Knowledge, Attitudes, and Practices of Healthcare Professionals Toward Artificial Intelligence in Healthcare: A Cross-Sectional Study in Kirkuk, Iraq

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Abstract: Artificial Intelligence (AI) is increasingly integrated into healthcare systems worldwide, offering promising solutions for diagnostics, treatment planning, and administrative efficiency. However, the successful adoption of AI tools depends largely on healthcare professionals' knowledge, attitudes, and practices (KAP), especially in developing countries like Iraq. To assess the knowledge, attitudes, and practices of healthcare professionals in Kirkuk city, Iraq, regarding the use of AI in clinical settings. A cross-sectional survey was conducted among 34 healthcare professionals using a structured, interviewer-administered questionnaire. The instrument covered demographics, knowledge, attitudes (Likert-scale), and practice patterns related to AI. Data were analyzed using SPSS version 26, and descriptive and comparative statistics were applied. The majority of participants demonstrated moderate knowledge about AI, with 64.7% correctly defining it and 55.9% reporting prior exposure through articles or lectures. Attitudes were generally positive; 70.6% strongly supported physician-supervised AI use, and 79.4% expressed interest in training. However, only 38.2% were aware of AI tools in their workplace, and 23.5% reported regular use. The most cited barriers were lack of training (23.5%) and unclear regulations (17.6%). While healthcare professionals in Kirkuk exhibit strong interest and positive attitudes toward AI, their practical use remains limited. There is an urgent need for structured AI training programs, national implementation guidelines, and increased institutional support to bridge the gap between readiness and real-world application.

Keywords: Artificial Intelligence, KAP, Healthcare Professionals, Iraq, Medical Technology, Digital Health, Clinical Practice, Health Informatics

Introduction

Artificial Intelligence (AI) is transforming modern healthcare by enabling faster, more accurate, and data-driven clinical decisions. From medical imaging analysis and diagnostic support systems to predictive analytics and virtual assistants, AI is now an essential tool in many healthcare domains. Its ability to handle big data, learn patterns, and automate complex tasks holds promise for enhancing patient outcomes and reducing medical errors [1,2]. The World Health Organization has acknowledged AI as a catalyst for improving access and quality in healthcare, especially in low- and middle-income countries [3]. Global adoption is rapidly growing, and the need to align healthcare systems with this technological evolution is now a top priority for sustainable health development.

Despite AI's global momentum, its successful implementation depends heavily on the knowledge, acceptance, and readiness of healthcare professionals. Studies suggest that while many HCPs have

positive attitudes toward AI, their knowledge remains limited, particularly regarding AI's technical foundations and ethical implications [4,5]. In regions with emerging AI infrastructure like Iraq, there is insufficient data on whether healthcare staff understand the potential and limitations of AI tools. Addressing this knowledge gap is essential, as a well-informed workforce is key to safe and effective AI deployment [6].

AI has been applied across diverse healthcare services—radiology (image interpretation), pathology (automated diagnostics), pharmacy (medication management), and public health surveillance (disease trend prediction). Decision-support systems powered by AI can assist physicians in identifying rare conditions, optimizing treatment protocols, and monitoring patient progress [7]. In Iraq, although some AI applications exist in radiology and administrative systems, their clinical use remains limited and poorly documented [8]. Understanding current usage patterns will help assess the technological readiness of health institutions and their staff.

Multiple barriers hinder the adoption of AI in clinical settings, particularly in low-resource countries. These include limited technical infrastructure, lack of training programs, concerns over data privacy, resistance from clinicians, and absence of local AI policies or regulations [9]. In Iraq, challenges such as fragmented health information systems, weak digital literacy, and post-conflict instability may further complicate AI integration. Healthcare professionals may also fear job displacement or question the reliability of AI recommendations, making it crucial to assess attitudes and real-world usage barriers [10].

This study aims to assess the knowledge, attitudes, and practices (KAP) of healthcare professionals in Kirkuk city, Iraq, toward the use of Artificial Intelligence tools in healthcare settings. The findings will provide a baseline for policy development, training programs, and technological investments tailored to the local context.

