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Assessment of Radiographers' Knowledge of the Application of Artificial Intelligence in Medical Imaging in Nnewi, Anambra State, Nigeria: Multi-Centre Study

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Abstract **Original Research Article**

Background of study: Artificial Intelligence is changing medical imaging by improving diagnostic accuracy, workflow, and patient care. However, many radiographers may not be fully prepared for its use in clinical practice. Aim: This study aimed to assess the knowledge, perception, and attitudes of radiographers toward the use of Artificial Intelligence in medical imaging in selected diagnostic centres in Nnewi, Anambra State, Nigeria. Objectives: The study focused on assessing radiographers' knowledge of Artificial Intelligence, their perception of its impact on radiographic practice, their attitudes toward its use in education and clinical work, and the challenges affecting its adoption Materials and methods: A descriptive cross-sectional survey was carried out among 158 licensed radiographers using structured questionnaires shared online and in print. Data were analyzed using descriptive statistics. Results: The majority 136 (86.1%) of respondents held a bachelor's degree in radiography, with most 72 (45.6%) having less than two years of practice. Large proportion 21 (13.3%) worked with X-ray. Large number 138 (87.3%) of respondents had heard of AI in medical imaging. Ninety five (60.1%) correctly identified AI as machines performing tasks that require human intelligence. While 67 (42.2%) of respondents were familiar with machine learning and deep learning. When asked about the artificial intelligence they know of, 40 (25.5%) of the respondents mentioned computer-Aided diagnosis. Despite high awareness, only 60(38.0%) of radiographers have used AI-powered tools at work. Conclusion: While awareness of Artificial Intelligence is high, there is limited knowledge and practical experience. Structured training programmes, curriculum integration, and strong institutional support are needed to ensure its effective and ethical use in clinical practice.

Keywords: Artificial intelligence, Imaging modalities, Radiographers

INTRODUCTION

AI-powered technology represents one of the fastest growing technologies during the last few years and has been adopted in various fields such as finance, law, cybersecurity, manufacturing, computer science and medicine [1]. AI technology application in various fields has gotten high momentum. In recent years, AI has become a relevant topic in social debate and politicians, economists, scientists as well as lay people are talking controversially about this unique subject[1].The positive impacts of AI in our daily lives are so enormous that they are no longer regarded as AI because we are much used to it[2].

Recently, AI is widely employed in the healthcare industry [2]. AI in medicine can be divided into two categories - virtual and physical AI [3, 4]. In medicine, the virtual part ranges from applications such as health record systems to neural network based guidance in treatment decisions [3,4] The physical part deals with robots assisting in performing surgeries, intelligent prostheses for handicapped people and elderly care [3,4] AI has been assisting doctors to diagnose, finding the sources of disease, suggesting various ways of treatment and also predicting if the illness is life-threatening [2]. Modern medicine is rapidly evolving and many fields have already integrated AI into clinical practice[5].

Within medical imaging and therapy, some of the earlier AI supported technologies were referred to using other terminology such as computer aided diagnosis or computer aided detection. Today, AI technologies contribute to a range of activities including the triaging of chest radiographs to prioritize reporting of abnormal cases first, segmentation of organs on images for further analysis and suggesting diagnoses [6]. Medical Imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) play a pivotal role in furnishing clinicians with detailed and comprehensive visual insights into the human anatomy. These imaging methods produces large quantity of data necessitating streamlined analysis and interpretation of tasks seamlessly undertaken by AI[7].

AI-enabled automation has affected different aspects of radiography and different modalities in varying degrees, including but not limited to patient positioning, image acquisition, therapy planning, workflows and reconstruction processes across modalities. Taking computed tomography as an example, erroneous patient positioning, which may be associated with inaccurate vertical centering of the patient within the scanner as a consequence of differing patient body morphology, remains one of the biggest causes of poor image quality, increased radiation dose and repeated examinations [6].

Explored this possibility of acquiring patient position data using a 3D camera system within the CT room thereby enabling AI to create a 3D patient body mesh from which the iso-center could be automatically identified and the vertical positioning of the CT couch automated[6]. This automated system performed significantly better, although not technically perfect, than radiographers in accurately positioning the patient, potentially improving image quality and reducing patient dose. With citable examples in other modalities, a common factor is that its use in medical imaging and radiotherapy services has promoted the standardization of practice and enabled processes to be more efficient and streamlined[6].

