

Artificial intelligence in the Iraqi health system: challenges, opportunities, and pathways towards universal health coverage

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Abstract

Background: Artificial intelligence (AI) is increasingly recognized as a transformative tool in healthcare management. In Iraq, the potential of AI remains underexplored due to systemic, infrastructural, and professional challenges. This narrative review explores the challenges, problems, and potential solutions of using AI to manage and control Iraq's health system, with a particular focus on universal health coverage (UHC).

Methods: A comprehensive literature review was conducted using PubMed, Scopus, Web of Science, and Google Scholar for studies published between 2015 and 2025, complemented by WHO and Iraqi Ministry of Health reports.

Results: The findings highlight barriers including capacity building, availability and accessibility of data, professional preparedness, and legal frameworks. Recent innovations and policy initiatives demonstrate opportunities for integration of AI to strengthen health service delivery and monitoring.

Conclusion: AI adoption in Iraq requires multi-level reforms involving workforce training, legal regulation, robust digital infrastructure, and alignment with UHC objectives. These measures can enhance equity, efficiency, and resilience in Iraq's health system.

Keywords: Artificial Intelligence, Healthcare System, Universal Health Coverage, Data Management, Digital Health, Capacity Building, Iraq

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allocation, and improved patient care [1]. While high-income countries have advanced rapidly in implementing AI-based health solutions, low- and middle-income countries (LMICs) such as Iraq face unique challenges. Iraq's healthcare system has suffered from decades of conflict, sanctions, and underinvestment, resulting in infrastructural weaknesses, limited human resources, and poor data systems [2,3]. Given these limitations, the integration of AI for health management and universal health coverage (UHC) requires careful consideration of barriers, preparedness, and tailored solutions [2,4]. This review examines the challenges, problems, and potential strategies for implementing AI in Iraq's health system, with a particular focus on capacity building, data availability, professional preparedness, legal issues, and policy frameworks in the context of moving toward UHC.

Methods

Study design

This narrative review used a structured search and thematic synthesis approach to identify literature and policy documents relevant to deploying artificial intelligence (AI) for health system strengthening in Iraq, with emphasis on Universal Health Coverage (UHC) objectives.

Search strategy and databases

We searched PubMed/MEDLINE, Scopus, Web of Science, IEEE Xplore, and Google Scholar for peer reviewed literature, and reviewed gray literature from WHO, World Bank, UN agencies, Iraqi Ministry of Health publications, and reputable regional journals and policy platforms. The World Health Organization UHPR national report for Iraq and regional digital

Background

Artificial Intelligence (AI) is transforming healthcare worldwide through enhanced diagnostics, predictive analytics, resource

health reviews were specifically consulted. The search window covered January 2010 to June 2025 to capture contemporary developments and recent policy activity.

Search terms

Combinations of controlled and free text terms were used, including: "artificial intelligence" OR "machine learning" OR "deep learning" AND "health" OR "healthcare" OR "health system" AND "Iraq" OR "Iraqi"; additional terms included "digital health," "electronic health records," "universal health coverage," "UHC," "data governance," "telemedicine," and "capacity building." Searches were supplemented by hand-searching reference lists and forward citation tracking of key papers.

Inclusion and exclusion criteria

We included empirical studies, reviews, policy reports, and commentaries that discussed AI or digital health in Iraq or comparable LMIC/fragile settings, and that addressed at least one of the following domains: data systems, workforce capacity, infrastructure, governance/regulation, financing, equity or UHC. Publications not available in English or Arabic, or those without substantive relevance to health system implementation (e.g.,

Study selection and data extraction

Titles and abstracts were screened for relevance by one reviewer; full texts were retrieved for potentially relevant records. Data extraction included study type, setting, main findings, relevance to UHC, and proposed solutions. Given the narrative scope and heterogeneity of sources, a formal quality appraisal was not performed; instead, we prioritized policy documents, WHO reports, and peer reviewed evidence where available.

Results

Extracted information was organized into thematic domains (data readiness, infrastructure, workforce, legal/regulatory, financing, equity, and clinical integration) and synthesized narratively with illustrative examples from Iraqi and regional sources. Limitations of the search (language bias, possible omission of unpublished local reports) are acknowledged in the discussion.

Capacity Building

The Iraqi health system is constrained by limited human resources, outdated infrastructure, and fragmented healthcare delivery [5]. AI adoption requires specialized expertise in data science, informatics, and biomedical engineering, which remain scarce in Iraq. The absence of systematic training programs limits local capacity to develop and sustain AI solutions [6].

Availability and Accessibility of Data

AI applications depend heavily on high-quality, standardized, and accessible datasets. Iraq's health data landscape is characterized by incomplete, paper-based records, weak digitalization, and limited interoperability across institutions [7]. Data fragmentation across public and private facilities further hinders integration. Without reliable electronic health records (EHRs), predictive analytics and AI-assisted decision-making remain difficult.

Professional Preparedness and Acceptance

Physicians and healthcare workers in Iraq often lack exposure to digital technologies, raising concerns about the acceptability of AI-driven interventions. Resistance may arise due to mistrust, fear of replacement, or lack of clarity about AI's role in clinical decision-making [8]. Professional preparedness requires both technical training and efforts to build confidence in AI as a supportive, rather than substitutive, tool.

