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Bridging the Gap: Nurses Knowledge, Challenges, and Enablers in the Era of Artificial Intelligence

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Abstract
Background: Rapid integration of Artificial Intelligence (AI) into healthcare is reshaping clinical practice, nurses must acquire updated knowledge and skills. Understanding nurses perceived challenges, and enabling factors is essential to ensure effective use of AI. **Aim of the Study:** Assess nurses' knowledge, perceived challenges, and enabling factors related to the integration of AI in nursing at AlRajhy Hospital. **Subjects and Methods:** A descriptive correlational design was employed with a convenience sample of 280 nurses. Data were collected using a validated, self-administered questionnaire comprising three tools: the first assessed nurses personal and job characteristics data, and knowledge regarding AI in healthcare services; the second addressed perceived challenges; and the third focused on enabling factors supporting AI integration. **Results:** The findings revealed that 66.8% of nurses had a satisfactory level of AI knowledge. Ethical concerns ranked highest among perceived challenges **5.12 ± 0.88**, while education and training emerged as the most significant enabling factor **23.88 ± 5.57**. Significant associations were observed between knowledge levels and both perceived challenges (negative correlation) and enabling factors (positive correlation). Personal and job-characteristics such as age, education, and years of experience also had a notable impact on these relationships. **Conclusion:** Higher levels of knowledge were associated with fewer perceived challenges and greater recognition of enabling factors, emphasizing the importance of bridging the gap between challenges and enabler in AI integration within nursing. **Recommendations:** Structured AI training programs should be implemented, targeting new employed nurses or nurses with lower educational qualifications.

Keywords: Artificial Intelligence, Challenges, Enabling Factors & Nurses' Knowledge

Introduction:
In today's rapidly evolving technological environment, Artificial Intelligence (AI) holds transformative potential for healthcare systems and nursing practice. It offers innovative solutions to enhance clinical decision-making, optimize workflows, and improve the quality of patient care **(Gupta et al., 2023)**. Nursing is among the healthcare sectors experiencing accelerated AI integration, with technologies supporting critical tasks such as early risk detection, predictive analytics, resource planning, and care personalization **(Hussein et al., 2023 & Romero et al., 2024).** Start-up companies are driving much of this innovation, introducing agile, creative, and disruptive solutions to long-standing healthcare challenges. However, the successful use of AI in nursing requires bridging the gap between technological advancements and frontline clinical implementation **(Abdullah, 2020 & Adi et al., 2023).** Applications of AI in nursing range from clinical decision support systems to the automation of routine tasks, offering a strong foundation for more efficient and individualized care delivery. For example, AI algorithms can analyze vast datasets from electronic health records (EHRs) to detect patient deterioration or predict complications, enabling timely intervention and reducing adverse outcomes **(Sabra et al., 2023 & Mahdi et al., 2023).** Moreover, AI-based tools assist in reducing medical errors, enhancing diagnostic accuracy, and alleviating the workload of nurses **(Ergin et al., 2023 & Wilson et al., 2023).** Despite these benefits, several ethical and organizational concerns persist. The introduction of AI has raised fears about undermining the nurse–patient relationship, devaluing human judgment, and fostering dependency on opaque algorithms **(Kanekar, 2023 & Bavli et al., 2024).**

A critical challenge to AI use is the limited understanding many nurses have of how AI functions and how its decisions are generated, which can erode trust and hinder practical integration **(Albert, 2022).** Healthcare institutions also face challenges such as data privacy concerns, regulatory compliance issues, and inadequate technological infrastructure. Furthermore, many nurses report insufficient training and support when working with AI tools, complicating their ability to utilize these technologies effectively **(Tran et al., 2024)**. Although the fear that AI may replace nurses is largely unfound, it remains widespread, and ethical concerns about algorithmic bias and data governance continue to be significant **(Samad et al., 2024).**

Nonetheless, AI cannot replace the humanistic components of nursing—such as empathy, ethical

reasoning, and emotional support—which remain central to holistic, patient-centered care **(Adi et al., 2023).** AI should be regarded as a tool that complements, rather than replaces, the expertise and judgment of nurses. The successful integration of AI into nursing practice depends on several factors, including comprehensive training, organizational preparedness, interprofessional collaboration, and clear regulatory frameworks. Equipping nurses with the necessary knowledge and competencies is vital to ensure the safe, effective, and ethical application of AI in clinical settings **(Gouripur, 2024).**

Nurses currently demonstrate varying levels of knowledge regarding AI, and their perceptions of its benefits and risks significantly influence its use. Understanding the challenges and enablers that shape nurses' attitudes and behaviors toward AI is essential to support its ethical and effective integration into healthcare systems **(Tursunbayeva & Renkema, 2023).** Key enablers include ongoing education and training, access to technological resources, leadership support, and interprofessional collaboration **(Hassan, et al., 2024).** Without these foundational elements, resistance to AI use is likely to persist, ultimately limiting its transformative potential in improving patient care and health system performance.

