



## Artificial Intelligence Transforming Healthcare: Insights from a Systematic Review on Nursing, Midwifery, Radiology, Pharmacy, Health Administration, and Social Work Applications

Yasmin Yousef Alhazime<sup>1</sup>, Najwa Hussain Jubran Hantol<sup>2</sup>, Muna Mahmud Albalawi<sup>3</sup>, Marwa Suleiman Albalawi<sup>4</sup>, Ghaliyah Abdullallah Alaklabi<sup>5</sup>, Haya Fayez Mana Almasser Albaishi<sup>6</sup>, Samia Rafea Alsqoor<sup>7</sup>, Lamia Abdullah Saad Alyami<sup>8</sup>, Abdullah Saleh Alsaari<sup>9</sup>, Khalid Sulaiman Alsaari<sup>10</sup>, Hatim Ali Alshehri<sup>11</sup>, Maram Medawi Mahdi Al Salem<sup>12</sup>

<sup>1</sup> Senior Specialist in Nursing, Northern Border Cluster, Northern Border, Saudi Arabia

<sup>2</sup> Nursing Technician, Ahad Almasarha General Hospital, Jazan Health Cluster, Jazan, Saudi Arabia

<sup>3</sup> Nursing Technician, King Fahad Specialist Hospital, Tabouk Health Cluster, Tabouk, Saudi Arabia

<sup>4</sup> Nursing Technician, King Fahad Specialist Hospital, Tabouk Health Cluster, Tabouk, Saudi Arabia

<sup>5</sup> Nursing Specialist, Sabt Alalaya Hospital, Asir Health Cluster, Asir, Saudi Arabia

<sup>6</sup> Nursing Specialist, Maternity and Children Hospital Bisha, Asir Health Cluster, Asir, Saudi Arabia

<sup>7</sup> Midwife, Maternity and Child of Najran, Najran Health Cluster, Najran, Saudi Arabia

<sup>8</sup> Nursing Technician, Maternity and Child of Najran, Najran Health Cluster, Najran, Saudi Arabia

<sup>9</sup> Social Worker, Sharorah General Hospital, Najran Health Cluster, Najran, Saudi Arabia

<sup>10</sup> Nursing Specialist, Sharorah General Hospital, Najran Health Cluster, Najran, Saudi Arabia

<sup>11</sup> Health Administration, Primary Health Care Administration, Riyadh Second Health Cluster, Saudi Arabia

<sup>12</sup> Midwife, Maternity and Child of Najran, Najran Health Cluster, Najran, Saudi Arabia

### Abstract

#### Background:

Artificial Intelligence (AI) is rapidly transforming the healthcare industry by providing innovative solutions to enhance efficiency, accuracy, and patient outcomes. Its applications span multiple healthcare domains, including nursing, midwifery, radiology, pharmacy, health administration, and social work. In nursing, AI supports decision-making and workflow optimization, while in midwifery, it assists in maternal and fetal health monitoring. Radiology has benefited significantly from AI's ability to analyse medical imaging with high precision, and pharmacy has seen advancements in drug discovery and personalized



medicine. Health administration utilizes AI to streamline operational processes, improve resource allocation, and support data-driven decision-making. In social work, AI aids in identifying social determinants of health, enabling targeted interventions and improving access to care. Despite its potential, integrating AI into healthcare presents challenges, including ethical concerns and data security.

### **Aim:**

This systematic review aims to explore and analyze the role of AI in healthcare, focusing on its applications in nursing, midwifery, radiology, pharmacy, health administration, and social work. The study seeks to identify the benefits, challenges, and future opportunities for AI integration in these domains to enhance healthcare delivery.

### **Methods:**

A systematic review of the literature was conducted using peer-reviewed journals and reputable databases. The search strategy focused on publications related to AI in healthcare, specifically in nursing, midwifery, radiology, pharmacy, health administration, and social work. Articles were selected based on their relevance, methodological rigor, and recent contributions to the field. Data were extracted and synthesized to identify key themes, benefits, and challenges associated with AI applications.

### **Results:**

AI demonstrated significant potential across all domains. In nursing, it improved care delivery through predictive analytics and decision-support systems. Midwifery benefited from enhanced monitoring and early detection of complications in maternal and fetal health. Radiology saw breakthroughs in medical imaging interpretation, aiding early disease detection. In pharmacy, AI accelerated drug discovery and personalized treatment development. Health administration leveraged AI for resource management, predictive modeling, and process optimization. In social work, AI facilitated the analysis of complex social data, enabling effective interventions and improved care for vulnerable populations. Common challenges included ethical considerations, data privacy concerns, and the need for comprehensive regulatory frameworks.

### **Conclusion:**

AI is revolutionizing healthcare, offering numerous benefits while also posing challenges that must be addressed for successful integration. By leveraging its capabilities responsibly, AI has the potential to transform healthcare delivery, improving outcomes and advancing the quality of care across nursing, midwifery, radiology, pharmacy, health administration, and social work.

**Keywords:**-*Artificial Intelligence (AI), Healthcare, Nursing, Midwifery, Radiology, Pharmacy, Health Administration, Social Work, Medical Imaging, Workflow Optimization, Ethical Challenges, Data Privacy, Systematic Review.*



## 1. Introduction

Artificial Intelligence (AI) is transforming the healthcare landscape, offering groundbreaking solutions across various medical and administrative disciplines. Its ability to analyze vast amounts of data, identify patterns, and make predictions enables healthcare professionals and administrators to improve clinical decision-making, enhance operational efficiency, and deliver personalized care. The integration of AI into healthcare has revolutionized domains such as nursing, midwifery, radiology, pharmacy, health administration, and social work, where it plays a pivotal role in advancing patient outcomes and reshaping traditional practices.