Methodology

This study employed a cross-sectional, questionnaire-based design conducted between May/2025 and Oct/2025 in Kirkuk City, Iraq. The research aimed to assess the knowledge, attitudes, and practices (KAP) of healthcare professionals (HCPs) regarding the use of artificial intelligence (AI) tools in healthcare settings.

The target population included physicians, pharmacists, nurses, and allied healthcare workers employed in both public and private health institutions in Kirkuk. A stratified random sampling method was used to ensure representation across different professions and healthcare sectors.

A structured questionnaire was developed based on WHO guidelines for KAP studies and literature on AI literacy in healthcare [11–13]. The tool consisted of four sections: Demographics – age, gender, profession, institution type, and experience (Q:1-Q:7). Knowledge – 7 multiple-choice questions (Q:8-Q:14) assessing understanding of AI concepts and applications. Attitude – 11 items (Q:15-Q:25) rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Practice – 9 questions (Q:26-Q:34) on real-world AI use, frequency, and training.

Questionnaires were distributed in person at major hospitals, health centers, and clinics across Kirkuk. Data collectors, who were trained healthcare researchers, explained the study purpose and obtained written informed consent from each participant. Participation was voluntary, and anonymity was ensured by assigning numerical codes instead of names.

Ethical approval was obtained from the training and development center at Kirkuk Health Directorate. All procedures adhered to the ethical standards of the Declaration of Helsinki.

Data were entered and analyzed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic data and KAP scores.

Results

The study sample included 34 healthcare professionals with a mean age of 42.7 ± 10.6 years. Most participants were male (67.6%) and married (88.2%). Physicians comprised the largest professional

group (44.1%), followed by pharmacists (29.4%) and nurses (17.6%). In terms of academic qualification, 38.2% held bachelor's degrees, while 41.2% had postgraduate credentials (Master's 23.5%, PhD 17.6%). Over half of the respondents (52.9%) had more than 15 years of experience, indicating a well-established professional population. The majority worked in public hospitals (52.9%), with others distributed across clinics, healthcare centers, and academic or administrative settings, as shown in Figure 1.
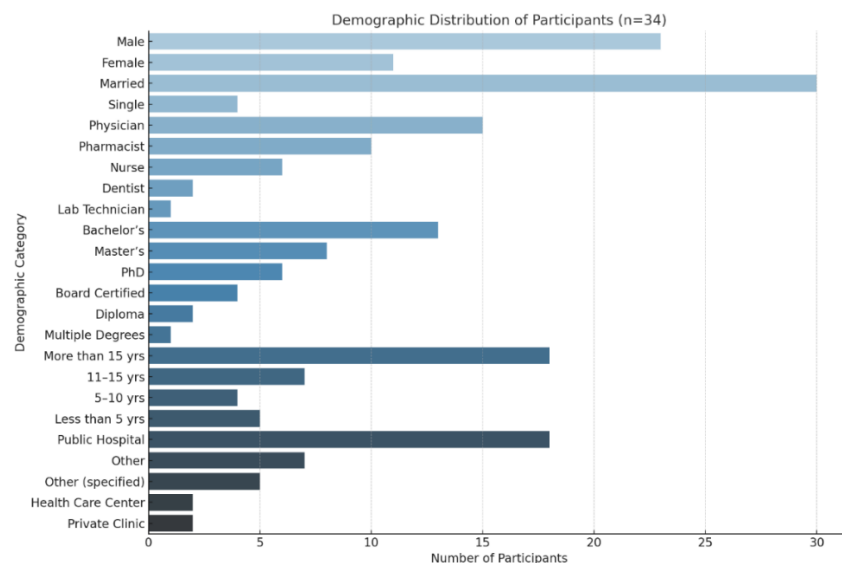

Figure 1. The bar chart illustrates the frequency distribution of the key demographic variables across gender, profession, qualification, years of experience, and workplace type.