Significance of the study:

Studies have highlighted significant knowledge gaps among nurses regarding AI concepts and applications in clinical practice **(Zhou et al., 2021),** accompanied by concerns related to ethical implications, technical limitations, and organizational readiness **(Blease et al., 2022).** On the other hand, strong enablers such as continuous education, leadership support, and interdisciplinary collaboration have been shown to facilitate AI acceptance in healthcare settings **(Rao et al., 2023).** As AI continues to rapidly reshape global healthcare, its integration into nursing practice is not only inevitable but also transformative. AI is projected to drive the healthcare sector to a market value exceeding $187 billion by 2030, with applications ranging from clinical decision support systems to predictive analytics **(Statista, 2023).** For nurses, AI offers the potential to improve patient outcomes, reduce medical errors, streamline workflows, and enable data-driven, personalized care **(Gouripur, 2024).**

However, despite these promising benefits, the use of AI in nursing remains inconsistent due to challenges such as limited awareness, ethical concerns, data security issues, and varying levels of readiness and acceptance among nurses **(Tursunbayeva & Renkema, 2023).** These barriers threaten to widen the gap between technological innovation and clinical application. Therefore, assessing nurses' knowledge, perceived challenges, and enabling factors related to AI has become a critically important area of focus to ensure safe, ethical, and effective integration into nursing practice.

Aim of the study: The present study aimed to assess nurse's knowledge, perceived challenges, and enabling factors related to the integration of artificial intelligence (AI).

Specific objectives:

1. Assess nurses' knowledge levels regarding the integration of artificial intelligence (AI).
2. Determine the levels of challenges encountered by nurses in using AI.
3. Identify the levels of enabling factors that support AI integration among nurses at AlRajhy Hospital.
4. Examine the association between nurses' knowledge levels and their perceived challenges and enabling factors at AlRajhy Hospital.
5. Investigate the associations between nurses' personal and professional characteristics and their knowledge levels, perceived challenges, and enabling factors related to AI at AlRajhy Hospital.

Research questions:

1. What are the levels of knowledge among nurses regarding artificial intelligence (AI) at AlRajhy Hospital?
2. What are the levels of perceived challenges encountered by nurses in using AI at AlRajhy Hospital?
3. What are the levels of enabling factors related to AI integration at AlRajhy Hospital?
4. Is there a statistically significant association between nurses' knowledge levels and their perceived challenges and enabling factors at AlRajhy Hospital?
5. Are nurses' personal and job-characteristics significantly associated with their knowledge levels, perceived challenges, and enabling factors regarding AI at AlRajhy Hospital?

Subject and Method:

Research Design: A cross-sectional descriptive correlational research design was utilized.

Setting: The study was conducted at AlRajhy Hospital, affiliated with Assiut University. The hospital comprises 13 different departments, with an average monthly patient admission rate of approximately 650 patients.

Subjects: The study included a convenience sample of nurses working across various departments at AlRajhy Hospital, with a total sample of 280 nurses.

Tools of the Study

Data were collected using a self-administered questionnaire consisting of three tools.

Tool One: Personal and Job Characteristics Form and Nurses' Knowledge Regarding AI

This tool consists of two parts. **The first part** collects personal and job-related data, including age, gender, educational qualifications, and years of experience. **The second part** is a knowledge assessment questionnaire developed by the researchers based on **Hwang et al., (2022)** to assess nurses' knowledge regarding the integration of AI in healthcare services. It consists of 22 dichotomous questions (Yes = 1, No = 0). Total scores were summed and converted into a percentage. A score greater than 60% indicates a satisfactory level of knowledge, while a score below 60% reflects an unsatisfactory knowledge level.