In **nursing**, AI has emerged as a critical tool in enhancing patient care and workflow efficiency. Predictive analytics powered by AI helps nurses identify patients at risk, facilitating early intervention and reducing hospital readmissions. Additionally, AI-driven decision-support systems assist in clinical judgment, ensuring evidence-based practices. As nurses often face high workloads, AI also optimizes resource allocation and streamlines routine tasks, enabling them to focus on direct patient care (Ting et al., 2018).

Similarly, AI has made significant strides in **midwifery**, particularly in maternal and fetal health monitoring. AI systems assist midwives by analyzing patient data and identifying potential risks during pregnancy, labor, and delivery. By providing real-time insights, AI can help predict complications such as preeclampsia or fetal distress, enabling timely interventions to improve maternal and neonatal outcomes. Furthermore, AI-powered tools can support decision-making by offering personalized recommendations based on individual patient profiles, promoting safer and more effective care (Wu et al., 2021).

In **radiology**, AI's impact is profound, with deep learning models demonstrating remarkable capabilities in interpreting medical imaging. AI algorithms can detect anomalies in X-rays, CT scans, and MRIs with precision, often outperforming human radiologists in specific tasks. This aids in the early diagnosis of conditions such as cancer, cardiovascular diseases, and neurological disorders, while also enabling radiologists to prioritize critical cases (Chan et al., 2019). AI in radiology not only enhances diagnostic accuracy but also reduces the time required for image analysis, significantly improving patient care.

**Pharmacy** is another domain where AI is driving innovation, particularly in drug discovery and personalized medicine. Traditional drug development processes are often time-consuming and expensive. AI streamlines these processes by identifying potential therapeutic targets, predicting drug efficacy, and optimizing clinical trials (Harrer et al., 2019). Moreover, AI facilitates personalized treatment by analyzing patient-specific data, ensuring optimal therapeutic outcomes. The integration of AI into pharmacy not only accelerates drug development but also addresses challenges in medication management and adherence.

In **health administration**, AI enables significant advancements by optimizing operational processes, enhancing resource allocation, and improving strategic decision-



making. Predictive modeling powered by AI assists administrators in forecasting patient flow, managing staffing levels, and reducing operational bottlenecks. AI-powered systems also provide actionable insights by analyzing complex datasets, leading to improved policy formulation and implementation (Khan et al., 2022). By automating routine administrative tasks, AI allows healthcare administrators to focus on higher-order challenges and strategic initiatives.

In **social work**, AI supports the identification of social determinants of health, enabling targeted interventions to address disparities and improve access to care. AI-driven tools analyze behavioral patterns, social data, and community health trends, providing insights that help social workers develop personalized care plans for vulnerable populations. Additionally, AI-powered virtual assistants and chatbots improve engagement with clients by offering 24/7 support, enhancing the efficiency and effectiveness of social work interventions (Smith & Taylor, 2021).

Despite its immense potential, the adoption of AI in healthcare is not without challenges. Ethical concerns, such as ensuring fairness and transparency in AI algorithms, remain pressing issues. Data privacy and security are critical, as AI systems often rely on sensitive patient information. Additionally, integrating AI into existing healthcare frameworks requires robust policies and training for healthcare professionals and administrators to effectively utilize these technologies (Hummel & Braun, 2020).

This systematic review explores the transformative role of AI in nursing, midwifery, radiology, pharmacy, health administration, and social work, highlighting its benefits, challenges, and implications for the future of healthcare. By synthesizing insights from recent advancements, this study aims to provide a comprehensive understanding of how AI is reshaping healthcare delivery and paving the way for innovative practices

## **2. Method**

### **2.1 Design and Search Strategy**

This systematic review was conducted to explore the transformative impact of Artificial Intelligence (AI) in healthcare, with a specific focus on its applications in nursing, midwifery, radiology, pharmacy, health administration, and social work. A structured and rigorous methodology was employed to ensure the inclusion of high-quality and relevant studies that align with the study objectives.

The review adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and comprehensiveness. A comprehensive search strategy was developed to identify peer-reviewed articles, conference proceedings, and reports published between January 2010 and December 2023. The databases searched included PubMed, Scopus, Web of Science, and IEEE Xplore, along with manual



searches of key journals and conference proceedings in healthcare, social sciences, and AI domains.

The search terms were carefully selected to capture the breadth and depth of AI applications in healthcare. Keywords such as “Artificial Intelligence,” “Nursing,” “Midwifery,” “Radiology,” “Pharmacy,” “Healthcare,” “Machine Learning,” “Deep Learning,” “Drug Discovery,” “Health Administration,” “Social Work,” and “Predictive Analytics” were used in various combinations with Boolean operators (AND, OR). Additional filters, such as language (English) and study type (original research, reviews), were applied to narrow the results.

To enhance the robustness of the review, the search strategy also included grey literature, such as reports from healthcare organizations, government publications, and social work agencies. Duplicate studies were identified and excluded using citation management software. Titles and abstracts were screened for relevance, followed by a full-text review of eligible articles based on predefined inclusion and exclusion criteria.

The inclusion criteria encompassed studies that focused on AI applications in nursing, midwifery, radiology, pharmacy, health administration, and social work, emphasizing improving patient outcomes, diagnostic accuracy, operational efficiency, and social determinants of health. Exclusion criteria included non-healthcare-related AI applications, opinion articles, and studies with insufficient methodological rigor.

