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Perception of Nurses on Artificial Intelligence (AI) and its Role in Nursing Care in Saudi Arabia: A Systematic Review

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ABSTRACT

Objectives: To synthesize current research on the perceptions of nurses in Saudi Arabia regarding the role and impact of AI in nursing care. Methods: A total of 1055 pertinent publications were found after a comprehensive search across four databases. 187 full-text publications were examined after duplicates were eliminated using Rayyan QCRI and relevance was checked; five studies finally satisfied the requirements for inclusion. Results: We included four studies with a total of 1055 participants and more than half of them 646 (61.2%) were females. Perception/ knowledge level among Saudi nurses regarding AI and its role in nursing care ranged from good to moderate. The studies show that nurses generally feel positive about AI in healthcare but have mixed feelings overall. Many nurses have a basic understanding of AI, mostly familiar with a few applications they've seen at work. Some worry that AI could replace their jobs, but most see the potential benefits, like helping with decisions and improving patient care. There's a strong acceptance of AI, especially in areas like diagnostics and personalized treatments. These findings suggest a need for better education and teamwork to help nurses feel confident about working with AI as a support tool, not a replacement. Conclusion: In summary, these studies show that nurses are cautiously hopeful about AI in healthcare. Many nurses see the potential benefits, but they're also concerned about job security and feel they need more knowledge. For AI to be accepted smoothly, healthcare systems should focus on providing the right education and support, addressing these concerns head-on. By helping nurses understand that AI is here to help them, not replace them, we can create a more confident and prepared workforce that's ready to take full advantage of AI's benefits, leading to better patient care and smoother operations.

KEYWORDS: Artificial intelligence; Machine learning; Nurses; Nursing; Saudi Arabia; Systematic review.

1. Introduction

By enhancing clinical judgment, patient care, and healthcare quality, artificial intelligence (AI) has revolutionized the nursing and healthcare sectors. AI integration in nursing and healthcare systems has promise for enhancing quality, improving patient outcomes, and increasing healthcare efficiency. However, chronic diseases and an aging population are driving up healthcare expenses. Given the numerous challenges that healthcare systems around the world confront, it is imperative to find innovative ways to enhance healthcare's affordability, accessibility, and quality. AI is revolutionizing healthcare through data analysis, process automation, and practitioner insights. Through sophisticated analysis of computed tomography (CT), magnetic resonance imaging (MRI), and X-ray data, it is transforming imaging and diagnosis. It has been demonstrated that these systems can quickly identify outliers [1]. Early disease detection and alternative therapy are made possible by machine learning algorithms, which improve practitioners' skills, especially in medical picture analysis [1].

By incorporating AI into nursing care and healthcare systems, healthcare technology has progressed. The intricacy of patient care and the exponential growth of healthcare data present new chances to use AI to improve clinical decision-making, patient outcomes, and healthcare delivery systems. This thorough study explores the use of AI in patient search systems and healthcare, emphasizing the benefits, drawbacks, and consequences of AI for nurses and healthcare [2].

Many health care companies are currently using AI-driven digital health technology that can make decisions without human intervention. In hospital settings, for instance, machine learning-based clinical decision support systems and early warning systems are being used to improve nursing efficiency and deliver more individualized patient care [3]. Another example of a digital health device that uses AI is virtual nurses. Health care companies can gather patient data, give discharge instructions, coach patients, and evaluate patients' health status remotely by using virtual nursing avatars that patients can access via their computer or smartphone [4].

With rapid advancements in healthcare technology, AI is transforming various aspects of nursing care, from enhancing patient monitoring to improving clinical decision-making. As the healthcare landscape in Saudi Arabia continues to evolve, there is an increasing interest in integrating AI tools into nursing practices to address challenges such as staff shortages, high patient loads, and the demand for improved patient outcomes. Nurses, being at the frontline of patient care, are pivotal to the successful adoption and utilization of AI within clinical settings. Their perceptions, attitudes, and readiness to engage with AI technologies can significantly influence how these innovations are implemented and sustained. However, integrating AI into healthcare systems also raises concerns related to job security, skill requirements, ethical considerations, and patient safety, all of which impact nurses directly. Understanding nurses' perceptions and attitudes toward AI in Saudi Arabia is therefore crucial to ensuring effective adoption and maximizing the potential benefits of AI in nursing care.

This systematic review aims to synthesize current research on the perceptions of nurses in Saudi Arabia regarding the role and impact of AI in nursing care.

