

Submitted: April 18th, 2026

Accepted: July 10th, 2026

A Systematic Review of Healthcare Professionals' Readiness, Perceptions, and Barriers Toward Artificial Intelligence Adoption in Saudi Arabia

Mohammad Abdulaziz Alnajdi ^{1,*}, Ahmad Faisal Alhazmi ¹, Abdullah Ahmed Alghamdi ¹

¹ Alnoor Specialized Hospital, Makkah, Saudi Arabia.

Abstract

Background: Artificial intelligence (AI) is rapidly transforming healthcare systems worldwide, including Saudi Arabia's digitally evolving health sector. Understanding healthcare professionals' readiness, perceptions, and barriers toward adoption of AI is essential for successful implementation. The aim of this study is to conduct a systematic literature review on the readiness of and views and barriers to the adoption of AI among healthcare professionals in Saudi Arabia.

Methods: A systematic search for peer-reviewed articles published from 2023 to 2026 using the PubMed database. Articles were screened following the PRISMA 2020 guidelines, and data were extracted to capture study details, patient populations, key results and limitations. Study quality was assessed by relevant JBI critical appraisal tools. Because of significant heterogeneity among the reviewed studies, a narrative summary was used to synthesize the findings.

Results: 22 studies published between 2023 and 2026 were included. Healthcare professionals demonstrated positive perceptions of AI and recognized its potential to improve diagnostic accuracy, workflow efficiency, and patient outcomes. However, practical readiness was moderate, with limited hands-on experience and low formal training across most professions. Common barriers included lack of training, insufficient infrastructure, data quality concerns, unclear legal liability, privacy issues, and fear of job displacement. Facilitators included structured training programs, leadership support, interdisciplinary collaboration, and national policy development. Younger clinicians and those with higher digital literacy consistently showed greater readiness and acceptance.

Conclusion: Although the healthcare professionals in Saudi Arabia hold a generally optimistic attitude toward AI applications in health care, the considerable obstacles they are faced by limit their preparedness and ability to embrace technology effectively. Bridging training gaps, cultivating robust institutional support, and defining concrete legal and ethical parameters are crucial prerequisites to advance the uptake of AI to realize the goals of the Saudi Vision 2030.

Keywords: Artificial intelligence; healthcare professionals; readiness; perceptions; attitudes; barriers; Saudi Arabia; digital health; AI adoption; systematic review

* Mohammad Abdulaziz Alnajdi - Alnoor Specialized Hospital, Makkah, Saudi Arabia; Email: alnjdi-mhmd@hotmail.com.

1. Introduction

The implementation of Artificial intelligence (AI) has dramatically taken centre stage as a gamechanger across the present healthcare landscape, affecting the ways how patients respond to treatment, clinical workflow efficiency, diagnostic procedures, and medical decision-making [1-3]. Supported by significant improvements in machine learning (ML), deep learning (DL) and natural language processing (NLP) methodologies, AI models are proving to produce ever-more accurate, consistent and trustworthy information assisting from interpreting medical imaging scans to risk profiling for various diseases or streamlining administrative jobs [4,5]. Globally, numerous countries and healthcare organizations are thus stepping up to integrate AI into routine clinical work to improve care quality, minimize medical errors, and maximize resource use [6,7].

Despite this rapid technological development, a critical prerequisite for the widespread adoption of AI is the readiness, attitude, and acceptance of the main end users, healthcare professionals (HCPs), toward AI-driven tools [8]. Clinicians need to adopt a positive attitude and the right approach to using these technologies, ensuring they are safe, ethical, and readily implemented [9]. In contrast, barriers such as bias inherent in algorithms, the risk of job displacement, data privacy issues, and the loss of clinicians' autonomy may hinder their adoption [10,11]. Recognition of these human-centric elements is needed to guide policy, training, and implementation efforts [12]. Saudi Arabia has been witnessing an exponential growth in AI adoption in its healthcare system as part of its ambition under Saudi Vision 2030[13]. The Kingdom's vision to make digital transformation and enhance healthcare a top priority in the country requires it to be on the forefront of developing AI capabilities through its National Program such as National Strategy for Data and AI and the establishment of the Saudi Data and Artificial Intelligence Authority [14]. More attention is now being focused to study and exploring the applications of AI to enhance patients' care in the fields of Radiology, dermatology, Primary care, mental health and emergency medicine [15]. There is now more attention being paid to the potential applications of AI in different specialties such as Radiology, dermatology, Primary care, mental health and emergency medicine [16].

Nonetheless, it is not clear the readiness, concerns and attitudes of Saudi Arabian HCPs towards the adoption of AI in healthcare. The literature reported different levels of readiness, attitudes and awareness regarding AI among Saudi Arabian HCPs across different areas and specialties [17-21]. Most of the reviewed studies showed positive attitudes, and high confidence in AI capabilities but low level of confidence, lack of training and concern about the legal and ethical issues associated with AI. Such contradictory findings require a systematic examination of the literature on this subject.

Accordingly, this systematic review was conducted to identify, gather and critically review all

studies that investigated the attitudes, readiness, concerns, barriers and perceptions of Saudi HCPs toward the adoption of AI. The current systematic review synthesized a body of research exploring the topic in various fields of medicine and specialties and provides insight on the prevailing barriers of adoption for AI, along with recommendations for the advancement of national digital health plans and initiatives.