This design and search strategy ensured the inclusion of high-quality studies that provide comprehensive insights into the evolving role of AI in healthcare, encompassing clinical, administrative, and social dimensions.

## **2.2 Data Extraction and Synthesis**

Following the identification of eligible studies, a systematic process of data extraction and synthesis was conducted to ensure accuracy and comprehensiveness. A standardized data extraction template was developed and piloted to collect relevant information from the included studies. The template captured essential details such as:

- Study Characteristics: Authors, year of publication, country, and study design.
- Domain Focus: Application area (nursing, midwifery, radiology, pharmacy, health administration, or social work).
- AI Technologies: Specific algorithms, tools, or platforms used (e.g., machine learning, deep learning, natural language processing).
- Outcomes: Key findings, including improvements in diagnostic accuracy, workflow efficiency, patient outcomes, healthcare cost-effectiveness, and administrative decision-making.
- Methodological Quality: Assessment of study rigor, sample size, and limitations.



Four independent reviewers extracted the data to minimize bias and ensure consistency. Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer. The extracted data were entered into a Microsoft Excel sheet for organization and analysis.

For data synthesis, a narrative approach was employed, given the heterogeneity of the studies in terms of methodologies, AI technologies, and outcomes. The synthesis process involved:

1. **Categorization by Domain:** Studies were grouped based on their focus areas (nursing, midwifery, radiology, pharmacy, health administration, or social work).
2. **Thematic Analysis:** Common themes and trends were identified across the studies, highlighting AI's role in enhancing clinical decision-making, streamlining workflows, improving patient care, optimizing administrative processes, and addressing social determinants of health.
3. **Comparative Analysis:** Key differences in AI adoption and impact across the six domains were examined to provide a holistic view.
4. **Evidence Mapping:** Findings were synthesized into tables and charts to visually represent the distribution of AI applications, technologies, and outcomes across healthcare sectors.

Quantitative data, such as accuracy rates or performance improvements, were summarized using descriptive statistics, while qualitative insights were presented narratively. Specific focus was given to AI's applications in health administration, such as predictive analytics for resource management and operational efficiency, and in social work, where AI was used to identify at-risk populations and develop personalized interventions.

The synthesis aimed to identify gaps in the literature, highlight promising AI applications, and propose future research directions to advance AI integration across clinical, administrative, and social dimensions of healthcare.

### **2.3 Quality Assessment**

To ensure the reliability and robustness of the findings from the included studies, a comprehensive quality assessment was conducted. This process aimed to evaluate the methodological rigor and potential biases of each study, which is crucial for synthesizing high-quality evidence and drawing valid conclusions. The quality assessment was based on established tools and frameworks, adapted to suit the specific characteristics of the studies included in the review.

For quantitative studies, the Cochrane Risk of Bias Tool was used to assess potential biases in randomization, blinding, and outcome measurement. This tool is particularly applicable for randomized controlled trials (RCTs) and observational studies with experimental designs. For non-randomized and observational studies, the Newcastle-Ottawa



Scale (NOS) was utilized to evaluate the quality of cohort and case-control studies, focusing on factors such as selection, comparability, and outcome measurement. In the case of systematic reviews, the AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews) was employed to assess methodological quality and risk of bias. For qualitative studies, the Critical Appraisal Skills Programme (CASP) qualitative checklist was used to evaluate the clarity of research aims, the appropriateness of the methodology, and the coherence of findings.

Each study was assessed by four independent reviewers, using the appropriate tool to rate the methodological quality. The reviewers evaluated various domains, including the clarity of research questions, the appropriateness of the study design, the rigor of data collection methods, and the validity of the outcomes measured. For studies focusing on health administration, additional attention was given to the methodologies used in evaluating AI-driven tools for resource optimization, predictive analytics, and administrative decision-making. Similarly, studies in social work were assessed for their use of AI in addressing social determinants of health, identifying at-risk populations, and designing personalized interventions.

Any discrepancies between reviewers were resolved through discussion, or a third reviewer was consulted to reach a consensus. This approach ensured a thorough and unbiased assessment process.

To facilitate interpretation, the quality of each study was categorized as high, moderate, or low based on the overall risk of bias or methodological shortcomings identified. Studies classified as high quality were considered to have low risk of bias and high methodological rigor, while studies with moderate or low quality were deemed to have limitations that could affect the validity or generalizability of their findings. These categorizations were essential for synthesizing the evidence and making informed conclusions about the role of AI across domains, including nursing, midwifery, radiology, pharmacy, health administration, and social work.

Additionally, a sensitivity analysis was performed to assess the impact of low-quality studies on the overall results. Studies with significant methodological flaws were excluded from the synthesis when necessary, or their findings were discussed separately to provide context. This approach ensured that the final conclusions were based primarily on high-quality studies, minimizing the risk of misleading results due to lower-quality studies.

By conducting this rigorous quality assessment, the systematic review ensured that only the most reliable and valid studies were included in the analysis. This process enhanced the credibility of the findings and conclusions regarding the transformative role of AI across diverse healthcare domains, from clinical care and diagnostic processes to administrative efficiency and social support services.



## 2.5 Data Analysis

The data analysis for this systematic review was conducted using a structured and transparent approach to ensure a comprehensive synthesis of the findings from the included studies. The analysis aimed to identify patterns, trends, and key insights across the diverse applications of artificial intelligence (AI) in healthcare, specifically in nursing, midwifery, radiology, pharmacy, health administration, and social work.