Tool Two: Challenges Regarding Artificial Intelligence Questionnaire

This tool was developed by the researchers based on the works of **Kumar, (2025) & Topaz & Pruinelli, (2017)** to assess the level of challenges as perceived by nurses in integrating AI into nursing practice. It includes 15 items distributed across five main dimensions: technical, clinical, ethical, organizational, and educational challenges (three items per dimension). Responses were measured using a 3-point Likert scale (Disagree = 0, Neutral = 1, Agree = 2). Total scores were categorized into three levels: low (less than 50%), moderate (50%–75%), and high (greater than 75%) levels of perceived challenges.

Tool Three: Nurses' Enablers of Artificial Intelligence Questionnaire

This tool was developed by the researchers following a comprehensive literature review **(Hassan et al., 2024 & Tran et al., 2024)** to identify enabling factors that facilitate AI integration in nursing practice. It consists of 15 items evenly distributed across five key dimensions: education and training, technological infrastructure, organizational support, clinical support, and collaboration and partnerships (three items per dimension). Each item was rated on a 3-point Likert scale (Disagree = 0, Neutral = 1, Agree = 2), yielding a total score ranging from 0 to 30. Scores were converted into percentages and classified into three levels: low (less than 50%), moderate (50% to less than 75%), and high (75% or more) levels of enabling factors.

Study Procedures:

The study was conducted in three main phases: the preparatory phase, the pilot study, and the fieldwork.

Preparatory Phase: This phase involved an extensive review of the available literature related to the research topic to support tool development and the formulation of the research proposal. The preparatory phase lasted approximately three months, from the beginning of January to the end of March 2025.

Face Validity: Face validity was conducted to ensure that the questionnaire items were clearly understood by the target population and accurately reflected the intended concepts. Feedback was obtained from nursing and AI experts to confirm clarity and appropriateness.

Content Validity: Content validity was assessed using confirmatory factor analysis to evaluate the relevance, importance, accountability, and clarity of the questionnaire items. This statistical analysis helped verify that the tools effectively measured the intended constructs.

Content Validity Using Confirmatory Factor Analysis (CFA)

Tool Name	Dimension	CFI	RMSEA	χ^2/df	SRMR	p-value
AI Challenges Tool	5-dimension	0.91	0.045	2.10	0.035	< 0.001
AI Enablers Tool	5-dimension	0.93	0.041	1.95	0.030	< 0.001
AI Knowledge Tool	22 items	0.89	0.052	2.25	0.038	< 0.001

The Comparative Fit Index test for all models exceeded 0.90

Reliability: The reliability of the study tools was assessed using Cronbach's alpha coefficient to determine internal consistency. The results indicated acceptable levels of reliability for all tools, confirming their suitability for measuring nurses' knowledge, perceived challenges, and enabling factors related to the integration of artificial intelligence (AI) in nursing practice.

Tool Name	Dimension	No of Items	Cronbach's Alpha
Nurses' Knowledge Tool	Total	21	0.87
AI Challenges Tool	Technical Challenges	3	0.85
	Clinical Challenges	3	0.88
	Ethical Challenges	3	0.80
	Organizational Challenges	3	0.86
	Educational Challenges	3	0.82
AI Enablers Tool	Education and Training	3	0.99
	Technological Infrastructure	3	0.81
	Organizational Support	3	0.87
	Clinical Support	3	0.86
	Collaboration & Partnerships	3	0.83

Cronbach's alpha coefficients test ranging from 0.80 to 0.99, indicating good internal consistency

Ethical considerations:

The research proposal was approved by the Ethical Committee of the Faculty of Nursing, Assiut University, under code number 1120251030, date 28 April, 2025. There was no risk posed to the study participants during the conduct of the research. The study adhered to the ethical principles outlined in clinical research guidelines, including respect for autonomy, beneficence, non-maleficence, and justice. Written informed consent was obtained from all nurses who agreed to participate after explaining the study's nature, purpose, and procedures. Participants were assured of the confidentiality and anonymity of their responses. They were also informed of their right to refuse participation or withdraw from the study at any time without providing justification. Privacy was strictly maintained throughout the data collection process.

Pilot study:

A pilot study was conducted following the translation of the study questionnaire and prior to the initiation of the main data collection phase. The purpose of the pilot study was to assess the clarity, relevance, and feasibility of the study tools, as well as to estimate the average time required for questionnaire completion. The pilot involved 10% of the total target sample (28 nurses) and was conducted before the commencement of the primary data collection. Based on feedback from the pilot participants and the results of the confirmatory factor analysis, necessary modifications were made to refine and finalize the study tools. Nurses who participated in the pilot study were excluded from the final sample to avoid any potential bias.

