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Evaluate the Effect of an Artificial Intelligence Education Program on Nurse's Perspectives and Attitudes toward an Artificial Intelligence

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Abstract

Background: Artificial intelligence (AI) is increasingly being adopted in healthcare to support clinical decision-making and enhance patient outcomes. However, successful implementation requires that nurses hold both a positive perspective and readiness to work with AI technologies. **Aim:** This study aimed to evaluate the effect of an educational intervention focused on AI on nurses' perspectives and attitudes toward its adoption in healthcare settings. **Design:** A quasi-experimental research design was employed. **Setting:** The study was conducted at Badr University Hospital, affiliated with the Ministry of Health and Helwan University. **Subjects:** A convenient sample of 77 nurses was selected. **Tools of data collection:** Two validated tools were used for data collection: (I) a self-administered questionnaire assessing nurses' perspectives toward AI in healthcare, and (II) the General Attitudes Toward Artificial Intelligence Scale. **Results:** After the intervention, 84.4% of the nurses demonstrated high knowledge of AI in the post-test phase, which remained at 79.2% during the three-month follow-up, compared to 15.6% at baseline. Additionally, 81.8% of nurses reported a positive attitude post-intervention, slightly decreasing to 77.9% at follow-up, up from 16.9% in the pre-test phase. All improvements were statistically significant. **Conclusion:** The educational intervention had a significant positive effect on nurses' knowledge and attitudes toward AI, sustained through the follow-up phase. **Recommendations:** Strategic planning for the integration of AI into healthcare systems—particularly in electronic health records—should be strengthened, along with ongoing professional development initiatives for nursing staff.

Keywords: *Artificial intelligence, Attitude, Education, Healthcare, Nursing, Perspective, Professional development, Quasi-experimental design, Technology adoption*

Introduction

Artificial intelligence (AI) is rapidly transforming healthcare by enhancing the quality, efficiency, and safety of patient care. Across various countries, AI technologies are being developed, approved, and integrated into clinical settings to support nursing practice and improve

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clinical decision-making **(Pailaha, 2023)**. These technologies aim to optimize healing processes, expand access to care, and elevate patient engagement within the nursing domain.

AI applications are advancing at a pace surpassing earlier predictions. Today's systems, driven by machine learning, can mimic certain cognitive functions of the human brain. While these systems cannot fully replicate human cognition, their potential is increasingly evident across industries, including banking, e-commerce, and healthcare **(Barbhuiya, 2023)**. AI encompasses a broad spectrum of technologies designed to perform tasks such as learning, interpretation, writing, and visual recognition, thereby contributing to solutions for complex healthcare challenges (**Gerich et al., 2022; Eggerth et al., 2020)**. AI-powered tools, such as mobile applications for medication adherence, have already shown efficacy in enhancing clinical outcomes **(Ghane et al., 2024).**

In healthcare, AI operates through computer systems simulating human intelligence using algorithms, machine learning, voice recognition, and natural language processing. These systems are being utilized to improve clinical decision-making, streamline workflows, and promote equitable healthcare delivery **(Jose et al., 2022)**. Moreover, AI facilitates disease diagnosis, risk stratification, treatment planning, and monitoring—providing actionable insights that can improve outcomes and reduce healthcare costs **(Liu et al., 2020; Uymaz et al., 2024)**.

The successful integration of AI into nursing practice requires nurses to acquire digital competencies and adapt to rapidly evolving technologies. Structured training programs are essential to empower nurses in effectively engaging with AI tools. Moreover, ethical considerations and ongoing evaluations are critical to ensure responsible and equitable AI deployment **(Ron, 2023)**. Nurse leaders must articulate clear positions regarding AI and champion its implementation, while ensuring frontline nurses are prepared and supported during this transition **(Arishi et al., 2023)**.

Despite the potential benefits, AI implementation in healthcare continues to face unresolved challenges such as strategic planning, socioeconomic implications, and ethical concerns **(Bhalerao et al., 2023)**. AI systems, although powerful in data analysis and workflow management, are still evolving in terms of integration with clinical realities. Their success depends not only on technological readiness but also on the attitudes and acceptance of healthcare professionals, particularly nurses.

AI offers significant opportunities to improve care quality, reduce operational costs, and optimize workforce deployment through real-time analytics and robotic support systems. Defined broadly, AI refers to the computational capacity to perform tasks that traditionally require human intelligence **(Sommer et al., 2024)**. In nursing specifically, AI can reduce administrative burden, support evidence-based practice, and enhance data-driven patient care **(Martinez-Ortigosa et al., 2023)**.