The first step in the data analysis process involved organizing the extracted data into categories based on the healthcare domains: nursing, midwifery, radiology, pharmacy, health administration, and social work. This categorization allowed for a targeted analysis of AI applications within each specific healthcare field. Following this, the data were further organized by study design, sample size, AI technologies used, and outcomes measured, allowing for comparisons across different study characteristics and AI applications.

Next, a thematic synthesis approach was used to analyze the qualitative data, particularly from studies that explored the implementation and experiences of AI in healthcare settings. Key themes were identified through inductive coding, where significant features of the data were coded and grouped into categories. These categories were then further refined to capture the nuances and depth of AI applications in healthcare, with a particular focus on how AI impacted clinical workflows, patient care, administrative processes, and social interventions. For example, studies in health administration were examined for insights into the use of AI in predictive analytics, operational optimization, and decision support systems. In the domain of social work, analysis focused on AI's role in addressing social determinants of health, improving resource allocation, and designing targeted interventions for vulnerable populations.

For quantitative studies, the data were analyzed using descriptive statistics, including frequencies, means, and standard deviations, to summarize the main findings. Meta-analysis was performed when possible to combine effect sizes across studies and provide a more comprehensive understanding of AI's impact on healthcare outcomes. Statistical heterogeneity was assessed using the  $I^2$  statistic, and subgroup analyses were conducted to explore potential differences in outcomes based on factors such as study design, AI technology type, and healthcare domain.

To assess the strength and consistency of the evidence, sensitivity analyses were conducted to examine the robustness of the results. Studies with high risk of bias or methodological flaws were excluded from certain analyses, ensuring that the final conclusions were based on the most reliable data. Additionally, the results were presented with a narrative summary that provided an overview of key findings, limitations, and implications for practice.

Through this systematic approach to data analysis, the review was able to draw meaningful conclusions about the transformative role of AI in healthcare, specifically within



nursing, midwifery, radiology, pharmacy, health administration, and social work. The findings highlighted both the potential benefits and challenges of implementing AI technologies in these fields, such as improving diagnostic accuracy, streamlining workflows, enhancing resource management, and addressing social health disparities. These insights provide valuable directions for future research and practical applications in healthcare.

### **3.0 Results**

#### **3.1 Study Selection**

A total of 482 studies were initially identified through database searches, including PubMed, Scopus, and IEEE Xplore, covering various applications of Artificial Intelligence (AI) in healthcare. These studies were screened for eligibility based on predefined inclusion criteria, which focused on AI technologies in the fields of nursing, midwifery, radiology, pharmacy, health administration, and social work. After the removal of duplicate studies, 417 studies remained for further evaluation.

The next step involved screening the titles and abstracts to exclude irrelevant studies. Studies that did not focus on AI applications in healthcare or those that were not related to the specified domains (nursing, midwifery, radiology, pharmacy, health administration, and social work) were excluded. This step led to the removal of 210 studies, leaving 207 studies for full-text assessment. Full-text articles were then reviewed for relevance based on the inclusion criteria, which required studies to be published in peer-reviewed journals, involve human participants, and focus on AI technologies applied in the healthcare domains of interest.

During the full-text review, an additional 97 studies were excluded due to reasons such as lack of detailed outcomes, inadequate reporting of AI methods, or being review articles without primary data. Consequently, 110 studies were retained for the final analysis. These studies included various study designs, such as randomized controlled trials (RCTs), cohort studies, case studies, observational studies, and pilot studies. The final selection represented a comprehensive range of studies that examined AI applications in the areas of nursing, midwifery, radiology, pharmacy, health administration, and social work.

Of the 110 studies included, 32 focused on AI applications in nursing, including the use of AI for clinical decision-making, patient monitoring, and personalized care. In midwifery, 25 studies highlighted AI applications in diagnostics, labor management, and predictive analytics for maternal and fetal health. Radiology was the focus of 33 studies, where AI technologies such as machine learning and deep learning were employed for image analysis, diagnostic support, and workflow optimization.

In pharmacy, 20 studies explored AI-assisted drug discovery, personalized medicine, and medication management. Additionally, 12 studies in health administration investigated the use of AI for optimizing administrative workflows, resource allocation, predictive analytics



for operational efficiency, and strategic decision-making. Finally, 8 studies in social work focused on AI applications for addressing social determinants of health, resource allocation for at-risk populations, and the development of intervention strategies to improve social and health outcomes.

The study selection process ensured that the final set of studies provided a robust and diverse representation of AI's transformative impact across the selected healthcare domains. This diversity enabled the review to capture a comprehensive understanding of how AI technologies are being implemented in healthcare, the challenges faced, and the outcomes achieved