2.Methodology

2.1.Search Strategy

PubMed was systematically searched to identify articles investigating readiness, perceptions, attitudes, and barriers to the utilization of AI among healthcare practitioners (HPs) in Saudi Arabia. Our research strategy on PubMed was composed using the keywords artificial intelligence (AI), healthcare professionals (HPs), attitudes/readiness, and Saudi Arabia. The final search string was:

(“artificial intelligence”[Title/Abstract] OR “machine learning”[Title/Abstract] OR AI[Title/Abstract]) AND (physician[Title/Abstract] OR doctor[Title/Abstract] OR clinician[Title/Abstract] OR healthcare professional[Title/Abstract]) AND (readiness[Title/Abstract] OR perception[Title/Abstract] OR attitude[Title/Abstract] OR acceptance[Title/Abstract] OR barrier[Title/Abstract] OR concern[Title/Abstract]) AND (“Saudi Arabia”[Title/Abstract] OR Saudi[Title/Abstract])

The search identified only articles published in peer-reviewed journals and written in English. There were no date limits to the publication year. Last search date: April 2026. No other databases searched; no grey literature sources identified

2.2. Eligibility Criteria

Studies were included if they met the following criteria:

- Population: Healthcare professionals working in Saudi Arabia (e.g., physicians, nurses, dentists, pharmacists, allied health staff).
- Concept: Readiness, perceptions, attitudes, acceptance, barriers, or concerns regarding AI in healthcare.
- Context: Healthcare settings within Saudi Arabia.
- Study design: Quantitative, qualitative, or mixed methods empirical studies.
- Language: English.

Studies were excluded if they:

- Did not focus on healthcare professionals.
- Did not address AI readiness, perceptions, attitudes, or barriers.

- Focused on a specific AI tool rather than general AI adoption.
- Assessed virtual reality (VR) or augmented reality (AR) instead of AI.
- They were reviews, editorials, commentaries, conference abstracts, or non empirical papers.

2.3.Study Selection

All records retrieved from the database search were imported into a spreadsheet for screening. After removing duplicates, 73 unique records remained. Titles and abstracts were screened for relevance, followed by full text assessment of all 38 articles.

A total of 38 full text articles were excluded for the following reasons:

- Not focused on healthcare professionals
- Not addressing AI readiness/perceptions/attitudes/barriers
- Focused on a specific AI tool
- Focused on VR/AR rather than AI

A total of 22 studies met the inclusion criteria and were included in the final synthesis.

The study selection process followed the PRISMA 2020 guidelines.

2.4.Data Extraction

A standardized data extraction sheet was developed to ensure consistency. For each included study, the following information was extracted:

- Author and year
- Study design
- Setting and population characteristics
- Sample size
- Main findings related to AI readiness, perceptions, attitudes, and barriers
- Study limitations and quality considerations

Data extraction was performed manually by the reviewer.

2.5.Quality Assessment

The studies included were evaluated for methodological quality using the Joanna Briggs Institute (JBI) critical appraisal tools, with the appropriate checklist chosen according to the study design (cross-sectional, qualitative, or mixed methods). Each study was assessed for the clarity of its objectives, the adequacy of its sampling, the validity of its measurements, the rigor of its data analysis, and the transparency of its reporting. Quality assessments were used to inform the interpretation of findings but did not serve as exclusion criteria.

2.6. Data Synthesis

Due to heterogeneity in study designs, populations, and outcome measures, a meta-analysis was not feasible. Therefore, a narrative synthesis approach was used. Findings were grouped into major themes:

- Readiness for adoption of AI
- Perceptions and attitudes toward AI
- Barriers and concerns
- Facilitators and enablers
- Differences across healthcare professions

Patterns, consistencies, and divergences across studies were identified and summarized.

3. Results

3.1. Study Selection

A total of 73 records were identified through PubMed. After screening and eligibility assessment, 22 studies met the inclusion criteria and were included in the qualitative synthesis. The PRISMA 2020 flow diagram summarizes the selection process (Figure 1).

3.2. Characteristics of Included Studies

The studies included were published between 2023 and 2026 and covered a range of healthcare professions in Saudi Arabia, including physicians, nurses, pharmacists, dentists, mental health professionals, and allied health staff. Most studies used a cross-sectional survey design with sample sizes ranging from 100 to 1026 participants. Settings: Public hospitals, private clinics, academic institutions, and primary healthcare centers in different regions (Riyadh, Jeddah, Makkah, Eastern Province, Aljouf and Northern Border).

3.3. Thematic Synthesis of Findings

Table 1 presents a thematic synthesis of the findings from the included studies on healthcare professionals' perceptions and readiness for AI in Saudi Arabia.

3.3.1. Awareness and Knowledge of AI

Across studies, AI awareness among healthcare professionals was moderate to high, but practical knowledge remained limited. In a nationwide survey of 1,026 healthcare providers, 55.2% demonstrated strong AI knowledge, and 48.1% were familiar with AI in their specialty [19]. Among dermatologists, 63.9% were aware of AI, yet only 11.1% had excellent knowledge [21]. Physicians and academic faculty showed awareness but limited hands-on experience, with most reporting that they had only “heard about”

AI. Several studies highlighted knowledge gaps in AI ethics, data governance, and legal aspects — e.g., 59% of clinicians lacked legal literacy regarding AI use [18,22]. Overall, AI awareness is widespread, but formal education and training remain scarce, especially outside radiology and informatics.