Specifically, it seeks to examine how nurses view AI's role in enhancing patient care, streamlining workflows, and addressing challenges within healthcare settings. Additionally, the review will identify barriers and facilitators that influence nurses' acceptance and integration of AI into their daily practices. By consolidating existing knowledge, this review intends to provide insights that can guide policymakers, healthcare administrators, and educators in designing strategies that foster a positive and effective integration of AI in nursing within the Saudi healthcare system.

2. Methods

Search strategy

The PRISMA and GATHER criteria were adhered to in the systematic review. To locate pertinent research on the perceptions of nurses in Saudi Arabia regarding the role and impact of AI in nursing care, a comprehensive search was carried out. Four electronic databases were searched by the reviewers: SCOPUS, Web of Science, Cochrane, and PubMed. We eliminated any duplicates and uploaded all of the abstracts and titles that we could find using electronic searches into Rayyan. After that, all of the study texts that met the requirements for inclusion based on the abstract or title were gathered for a thorough examination. Two reviewers independently assessed the extracted papers' suitability and discussed any discrepancies.

Study population—selection

The PEO (Population, Exposure, and Outcome) factors were implemented as inclusion criteria for our review: (i) Population: Saudi nurses, (ii) Exposure: Use of AI, (iii) Outcome: Perception and effect on nursing care.

Data extraction

Data from studies that satisfied the inclusion requirements were extracted by two objective reviewers using a predetermined and uniform methodology. The following information was retrieved and recorded: (i) First author (ii) Year of publication, (iii) Study design, (iv) Participants' number, (v) Age, (vi) Gender, (vii) Knowledge/ perception level, (viii) Main outcomes.

Quality review

Since bias resulting from omitted factors is frequent in studies in this field, we used the ROBINS-I technique to assess the likelihood of bias since it enables a thorough examination of confounding. The ROBINS-I tool can be used for cohort designs where individuals exposed to different staffing levels are tracked over time and is designed to assess non-randomized studies. Each paper's risk of bias was evaluated independently by two reviewers, and any differences were settled by group discussion [5].

3. Results

The specified search strategy yielded 360 publications (Figure 1). After removing duplicates (n =173), 187 trials were evaluated based on title and abstract. Of these, 132 failed to satisfy eligibility criteria, leaving just 52 full-text articles for comprehensive review. A total of 4 satisfied the requirements for eligibility with evidence synthesis for analysis.