However, the integration and advancements of Artificial intelligence in the field of medical imaging has generated a substantial knowledge base and diverse perspectives on AI's role in medical imaging especially that with the progressive development of AI, human labour will no longer be needed as everything can be done mechanically [2]. Conversely, the European Society of Radiology contends that AI will not supplant radiologists but rather augment their value and enhance the field as a whole[8]. Knowing the undeniable potential of artificial intelligence in revolutionizing the field of medical imaging, it is therefore imperative for Radiographers to be proficiently educated with the skill and knowledge of AI applications in medical imaging, hence, this study was designed to assess the knowledge of Radiographers working in some selected radio-diagnostic

centres in Nnewi Anambra State Nigeria of the application of AI in medical imaging.

MATERIALS AND METHODS

A cross-sectional study prospective questionnaire-based study was conducted among 158 Radiographers who consented to participate in the study in some selected Radio-diagnostic centres in Nnewi, Anambra state. The 158 Radiographers met the inclusion criteria which include; willingness to take part in the study, BSc. holders in the Radiography profession, licensed radiographers working in the selected diagnostic centers during the period of this study(July to September, 2025) and those willing to give honest reviews while participating in the study were included using convenience sampling technique. Ethical approval **(FSHT/REC/024/1027)** for this study was obtained from the Research Ethics Committee of the Faculty of Health Sciences and Technology, College of Health Sciences, Nnamdi Azikwe University, Nnewi Campus, Anambra State, Nigeria and the aim of the study was explained to the participants and their consents sought using written informed consent form. All information given by the participants were kept in strict confident and use for the purpose of this study only.

Instrument for data collection was a questionnaire designed to address the aim of the study and which consist of four sections. Each section of the questionnaire captured the needed information for this study. The validity of the questionnaire was measured using the Index of item Objective Congruence (IOC) technique previously used by Turner and Carlson[9], Mbaba *et al*.[10], Ogolodom *et al*.[11] and Ogolodom *et al*[12]. This was done by calculating the index of item-objective congruence (IOC). According to the index parameters, an IOC score higher than 0.6 was assumed to show adequate content validity , and all the scores obtained in this study for all the items of the questionnaire after IOC analysis was higher than 0.6

The questionnaire was constructed in both hardcopy and softcopy. The softcopy was designed with Google forms and the link shared electronically while the hardcopy version was distributed using one-to-one method of questionnaire administration. Completed questionnaire were retrieved physically and electronically for hardcopy and softcopy respectively.

The collected data was analyzed using statistical software, specifically Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Descriptive and basic statistical analyses were conducted to examine the obtained results.

RESULTS

Table 1. Frequency and percentage distributions of demographic data of the participants

Variable	class	frequency	Percentage
1. What is your highest qualification in Radiography	Diploma	1	0.6
	Bachelor's	136	86.1
	Doctorate	7	4.4
	Master's	14	8.9
	< 2 years	72	45.6

2.	How many years have you been practicing as a radiographer?	2 – 5 years	54	32.2
		6-10 years	30	19.0
		> 10 years	2	1.3
3.	Main Medical Imaging Modality You Work With?	Computed Tomography	13	8.2
		Computed Tomography and Magnetic Resonance Imaging	3	1.9
		Magnetic Resonance Imaging	14	8.9
		Ultrasound	13	8.2
		X-ray	21	13.3
		X-ray and Computed Tomography	13	8.2
		X-ray, Computed Tomography and Magnetic Resonance Imaging	3	1.9

From Table 1 above, the majority 86.1%(n=136) of respondents held a bachelor's degree in radiography, with most 45.6%(n=72) having less than two years of practice. Large proportion 13.3% (n=21) worked with X-ray, followed by Magnetic Resonance Imaging 8.9% (n=14).