Of particular interest is AI's role in continuous patient monitoring—one of the areas where nurses express both interest and concern. AI-driven systems can collect and interpret large volumes of clinical data in real time, yet the extent to which nurses are prepared to trust and use these technologies remains unclear **(Mir et al., 2023).** As expectations for nursing performance grow, nurses must remain at the forefront of technological transformation.

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Active nursing engagement is vital for the ethical, safe, and sustainable implementation of AI in healthcare. Although awareness of AI has increased over the past decade, nurses still exhibit varying degrees of knowledge and attitude toward its application, influenced by professional experience, institutional support, and ethical understanding **(Fritsch et al., 2022)**.

While the literature recognizes the transformative potential of AI in healthcare, empirical research evaluating the direct impact of structured educational interventions on nurses' AI-related attitudes and perspectives remains limited. Most existing studies focus on general awareness or institutional readiness without investigating behavioral or attitudinal shifts following targeted training **(Arishi et al., 2023; Jose et al., 2022; Ron, 2023).** Moreover, few studies provide longitudinal data that assess whether such changes are sustained over time **(Fritsch et al., 2022; Mir et al., 2023).**

Given that nurses are frontline stakeholders in patient care and data management, understanding their readiness to engage with AI is essential for successful integration. The present study addresses this gap by implementing a structured AI education program and evaluating its effect on nurses' knowledge and attitudes across three time points—pre-intervention, post-intervention, and three-month follow-up. By focusing on a convenience sample of nurses in a real-world hospital setting in Egypt, this study contributes novel insights into the sustainability of educational impact, offering a practical framework for AI adoption within nursing practice.

Significance of Study

Despite the growing integration of Artificial Intelligence (AI) in healthcare systems, its adoption within nursing practice continues to face practical and perceptual barriers. According to global surveys, up to 60% of healthcare providers express skepticism regarding AI's ability to independently generate accurate diagnoses or personalized treatment plans **(Jha et al., 2022)**. Moreover, in a Saudi-based study, 63.2% of healthcare workers reported a positive attitude toward robotic surgery, yet nearly 50% of them raised concerns about patient trust and acceptance of AI-driven procedures. These figures highlight a persistent gap between technological advancement and clinical confidence.

Specifically, recent findings suggest a high level of openness to digital health tools—89.4% report strong technology acceptance and 65.1% have adopted some form of AI in practice. However, more than 50% still report discomfort or insecurity in using AI tools, with 60% expressing moderate or high levels of unease **(Abdelaliem et al., 2023)**. These statistics reflect not only a readiness gap, but also an emotional and professional hesitation that must be addressed through intentional educational interventions.

This study is particularly significant as it moves beyond general awareness surveys by implementing and evaluating a structured AI education program using a quasi-experimental design. It provides longitudinal data through pre-, post-, and follow-up assessments, allowing for an analysis of both immediate impact and sustained change in nurses' perspectives and attitudes. Unlike many studies limited to theoretical discussions, this research measures real-world outcomes in a clinical setting within Egypt, a context where AI readiness data is still scarce.

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Furthermore, the inclusion of a follow-up phase enhances the study's value by capturing long-term effects, a dimension frequently overlooked in AI training research. The insights generated can inform the design of scalable, evidence-based educational strategies to support AI implementation, particularly in low- and middle-income countries where digital transformation is accelerating but unevenly applied.

By addressing both cognitive and emotional dimensions of AI adoption, this study aims to close the gap between technological potential and frontline clinical engagement—ultimately contributing to safer, more efficient, and digitally enabled nursing practice.

Aim of the Study

This study aimed to evaluate the effect of an artificial intelligence (AI) education program on nurses' perspectives and attitudes toward AI through the following objectives:

1. To evaluate nurses' baseline perspectives and attitudes toward AI in healthcare as a foundation for tailored educational planning.
2. To design an AI education program that specifically addresses the identified learning needs and gaps among nursing personnel.
3. To implement the AI education program within a clinical nursing setting.
4. To reassess nurses' perspectives and attitudes toward AI immediately after the intervention and again at a three-month follow-up.
5. To determine the overall impact of the tailored AI education program on nurses' perspectives and attitudes over time.

Research Hypothesis

The AI education program will produce a statistically significant improvement in nurses' perspectives and attitudes toward artificial intelligence, thereby enhancing their readiness and capacity to effectively integrate AI into clinical nursing practice.

Subjects and Methods

Research Design

A quasi-experimental research design was adopted to assess the impact of an Artificial Intelligence (AI) education program on nurses' perspectives and attitudes. The study involved three phases of data collection: pre-intervention, post-intervention, and a three-month follow-up, enabling the evaluation of both immediate and sustained effects of the intervention.