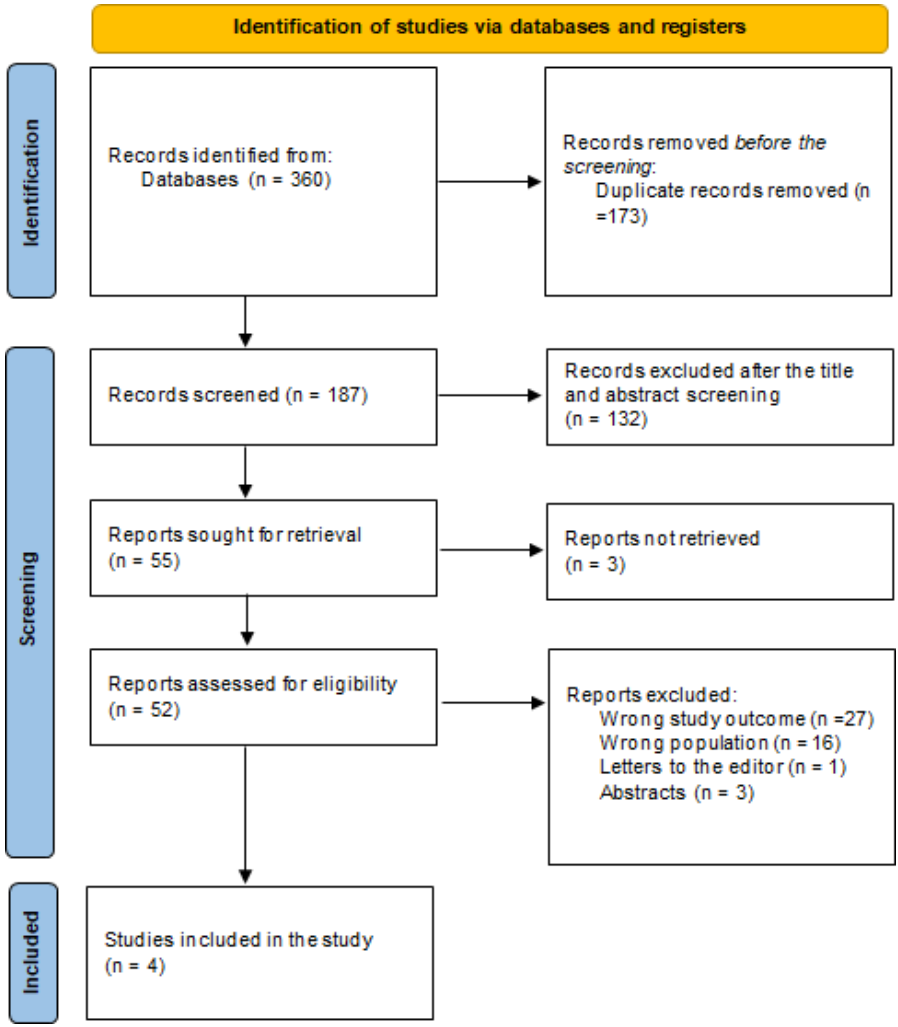

Figure (1): PRISMA flowchart [6].

Sociodemographic and clinical outcomes

We included four studies with a total of 1055 participants and more than half of them 646 (61.2%) were females. Regarding study designs, all of them were cross-sectional studies [7-10]. One study was implemented in Sakaka [7], one in Riyadh

[8], one in Jeddah [9], and one in Dammam [10].

Perception/ knowledge level among Saudi nurses regarding AI and its role in nursing care ranged from good to moderate. Generally, nurses demonstrate a moderate level of awareness about AI technology, with many only familiar with its basics or with limited applications they've encountered in their work settings [7].

Interestingly, the reactions to AI among nurses are mixed. Some express concerns about the possibility of AI replacing human jobs, a worry that stems from uncertainties about how technology might alter traditional nursing roles. These concerns underscore a need for more education that clarifies AI's supportive role in healthcare rather than a replacement for human efforts [8]. Despite these concerns, many nurses maintain a positive attitude toward AI, recognizing its potential to improve decision-making and patient outcomes [9]. However, this positivity is tempered by a cautious perspective, as many nurses remain apprehensive about how AI might impact their future roles. They acknowledge the benefits but approach them with some degree of reservation, underscoring a need for further reassurance and education on AI's long-term place in healthcare [10].

Table (1): Outcome measures of the included studies

Study ID	Study design	Country	Sociodemographic	Knowledge level	Main outcomes
Alruwaili et al., 2024 [7]	Cross-sectional	Sakaka	N=220 Age range: 20-59 Females: 162 (73.6%)	Moderate	Nurses' awareness of AI technology was "moderate," with 70.9% of them knowing the basics and just 58.2% (128 nurses) being "aware" of it because they have used one of its healthcare applications.
Abdullah & Fakieh, 2020 [8]	Cross-sectional	Riyadh	N=250 Age range: 20 to >50 Females: 187 (74.8%)	NS	The findings were conflicting, ranging from ignorance of AI technologies to worry about AI replacing jobs. The study's findings thus point to the necessity of education on the benefits, difficulties, and problems associated with the application of AI in healthcare as well as the technologies' potential to enhance procedures and efficiency in the field.
Serbaya et al., 2024 [9]	Cross-sectional	Jeddah	N=361 Mean age: 35.2 Females: 223 (61.8%)	Good	Healthcare professionals including nurses demonstrated positive attitudes and good general awareness regarding AI. The majority were concerned about the possible repercussions of AI replacing their occupations in the future, even though they had a positive awareness and attitude.
Amin & Alanzi, 2024 [10]	Cross-sectional	Dammam	N=224 Females: 74 (33%)	NS	Significant AI acceptance, particularly among nurses, is revealed by this study, suggesting a radical change in decision-making procedures. The results emphasize the promise of AI in customized medicine and diagnostics, emphasizing the necessity of focused interventions and teamwork to overcome obstacles and optimize AI's advantages in healthcare.

*NS=Not-specified.

Table (2): Risk of bias assessment using ROBINS-I

Study ID	Bias due to confounding	Bias in the selection of participants into	Bias in the classification of interventions	Bias due to deviations from the intended interval	Bias due to missing data	Bias in the measurement of outcomes	Bias in the selection of reported result	Overall bias
Alruwaili et al., 2024 [7]	Mod	Mod	Low	Low	Low	Low	Low	Low
Abdullah & Fakieh, 2020 [8]	Low	Low	Low	Low	Low	Mod	Low	Low
Serbaya et al., 2024 [9]	Mod	Low	Mod	Mod	Low	Low	Low	Moderate
Amin & Alanzi, 2024 [10]	Mod	Mod	Low	Low	Low	Mod	Mod	Moderate