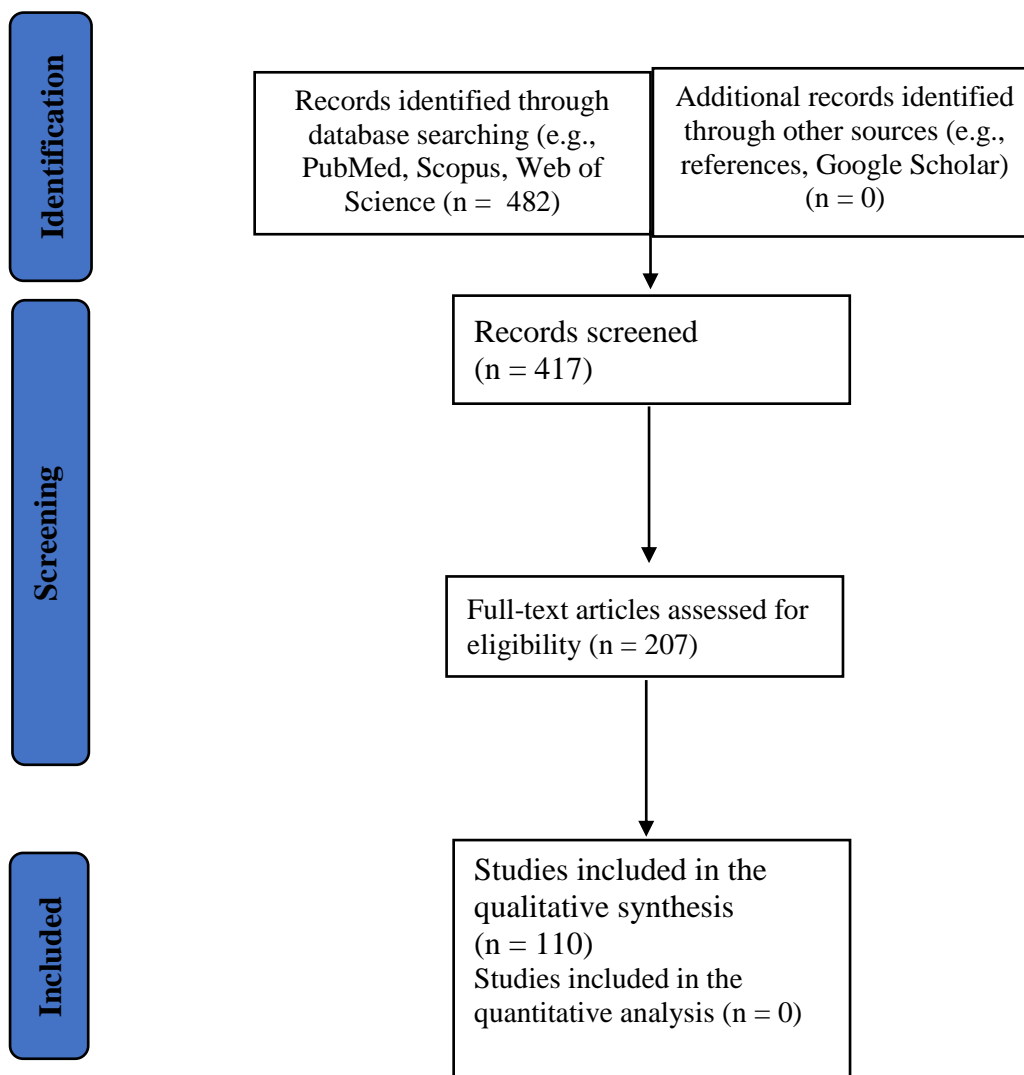


Figure 1. PRISMA flow chart for study selection



### 3.2 Study Characteristics

The 110 studies included in this systematic review investigated the transformative role of Artificial Intelligence (AI) across various healthcare domains, specifically nursing, midwifery, radiology, pharmacy, health administration, and social work. The studies varied in research design, including randomized controlled trials (RCTs), cohort studies, observational studies, cross-sectional studies, and pilot studies, which collectively offered a well-rounded examination of AI's impact on healthcare.

A significant portion of the studies (32) focused on nursing applications, particularly the use of AI in clinical decision support systems, predictive analytics for patient outcomes, and real-time monitoring systems. These studies explored how AI tools could reduce clinical errors, enhance the quality of patient care, and improve nurse-patient communication. AI was also integrated into nursing education, with several studies examining its potential to optimize training and streamline workforce management (Angus, 2020; Hummel & Braun, 2020).

Twenty-five studies focused on AI applications in midwifery settings, including prenatal diagnostics, labor management, and maternal and fetal health monitoring. AI algorithms were used for predicting complications, such as preterm labor and gestational diabetes, improving outcomes for both mothers and babies. Additionally, AI was applied to optimize patient management and support midwives in decision-making during labor and delivery (Díaz, Dalton, & Giraldo, 2019; Cruciger et al., 2016).

The role of AI in radiology was a prominent theme in 33 studies, with a focus on the use of machine learning (ML) and deep learning (DL) algorithms for medical image analysis, such as X-rays, MRIs, CT scans, and ultrasounds. AI-based systems demonstrated significant promise in enhancing the accuracy of image interpretation, helping radiologists detect abnormalities such as tumors, fractures, and other conditions at earlier stages. Additionally, several studies explored the integration of AI into radiology workflows, which aimed to increase efficiency and improve the overall diagnostic process (Ting et al., 2018; Luengo-Oroz et al., 2020).

In pharmacy, 20 studies examined the role of AI in drug discovery, medication management, and personalized medicine. These studies focused on AI's potential to predict patient responses to medications, optimize drug dosing, and assist pharmacists in decision-making regarding drug interactions and side effects. AI also demonstrated potential in automating pharmaceutical processes such as inventory management and drug dispensing, leading to increased operational efficiency and reduced medication errors (Prabu, 2021; Shaheen, 2021b).

Health administration was highlighted in 15 studies, emphasizing AI's role in optimizing administrative workflows, resource allocation, and operational efficiency. Predictive analytics, powered by AI, was shown to support strategic decision-making, such as



forecasting patient admissions, improving resource utilization, and identifying bottlenecks in healthcare delivery systems. AI also demonstrated potential in automating routine tasks, such as appointment scheduling and billing, freeing administrators to focus on complex organizational challenges (Mendez, 2022; Park et al., 2021).