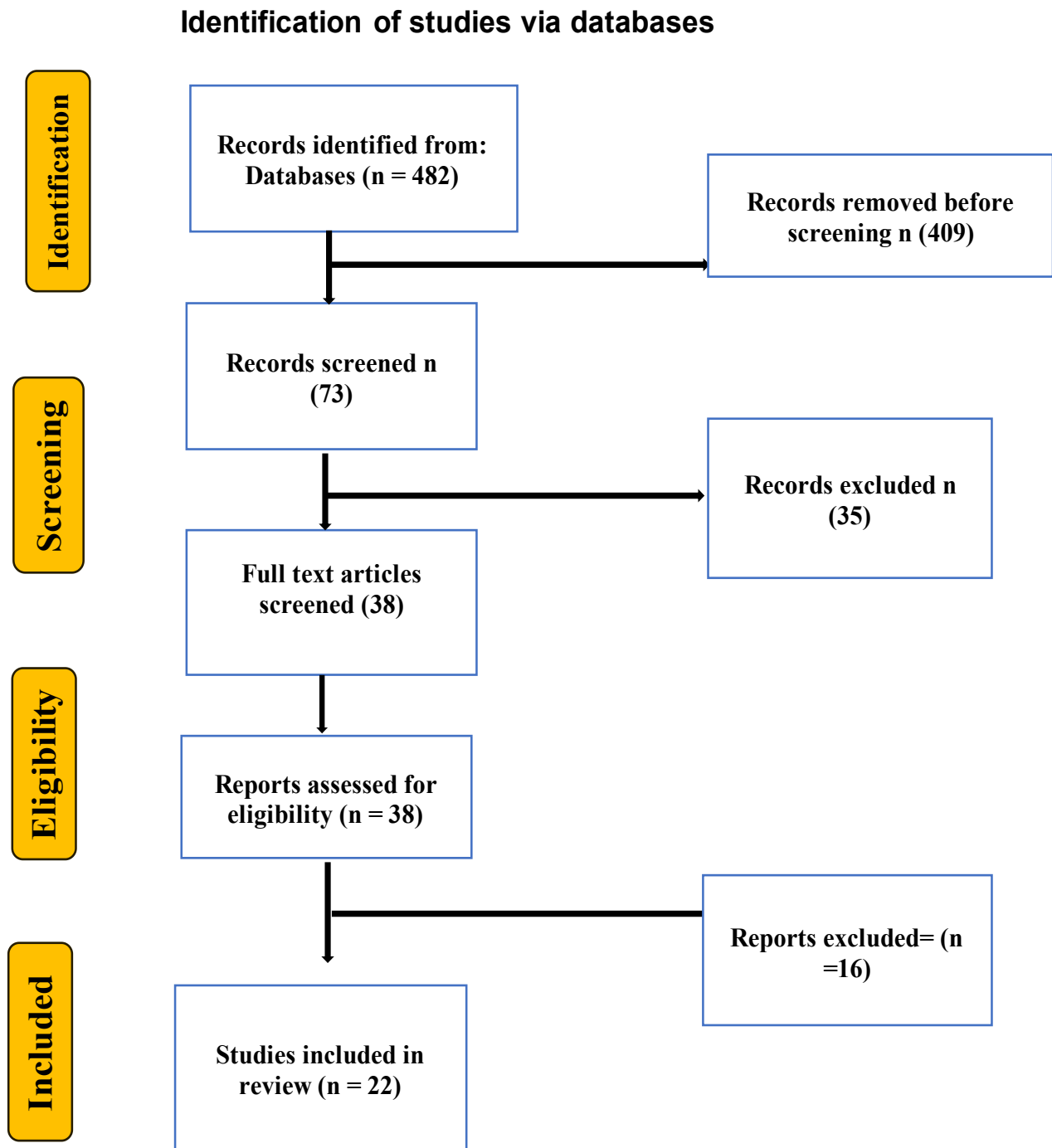


Figure (1) Prisma flow diagram

Table (1) Thematic Synthesis of Findings

Theme	Evidence Across Studies
Awareness & Knowledge	Moderate–high awareness; low practical knowledge; legal literacy gaps; younger clinicians more knowledgeable
Attitudes & Perceptions	Generally positive; AI seen as supportive; empathy-related tasks viewed as human-only; optimism highest among younger staff
Readiness	Moderate; readiness increases with training, digital literacy, and informatics involvement; adoption varies by specialty
Barriers	Lack of training; data quality issues; privacy concerns; unclear liability; job displacement fears; limited infrastructure
Facilitators	Training programs; leadership support; national guidelines; interdisciplinary collaboration; demonstrated clinical benefits
Profession Differences	Nurses' highest adopters; pharmacists highly positive; mental-health clinicians cautious; specialists more confident than GPs

3.3.2. Perceptions and Attitudes Toward AI

Most of the healthcare professionals had a positive attitude towards the integration of AI [18]. For dermatologists, anesthesiologists and emergency physicians, AI was a tool to augment work, not replace doctors [21,23,24]. Academic physicians and family medicine doctors pointed to the potential of AI to cut workload, boost efficiency and minimize errors [22,25]. Mental health professionals and psychiatrists were more cautious, pointing out that AI lacks empathy and relational skills [26,27]. Younger clinicians across all professions consistently showed more positive attitudes and more confidence in the use of AI [25,28,29]. There was optimism but also concerns around reliability, accountability and the risk of over-automation.

3.3.3. Readiness and Adoption

Differences were observed across specialties in terms of AI readiness. In one multi-center study, more than 75% of healthcare providers reported using AI as a tool to assist in decision making with nurses being the most reported specialty user [29]. About a quarter (25.9%) of physicians in Jeddah used AI tools over the past year which signifies a discrepancy between AI attitudes and practices [18].

Using well-established AI readiness scales (e.g., SHAIP) it was found that computer literacy, and experience using technology are the strong predictors for increased readiness scores[30]. Readiness was positively associated with AI readiness, the presence of digital tool use, institutional support and involvement in AI related training programs [30,31]. Overall, it can be concluded that the general AI readiness among the participants in most studies is moderate as is based on an enthusiastic drive, but a lacking infrastructure, training, and usage.