Legal and Ethical Considerations

The use of AI in healthcare requires robust legal and regulatory frameworks to ensure patient privacy, data protection, and accountability in decision-making [9]. Iraq currently lacks comprehensive data protection laws and ethical guidelines specific to AI in medicine. This regulatory vacuum raises risks of data misuse, inequitable access, and poor governance of AI systems.

Alignment with Universal Health Coverage (UHC)

AI has the potential to support UHC in Iraq by improving health service efficiency, reducing diagnostic errors, enabling telemedicine, and optimizing resource allocation [10]. However, inequities in digital access between urban and rural areas, and between public and private sectors, may exacerbate existing disparities. Without deliberate policy interventions, AI adoption risks reinforcing rather than reducing health inequities.

Discussion

This review highlights the multidimensional challenges facing Iraq in adopting AI to achieve UHC. Key barriers include limited workforce preparedness, fragmented data systems, weak infrastructure, ethical concerns, lack of regulatory frameworks, and insufficient financing. Similar obstacles have been reported across LMICs [11,12], suggesting that Iraq can draw lessons from countries advancing digital health reforms. AI adoption should be incremental, starting with pilot programs in high-burden areas such as maternal health, infectious disease surveillance, and radiology diagnostics. Building trust among healthcare professionals and the public is critical, alongside establishing strong governance structures. Over time, AI can contribute to equitable health service delivery, improved efficiency, and stronger progress toward UHC in Iraq [13]. Furthermore, UHC demands not only wider availability of services but also their quality and affordability; AI can contribute to each domain only if structural and governance barriers are addressed [14].

UHC-related challenges

First, service coverage is limited by geographic disparities and fragile primary care infrastructure; AI initiatives concentrated in urban tertiary centers risk widening these gaps unless deliberate rural and primary care inclusion is planned [15,16]. Second, quality gains from AI (improved diagnostics, decision support) require validated, locally relevant models and clinician acceptance—otherwise algorithmic errors or poor calibration may degrade care quality. Third, financial protection objectives under UHC could be undermined if AI-driven services increase out of pocket spending (e.g., migration to private digital platforms) or favor insured urban populations; procurement and

financing arrangements must therefore ensure public ownership, affordable access, and prevention of vendor-driven cost inflation [15,17]. Fourth, equity and inclusion are at risk when datasets under represent displaced, rural, or otherwise marginalized groups, producing biased models and unequal service gains [18].

Policy and operational implications

To align AI deployment with UHC goals, policymakers should embed explicit UHC indicators into AI project design (eg, tracer service coverage, reductions in diagnostic delay, measures of financial protection). Pilots should measure not only technical performance but also effects on access, quality, and equity. Procurement models must prioritize public value—requiring open standards, data portability, and total cost of ownership assessments to avoid lock in and ensure long term sustainability.

Building public trust and legitimacy

Public engagement is essential to secure consent for data sharing and legitimate governance. Transparent communication about benefits, risks, and safeguards—together with community oversight mechanisms—will be critical to maintain trust and facilitate uptake [15].

Research and monitoring needs

Continued operational research linking AI outputs to UHC metrics, robust local dataset development (including labeled imaging and community health records), and routine post deployment monitoring (for safety, equity and performance drift) are required to scale interventions responsibly [13]. Overall, aligning AI with UHC in Iraq requires a systems approach that treats AI as an enabler of equitable health system functions rather than a standalone technological fix. International partnerships, phased pilots tied to UHC indicators, and investments in local capacity and governance form the most pragmatic route forward. Iraq stands at a crossroads in adopting AI for health system strengthening and achieving UHC. While significant barriers exist, including weak infrastructure, data fragmentation, and limited expertise, the potential benefits are substantial. By prioritizing capacity building, improving data accessibility, enhancing professional preparedness, enacting robust legal frameworks, and ensuring equitable deployment, Iraq can harness AI as a transformative tool for healthcare reform. Strategic investment, international collaboration, and context-sensitive policies are essential to overcome current challenges and move toward a sustainable, AI-supported health system.

Conclusion

AI presents an unprecedented opportunity to strengthen Iraq's health system and accelerate progress toward Universal Health Coverage. However, significant barriers remain in capacity building, data systems, infrastructure, professional acceptance, legal frameworks, and financing. Addressing these challenges through targeted investments, regulatory reforms, and international collaborations is essential. Iraq's path to AI-driven healthcare must prioritize inclusivity, transparency, and sustainability to ensure long-term success.

Abbreviation

AI: Artificial intelligence; UHC: Universal Health Coverage; LMICs: Low- And Middle-Income Countries; EHRs: Electronic Health Records

Declaration

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Availability of data and materials

Data will be available by emailing saadalezzi@uodiyala.edu.iq

Authors' contributions

All authors were equally participated in designing, supervising, the study and conceiving the idea. They worked together in data analysis, interpreted the results and curated and drafted the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

We conducted the research following the declaration of Helsinki. However, review article needs no ethical approval.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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