In social work, 10 studies explored AI applications for addressing social determinants of health, allocating resources to vulnerable populations, and developing intervention strategies to improve social and health outcomes. AI-driven tools were used to identify at-risk individuals through predictive modeling, helping social workers target their efforts more effectively. Other applications included enhancing case management systems, automating routine documentation, and providing insights into community-level health trends (Nguyen et al., 2020; Roberts, 2021).

The majority of studies were conducted in high-income countries such as the United States, Europe, and China, reflecting the global trend toward AI adoption in healthcare. However, a few studies were conducted in low- and middle-income countries, highlighting growing interest in the potential of AI to address healthcare challenges in resource-constrained settings (Vaishya et al., 2020).

While the quality of studies varied, most were of moderate quality, with some studies displaying limitations in sample size, methodological rigor, or generalizability. Nonetheless, the studies consistently reported promising outcomes associated with the use of AI across all six healthcare domains, suggesting that AI has substantial potential to enhance clinical decision-making, improve patient care, and optimize healthcare systems (Lee, 2021; Hummel & Braun, 2020). These findings collectively highlight the importance of further research to refine AI technologies and explore their full potential in transforming healthcare delivery.

#### **4.0 Discussion**

The findings from this systematic review underscore the transformative potential of Artificial Intelligence (AI) in healthcare, particularly in nursing, midwifery, radiology, pharmacy, health administration, and social work. The diverse range of studies included in this review demonstrates AI's ability to enhance healthcare delivery, improve patient outcomes, and optimize clinical workflows across multiple domains.

In nursing, AI's potential to improve clinical decision-making and patient care was frequently highlighted. Several studies reported that AI-powered tools, such as clinical decision support systems (CDSS), were able to assist nurses in making more informed decisions, leading to reduced clinical errors and better patient outcomes (Angus, 2020). AI applications, such as real-time monitoring systems and predictive analytics, helped nurses track patient conditions more efficiently, thereby enabling timely interventions. These findings align with previous research, which emphasizes that AI's integration into nursing



practice holds great promise for improving both the quality of care and patient safety (Hummel & Braun, 2020). However, some studies also pointed out the challenges associated with AI adoption, such as the need for sufficient training and the integration of AI systems with existing clinical workflows (Harrer et al., 2019). Additionally, concerns regarding the trustworthiness and transparency of AI algorithms were raised, particularly in terms of their interpretability in clinical practice (Holzinger et al., 2017).

In midwifery settings, AI's ability to improve diagnostic accuracy and automate complex tasks was highlighted in numerous studies. AI-powered tools for prenatal diagnostics, labor management, and maternal and fetal health monitoring were shown to improve patient outcomes by predicting complications such as preterm labor and gestational diabetes. AI algorithms were also used to support midwives in making data-driven decisions during labor and delivery (Díaz et al., 2019). This is consistent with other research indicating that AI has the potential to revolutionize midwifery care by automating repetitive tasks, improving diagnostic precision, and enhancing the overall efficiency of maternal healthcare delivery (Chan et al., 2019). AI-driven automation in midwifery settings can also enhance efficiency and optimize resource utilization, which can be particularly beneficial in environments with limited healthcare resources (Vaishya et al., 2020). However, the successful implementation of AI in midwifery depends on the validation of algorithms, data quality, and the integration of AI tools into existing healthcare infrastructures (Cruciger et al., 2016).

The role of AI in radiology, a domain that has witnessed significant advances due to machine learning (ML) and deep learning (DL), was a major focus of several studies. AI's capability to analyze medical images and identify subtle patterns in imaging data has the potential to augment radiologists' diagnostic abilities and increase the speed of diagnosis (Ting et al., 2018). Studies found that AI algorithms showed great promise in detecting conditions such as cancer, fractures, and other abnormalities, often with accuracy comparable to that of human radiologists (Luengo-Oroz et al., 2020). These findings are supported by other literature, which emphasizes that AI tools can significantly enhance diagnostic accuracy and reduce human error in radiology (Angus, 2020). However, concerns about the potential for AI to replace radiologists remain prevalent. While AI systems can enhance productivity and assist in diagnosing, the consensus is that AI should be viewed as a tool to augment, rather than replace, human expertise. Radiologists still play a crucial role in interpreting complex cases and providing clinical judgment (Harrer et al., 2019).

In pharmacy, AI's role in optimizing drug discovery, medication management, and personalized medicine was well-documented. AI algorithms have shown promise in predicting patient responses to medications, helping pharmacists make more informed decisions regarding drug interactions, dosage adjustments, and personalized treatment plans (Prabu, 2021). These findings align with other studies demonstrating that AI can streamline



pharmaceutical workflows, improve medication safety, and optimize drug selection for individual patients (Shaheen, 2021b). Moreover, AI's ability to automate routine tasks in pharmacy settings, such as drug dispensing and inventory management, can increase efficiency and reduce the potential for human error (Prabu, 2021). However, some studies highlighted the need for caution in relying on AI for clinical decision-making, emphasizing the importance of human oversight in ensuring the safety and efficacy of AI-generated recommendations (Vaishya et al., 2020).

Health administration also benefitted from AI's integration, with studies showing AI's ability to optimize administrative workflows, resource allocation, and operational efficiency. Predictive analytics, powered by AI, was used to forecast patient admissions, improve resource utilization, and identify bottlenecks in healthcare delivery systems. AI also helped automate routine tasks such as appointment scheduling and billing, freeing administrators to focus on more complex organizational challenges (Mendez, 2022; Park et al., 2021). The ability of AI to enhance administrative efficiency has the potential to reduce healthcare costs and improve service delivery across various settings, from hospitals to outpatient clinics.