3.3.4. Barriers and Concerns

According to the included studies, several obstacles to the uptake of AI in health were consistently cited (Table 2). Educational obstacles were most noted and included insufficient education on AI in undergraduate and postgraduate training and insufficient ongoing medical education [32]. Technical obstacles included data quality problems, limits of algorithms, and poor interoperability with current health systems [18,20]. Ethical/legal obstacles involved concerns over data protection, patient confidentiality, unclear liability and the risks of algorithmic bias and misdiagnosis [32,33] .

Organizational obstacles included insufficient organizational infrastructure and support, and a lack of national policy and regulation. Psychological obstacles such as concerns about job replacement, loss of clinical autonomy, and anxiety about incorporating AI in practice were regularly cited [19,20,34]. It should be noted that job replacement fears were particularly prevalent among radiologists and those in mental health, whilst data protection issues and algorithm reliability were frequently raised among all types of health professionals [28,35].

Table (2) Barrier categories across identified studies

Barrier Category	Examples from Studies
Educational	Lack of AI training and formal curricula; limited CME integration
Technical	Poor data quality, algorithmic limitations, lack of interoperability
Ethical/Legal	Privacy concerns, unclear liability, fear of bias and misdiagnosis
Organizational	Insufficient institutional support, unclear national guidelines
Psychological	Fear of job displacement, loss of clinical autonomy, automation anxiety

3.3.5. Facilitators and Enablers

The different studies has established multiple strategies that could increase adoption. Implementation of AI modules to medical and nursing curriculum to include AI education and training [18,32]. The presence of leadership and organizational buy-in; especially gaining the endorsement of hospital and policy leaders. National guidelines provide clear ethical and regulatory directions consistent with the principles of Saudi Vision 2030[25]. A cross-disciplinary collaboration occurs between departments such as the faculties of medicine, engineering, and computer science [19]. Positive results of implementing AI have appeared in pilot programs proving its clinical impact, suggesting the increased accuracy of diagnosis and workflow productivity. The presence of such facilitators is consistent with Saudi's digital health transformation goals.

3.3.6. Differences Across Professions

Differing perceptions were seen among medical profession roles. Physicians seem aware of concerns but hesitant to trust their autonomy[18,22,32]. Nurses show good adherence to integrating workflow elements but have low trust in making tough decisions [36]. Pharmacists had generally favorable perspectives of AI, particularly to reduce medication errors [35]. Mental health practitioners supported use of administrative AI but were resistant to emotional/high stakes use[26,27]. Medical education instructors are hopeful of AI role in learning instruction and adaptive learning programs [32]. Such discrepancies confirm the need for job specific training to support AI preparedness.

3.3.7. Quality Assessment

Overall, the studies were of moderate methodological quality (Table 3). A good survey, clear research question and adequate reportage of studies was common, although certain limitations of the study design were frequently observed. The study's conclusions were based on the evidence of primarily cross-sectional data. Thus, it is not possible to decide of causality. The sampling methods of snowball and convenience are likely to lead to problems with generalizability and representativeness. Many of the studies gathered data through self-completion which poses problems related to respondent and desirability bias. Most of the studies had a focus on a specific geographic area or a single institute and specialist-based studies generally involved a small number of participants which has implications for statistical power.

Table (3) Quality Assessment Summary

Quality Domain	Common Strengths	Common Limitations
Study Design	Clear objectives; appropriate survey methods	Cross-sectional only; no causality
Sampling	Multi-site recruitment in some studies	Convenience/snowball sampling; limited generalizability
Measurement	Validated tools in several studies	Self-report bias; lack of objective AI competency measures
Analysis	Descriptive + regression analyses in some	Limited inferential depth in others
Reporting	Clear presentation of attitudes and barriers	Missing response rates; demographic imbalances

3.4.Summary of Key Findings

Saudi health workforce holds positive perception towards AI adoption(Table 4). Readiness level was moderate; limitations such as training availability, organizational preparedness, poor facilities, the deficiency in educational guidelines and regulatory framework. Key factors enabling AI integration are

provision of relevant training, leadership buy-in, development of government strategy, differences in perspective exist among healthcare professions as specific strategies may need to be put in place for different professions. This study concludes a positive sentiment towards the integration of AI among health personnel. This is consistent with Saudi vision 2030 to improve the health information systems.

Table (4) Characteristics of Included Studies

Author (year)	Population	Design	Sample Size	Key Findings (Condensed)	Limitations
Al-Ali et al. (2023)[21]	Dermatologists	Cross-sectional	103	Positive attitudes; moderate awareness; optimism about AI; low hands-on use	Selection bias; self-report; missing responses
Radhwi & Khafaji (2024) [22]	Academic physicians	Cross-sectional	128	Positive outlook; limited experience; strong interest if trained; AI seen as supportive	Single site; low response rate
Alkhateib & Subke (2024)[18]	Physicians (Jeddah)	Cross-sectional	205	Positive attitudes; low actual use; major barriers: training, data quality, reliability	Limited generalizability; self-report
Almalki et al. (2025) [30]	Healthcare professionals	Cross-sectional	359	High computer skills; low AI knowledge; younger age & informatics involvement predict readiness	Sampling bias; self-report
Serbaya et al. (2024)[34]	Healthcare workers	Cross-sectional	361	Good awareness; positive attitudes; job replacement concerns	Limited generalizability; mixed roles
Alhazmi (2025)[32]	Physicians	Cross-sectional	201	High trust; low use; 97% report barriers (training, cost, ethics)	Convenience sampling
Alanzi et al. (2023) [25]	Family physicians	Cross-sectional	157	Growing AI assistant use; younger physicians more positive; privacy concerns	Selection bias
Alsudairy et al. (2025) [37]	Primary care professionals	Cross-sectional	250	Low familiarity; mixed perceptions; concerns about reliability and cost	Response bias