Table 2 Knowledge of artificial intelligence and machine learning

Variable		Class	Frequency	Percentage
1.	Have you heard of Artificial Intelligence (AI) in medical imaging?	No	20	12.7
		Yes	138	87.3
2.	Which of the following	AI is just advanced computer programming	45	28.5

	best defines Artificial Intelligence (AI)?	AI refers to machines performing tasks requiring human intelligence	95	60.1
		AI refers to machines performing tasks requiring human intelligence , AI is just advanced computer programming	12	7.6
		Don't know.	6	3.8
3.	Are you familiar with machine learning or deep learning?	No	31	19.6
		Somewhat	67	42.4
		Yes	60	38.0
4.	Which Artificial Intelligence applications in imaging do you know of?	Automatic positioning	15	9.5
		Automatic positioning, Workflow tools	3	1.9
		Computer-Aided Diagnosis(CAD)	40	25.3
		Computer-Aided Diagnosis(CAD), Automatic positioning	11	\6.9
		Computer-Aided Diagnosis(CAD), Automatic positioning, Workflow tools	12	7.6
		Computer-Aided Diagnosis(CAD), Workflow tools	25	15.8
		None	40	25.3
		Workflow tools	12	7.6
5.	Have you ever used AI-powered	No	98	62.0
		Yes	60	38.0

	tools at work?		

From table 2 above, large number 87.3% (n=138) of respondents had heard of AI in medical imaging. When asked for a definition, 60.1% (n=95) correctly identified AI as machines performing tasks that require human intelligence. While 42.2 %(n=67) of respondents were familiar with machine learning and deep learning. When asked about the artificial intelligence they know of, 25.5 %(n=40) of the respondents mentioned computer-Aided diagnosis. Despite high awareness, only 38.0% (n=60) of radiographers have used AI-powered tools at work.

Table 3 Frequency and percentage distributions of the applications of artificial intelligence in imaging modalities

Variable	Class	Frequency	Percentage
1. Which Modalities Do You Think Artificial Intelligence Is Already Being Used In?	Computed Tomography	20	12.7
	Computed Tomography, Magnetic Resonance Imaging	23	14.6
	Computed Tomography, Magnetic Resonance Imaging, Ultrasound	6	3.8
	I Don't Know	18	11.4
	Magnetic Resonance Imaging	14	8.9
	Magnetic Resonance Imaging, Ultrasound	1	0.6
	Ultrasound	6	3.8
	X-Ray	28	17.7
	X-Ray, Computed Tomography	10	6.3

		X-Ray, Computed Tomography, Magnetic Resonance Imaging	12	7.6
		X-Ray, Computed Tomography, Magnetic Resonance Imaging, Ultrasound	17	10.8
		X-Ray, Computed Tomography and Ultrasound	2	1.3
		X-Ray, Ultrasound	1	0.6
2.	Do you think Artificial Intelligence improves diagnostic imaging quality	Agree	67	42.4
		Disagree	21	13.3
		Not sure	29	18.4
		Strongly agree	41	25.9

From table 3 above, the majority 17.7 %(n= 28) of the respondents, identified X-ray as the area where AI is most commonly used, while 14.6%(n= 23) of the respondents mentioned Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). In addition, 25.9% (n=41) respondents strongly agreed that artificial intelligence enhances the quality of diagnostic imaging.

Table 4 Frequency and percentage distributions of perceived benefits and challenges of AI applications in medical imaging

Variable		Class	Frequency	Percentage
1.	What benefit of Artificial Intelligence in imaging st,s	Accuracy	18	11.4
		Accuracy, Efficiency, Patient Outcomes	1	0.6
		Accuracy, Patient Outcomes	1	0.6

	out most to	Accuracy, Speed	11	7.0
	you?	Accuracy, Speed, Efficiency	10	6.3
		Accuracy, Speed, Efficiency, Patient Outcomes	6	3.8
		Accuracy, Speed , Patient Outcomes	1	.6
		Efficiency	27	17.1
		Efficiency, Patient Outcomes	1	0.6
		Patient Outcomes	6	3.8
		Speed	55	34.8
		Speed, Efficiency	19	12.0
		Speed, Patient Outcomes	2	1.3
2.	What challenge concerns you the most about Artificial Intelligence?	Cost	18	11.4
		Cost, Lack of training	11	6.9
		Cost, Lack of training, Privacy	3	1.9
		Cost, Privacy	3	1.9
		I'm not concerned.	5	3.2
		Job loss	45	28.5
		Job loss, Cost	14	8.9
		Job loss, Cost, Lack of training	8	5.1
		Job loss, Cost, Lack of training, Privacy	4	2.5
		Job loss, Lack of training	9	5.7
		Job loss, Lack of training, Privacy	1	0.6
		Job loss, Privacy	3	1.9