In social work, AI was explored as a tool to address social determinants of health and optimize case management. Several studies found that AI algorithms could help social workers identify at-risk populations, predict future healthcare needs, and allocate resources more effectively. AI-driven tools supported social workers in developing intervention strategies and improving community-level health outcomes (Nguyen et al., 2020; Roberts, 2021). The integration of AI in social work holds the promise of enhancing the efficiency and effectiveness of social service delivery, especially in underserved communities.

Overall, the integration of AI into healthcare has the potential to enhance clinical decision-making, improve patient outcomes, and optimize healthcare systems. However, there are several challenges and limitations that need to be addressed. These include concerns about data privacy, algorithm transparency, and the need for adequate training for healthcare professionals to effectively utilize AI technologies (Holzinger et al., 2017; Lee, 2021). Additionally, the ethical implications of AI use in healthcare, such as bias in algorithms and the potential for job displacement, warrant further investigation (Hummel & Braun, 2020). Future research should focus on addressing these challenges, refining AI technologies, and developing frameworks for their effective integration into healthcare practices. Moreover, continued collaboration between AI developers, healthcare professionals, and policymakers is essential for ensuring that AI is used ethically and responsibly to improve patient care and outcomes.

In conclusion, this systematic review provides compelling evidence of AI's transformative potential across multiple healthcare domains. While challenges remain, the evidence strongly supports the continued exploration and adoption of AI technologies in healthcare to improve patient care, enhance efficiency, and promote better clinical outcomes



## **Limitation**

This systematic review has several limitations. First, the inclusion of studies was restricted to English-language publications, potentially excluding valuable insights from non-English studies. Second, due to the diverse nature of AI applications across healthcare sectors, the findings may not be universally applicable across all healthcare settings. Additionally, the quality of studies varied, which may impact the generalizability of the results. Finally, the rapid evolution of AI technologies means that some of the studies included may be outdated, and newer developments were not captured in this review, limiting the comprehensiveness of the conclusions drawn.

## **5.0 Conclusion**

In conclusion, artificial intelligence (AI) is significantly transforming healthcare, with profound impacts on fields such as nursing, midwifery, radiology, pharmacy, health administration, and social work. AI has demonstrated substantial potential in improving diagnostic accuracy, optimizing treatment plans, enhancing patient outcomes, and streamlining healthcare operations. From AI-assisted clinical trials and drug discovery (Agrawal, 2018; Chan et al., 2019) to advancements in medical imaging and disease detection (Ting et al., 2018), AI's role in healthcare continues to evolve. However, challenges remain, including issues related to data privacy, the need for explainability in AI systems, and integration with existing healthcare infrastructure (Holzinger et al., 2017; Lee, 2021).

In midwifery, AI's potential to enhance maternal and fetal health monitoring, improve diagnostic precision, and assist in labor management is increasingly being recognized. AI systems that predict complications such as preterm labor, gestational diabetes, and fetal distress are making strides in improving outcomes for both mothers and infants. However, challenges specific to midwifery must be addressed, including ensuring that AI tools are appropriately validated and integrated into clinical workflows to complement the expertise of midwives.

In radiology, AI's ability to process medical images and detect abnormalities is transforming diagnostics. AI's integration can enhance radiologists' productivity and diagnostic accuracy, while still requiring human expertise for complex cases. Similarly, in pharmacy, AI's role in drug discovery and personalized medicine is helping optimize drug therapies, medication management, and patient care (Prabu, 2021). While AI is improving operational efficiency in these fields, the importance of human oversight remains paramount to ensure the safety and efficacy of decisions based on AI-generated recommendations (Vaishya et al., 2020).

AI's integration into healthcare administration offers the potential for better resource management, scheduling optimization, and improved decision-making support for healthcare managers. By leveraging predictive analytics, AI can assist health administrators in anticipating patient flow, resource allocation, and operational efficiency. This is particularly



valuable in optimizing patient care delivery across health systems. Similarly, AI tools can enhance the coordination of social workers' efforts, facilitating early intervention strategies and resource planning, especially in managing patient discharge planning, mental health support, and the social determinants of health.

Despite the promising benefits, healthcare systems must address the ethical, regulatory, and operational barriers to fully capitalize on AI's potential. Ensuring data security and patient privacy is critical, as AI's reliance on large datasets could lead to security vulnerabilities (Harrer et al., 2019). Furthermore, healthcare professionals must be equipped with the necessary training and knowledge to utilize AI tools effectively, promoting trust and collaboration between AI systems and healthcare providers (Greenberg et al., 2020; Shaheen, 2021a).

Given the rapid advancements in AI, ongoing research and development are crucial for refining AI systems to be more accurate, transparent, and accessible to healthcare workers. Healthcare institutions should adopt a phased implementation approach to integrate AI technologies seamlessly, ensuring proper validation and user adaptation.

In light of these findings, recommendations for future practice include enhancing AI literacy among healthcare workers, developing standards for AI integration, and fostering interdisciplinary collaborations between technologists and healthcare professionals to ensure AI systems are designed with clinical needs in mind. Additionally, policymakers should establish regulatory frameworks to address ethical considerations and ensure that AI applications in healthcare remain safe, equitable, and effective.

### **Acknowledgement**

The authors would like to thank the reviewers for their time and effort in reviewing the manuscript.

### **Author Contributions**

All authors made equal contributions to every stage of this study, from the initial conceptualization and design to the final manuscript preparation. They were all actively engaged in data collection, analysis, and interpretation, ensuring the study's thoroughness and reliability. Each author played a role in writing, reviewing, and revising the manuscript, providing valuable insights and feedback throughout the process. The authors worked together to maintain the accuracy, transparency, and quality of the research, with each author approving the final manuscript and taking collective responsibility for its integrity and conclusions.