Fieldwork:

The researchers met with all participating nurses to explain the study's objectives and obtain their written informed consent. Group meetings were organized in coordination with the nursing directors to ensure that patient care services were not disrupted during data collection to be able to collect the questionnaire from nurses without losing it. Each session included approximately 13 nurses and was held in the teaching hall at AlRajhy Hospital, with representation from all hospital departments. After obtaining consent, participants were provided with the self-administered questionnaire to complete. On average, each nurse required about 20 minutes to finish the questionnaire. The data collection process was carried out over a one-month period, from the end of April after taking approval from the ethical committee to the end of May 2025.

Statistical analysis design:

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participants' personal and professional characteristics, as well as responses to the study tools. The internal consistency reliability of the instruments was assessed using Cronbach's alpha coefficients. Construct validity was evaluated through Confirmatory Factor Analysis (CFA), with model fit assessed using standard indices, including the Confirmatory Factor Index (CFI). Pearson's correlation coefficients were calculated to examine the relationships among key study variables. A p-value of less than 0.05 was considered statistically significant.

Results

Table (1): Distribution of Personal & job Characteristics among the Studied Nurses at AlRajhy Hospital (n = 280)

Personal & job characteristics	N	%
Age (years)		
< 30	56	20.0
30 – < 40	140	50.0
≥ 40	84	30.0
Mean ± SD	**36.15 ± 6.99**	
Gender		
Male	76	27.1
Female	204	72.9
Educational Qualification		
Secondary Nursing School diploma	74	26.4
Technical Institute of Nursing diploma	190	67.9
Bachelor's degree in nursing	16	5.7
Marital Status		
Single	57	20.4
Ever Married	223	79.6
Years of Experience		
< 10 years	111	39.6
10 – < 20 years	103	36.8
≥ 20 years	66	23.6
Mean ± SD	**12.49 ± 7.91**	

Table (2): Nurses' Knowledge Levels Regarding Artificial Intelligence at AlRajhy Hospital (n = 280)

Knowledge Level	(n)	(%)	Mean ± SD
Satisfactory Knowledge level	187	66.8	69.17 ± 25.30
Unsatisfactory Knowledge level	93	33.2	43.84 ± 18.47
Total	**280**	**100**	

Table (3): Mean Scores of Nurses Perceived Challenges Regarding Artificial Intelligence at AlRajhy Hospital (n = 280)

AI Challenges' Dimensions	Mean ± SD	p-value
Technical Challenges	**3.85 ± 1.12**	0.001**
Clinical Challenges	4.20 ± 1.05	0.001**
Ethical Challenges	**5.12 ± 0.88**	0.001**
Organizational Challenges	4.01 ± 1.09	0.001**
Educational Challenges	4.50 ± 1.00	0.001**

One-way ANOVA and Independent Sample T-Test p < 0.05 indicates statistically significant differences

Table (4): Nurses' Challenge Levels regarding Artificial Intelligence at AlRajhy Hospital (n = 280)

Challenges Level	(n)	(%)	Mean ± SD
Low challenge level	103	36.8	**1.96 ± 0.83**
Moderate challenge level	86	30.7	
High challenge level	91	32.5	

Table (5): Mean Scores of Nurses' Perceived Enabling Factors Regarding Artificial Intelligence at AlRajhy Hospital (n = 280)

Enabling Factors Dimensions	Mean ± SD	p-value
Education and training	**23.88 ± 5.57**	.001**
Technological infrastructure	22.26 ± 5.69	.001**
Organizational support	21.27 ± 5.28	.001**
Clinical support	**20.99 ± 4.39**	.001**
Collaboration and partnerships	21.72 ± 5.13	.001**

*Independent sample T test & Independent sample T test, *Significant level at P value < 0.05.*