Setting

The study was conducted at Badr University Hospital, a tertiary-care teaching facility affiliated with Helwan University and located in Badr City, Cairo, Egypt. The hospital comprises a two-story structure with a total capacity of 100 beds and provides a wide array of healthcare services, including inpatient and outpatient care, emergency services, dialysis, and intensive care units for adults, pediatrics, and neonates. As part of a university-affiliated institution, the hospital is equipped with modern medical technologies and serves a diverse patient population. Its commitment to innovation and professional development created an ideal environment for implementing and evaluating the AI education program within nursing practice.

Sampling

A convenience sampling technique was used to recruit participants. The sample consisted of 77 members of the nursing staff of both genders who were available and willing to participate during the study period. Participants represented various clinical departments within the hospital and were included based on their availability and consent. This sampling method

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allowed for practical access to the target population while capturing a realistic representation of the nursing workforce within the study setting.

Inclusion Criteria:

Eligible participants were full-time, permanent members of the nursing staff who had completed at least six months of continuous service in hospital departments. The participant distribution was as follows:

Hospital Departments	No.of nursing personnel
ICU	11
CCU	3
ER	14
OR	4
Inpatient	20
Outpatient	10
Oncology	3
Catheterization	1
Dialysis	11
Total	**77**

Tools for Data Collection

Tool (I): Nurses' Perspectives Toward Artificial Intelligence in Healthcare Questionnaire
This tool consists of two main parts:

- **Part (I): Personal Characteristics Sheet**

This section was developed to gather demographic and professional information from the study participants, including their age, gender, marital status, level of nursing education, years of professional experience, monthly salary, duration of exposure to technology or artificial intelligence in nursing, and current departmental or unit assignment.

- **Part (II): Structured Self-Administered Questionnaire**

This questionnaire was developed and adapted by the researcher based on the framework established by Sabra et al. (2023). Prior to implementation, it underwent expert review and pilot testing to ensure clarity and relevance. The instrument comprises 15 items, organized into two dimensions:

- **Knowledge of Artificial Intelligence:** This dimension consists of 10 items designed to assess nurses' comprehension and familiarity with AI concepts within the healthcare context.
- **Application of Artificial Intelligence in Healthcare:** This dimension includes 5 items that evaluate nurses' perceived ability to apply AI technologies in their clinical practice.

Scoring system and measurement tools

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Tool I: **Nurses' perspectives toward artificial intelligence in healthcare questionnaire**

This tool was developed and adapted from validated instruments by **Ahmed, Osman, and Mohamed (2024)** and **Ahmed and Elderiny (2024)**. It consists of two dimensions and includes 15 items, with a total possible score of 75. A 5-point Likert scale was used, where responses were rated as: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. Negative items were reverse-coded to ensure consistency.

The total scores were calculated and converted into percentage values. Based on these values, participants' perspectives were classified as follows: less than 60% (score range: 15–44) was considered a low level, 60% to less than 75% (score range: 45–56) as a moderate level, and 75% or higher (score range: 57–75) as a high level. This categorization enabled the assessment of nurses' perspectives at pre-, post-, and follow-up phases.

Tool II: General attitudes toward artificial intelligence scale (GAAIS)

This self-administered scale was constructed and adapted by the researchers based on the instrument developed by **Schepman and Rodway (2022)**. It includes 21 items designed to assess general attitudes toward AI, and it was validated by a panel of experts and pilot-tested prior to full application. The scale includes both positive and negative items. Positive items are: 1, 2, 4, 5, 7, 11, 12, 13, 14, 16, 17, and 18, while negative items are: 3, 6, 8, 9, 10, 15, 19, 20, and 21. Negative items were reverse-coded.

The same 5-point Likert scale was used, and scores were transformed into percentages. According to **Hamedani et al. (2023)**, the levels were classified as follows: less than 60% (score range: 21–62) indicated a low level, 60% to less than 75% (score range: 63–78) indicated a moderate level, and 75% or higher (score range: 79–105) indicated a high level.

Validity and Reliability

Validity:

Both face and content validity of the data collection instruments were established. The tools were translated into Arabic and subsequently evaluated by a panel of five academic experts in nursing administration, representing three institutions: three professors from Ain Shams University, one from Damanhour University, and one from Cairo University. Their feedback ensured that the items were appropriate, contextually relevant, and aligned with the study objectives.

Reliability:

The internal consistency of the instruments was evaluated using Cronbach's Alpha to determine the extent to which items within each scale were correlated. The reliability analysis demonstrated high internal consistency, with a Cronbach's Alpha coefficient of 0.990 for the Nurses' Perspectives Toward Artificial Intelligence in Healthcare Questionnaire and 0.977 for the General Attitudes Towards Artificial Intelligence Scale.

