaging procedures had a mean score of 1.62 with a standard deviation of 0.85. Among the respondents, 62.24% (n = 855) indicated they were willing, 24.31% (n = 334) were unsure, and 13.45% (n= 185) were not willing.

Regarding the importance of having a human radiologist review AI findings, the mean score was 1.41 with a standard deviation of 0.65. Specifically, 67.00% (n = 920) considered it very important, 26.14% (n = 359) found it somewhat important, 5.82% (n = 80) were neutral, 1.09% (n = 15) thought it was not very important, and 0.95% (n = 13) felt it was not at all important (Table 4).

Table 5: Acceptance and Trust

Acceptance and Trust in AI- Assisted Radiology Procedures	**Frequency**	**Percentage**	**Mean**	**SD**
Willingness for AI-assisted imaging procedure			1.62	0.85
Yes	855	62.24%		
Unsure	334	24.31%		
No	185	13.45%		
Importance of human radiologist review			1.41	0.65
Very important	920	67.00%		
Somewhat important	359	26.14%		
Neutral	80	5.82%		
Not very important	15	1.09%		
Not at all important	13	0.95%		

The study identified several key concerns about AI in radiology, with a mean score of 3.12 and a standard deviation of 1.37. The main concerns reported were lack of human oversight, cited by 50.95% (n = 700) of respondents, loss of human jobs, mentioned by 45.41% (n = 623), and the potential for misdiagnoses/errors, which concerned 55.68% (n = 764). Additional concerns included privacy and data security, reported by 6.91% (n = 95), and the combined concern of privacy and data security along with lack of human oversight, which was noted by 2.55% (n = 35) of respondents (Table 5).

Table 5: Final Thoughts

Concerns about AI in Radiology	**Frequency**	**Percentage**	**Mean**	**SD**
Main concerns about AI in radiology			3.12	1.37
Lack of human oversight	700	50.95%	-	-
Loss of human jobs	623	45.41%	-	-
Misdiagnoses/errors	764	55.68%	-	-
Privacy and data security	95	6.91%	-	-
Privacy and data security & Lack of human oversight	35	2.55%	-	-

The correlation analysis examined the relationships between various variables related to the understanding and attitudes toward AI in radiology. Understanding of AI in radiology showed a positive correlation with AI improving accuracy (r = 0.17), AI leading to faster care (r = 0.19), willingness to undergo AI-assisted procedures (r = 0.22), and the importance of having a human radiologist review AI findings (r = 0.10). However, it negatively correlated with concern about AI replacing human radiologists (r = -0.24).

AI improving accuracy had a positive correlation with AI leading to faster care (r = 0.40), willingness to undergo AI-assisted procedures (r = 0.36), and the importance of having a human radiologist review AI findings (r = 0.10). It negatively correlated with concern about AI replacing human radiologists (r = -0.15).

Concern about AI replacing human radiologists had negative correlations with understanding of AI in radiology (r = -0.24), AI improving accuracy (r = -0.15), AI leading to faster care (r = -0.23), and willingness to undergo AI-assisted procedures (r = -0.16). It showed a weak positive correlation with the importance of a human radiologist reviewing AI findings (r = 0.04).

AI leading to faster care showed positive correlations with AI improving accuracy (r = 0.40), willingness to undergo AI-assisted procedures (r = 0.38), and the importance of having a human radiologist review AI findings (r = 0.05). It negatively correlated with concern about AI replacing human radiologists (r = -0.23). Willingness to undergo AI-assisted procedures had positive correlations with understanding of AI in radiology (r = 0.22), AI improving accuracy (r = 0.36), AI leading to faster care (r = 0.38), and the importance of having a human radiologist review AI findings (r = 0.10). It negatively correlated with concern about AI replacing human radiologists (r = -0.16).

The importance of having a human radiologist review AI findings showed weak positive correlations with understanding of AI in radiology (r = 0.10), AI improving accuracy (r = 0.10), concern about AI replacing human radiologists (r = 0.04), AI leading to faster care (r = 0.05), and willingness to undergo AI-assisted procedures (r= 0.10) (Table 6).

Table 6: Correlation Analysis

Variable	Understanding of AI in Radiology	AI Improves Accuracy	Concern About AI Replacement	Confidence in AI	AI Faster Care	Willingness for AI Procedure	Importance of Human Radiologist
Understanding of AI in Radiology	1	0.17	-0.24	NaN	0.19	0.22	0.1
AI Improves Accuracy	0.17	1	-0.15	NaN	0.4	0.36	0.1
Concern About AI Replacement	-0.24	-0.15	1	NaN	-0.23	-0.16	0.04
AI Faster Care	0.19	0.4	-0.23	NaN	1	0.38	0.05
Willingness for AI Procedure	0.22	0.36	-0.16	NaN	0.38	1	0.1
Importance of Human Radiologist	0.1	0.1	0.04	NaN	0.05	0.1	1

The factor analysis revealed the following factor loadings for each variable:

Understanding of AI in Radiology loaded on Factor 1 (0.500104), Factor 2 (0.202751), and Factor 3 (-0.283918).