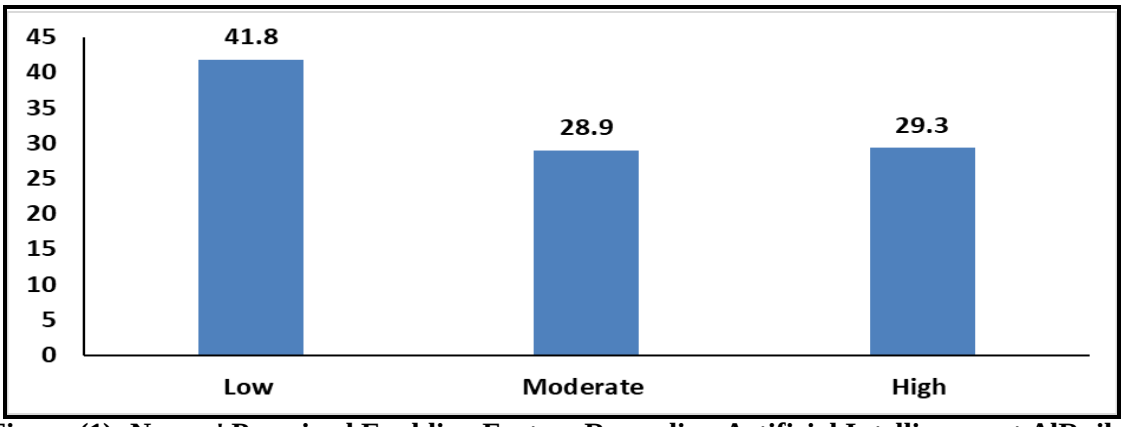

Figure (1): Nurses' Perceived Enabling Factors Regarding Artificial Intelligence at AlRajhy Hospital (n = 280)

Table (6): Correlation Matrix between Nurses' Knowledge, Perceived Challenges, and Enabling Factors Regarding AI (n = 280)

Study variables	Nurses Knowledge	Perceived Challenges	Enabling factors
Nurses Knowledge	1.00	**r = -0.36** p < 0.001**	**r = 0.41** p < 0.001**
Perceived Challenges	**r = -0.36** p < 0.001**	1.00	**r = -0.28** p < 0.001**
Enabling factors	**r = 0.41** p < 0.001**	**r = -0.28** p < 0.001**	1.00

Pearson's correlation coefficient (r).Significance level considered at p < 0.05

Table (7): Correlation Matrix between nurse's knowledge, perceived challenges, enabling factors and Personal & job Characteristics (n = 280)

Personal and job-characteristics	Nurses Knowledge	Perceived Challenges	Enabling factors
Age (years)	r = 0.22	r = -0.18	r = 0.20
P value	p = 0.001**	p = 0.004**	p = 0.002**
Gender	r = 0.10	r = -0.06	r = 0.09
P value	p = 0.078	p = 0.210	p = 0.104
Educational Qualification	r = 0.33	r = -0.30	r = 0.35
P value	p < 0.001**	p < 0.001**	p < 0.001**
Years of Experience	r = 0.24	r = -0.20	r = 0.21
P value	p < 0.001	p = 0.001	p = 0.001

Pearson's correlation coefficient (r).Significance level considered at p < 0.05

Table (1): Presents the distribution of personal and job characteristics among the participating nurses. The results indicate that half of the participants (50%) are aged between 30 and less than 40 years. The majority of the nurses are female (72.9%), and more than two-thirds (67.9%) hold a Technical Institute of Nursing diploma. Regarding marital status, most participants are ever married (79.6%). In terms of professional experience, more than one-third of the nurses (39.6%) have fewer than 10 years of work experience.

Table (2): Demonstrates that more than two-thirds of the nurses (66.8%) report a satisfactory level of knowledge regarding artificial intelligence (AI), with a mean score of 69.17 ± 25.30. In contrast, 33.2% of the participants exhibit an unsatisfactory level of knowledge, with a lower mean score of 43.84 ± 18.47.

Table (3): Presents the mean scores of nurses' perceived challenges related to the integration of artificial intelligence (AI) at AlRajhy Hospital. Among the five dimensions, ethical challenges record the highest perceived mean score (M ± SD = 5.12 ± 0.88), indicating greater concern in this area. In contrast, the technical challenges dimension have the lowest mean score (M ± SD = 3.85 ± 1.12). The differences in mean scores across the five dimensions are statistically significant (p < 0.001).

Table (4): Presents the distribution of nurses according to their perceived challenge levels regarding the integration of artificial intelligence (AI) at AlRajhy Hospital. The data indicates that the highest percent exhibit low challenge level (36.8%) and the lowest percent exhibit moderate challenge level (30.7%). The overall mean score was 1.96 ± 0.83.