Ethical and Legal Considerations

Ethical approval was obtained from the Faculty of Nursing Ethical Committee at Helwan University prior to the initiation of the training intervention. Institutional permission was also received from the Director of Badr University Hospital. Informed consent was obtained from all participants after they were fully briefed on the study's purpose, procedures, and expected outcomes. Participants were assured of their right to voluntary participation and withdrawal at any stage without consequence. Confidentiality and anonymity were strictly preserved, and all data collected were used solely for research purposes. The study was conducted in accordance with ethical standards that promote integrity, cultural sensitivity, and mutual respect.

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Pilot Study

A pilot study was conducted with 10% of the total sample (n = 8) to assess the clarity, relevance, and timing of the data collection tools. As no modifications were required based on pilot feedback, the pilot participants were included in the final study sample.

Field Work

The field work was carried out over a ten-month period, from August 2023 to May 2024, and was systematically structured into four distinct phases: assessment, program design, implementation, and evaluation.

1. **Assessment Phase (August – September 2023):**

Upon obtaining formal approval, the principal investigator liaised with the Director of Badr University Hospital to communicate the objectives of the study and to obtain a comprehensive list of eligible nursing staff. This list included demographic and professional details such as department, educational qualifications, gender, age, and years of clinical experience. A pilot study was conducted on eight nurses, whose data were retained in the final sample (n = 77), as no substantive adjustments to the tools or methodology were required.

Baseline (pre-intervention) data were collected over the course of one month using two validated, self-administered instruments: (1) the Nurses' Perspectives toward Artificial Intelligence in Healthcare Questionnaire and (2) *the* General Attitudes toward Artificial Intelligence Scale. Completion of each instrument required approximately 15–20 minutes. Data collection was carefully scheduled to minimize disruption to clinical workflows, with the researcher conducting site visits three times weekly during the morning shift (9:00 AM–2:00 PM), each lasting approximately 4–5 hours.

2. **Program Design Phase (October – November 2023):**

Informed by the findings of the pre-intervention assessment, an educational training program was developed to enhance nurses' knowledge and attitudes regarding the application of artificial intelligence in clinical practice. Participants were stratified into nine groups (eight groups of 10 nurses and one group of 7) based on staffing patterns and workload considerations, in coordination with hospital nursing administration.

3. **Implementation Phase (December 2023 – January 2024):**

The training program was implemented over an 8-week period. Each group received six sessions, with three sessions scheduled per week. Sessions were held in the hospital's designated educational room during day shifts and employed a range of instructional strategies, including didactic lectures, interactive group discussions, and collaborative brainstorming exercises. Instructional materials comprised PowerPoint presentations, whiteboard visuals, and printed booklets prepared by the researcher. Each session lasted approximately 2–3 hours, inclusive of a 15-minute intermission. At the conclusion of each session, participants were briefed on the objectives and schedule for the subsequent session.

4. **Evaluation Phase (February – May 2024):**

Program effectiveness was assessed at two points: immediately following the conclusion of the final session (post-test) and again three months later (follow-up). The same two validated instruments utilized during the pre-intervention phase were re-administered to measure

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changes in nurses' perceptions and attitudes toward artificial intelligence. The follow-up data collection was completed between April and May 2024.

Statistical analysis

Data admission and exploration were completed using SPSS statistical package version 26. Categorical variables were articulated as number and percentage while incessant variables were conveyed as (mean ±SD). Chi-Square (x2) tested the association between row and column variable of qualitative data. ANOVA test associate the mean of typically disseminated quantitative variables. While T independent test associate the mean of typically disseminated quantitative variables in two groups. As well, Pearson correlation measured correlation between quantitative variables.

For all tests, a two-tailed p-value ≤ 0.05 was considered statistically significant, P-value ≤ 0.01 was considered highly statistically significant, while, p-value> 0.05 was considered not significant. Eta square (**η2)** measured the effect size (The referential framework for identifying the effect size for ANOVA-test value) **(Cognitive and Brain Science Unit, 2021*).***

Results

Table (1): Frequency distribution of personal characteristics among the studied nurses (n=77)

Personal characteristics		**No**	**%**
▪ **Age (in years)**	20 < 25	46	**59.7**
	25- < 30	29	37.7
	30- < 35	2	2.6
	$\bar{x}$ ± SD	**24.98 ± 2.39**	
▪ **Gender**	Male	45	**58.4**
	Female	32	41.6
	Male to Female Ratio	**1.4:1**	
▪ **Marital status**	Single	45	**58.4**
	Married	32	41.6
▪ **Educational Level**	Nursing Diploma	13	16.9
	Technical Institute	41	**53.2**
	Bachelor	23	29.9
▪ **Year of experience**	1 < 5 years	50	**64.9**
	5 years < 10 years	27	35.1
	$\bar{x}$ ± SD	**4.80 ± 2.11**	
▪ **Wages**	3000 < 4000 pounds	29	37.7
	4000 < 5000 pounds	38	**49.4**
	5000 < 6000 pounds	7	9.1
	≥ 6000 pounds	3	3.9
	$\bar{x}$ ± SD	**4305.2 ± 807**	
▪ **Years of working with A.I.**	1 < 3 years.	45	58.4
	3 < 5 years.	22	28.6