AI Improves Accuracy loaded on Factor 1 (0.281725), Factor 2 (-0.283199), and Factor 3 (0.073224).

Concern About AI Replacement loaded on Factor 1 (-0.498937), Factor 2 (-0.287764), and Factor 3 (-0.225555). Confidence in AI had negligible loadings on all factors (1.52E-23 on Factor 1, -1.71E-22 on Factor 2, and -6.15E- 23 on Factor 3). AI Faster Care loaded on Factor 1 (0.272431), Factor 2 (-0.244906), and Factor 3 (0.14418).

Willingness for AI Procedure loaded on Factor 1 (0.388168), Factor 2 (-0.389199), and Factor 3 (-0.046362). The importance of human radiologists is loaded on Factor 1 (0.006516), Factor 2 (-0.104796), and Factor 3 (- 0.242294).

These factor loadings indicate the extent to which each variable is associated with the underlying factors identified in the analysis. The results suggest that some variables, like understanding of AI in radiology and willingness for AI procedures, load significantly on Factor 1,

which may represent a positive perception of AI. In contrast, concern about AI replacement shows negative loadings, indicating a potential skepticism or concern factor (Table 7).

Table 7: Factor Loadings

Variable	Factor 1	Factor 2	Factor 3
Understanding of AI in Radiology	0.500104	0.202751	-0.283918
AI Improves Accuracy	0.281725	-0.283199	0.073224
Concern About AI Replacement	-0.498937	-0.287764	-0.225555
Confidence in AI	1.52E-23	-1.71E-22	-6.15E-23
AI Faster Care	0.272431	-0.244906	0.14418
Willingness for AI Procedure	0.388168	-0.389199	-0.046362
Importance of Human Radiologist	0.006516	-0.104796	-0.242294

DISCUSSION

This study examined general public perceptions, attitudes, and acceptance of AI integration in radiology, highlighting both barriers and facilitators to its adoption. The survey results revealed a moderate level of awareness and understanding of AI in radiology, with significant variations in attitudes and perceptions based on demographic factors.

Our findings align with previous studies indicating a general lack of awareness and understanding of AI applications in radiology among the public. Abuzaid et al. [6] found a significant knowledge gap among radiologists and radiographers regarding AI integration, necessitating structured training programs to improve AI appreciation and implementation. Similarly, Huisman et al. [7] reported that limited AI-specific knowledge levels among radiologists are associated with fear, whereas intermediate to advanced knowledge levels correlate with positive attitudes towards AI.

Most of our respondents agreed that AI can improve diagnostic accuracy and patient care speed, which is consistent with the positive perceptions reported in other studies. For instance, a survey of radiographers by Sharip et al. [8] showed high enthusiasm for AI tools, although concerns about job security and the need for training were prevalent. Furthermore, Pesapane et al. [1] emphasized that while AI advances radiology,

The radiologists' roles will evolve rather than be replaced, addressing fears of job loss.

Our study found that most participants expressed willingness to undergo AI-assisted procedures, conditional on human oversight. This is in line with findings by Chen et al. [9], who reported that most radiology residents are optimistic about AI but stress the importance of integrating AI education into training programs to ensure safe and effective use. Multiple researchers also highlighted that high expectations of AI's potential benefits are critical enablers for its acceptance, while lack of knowledge and trust remain significant barriers [10-19].

Concerns about misdiagnoses, data privacy, and the need for human oversight were prominent among our respondents. These concerns are echoed in the literature. For instance, a study by Zhang et al. [20] on patient perceptions highlighted similar concerns about accuracy, cybersecurity, and the lack of empathy in AI systems. Moreover, Rainey et al. [4] noted a perceived lack of sufficient knowledge and training among radiographers, stressing the need for comprehensive education to ensure AI's safe integration into clinical practice.

Our findings emphasize the importance of public education and transparent communication about AI's capabilities and limitations. Addressing the identified concerns and enhancing public understanding through targeted educational initiatives could facilitate greater acceptance of AI in radiology. Additionally, integrating AI-specific training into medical and radiology curricula is crucial to prepare healthcare professionals for future AI-driven workflows.

CONCLUSION

In conclusion, while the general public is positive toward AI integration in radiology, significant barriers such as knowledge gaps, job security concerns, and the need for human oversight remain. Addressing these barriers through education, transparent communication, and robust training programs will be essential for successfully adopting AI in radiology. Further research should continue to explore these dynamics to develop effective strategies for integrating AI into healthcare settings.

INFORMED CONSENT

Informed consent was obtained from all participants included in the study.

ETHICAL CONSIDERATION

This study was reviewed and approved by the Research Ethics Committee (REC) at the University of Hail on March 25, 2024, with the reference number H-2024-208.

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No

AUTHOR CONTRIBUTIONS

All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

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CONFLICT OF INTEREST

There are no conflicts of interest.

DATA AND MATERIALS AVAILABILITY

All data associated with this study are present in the paper.

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