Table (5): Illustrates the mean scores of nurses' perceptions of enabling factors for AI integration across different domains. The highest mean score regarding the "Education and Training" domain (M ± SD 23.88 ± 5.57), indicating its strong influence as a facilitator. In contrast, the "Clinical Support" domain receive the lowest mean score (M ± SD 20.99 ± 4.39).

Figure (1): Demonstrates that the highest percentage of the studied nurses (41.8%) report a low level of enabling factors for using of artificial intelligence (AI) in clinical settings. In contrast, the lowest percentage (28.9%) of nurses report a moderate level of enabling factors.

Table (6): Depicts the correlation matrix illustrating statistically significant associations among the core study variables. A moderate negative correlation is observing between nurses' knowledge levels and their perceived challenges (r = -0.36, p < 0.001). Additionally, a moderate positive correlation is find between knowledge levels and enabling factors (r = 0.41, p < 0.001). Moreover, an inverse association is identified between perceived challenges and enabling factors (r = -0.28, p < 0.001).

Table (7): depicts statistically significant positive associations between nurses' knowledge levels and their age (r = 0.22, p = 0.001), educational qualifications (r = 0.33, p < 0.001), and years of experience (r = 0.24, p < 0.001). Similarly, enabling factors are positively correlated with these same personal and job characteristics, indicating that older, has more education, and more experience nurses perceive greater support for AI integration. In contrast, perceived challenges were negatively correlate with these factors, particularly with education (r = -0.30, p < 0.001). Gender was not significantly associate with any of the core study variables.

Discussion

Artificial intelligence (AI) is increasingly influencing healthcare delivery, and its integration into nursing practice depends heavily on frontline nurses' knowledge, perceived challenges, and the presence of supportive enabling factors. Nurses' knowledge of AI is fundamental to their ability to engage with AI systems safely and effectively (**Zhou et al., 2021; Gouripur, 2024**). **Albert, (2022)** reported significant variations in nurses' familiarity with AI concepts, particularly in low-resource settings. Beyond cognitive readiness, AI integration is also shaped by

perceived challenges such as ethical dilemmas, limited technical resources, and concerns about data privacy (**Topaz & Pruinelli, 2017; Blease et al., 2022 & Kanekar, 2023**).

These barriers can undermine trust in AI systems and hinder their clinical application. In contrast, enabling factors—such as structured education programs, robust technological infrastructure, interprofessional collaboration, and supportive leadership—have been identified as essential for successful AI use (**Rao et al., 2023; Hassan et al., 2024 & Tran et al., 2024**).

Global evidence increasingly emphasizes the importance of both individual and organizational factors in shaping AI use. Nurses' knowledge not only influences how they understand and utilize AI but also mediates their perceptions of its associated risks and benefits (**Samad et al., 2024; Tursunbayeva, & Renkema, 2023**). The present study aimed to assess nurses' knowledge, perceived challenges, and enabling factors regarding the integration of AI into nursing practice at AlRajhy Hospital.

The sample primarily comprised female nurses, most of whom were in their thirties and held diplomas from Technical Nursing Institutes. The majority were married and had varying levels of professional experience, providing a diverse base for exploring how personal and job-characteristics influence readiness for AI use. Similar findings were reported by **Zhou et al., (2021)**, who observed that nurses with mid-level experience and technical qualifications generally possessed foundational awareness of AI but required further training for meaningful engagement.

The current study revealed that two-thirds of nurses demonstrated a satisfactory level of AI knowledge. This finding may reflect increased exposure to digital health concepts in both academic curricula and clinical settings. It aligns with the findings of **Gouripur, (2024) and Tursunbayeva & Renkema, (2023)**, who observed growing AI awareness among nurses, particularly in digitally progressive institutions. However, this contrasts with **Albert, (2022)**, who found that many nurses lacked basic AI understanding in institutions without structured AI education or training programs.

Regarding perceived challenges, ethical concerns ranked highest among the five assessed domains, followed by educational and clinical challenges. This suggests that nurses remain apprehensive about issues such as data privacy, algorithmic decision-making, and the potential erosion of the nurse–patient relationship.

These concerns are supported by **Kanekar, (2023) & Blease et al., (2022)**, who emphasized nurses' discomfort with AI's lack of transparency and potential ethical pitfalls. Interestingly, technical challenges were rated lowest in the current study, possibly due to the existing technological infrastructure at AlRajhy Hospital. This finding diverges from **Topaz & Pruinelli, (2017)**, who reported that nurses in many settings struggle with limited access to adequate technology and insufficient technical support.