		Job lost, Cost	1	0.6
		Job lost, Lack of training	1	0.6
		Job lost, Privacy	1	0.6
		Lack of training	22	13.9
		Lack of training, Privacy	2	1.3
		Privacy	7	4.4
3.	Do you feel confident working with AI tools today?	No	31	19.6
		Somewhat	78	49.4
		Yes	49	31
4.	What do you think are the biggest challenges or limitations to adopting Artificial intelligence in medical imaging?	Concerns about data security, privacy	11	7.0
		Concerns about data security, privacy, Uncertainty about AI's impact on patient care	6	3.8
		Lack of training or education	14	8.9
		Lack of training or education, Concerns about data security, privacy	6	3.8
		Lack of training or education, Concerns about data security, privacy, Uncertainty about AI's impact on patient care	4	2.5
		Lack of training or education, Limited	18	11.4

	access to AI-powered tools		
	Lack of training or education, Limited access to AI-powered tools, Concerns about data security, privacy	8	5.1
	Lack of training or education, Limited access to AI-powered tools, Concerns about data security, privacy, Uncertainty	15	9.5
	Lack of training or education, Limited access to AI-powered tools, Uncertainty about AI's impact on patient care	8	5.1
	Lack of training or education, Uncertainty about AI's impact on patient care	7	4.4
	Limited access to AI-powered tools	22	13.9
	Limited access to AI-powered tools, Concerns about data security, privacy	5	3.2

	Limited access to AI-powered tools, Concerns about data security, privacy, Uncertainty about AI's impact on patient	8	5.1
	Limited access to AI-powered tools, Uncertainty about AI's impact on patient care	5	3.2
	Uncertainty about AI's impact on patient care	21	13.3

From table 4 above, the majority 34.8 %(n= 55) (of the radiographers, identified increased speed as the most significant benefit of AI in medical imaging. Conversely, 28.5 %(n=45) respondents indicated that their greatest concern is the potential for job loss. Additionally, 49.4 %(n=78) respondents reported feeling confident when working with AI tools in today's medical imaging practice. Furthermore, 13.9% (n=22) respondents noted that limited access to AI-powered tools represents their main challenge or barrier to adopting AI in medical imaging.

Discussion of Findings

The findings of this study revealed a complex picture of optimism, concern, and readiness among radiographers regarding AI adoption in medical imaging.

Knowledge of artificial intelligence:

The high awareness (87.3%) found in this study demonstrated that AI had become a recognized concept among radiographers in Nnewi. However, deeper knowledge was limited, as only 38% were familiar with machine learning and deep learning. This was consistent with the findings of Coakley *et al.[13]*, who reported that radiographers often knew about AI in principle but lacked advanced understanding of its algorithms. Similarly, Ong *et al.[14]* found that radiographers' exposure to AI was often limited to general awareness, without practical application in clinical settings.

Applications in imaging modalities:

Participants in this study most commonly associated AI with X-ray, CT, and MRI. These modalities were consistent with those most advanced in AI integration globally. Malamateniou *et al*. [6] reported that AI applications in chest radiography and CT, such as triage and dose optimization, were among the first to be successfully implemented. Likewise, Potocnik *et al.*[15] highlighted MRI's increasing reliance on AI for image reconstruction and segmentation.

However, fewer respondents recognized AI applications in ultrasound and fluoroscopy. This limited awareness suggested that local exposure

to AI beyond advanced modalities remained minimal. The trend reflected the uneven diffusion of new technologies, where high-demand imaging modalities were prioritized for innovation before spreading to other areas of practice.

Conclusion

This study concludes that radiographers in Nnewi have strong awareness but limited practical knowledge and training regarding AI in medical imaging. While radiographers recognize the potential of AI to improve speed, efficiency, and diagnostic quality, they remain concerned about job security, inadequate training opportunities, and ethical considerations. Overall, the findings suggest that the workforce is optimistic but not fully prepared, showing a strong willingness to embrace AI if supported by formal education, professional training, and clear regulatory guidelines.

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All authors have read and approved the manuscript. Each author participated sufficiently in this submission and the roles of the authors are: SON and MPO were the main researchers, drafted the manuscript, responsible for data capturing. SON, AOE, MPO, NPN and AAC carried out presentation and interpretation of results. AOE, MPO, NPN and AAC gave recommendations on the review of the literature and also provide critical comments on the research work.

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