Out of 34 respondents, 64.7% correctly identified "Artificial Intelligence" as the full form of AI, while others confused it with terms like "Artificial Integration" or "Analytical Interface." When asked about areas of AI application, 58.8% selected "All of the above," indicating broad awareness, though response diversity suggested fragmented understanding. More than half (55.9%) reported reading articles or attending lectures on AI, yet only 38.2% were aware of any AI tool currently used in their field. The most cited tools included ChatGPT, Gemini, and radiology software. Regarding factual knowledge, 41.2% believed AI tools could outperform humans in diagnosis, while 85.3% correctly recognized the need for large, high-quality datasets, and 97.1% acknowledged AI's limitations in understanding human emotions. These findings reflect moderate conceptual and functional knowledge, with noticeable gaps in practical exposure and critical comprehension, as illustrated in Figure 2.
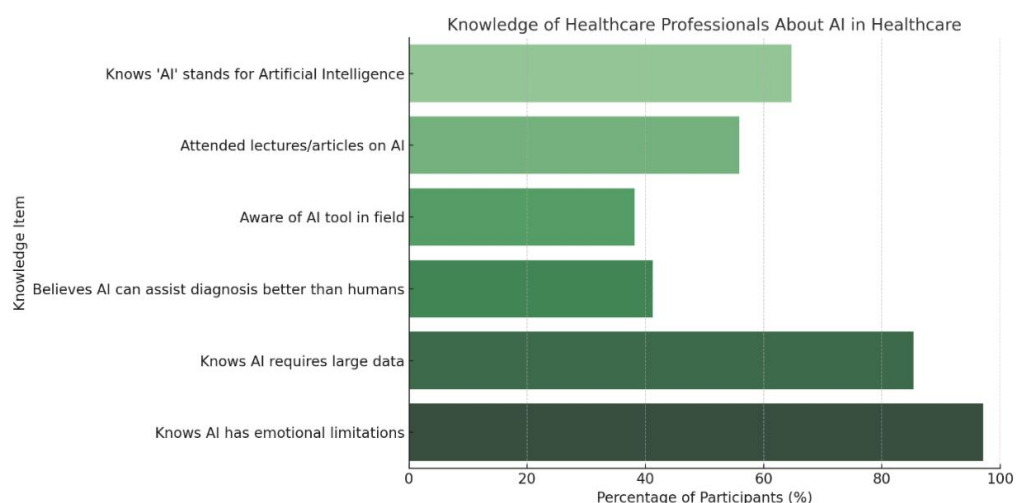

Figure 2. The bar chart summarizing the knowledge levels of healthcare professionals regarding AI in healthcare.

Among the 34 healthcare professionals surveyed in Kirkuk, Iraq, attitudes toward artificial intelligence (AI) in healthcare were generally positive, with high agreement on the need for human supervision (mean = 4.32 ± 1.25), regulatory oversight (3.85 ± 1.28), and enthusiasm for AI training (4.00 ± 1.04). Participants moderately agreed that AI can enhance diagnosis (3.41 ± 1.18), support clinical decisions (3.32 ± 1.12), and reduce workload (3.18 ± 1.19). Ethical concerns (3.56 ± 1.28) and fears of job replacement (3.38 ± 1.39) were notable. However, only 41.2% reported prior use of AI tools in practice, despite 70.6% strongly supporting supervised implementation, indicating a gap between positive attitudes and real-world usage. These findings highlight the need for structured training and infrastructure to translate attitudes into practical integration, as seen in the heatmap Figure 3.
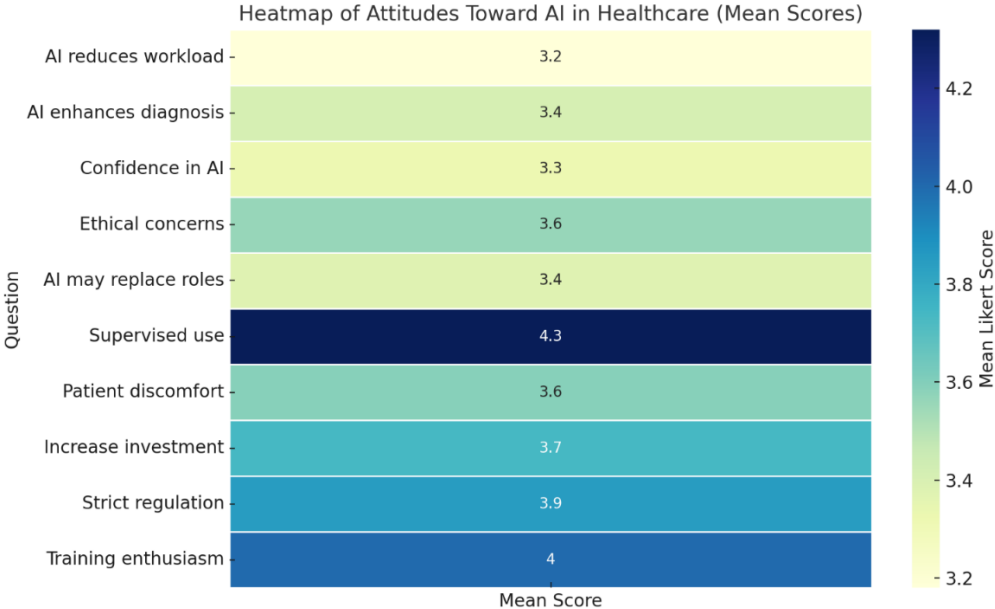