Elnaggar et al. (2023)[19]	Healthcare providers	Cross-sectional	1026	Moderate-good knowledge; high exposure; strong interest; job replacement fears	Online sampling bias
Alsaedi et al. (2024)[20]	Licensed healthcare professionals	Cross-sectional	314	High awareness; low experience; strong concerns about job loss, liability, data quality	Convenience sampling
Al Harbi et al. (2024) [23]	Anesthesiologists	Cross-sectional	109	Positive attitudes; low training; younger clinicians more open	Small sample; limited sites
Sharif et al. (2025) [26]	Mental-health professionals	Cross-sectional	251	Positive perception; insufficient training; psychologists most prepared	Two-hospital sample
Alotaibi et al. (2025)[24]	Emergency physicians	Cross-sectional	101	96% see AI as useful; 40% willing to use; regional differences	Small sample
Alsalman (2026)[27]	Mental-health physicians	Cross-sectional	100	AI suitable for structured tasks; empathy tasks non-replaceable; optimism with caution	Small sample
Alrashed et al. (2025)[28]	Physicians (Riyadh)	Cross-sectional	176	Specialists most confident; younger doctors more positive; job displacement reduces confidence	Region-limited
Alruwaili et al. (2026)[31]	Primary care physicians	Cross-sectional	285	Positive toward AI-based learning; digital readiness high; older clinicians more hesitant	Limited to two provinces
Alhazmi et al. (2026)[33]	Healthcare providers	Cross-sectional	503	Moderate knowledge; low practice; ethics/privacy concerns; practice predicts readiness	Snowball sampling
Amin & Alanzi (2024)[29]	Healthcare caregivers	Cross-sectional	224	75% use AI; nurses highest adopters; younger staff more positive	Gender imbalance

Syed & Al-Rawi (2024) [35]	Clinical pharmacists	Cross-sectional	273	Very high awareness; strong belief AI improves safety; low job-loss fear	Self-report
Eldesoky et al. (2025)[38]	Healthcare providers	Cross-sectional	238	Moderate knowledge; attitudes predict safety culture; training gaps	Single site
Alanazi (2025)[36]	Physicians, nurses, allied health	Mixed-methods	357 + 12	Low legal literacy; liability concerns; training improves readiness	Limited representativeness
Alomran et al. (2024)[39]	Pediatric orthopedic surgeons	Cross-sectional	128	Low familiarity; high willingness; strong demand for training	Specialty-specific

4. Discussion

This systematic review synthesized evidence from 22 studies examining the readiness, perceptions, and barriers toward AI adoption among healthcare professionals in Saudi Arabia. Overall, the findings demonstrate a consistently positive attitude toward AI across diverse healthcare professions, accompanied by moderate readiness and substantial gaps in training, infrastructure, and regulatory clarity. These results align with global trends but also reflect unique contextual factors within the Saudi healthcare system.

Across nearly all including studies, healthcare professionals expressed optimism about AI's potential to enhance diagnostic accuracy, improve workflow efficiency, reduce medical errors, and support clinical decision making. Dermatologists, anesthesiologists, emergency physicians, pharmacists, and primary care clinicians all report favorable attitudes toward AI as a supportive tool rather than a replacement for clinicians [21,23,24].

However, despite positive perceptions, actual AI use remained low in many settings. For example, only 25–30% of physicians reported using AI tools in practice, and several studies noted that most clinicians had only “heard about” AI without hands on experience [26,32,33]. This gap between perception and practice mirrors findings from international literature, where enthusiasm for AI often outpaces real world implementation due to limited exposure, training, and system readiness.

Readiness for AI adoption varied across demographic and professional groups. Younger clinicians consistently demonstrated higher confidence, greater openness, and stronger adoption behaviors. Studies using validated readiness scales (e.g., SHAIP) found that computer literacy, prior exposure to digital tools,

and involvement in health informatics were strong predictors of AI preparedness [30].

There were significant variations in integration and attitudes towards AI, specifically within each profession included in the studies. Nurses showed the highest rate of integration for workflow-related tasks and were the most enthusiastic about AI applications in clinical documentation, patient care coordination and monitoring of care [29,36]. Pharmacists were the most optimistic about AI applications in the field of medication safety, believing AI would help reduce medication errors associated with prescribing and dispensing medications [35].

In contrast, mental health professionals raised concerns that while AI may offer assistance, AI applications do not replace the need for human compassion, discretion and human interaction in a therapeutic alliance [26,27]. Medical specialists such as anesthesiologists, orthopedic surgeons, and dermatologists were generally more confident in AI applications compared to general medical practitioners, probably due to their greater use of AI tools in their own practices such as in radiology [21,23,39]. *Understanding of and Attitudes to the Use of AI Applications in Healthcare: the Need for Training and Education.*

Non-existence of AI training is the commonly reported barrier in the studies reviewed. Although, most health professionals showed a moderate to high awareness about AI, a large proportion expressed that they possess minimal practical skills and that they are inadequately trained and prepared for the use of AI in their practice. Participants universally acknowledged that proper training, hands-on experience and continuing education were necessary to apply AI appropriately [19,26,32,37]. This finding is consistent with international evidence, where non-existence of adequate training was described as a barrier to AI in healthcare.

The potential technological barriers to the implementation of AI in clinical practice were acknowledged by health professionals. A lack of quality data, a barrier to its performance, was one such barrier raised by stakeholders, as was concern regarding the trustworthiness and stability of AI-generated recommendations. Another barrier that arose repeatedly was a lack of interoperability between AI tools and the electronic health records currently used, making them difficult to integrate into the care workflow [25,32].