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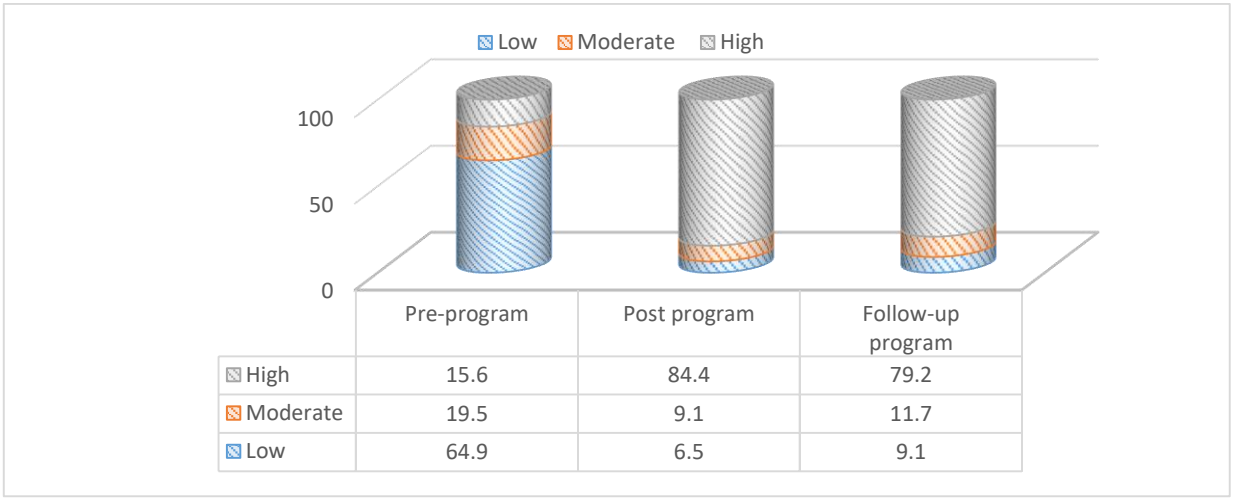
	5 < 10 years.	9	11.7
	≥ 10 years.	1	**1.3**
	$\bar{x}$ ± SD	**3.25 ± 1.85**	
▪ **Working Department**	ICU	11	14.3
	CCU	3	3.9
	ER	14	18.2
	OR	4	5.2
	Inpatient	20	**26.0**
	Outpatient	10	13.0
	Oncology	3	3.9
	Catheterization	1	**1.3**
	Dialysis	11	14.3

Table (1) presents the demographic characteristics of the studied nurses. The findings indicate that 59.7% of the participants were aged between 20 to < 25 years**,** with a mean age of 24.98 ± 2.39 years**.** In terms of gender and marital status, the majority of the nurses **(**58.4%**)** were male, resulting in a male-to-female ratio of 1.4:1**,** with most participants being single. Regarding educational qualifications, 53.2% of the studied nurses held a technical certificate or a bachelor's degree in nursing. With respect to years of experience, 64.9% of the studied nurses had 1 to < 5 years of experience in the nursing field, with a total mean experience of 4.80 ± 2.11 years**.** Furthermore, 58.4% of nurses had experience working with artificial intelligence (AI) for 1 to < 3 years, with a total mean of 3.25 ± 1.85 years**.** In terms of salary, 49.4% of the studied nurses reported receiving a monthly income ranging from 4000 to < 5000 Egyptian pounds**,** with a total mean salary of 4305.2 ± 807 Egyptian pounds. Regarding the department of work, 26% of the nurses were employed in the inpatient department, while only 1.3% were working in the catheterization unit.