Figure 3. The heatmap showing the average attitude scores of healthcare professionals toward AI in healthcare (based on a 5-point Likert scale): Darker shades = Higher agreement. Lighter shades = Lower agreement.

Among the 34 healthcare professionals surveyed, the frequency of AI use varied: 23.5% reported daily or weekly usage, while an equal proportion (23.5%) had never used AI tools. A majority (82.4%) had never received formal AI training, and 64.7% indicated that AI tools were not implemented in their departments. Regarding confidence in interpreting AI outputs, 55.9% were "somewhat confident," and only 23.5% felt "very confident." The most commonly cited barriers to AI adoption were lack of training (23.5%), unclear regulations (17.6%), and lack of access (11.8%). Encouragingly, 79.4% expressed willingness to attend AI-related workshops, and 76.5% had recommended AI tools to colleagues. The most preferred AI application was diagnostic support (35.3%), followed by imaging (17.6%) and drug interaction checkers (14.7%), as shown in Fogure 4.
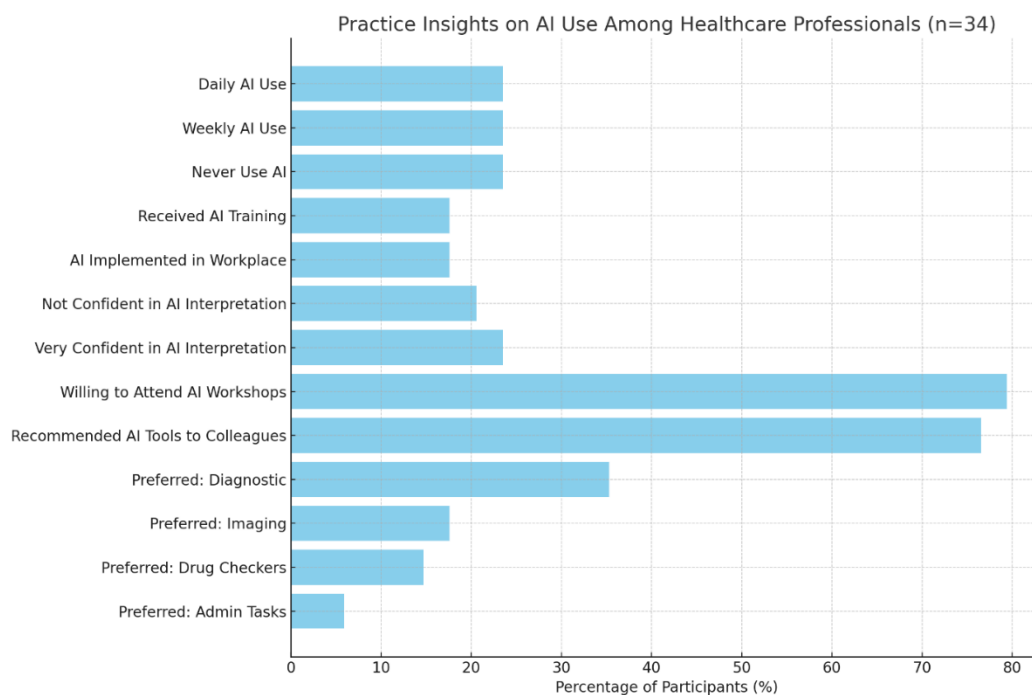
Figure 4. The bar chart summarizing key practice-related insights on the use of AI among healthcare professionals in Kirkuk.