A lack of availability of the required digital technologies and supporting systems was also frequently highlighted, particularly in the lower income and middle-income country contexts. Overall, this data indicate a large challenge in digitizing the health systems in question and suggest that well developed digital systems with quality data are necessary for effective implementation [25,40].

A plethora of research has identified profound ethical and legal issues in applying AI in healthcare

practice. Healthcare clinicians have raised alarms that errors generated by AI could cause misdiagnosis and jeopardize patient safety [25,32,37]. They commonly expressed ambiguity around legal responsibility for AI in clinical decisions and expressed uncertainty of which individual or entity would bear liability when an AI system makes recommendations which resulted in negative outcome [19,32].

Furthermore, there have been extensive concerns about patient privacy, data security and confidentiality, and worries about algorithmic bias that might exacerbate health inequalities in healthcare delivery [25,33,34]. In a mixed-methods study, one hundred percent of participants with low and average self-assessed levels of clinical knowledge regarding the AI system expressed not having enough legal knowledge[22,40]. A similar majority of the participants (59%) self-reported not having enough legal knowledge of the AI in medical care[22]. This signifies a prominent knowledge gap that must be supplemented with adequate regulatory education, governance structures, and ethical principles.

Orthopedics practitioners, mental health practitioners and novice clinicians all felt particularly insecure in relation to AI in the workplace as they predicted much of their current job activities to be automated [26,27]. It was common for the concerns of reduced job security to coincide with concern around professional autonomy and role. Nevertheless, most felt that AI was likely to support them rather than replace clinicians[19,32,34]. The views that AI has the potential to improve decision making, speed up workflows, and reduce tedium were frequently voiced, however, clinicians believed that human experience, clinical judgment, empathy and patient-centered care are indispensable[21,23,24,27]. This perspective supports a global shift towards what is increasingly referred to as "augmented intelligence" where the role of AI is as an aid to humans rather than as its replacement[1].

The review identified several key factors that may speed up successful integration of AI in healthcare, including the integration of AI in under-graduate medical, nursing and allied health programs, continuing medical education (CME), and various continuing professional education and development courses targeting to enhance clinician's health care AI know-how [19,26,32,35]. Having leaders and top-down administrative support at the hospital level is perceived as fundamental in fostering a culture of innovation and for driving AI adoption [25,33]. In addition, a comprehensive national policy and regulatory environment should be developed and in place to cover aspects such as ethics, legal accountability, data ownership and privacy to gain public confidence and accountability.

It is considered critical to have strong inter-disciplinary teams that combine the talents of clinicians, engineers and computer scientists to build relevant AI applications in the healthcare setting. The value of pilot and exemplar projects demonstrates the safety, effectiveness, and clinical utility of AI tools can help to increase clinician confidence and acceptance [19,25,32,34]. All the identified facilitators

for integration and implementation of AI have direct correlations with the goals of Saudi Vision 2030 for digital transformation, development of skilled workforce, fostering innovation and use of data driven healthcare for better health services.

The finding of this review closely resembles that from international literature pertaining to perceptions of AI among health professionals. Similarly to other research, in our sample health professionals have shown a high level of knowledge about AI but limited practical experience in clinical applications [26,30,32]. Attitudes towards AI were positive, but this positive outlook is tempered with considerations concerning ethicolegal matters, data privacy and patient safety [19,32,34].

The younger age and higher digital literacy level of health professionals consistently correlates with greater preparedness and adoption of AI technologies [30,33]. A common and prominent trend observed throughout the literature is the need for formal AI training, continuing professional development, and governing regulations [19,26,35]. Nevertheless, there appeared to be some particular concerns that stood out in the Saudi Arabian context including the legal responsibility of health professionals in relation to the use of AI, the role of AI in the delivery of mental health services and the acceptable level of engagement AI might have within a therapeutic patient-provider relationship that centers empathy and trust, and concerns related to cultural factors associated with the application of AI within the context of care delivery, which perhaps may point to the evolution of legal frameworks governing AI within the Saudi Arabian health system, and to patient and provider expectations on human-provider interaction [26,27]. These might well suggest a need for country-specific policies, guidelines and education and training strategies when implementing AI technology within Saudi Arabian.

The studies described in this review provide useful information on how various types of professionals, in a diversity of settings, from around the globe, have approached and the level of adoption of AI. Overall, many studies used validated measures, had stated aims, and employed appropriate statistics, strengthening the evidence. Despite this, some limitations appeared to be repeatedly reported in this area of study: A preponderance of cross-sectional study designs limit our ability to infer causation or demonstrate trends over time. Often convenient samples of healthcare professionals were used (e.g., snowball), making our evidence base less generalized to wider professional populations.

Studies relied on the data of self-report measures, which is prone to reporting and socially desirable bias. There was uneven coverage of health professions and geographical areas, and a remarkable lack of longitudinal, experimental and implementation-style research conducted in practice settings. While the literature to date shows a pattern of results across the wide range of studies, these limitations highlight the need for future, more comprehensive, longitudinal, interventional, and multicenter study research.

5. Implications for Practice and Policy

Based on the synthesized evidence, the following recommendations are formulated in order to strengthen the uptake of AI within the Saudi Arabian healthcare system: Create national AI competency frameworks at the policy level. These will detail required knowledge and skills that will equip healthcare workers in Saudi Arabia for the AI era. Establish robust legal and ethical frameworks that define accountability, data governance, data privacy, and patient safety in AI applications within healthcare. Invest in and advocate for development of relevant digital infrastructure, and regulatory guidelines conducive to the safe and equitable AI integration in healthcare sector.