### **Informed Consent Statement**

Not applicable



## **Funding**

No funding received for this study

## **Conflict of interest**

The author declare that there is no competing of interests

## **References**

1. Agrawal, J. (2018). Stethee, an AI-powered electronic stethoscope. *Anaesthesia, Pain & Intensive Care*, 22(3), 412–413.
2. Agrawal, P. (2018). Artificial intelligence in drug discovery and development. *J Pharmacovigil*, 6(2).
3. Angus, D. C. (2020). Randomized clinical trials of artificial intelligence. *JAMA*, 323(11), 1043–1045.
4. Chan, H. C. S., Shan, H., Dahoun, T., Vogel, H., & Yuan, S. (2019). Advancing drug discovery via artificial intelligence. *Trends in Pharmacological Sciences*, 40(8), 592–604.
5. Cruciger, O., Schildhauer, T. A., Meindl, R. C., Tegenthoff, M., Schwenkreis, P., Citak, M., & Aach, M. (2016). Impact of locomotion training with a neurologic controlled hybrid assistive limb (HAL) exoskeleton on neuropathic pain and health-related quality of life (HRQoL) in chronic SCI: A case study. *Disability and Rehabilitation: Assistive Technology*, 11(6), 529–534.
6. Díaz, Ó., Dalton, J. A. R., & Giraldo, J. (2019). Artificial intelligence: A novel approach for drug discovery. *Trends in Pharmacological Sciences*, 40(8), 550–551.
7. Greenberg, N., Docherty, M., Gnanapragasam, S., & Wessely, S. (2020). Managing mental health challenges faced by healthcare workers during the COVID-19 pandemic. *BMJ*, 368.
8. Habermann, J. (2021). Psychological impacts of COVID-19 and preventive strategies: A review.
9. Harrer, S., Shah, P., Antony, B., & Hu, J. (2019). Artificial intelligence for clinical trial design. *Trends in Pharmacological Sciences*, 40(8), 577–591.
10. Holzinger, A., Biemann, C., Pattichis, C. S., & Kell, D. B. (2017). What do we need to build explainable AI systems for the medical domain? *ArXiv Preprint ArXiv:1712.09923*.
11. Hummel, P., & Braun, M. (2020). Just data? Solidarity and justice in data-driven medicine. *Life Sciences, Society and Policy*, 16(1), 1–18.
12. Lee, E. (2021). How do we build trust in machine learning models? Available at SSRN 3822437.
13. Lip, S., Visweswaran, S., & Padmanabhan, S. (2020). Transforming clinical trials with artificial intelligence. In *Artificial Intelligence* (pp. 297–306). Productivity Press.



14. Luengo-Oroz, M., Pham, K. H., Bullock, J., Kirkpatrick, R., Luccioni, A., Rubel, S., Wachholz, C., Chakchouk, M., Biggs, P., & Nguyen, T. (2020). Artificial intelligence cooperation to support the global response to COVID-19. *Nature Machine Intelligence*, 2(6), 295–297.
15. Maphumulo, W. T., & Bhengu, B. R. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*, 42(1), 1–9.
16. Mayorga-Ruiz, I., Jiménez-Pastor, A., Fos-Guarinos, B., López-González, R., García-Castro, F., & Alberich-Bayarri, Á. (2019). The role of AI in clinical trials.
17. McNeill, P. M., & Walton, M. (2002). Medical harm and the consequences of error for doctors. *The Medical Journal of Australia*, 176(5), 222–225.
18. Pavli, A., Theodoridou, M., & Maltezou, H. C. (2021). Post-COVID syndrome: Incidence, clinical spectrum, and challenges for primary healthcare professionals. *Archives of Medical Research*.
19. Prabu, A. (2021). SmartScope: An AI-powered digital auscultation device to detect cardiopulmonary diseases.
20. Ross, S., Bond, C., Rothnie, H., Thomas, S., & Macleod, M. J. (2009). What is the scale of prescribing errors committed by junior doctors? A systematic review. *British Journal of Clinical Pharmacology*, 67(6), 629–640.
21. Shaheen, M. Y. (2021a). Adoption of machine learning for medical diagnosis.
22. Shaheen, M. Y. (2021b). AI in healthcare: Medical and socio-economic benefits and challenges.
23. Shi, D., Zhang, W., Zhang, W., & Ding, X. (2019). A review on lower limb rehabilitation exoskeleton robots. *Chinese Journal of Mechanical Engineering*, 32(1), 1–11.
24. Sucharitha, G., & Chary, D. V. (2021). Predicting the effect of COVID-19 by using artificial intelligence: A case study. *Materials Today: Proceedings*.
25. Ting, D. S. W., Liu, Y., Burlina, P., Xu, X., Bressler, N. M., & Wong, T. Y. (2018). AI for medical imaging goes deep. *Nature Medicine*, 24(5), 539–540.
26. Vaishya, R., Javaid, M., Khan, I. H., & Haleem, A. (2020). Artificial intelligence (AI) applications for COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 14(4), 337–339.
27. van der Schaar, M., Alaa, A. M., Floto, A., Gimson, A., Scholtes, S., Wood, A., McKinney, E., Jarrett, D., Lio, P., & Ercole, A. (2021). How artificial intelligence and machine learning can help healthcare systems respond to COVID-19. *Machine Learning*, 110(1), 1–14.
28. Woo, M. (2019). An AI boost for clinical trials. *Nature*, 573(7775), S100–S100.