Further analysis of challenge levels revealed that more than one-third of the nurses reported a low perception of AI-related challenges. This may indicate growing adaptation or increasing tolerance among nurses toward AI systems. Nevertheless, a significant proportion of participants still reported moderate to high challenge levels, emphasizing the need for systemic support to reduce apprehension and improve integration. These findings are consistent with those of **Samad et al., (2024)**, who noted that despite advances in AI tools, perception-based barriers persist unless actively addressed through training and support.

In evaluating enabling factors, education and training emerged as the most influential domain in promoting AI integration. However, the study also found that the largest proportion of nurses reported a low overall level of enabling factors. This discrepancy suggests institutional gaps in the visibility or implementation of supportive strategies. The findings align with those of **Hassan et al., (2024) & Tran et al., (2024)**, who highlighted the need for comprehensive organizational efforts—such as AI-focused training, mentorship programs, and interdepartmental collaboration—to foster a conducive environment for AI use.

Correlation analyses revealed significant relationships among the three core variables. Nurses' knowledge was positively associated with enabling factors and negatively associated with perceived challenges. This supports the premise that enhanced knowledge can mitigate resistance and foster greater AI acceptance. These associations are consistent with those reported by **Rao et al., (2023) and Tursunbayeva & Renkema, (2023)**, who emphasized the pivotal role of knowledge and education in shaping perceptions and facilitating successful AI implementation.

Finally, the study identified statistically significant associations between nurses' personal and job-characteristics—specifically age, educational level, and years of experience—and their knowledge, perceived challenges, and enabling factors. Nurses with more experience and higher education demonstrated greater knowledge, perceived more enabling factors, and reported fewer challenges related to AI.

These results echo those of **Zhou et al., (2021) & Gouripur, (2024)**, who found that older and better-educated nurses tend to be more prepared for AI

integration. In contrast, gender was not significantly associated with any of the study variables, slightly differing from findings by **Ergin et al., (2023)**, who observed that male nurses were marginally more receptive to AI technologies.

The current study has several strengths, including its focus on a timely and emerging topic—AI integration in nursing practice—and the use of validated, comprehensive tools to assess nurses' knowledge, perceived challenges, and enabling factors. The relatively large sample size and inclusion of nurses from multiple departments at AlRajhy Hospital enhanced the internal validity and relevance of the findings. Additionally, robust statistical methods, including correlation and factor analysis, strengthened the credibility of the results.

However, the study is not without weakness points. Its cross-sectional design restricts the ability to establish causal relationships, and the use of a single hospital setting limits the generalizability of the findings to other contexts. Furthermore, reliance on self-reported questionnaires may introduce response bias, and the absence of qualitative data limits a deeper understanding of nurses' perceptions and experiences regarding AI use .

Conclusions:

Based on the results of the present study, the following conclusions:

The findings of this study demonstrated that more than two-thirds of nurses at AlRajhy Hospital possessed satisfactory knowledge about artificial intelligence (AI); however, a significant proportion still exhibited unsatisfactory knowledge levels. Ethical concerns emerged as the most prominent perceived challenge, followed by educational and clinical barriers, highlighting that moral dilemmas and insufficient training remain critical obstacles to AI use in nursing practice. On the other hand, education and training were identified as the most influential enabling factor. Despite this, the highest percentage of nurses perceived an overall low level of enabling factors, suggesting gaps in institutional support and resource visibility for effective AI integration.

Correlation analysis revealed that higher knowledge levels among nurses were significantly associated with fewer perceived challenges and greater enabling factors, highlighting the pivotal role of knowledge in bridging the gap between barriers and facilitators to AI use in nursing practice.

Recommendations:

The researchers recommended the following

- **Implement structured AI training programs** for nurses, particularly targeting those with lower educational qualifications or fewer years of experience.
- **Prioritize ethical training and awareness** concerns related to data privacy, patient autonomy, and algorithm transparency.
- **Enhance organizational AI enablers**, particularly in clinical support and partnerships.
- **Strength leadership engagement** to ensure alignment between administrative decisions and frontline nurses needs
- **Develop policies based on empirical evidence**, using this study's findings to inform institutional AI-readiness frameworks, ensuring tailored responses to the unique needs of nurses in various departments.

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