Prioritize development and delivery of comprehensive AI training and continuing medical education (CME) modules to improve workforce's readiness to adopt AI technologies. Encourage interdisciplinary collaboration between clinicians, computer scientists and engineers through demonstration projects. Build solid data governance, interoperability, and cybersecurity systems, and invest in developing them to enable the secure and trustworthy AI integration. Develop comprehensive curriculum covering AI applications within clinical practice, ethical, legal and practical implication for undergraduate and postgraduate medical students and professional healthcare workers.

Future research should focus on longitudinal research assessing the state of readiness over time, identifying professional specific barriers and facilitators to AI adoption, and evaluating the real-world performance and safety of AI integration in varied healthcare settings.

6. Strengths and Limitations of this Review

Several notable strengths characterize this review. To the best of our knowledge, this is the first comprehensive review that synthesizes studies on the readiness, perception and utilization of AI among health care professionals in Saudi Arabia. It systematically included studies from various health care disciplines including doctors, nurses, chemists, mental health workers and allied health workers to give a holistic perspective of perceptions regarding the AI application across the health workforce. The systematic review process was guided by PRISMA 2020 guidelines which aim to ensure transparency in methodology and reproducibility.

In addition, a systematic assessment of the methodological quality of the studies included was carried out using the Joanna Briggs Institute (JBI) critical appraisal tools. The recommendations emerging from the findings are aligned to Saudi Vision 2030 goals, especially digital transformation, workforce enhancement, adoption of innovative technologies. Strengths notwithstanding, the following weaknesses and limitations should be borne in mind when interpreting the results. Firstly, the scope of literature searches was restricted to PubMed only, therefore, relevant studies accessible through other search

engines may have been overlooked.

Secondly, many studies used cross-sectional study designs and self-report data thereby limiting the scope for determining causality and introducing bias through socially desirable responses. Third, as heterogeneity in terms of study population, setting, and measures used were diverse, we were unable to perform a quantitative synthesis of results via a meta-analysis. Fourth, some parts of Saudi Arabia remain under-represented due to uneven distribution of studies. As such the generalizability of the results to other parts of Saudi Arabia is limited. Finally, inclusion of studies in peer-reviewed journals could have led to publication bias as unpublished studies may not represent favorable results

7. Conclusion

Results of this systematic review suggest that the perception of AI is mostly favorable among Saudi Arabian health care workers who anticipate that AI can be a beneficial tool for improving diagnostic precision, workflow efficiency and patient safety. The overall perceived readiness to adopt AI is moderate as training, hands-on experience are limited and there are concerns regarding the data privacy, security, ethical considerations, and reliability of the system. Institutional support and ambiguity in regulations also exist as obstacles for AI adoption.

This review further identifies crucial facilitators that should be considered, such as the well-structured AI education, leader endorsement and support, and teamwork across professions and sectors to strengthen and integrate these within a national guideline which align with Saudi Vision 2030. Differences between professions exist, indicating a specific approach is needed to increase their competence and confidence.

8. Declarations

8.1 Conflict of Interest Statement

The authors have no conflict of interests to declare.

8.2 Funding Disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

9. References

- [1]. Topol, E.J., High-performance medicine: the convergence of human and artificial intelligence. *Nature medicine*, 2019. 25(1): p. 44-56.
- [2]. Jiang, F., et al., Artificial intelligence in healthcare: past, present and future. *Stroke and vascular neurology*, 2017. 2(4).
- [3]. Esteva, A., et al., A guide to deep learning in healthcare. *Nature medicine*, 2019. 25(1): p. 24-29.
- [4]. LeCun, Y., Y. Bengio, and G. Hinton, Deep learning. *nature*, 2015. 521(7553): p. 436-444.
- [5]. Rajpurkar, P., et al., AI in radiology: Current applications and future directions. *Nature Medicine*, 2022.
- [6]. Davenport, T. and R. Kalakota, The potential for artificial intelligence in healthcare. *Future healthcare journal*, 2019. 6(2): p. 94-98.
- [7]. Yu, K.-H., A.L. Beam, and I.S. Kohane, Artificial intelligence in healthcare. *Nature biomedical engineering*, 2018. 2(10): p. 719-731.
- [8]. Oh, S., et al., Physician Confidence in Artificial Intelligence: An Online Mobile Survey. *J Med Internet Res*, 2019. 21(3): p. e12422.
- [9]. Alami, H., et al., Artificial intelligence and health technology assessment: anticipating a new level of complexity. *Journal of medical Internet research*, 2020. 22(7): p. e17707.
- [10]. Vayena, E., et al., Digital health: meeting the ethical and policy challenges. *Swiss medical weekly*, 2018. 148: p. w14571.
- [11]. Lerzynski, G., Ethical implications of digitalization in healthcare, in *Digitalization in Healthcare: Implementing Innovation and Artificial Intelligence*. 2021, Springer. p. 163-170.
- [12]. Heinrichs, H., et al., Physicians' attitudes toward artificial intelligence in medicine: mixed methods survey and interview study. *Journal of medical Internet research*, 2025. 27: p. e74187.
- [13]. Alanazi, A.S., A. Salah Alanazi, and H. Benlaria Enhancing Healthcare for People with Disabilities Through Artificial Intelligence: Evidence from Saudi Arabia. *Healthcare*, 2025. 13, 1616 DOI: 10.3390/healthcare13131616.
- [14]. Bayer, M. and A. Eisawi, Exploring the Landscape of Artificial Intelligence in Saudi Arabia's Healthcare Sector: Current Trends and Challenges. *Cureus*, 2025. 17(5): p. e84163.
- [15]. Alowais, S.A., et al., Revolutionizing healthcare: the role of artificial intelligence in clinical practice. *BMC medical education*, 2023. 23(1): p. 689.
- [16]. Shaheen, M.Y., Applications of Artificial Intelligence (AI) in healthcare: A review. *ScienceOpen*

Preprints, 2021.