χ2=103.7, P=0.000

Figure (1): Percentage Distribution of the Studied Nurses' Perspectives Regarding Artificial Intelligence in Healthcare During Pre-, Post-, and Three-Month Follow-Up Phases (n=77)

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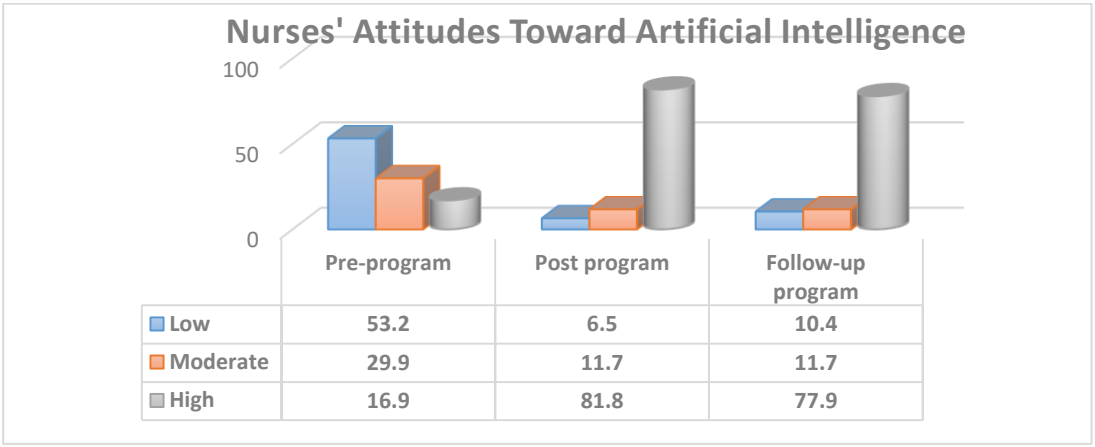
Fig (1) illustrates that 84.4% of the studied nurses demonstrated a high level of perception regarding artificial intelligence in healthcare during the post-test phase. This percentage slightly decreased to 79.2% during the follow-up phase, while only 15.6% of nurses exhibited a high level of perception in the pre-test phase.

Table (2): Overall Mean Score of the Studied Nurses' Perspectives on Artificial Intelligence in Healthcare Across Pre-Test, Post-Test, and Three-Month Follow-Up Phases (n=77)

Items		Pre	Post	3 months follow up	F Test	P- Value
		$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD		
Knowledge	Low	19.02±5.15	24.20±6.2	23.14±6.3	**103**	0.000 ***
	Moderate	32.80±2.30	33.86±2.2	33.89±2.4		
	High	42.25±3.44	46.83±4.4	42.74±4.2		
	Total	**25.32±10.1**	**44.18±7.8**	**39.92±7.3**		
Application	Low	9.78±2.1	11.50±3.1	11.0±2.82	**78.1**	0.000 ***
	Moderate	15.85±1.3	16.86±1.06	16.0±1.15		
	High	21.71±2.3	23.41±2.31	21.36±2.1		
	Total	**14.0±4.9**	**22.19±3.87**	**20.06±3.7**		
Total	Low	30.16±7.9	36.40±9.3	34.71±9.3	**95.6**	**0.000** * **
	Moderate	49.80±3.5	51.28±3.1	51.0±4.1		
	High	64.41±5.3	70.30±6.6	64.2±6.3		
	Total	**39.32±14.9**	**66.37±11.6**	**59.98±11.1**		

*Significant p ≤ 0.05 **Highly significant p ≤ 0.01 F: ANOVA Test

Table (2) indicates that during the post-test phase, the studied nurses achieved a higher mean score of AI perception in healthcare (66.37±11.6), which subsequently decreased to 59.98±11.1 in the follow-up phase. In comparison**,** the pre-test phase recorded a lower mean score of 39.32±14.9 (Total score = 75).



χ2=88.5, P=0.000

Figure (3): Percentage Distribution of the Studied Nurses' Attitudes Toward Artificial Intelligence in Healthcare Across Pre-Test, Post-Test, and Three-Month Follow-Up Phases (n=77)

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Figure (3) shows that 81.8% of the studied nurses demonstrated a high level of positive attitude towards AI in healthcare during the post-test phase. This percentage slightly declined to 77.9% in the follow-up phase, in contrast to the pre-test phase, where only 16.9% of nurses exhibited a high level of attitude.

Table (3): Overall Mean Score of the Studied Nurses' Attitudes Toward Artificial Intelligence in Healthcare Across Pre-Test, Post-Test, and Three-Month Follow-Up Phases (n=77)

Items		Pre	Post	3 months follow up	F Test	P-Value
		$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD		
Positive effect of A.I.	Low	21.87 ± 6.2	29.80 ± 3.5	29.13 ± 4.4	**84.0**	0.000***
	Moderate	37.26 ± 2.4	39.0 ± 2.1	39.0 ± 2.8		
	High	52.58 ± 5.7	55.97 ± 5.4	51.38 ± 5.3		
	Total	**32.05 ± 12.3**	**52.73** ±9.3	**47.78 ± 8.9**		
Negative effect of A.I.	Low	16.59 ± 4.4	22.25 ± 3.0	21.29 ± 2.9	**83.0**	0.000***
	Moderate	27.86 ± 1.6	29.50 ± 1.5	29.60 ± 1.4		
	High	39.50 ± 3.8	42.27 ± 3.9	38.52 ± 3.9		
	Total	**23.97 ± 9.6**	**39.57 ± 6.9**	**35.79 ± 6.5**		
Total	Low	39.49 ± 11.4	53.0 ± 6.8	51.13 ±7.7	**83.8**	**0.000** * **
	Moderate	65.26 ± 4.2	70.22 ± 4.6	69.67 ± 4.6		
	High	91.85 ± 9.6	98.57 ± 9.0	89.98 ± 9.2		
	Total	**56.03 ± 21.9**	**92.30 ± 16.2**	**83.57 ± 15.5**		