4. Discussion

These studies shed light on how nurses feel about AI in healthcare, showing a mix of optimism and worry. Nurses generally see the potential for AI to help with patient care, decision-making, and making tasks more efficient. However, there's some anxiety about AI possibly replacing human roles, partly due to limited understanding of the technology. While many are hopeful about AI's use in things like diagnostics and personalized treatments, their lack of full knowledge creates some hesitation. This suggests a need for better education and support so nurses can feel more comfortable and confident about AI. Koo et al. demonstrated that AI in nursing and healthcare, with an emphasis on how it can affect clinical judgment, patient care delivery, and healthcare procedures. Legal and ethical issues are brought up by the ethical use of AI in healthcare, where patient autonomy, privacy, and justice should come first. Encouraging integrity, responsibility, and security is crucial. According to our thorough research, AI is helping patients and frontline nurses alike by increasing the efficacy and efficiency of diagnosis, treatment, individualized care, predictive analytics, and clinical decision-making. Nonetheless, issues with algorithmic biases, transparency, and data privacy continue to exist. Strong privacy protection, transparency, and bias mitigation strategies must be put in place to address these issues, with an emphasis on encouraging moral AI applications that enhance patient safety and healthcare results [11].

Buchanan et al. also found that Nursing roles, workflows, and the nurse-patient connection are already being influenced by AI. To the best of our knowledge, this is the first scoping study to map the depth and breadth of information about the projected and existing impacts of AI technology on nursing domains and compassionate care. As AI in nursing is expected to grow, the review's conclusions will assist nurse leaders at all levels and in all fields in proactively forming the

nursing-AI interface and guaranteeing that it is in line with fundamental nursing values that support moral, secure, superior, and person-centered compassionate care for patients, families, and caregivers [12].

The rule-based expert system is one of the artificial intelligence subtypes that has arguably drawn the most attention in recent years within natural language processing (NLP). It is used not only to treat COVID-19 symptoms but also to treat social anxiety patients and elderly individuals who are immunocompromised or at risk of isolation [13]. These kinds of systems have demonstrated efficacy in real-time remote patient monitoring, enhancing the accessibility of current clinical data, freeing up more time for nursing care, and enhancing patient safety in remote, special services, and primary care settings [14, 15]. Its deployment is hindered by the fact that, similar to other forms of AI, most systems that rely on remote patient monitoring still need longer learning stages to reach clinical dependability [16]. The use of other forms of AI, such as physical robots or the automation of robotic processes [17], has, however, been demonstrated in some studies to be satisfactory through their use as a mobile application, improving the efficacy and efficiency of nurses' work in the context of tissue injuries and optimizing wound identification and administration, venepuncture pain control, or adherence to treatment, among other things [18]. However, in contrast to other more popular forms of AI, such explainable AI or systems based on natural language processing, little is now known about these kinds of AI [19].

For AI to work well in healthcare, it's important to support nurses by addressing both the technical and human sides of this transition. Nurses need clear and practical training on how AI can make their jobs easier without taking over. Education should focus on how AI helps rather than replaces, which could ease worries about job security. Showing specific ways AI can improve patient care and safety would likely boost acceptance. For healthcare organizations, this approach is key to bringing AI into daily practices in a way that strengthens patient care by preparing staff well.

5. Strengths and limitations

These studies offer a broad look at nurses' views across different regions, which helps highlight common themes despite some differences. This variety makes the findings more relatable and useful. Another strength is the focus on real applications of AI, like diagnostics and decision-making, which directly impact nursing work. The studies give us a clear snapshot of current attitudes, providing useful insights for immediate steps healthcare systems can take to support AI acceptance.

One limitation is that these studies only capture nurses' feelings at one point in time. Attitudes might change as AI becomes more common in healthcare. Also, since knowledge levels were self-reported, they might not accurately show how well nurses actually understand AI. Differences in sample sizes and backgrounds could limit how well the results apply to all nurses, as feelings about AI might vary in larger or more diverse groups. The studies also don't consider that nurses with more experience using AI might feel differently than those with less exposure.

6. Conclusion

In summary, these studies show that nurses are cautiously hopeful about AI in healthcare. Many nurses see the potential benefits, but they're also concerned about job security and feel they need more knowledge. For AI to be accepted smoothly, healthcare systems should focus on providing the right education and support, addressing these concerns head-on. By helping nurses understand that AI is here to help them, not replace them, we can create a more confident and prepared workforce that's ready to take full advantage of AI's benefits, leading to better patient care and smoother operations.

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