- [17]. Alanazi, S.K., et al. Artificial Intelligence in Dermatology Among Saudi Adults: Cross-Sectional Survey Study. *Healthcare*, 2026. 14, 1963 DOI: 10.3390/healthcare14131963.
- [18]. Alkhatieb, M. and A.A. Subke, Artificial Intelligence in Healthcare: A Study of Physician Attitudes and Perceptions in Jeddah, Saudi Arabia. *Cureus*, 2024. 16(3): p. e57256.
- [19]. Elnaggar, M., et al., Assessment of the Perception and Worries of Saudi Healthcare Providers About the Application of Artificial Intelligence in Saudi Health Facilities. *Cureus*, 2023. 15(8): p. e42858.
- [20]. Alsaedi, A.R., et al., Perceived Worries in the Adoption of Artificial Intelligence Among Healthcare Professionals in Saudi Arabia: A Cross-Sectional Survey Study. *Nurs Rep*, 2024. 14(4): p. 3706-3721.
- [21]. Al-Ali, F., et al., Attitudes Towards Artificial Intelligence Among Dermatologists Working in Saudi Arabia. *Dermatol Pract Concept*, 2023. 13(1).
- [22]. Radhwi, O.O. and M.A. Khafaji, The wizard of artificial intelligence: Are physicians prepared? *J Family Community Med*, 2024. 31(4): p. 344-350.
- [23]. Al Harbi, M., et al., Perspectives toward the application of Artificial Intelligence in anesthesiology-related practices in Saudi Arabia: A cross-sectional study of physicians views. *Health Sci Rep*, 2024. 7(10): p. e70099.
- [24]. Alotaibi, K.M., et al., Perceptions and Attitudes of Emergency Physicians in Saudi Arabia Regarding Medical Use of Artificial Intelligence. *Cureus*, 2025. 17(12): p. e98583.
- [25]. Alanzi, T., et al., Barriers and Facilitators of Artificial Intelligence in Family Medicine: An Empirical Study With Physicians in Saudi Arabia. *Cureus*, 2023. 15(11): p. e49419.
- [26]. Sharif, L., et al., Perceptions of mental health professionals towards artificial intelligence in mental healthcare: a cross-sectional study. *Front Psychiatry*, 2025. 16: p. 1601456.
- [27]. Als Salman, Z., Artificial Intelligence in Mental Health Care: Task-Specific Perspectives of Professionals in Saudi Arabia. *Healthcare (Basel)*, 2026. 14(6).
- [28]. Alrashed, F.A., et al. Exploring Medical Doctors' Confidence in Artificial Intelligence: The Role of Specialty, Experience, and Perceived Job Security. *Healthcare*, 2025. 13, 2377 DOI: 10.3390/healthcare13182377.
- [29]. Amin, H.A. and T.M. Alanzi, Utilization of Artificial Intelligence (AI) in Healthcare Decision-Making Processes: Perceptions of Caregivers in Saudi Arabia. *Cureus*, 2024. 16(8): p. e67584.
- [30]. Almalki, M., M.A. Choukou, and A.M. Alzahrani, Factors Shaping Healthcare Professionals'

- Perceptions of AI in Saudi Arabia: A Cross-Sectional Study. *Stud Health Technol Inform*, 2025. 329: p. 1342-1346.
- [31]. Alruwaili, B.F., et al. Assessing Primary Care Physicians' Readiness for AI-Based Adaptive Learning: Perceptions, Barriers, and Learning Needs in Northern Saudi Arabia. *Healthcare*, 2026. 14, 865 DOI: 10.3390/healthcare14070865.
- [32]. Alhazmi, F., Understanding Physician Attitudes Toward AI in Clinical Decision-Making: Cross-Sectional Study. *JMIR Form Res*, 2025. 9: p. e79730.
- [33]. Alhazmi, A., et al., Healthcare providers' knowledge, attitudes, and practices toward integrating evidence-based practice and artificial intelligence in Saudi Arabia: a cross-sectional study. *BMC Health Services Research*, 2026. 26(1): p. 845.
- [34]. Serbaya, S.H., et al., Knowledge, Attitude and Practice Toward Artificial Intelligence Among Healthcare Workers in Private Polyclinics in Jeddah, Saudi Arabia. *Adv Med Educ Pract*, 2024. 15: p. 269-280.
- [35]. Syed, W. and M.B.A. Al-Rawi, Community pharmacists awareness, perceptions, and opinions of artificial intelligence: A cross-sectional study in Riyadh, Saudi Arabia. *Technol Health Care*, 2024. 32(1): p. 481-493.
- [36]. Alanazi, A. Assessing Clinicians' Legal Concerns and the Need for a Regulatory Framework for AI in Healthcare: A Mixed-Methods Study. *Healthcare*, 2025. 13, 1487 DOI: 10.3390/healthcare13131487.
- [37]. Alsudairy, N., et al., Artificial intelligence in primary care decision-making: survey of healthcare professionals in Saudi Arabia. *Cureus*, 2025. 17(4).
- [38]. Eldesoky, H.A.M., et al., Solicitude toward artificial intelligence among health care providers and its relation to their patient's safety culture in Saudi Arabia. *BMC Health Serv Res*, 2025. 25(1): p. 889.
- [39]. Alomran, A.K., et al., Artificial intelligence awareness and perceptions among pediatric orthopedic surgeons: A cross-sectional observational study. *World J Orthop*, 2024. 15(11): p. 1023-1035.
- [40]. Alzghaibi, H. and H.A. Hutchings, Barriers to the implementation of large-scale electronic health record systems in primary healthcare centers: a mixed-methods study in Saudi Arabia. *Frontiers in Medicine*, 2025. Volume 12 - 2025.