*Significant p ≤ 0.05 **Highly significant p ≤ 0.01 F: ANOVA Test

Table (3) indicates that during the post-test phase, the studied nurses achieved a higher mean attitude score toward AI in healthcare (92.30 ± 16.2), which decreased to 83.57 ± 15.5 during the follow-up phase. In contrast, the pre-test phase recorded a lower mean score of 56.03 ± 21.9 (Total score = 105).

Table (4): Correlation Matrix Between Nurses' Perspectives and Attitudes Toward Artificial Intelligence (n=77)

Attitude regarding artificial intelligence:	Artificial intelligence in health care					
	Pre-test		Post-Test		Follow-up	
	r	P	r	P	r	P
Pre-test	0.984	0.000**				
Post-Test			0.990	0.000**		
Follow-up					0.984	0.000**

*Significant p ≤ 0.05 **Highly significant p ≤ 0.01

Table (4) clarifies that, there was a high statistically significant positive correlation between AI in health care and throughout the study phases among the studied nurse at r= ranged from 0.948 to 0.990 & P= 0.000.

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Table (5): Effect size and η2 of implemented of an artificial intelligence education program in health care on the studied nurses' attitude during pre, post & three months follow up (n=77)

Interval	Mean	SD	F Test	P value	η	η2	Effect size
Pre-test	56.03	21.9	83.8	0.000***	0.651	0.424 ***	Large effect
Post-test	92.30	16.2					
Follow up	83.57	15.5					
Total	**77.30**	**23.7**					

*Significant p ≤ 0.05 **Highly significant p ≤ 0.01 F: ANOVA Test

* Small effect size = 0.01 to < 0.06 **Medium effect size =0.06 to < 0.14 ***Large effect size ≥ 0.14

Table (5) demonstrates that the implementation of the artificial intelligence education program in healthcare had a significant and substantial effect on the studied nurses' attitudes across all study phases, with an effect size of $\eta^2 = 0.424$. This finding provides strong evidence in support of the research hypothesis.

Discussion

The present study contributes to the growing body of literature highlighting the transformative role of artificial intelligence (AI) in nursing, particularly in enhancing clinical decision-making, supporting individualized care, and improving nurses' digital competencies. Consistent with prior research (**Abd El-Monem et al., 2023)**, the findings affirm that AI, when systematically integrated into nursing practice, can optimize healthcare delivery and elevate the quality of care provided. However, as noted by **Ikkatai et al. (2022**), the absence of structured frameworks to assess nurses' perceptions and readiness for AI adoption remains a critical barrier to widespread implementation. This underscores the relevance of the current study in addressing this gap through a targeted educational intervention.

The demographic analysis revealed that the majority of participating nurses were between 20 and 30 years old, with a mean age of 24.98 ± 2.39 years. Notably, male participants outnumbered female participants with a ratio of 1.4:1. Most had limited professional experience (1 to < 5 years in nursing and 1 to < 3 years of exposure to AI), reflecting a relatively young and early-career workforce. These findings align with **Elsawy et al. (2024),** who reported that younger nurses tend to be more open and adaptive to technological innovation, likely due to their digital fluency and early exposure to informatics in both academic training and practice. The enthusiasm observed among younger nurses may present a strategic advantage for healthcare institutions aiming to integrate AI, especially if targeted training programs are implemented early in their careers.

An important contextual insight emerged regarding nurses holding bachelor's degrees or higher: many expressed a preference for employment in the private sector or abroad, often citing financial benefits and opportunities for advancement. This observation reflects broader workforce management challenges in retaining skilled nurses within public healthcare institutions (**Sabra et al., 2023)**. Previous studies have highlighted how organizational factors such as limited career mobility, inadequate incentives, and rigid staffing structures can negatively affect motivation and professional satisfaction, thereby reducing openness to

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innovation and digital transformation **(Mohamed et al., 2023)**. Strategic investment in continuous professional development—including digital literacy and AI-specific training—has been recommended as a means to align institutional goals with nurses' evolving career aspirations, ultimately enhancing both retention and readiness for AI integration **(Elsabahy et al., 2023; Fritsch et al., 2022).**

In terms of knowledge and perception, the AI education program yielded significant improvements. Over 80% of nurses demonstrated a positive perspective on AI following the intervention, although a slight decline was noted at the three-month follow-up. This decline highlights the transient nature of educational impact if not reinforced through ongoing training and support mechanisms. The pattern observed mirrors that reported by **Mohamed et al. (2023)**, where post-intervention gains in AI acceptance among nurses gradually diminished without follow-up engagement. These findings suggest that isolated training sessions, though initially effective, must be embedded within a broader framework of continuous professional development.