Discussion

Artificial Intelligence (AI) is rapidly transforming global healthcare systems by optimizing diagnostic accuracy, improving clinical workflows, and enhancing patient outcomes through data-driven decision-making. Its integration into health services allows for earlier disease detection, individualized treatment plans, and automated support in high-volume tasks such as imaging, administration, and predictive analytics [14,15]. For developing countries like Iraq, AI presents an opportunity to bridge healthcare gaps caused by workforce shortages and limited specialist access. However, successful integration depends not only on technological infrastructure but also on the preparedness and acceptance of healthcare professionals [16].

In this study, knowledge regarding AI among healthcare professionals in Kirkuk was moderate. While 64.7% correctly defined "AI" and 55.9% had attended lectures or read articles on the topic, only 38.2% were aware of any AI tools currently implemented in their workplace. These findings suggest a knowledge gap in real-world application, despite theoretical familiarity. A similar trend was observed in a study by Vanamali et al. in India, where a high percentage of physicians had positive views about AI but limited understanding of actual tools [17]. Çapuk et al. also noted that AI literacy among healthcare workers in Turkey was inconsistent, especially regarding ethical concerns and algorithmic transparency [18]. Our results align with these studies and reinforce the need for formal AI education in medical and allied health curricula to support future adoption.

Attitudes toward AI were generally positive yet cautious. Most participants agreed that AI could reduce workload and enhance diagnostic accuracy, but emphasized the need for physician supervision (mean = 4.32) and strict regulation (mean = 3.85). These findings mirror those of Davenport and Kalakota, who found that healthcare professionals trust AI more when it is perceived as an assistive rather than autonomous tool [19]. Enthusiasm for training was high (mean = 4.00), indicating strong interest in professional development despite practical limitations. Ethical concerns, such as fears of job displacement and accountability, were also noted, as in other regional studies, suggesting that emotional and cultural factors must be addressed alongside technical training [20].

Despite moderate knowledge and positive attitudes, the actual practice of using AI was limited. Only 23.5% reported daily or weekly use, and a majority (82.4%) had never received formal

training. This gap between attitude and implementation is consistent with Othman et al.'s findings in the Kurdistan region, where enthusiasm for AI was not matched by infrastructure or institutional readiness [21]. In our study, the primary barriers to AI adoption were lack of training (23.5%), unclear regulations (17.6%), and access limitations (11.8%). However, a promising 79.4% indicated willingness to attend workshops, and 76.5% had recommended AI tools to peers, suggesting that structured, targeted training could substantially improve adoption rates.

This study is limited by its cross-sectional design and relatively small sample size (n=34), which restricts generalizability. Additionally, self-reported responses may be subject to bias. The study was also geographically limited to Kirkuk city, and thus may not reflect national perspectives. Future studies with larger, more diverse samples and longitudinal follow-up are needed to assess evolving trends and the impact of training interventions.

Conclusion

Healthcare professionals in Kirkuk demonstrate moderate knowledge, positive attitudes, but limited practical engagement with AI tools. Key barriers include lack of training and regulatory clarity. There is strong interest in learning and willingness to adopt AI if support systems are provided. We recommend that Iraqi healthcare authorities: Integrate AI modules into medical and pharmacy education, develop national AI implementation guidelines, and offer continuing professional development (CPD) workshops to upskill current staff. Such strategies will help bridge the gap between interest and implementation, enabling Iraq to benefit from the growing global movement toward AI-enhanced healthcare.

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