The study also documented a marked improvement in nurses' attitudes toward AI post-intervention. However, as with perspectives, a reduction was observed at the follow-up stage. This reinforces the assertion by **Wang et al. (2024)** that the successful integration of AI in healthcare is not solely dependent on technical training but also requires cultural adaptation. A supportive institutional culture that normalizes technology use, fosters curiosity, and mitigates resistance is essential for long-term change.

A key contribution of this study is the identification of a strong positive correlation between nurses' perspectives and their attitudes toward AI across all time points. This relationship supports findings by **Elsayed and Sleem et al. (2021)**, who noted that favorable perceptions among nurse leaders were significantly associated with proactive engagement in AI adoption. Thus, improving perception through education is not only beneficial in isolation but also instrumental in shaping broader attitudinal change and behavioral readiness.

Finally, the educational intervention demonstrated a statistically significant and substantial impact on nurses' attitudes toward AI, with an effect size of $\eta^2 = 0.424$. This robust finding provides empirical support for the study's hypothesis and aligns with the results of **Elsabahy et al. (2023)**, who reported that structured AI training programs contribute to improved nurse competency, professional satisfaction, and patient care outcomes. The implication is clear: investing in evidence-based, longitudinal education programs focused on AI can serve as a catalyst for digital transformation in nursing practice.

Researchers' Perspective

From the researchers' viewpoint, the observed improvements in nurses' perspectives and attitudes toward AI following the educational intervention underscore the critical role of structured, context-specific training in bridging the gap between technological availability and practical readiness. While the short-term impact was encouraging, the decline in scores at follow-up suggests that single interventions are insufficient to produce lasting change. Therefore, the researchers believe that institutional commitment to continuous education, coupled with leadership support and resource allocation, is essential to sustain digital transformation in nursing practice.

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Implications for Practice

The findings of this study emphasize the crucial role of targeted AI education programs in enhancing nurses' knowledge and attitudes toward AI. To ensure the effective integration of AI in healthcare settings, the following actions are recommended:

1. **Develop comprehensive AI training programs** that address both technical and ethical considerations to enhance nurses' competency and confidence in AI applications.
2. **Foster a supportive organizational culture** that promotes AI adoption and mitigates resistance by encouraging open communication and collaboration.
3. **Implement continuous professional development initiatives** to sustain the positive impacts of AI education and ensure ongoing competency among nursing personnel.

Limitations and Future Research

Despite the promising findings, this study has several limitations. As it was conducted within a single healthcare institution, the generalizability of the results to other healthcare settings may be limited. Future research should explore multi-center studies with larger and more diverse sample sizes to obtain a broader understanding of nurses' perspectives and attitudes toward AI. Additionally, longitudinal studies are warranted to assess the long-term impact of AI education programs on nursing practice and patient outcomes.

Conclusion

The implementation of an AI education program significantly improved nurses' perspectives and attitudes toward AI in healthcare. A strong positive correlation was observed between AI knowledge and attitudes, reinforcing the importance of continuous education and organizational support for successful AI integration. The study provides robust evidence supporting the need for structured AI training initiatives to empower nurses with the necessary skills and confidence to leverage AI technologies, ultimately contributing to enhanced healthcare delivery and improved patient care outcomes.

Recommendations

Based on the findings of the current study, the following recommendations are proposed at multiple levels to facilitate AI integration in nursing practice:

Nursing Personnel Level:

- Provide continuous training programs to enhance nurses' understanding and practical application of AI technologies in clinical settings.
- Encourage nurses to actively participate in AI-driven decision-making processes to improve patient care and clinical efficiency.
- Foster a culture of adaptability and technological openness among nursing personnel to minimize resistance to AI adoption.

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Organizational Level:

- Develop and implement AI-friendly policies that support the integration of AI tools into routine nursing operations.
- Establish interdisciplinary support teams, including IT professionals and clinical experts, to assist nurses in navigating AI systems.
- Allocate sufficient funding for pilot programs and initiatives to evaluate the effectiveness and impact of AI in nursing workflows.

Educational Level:

- Incorporate AI-focused courses into nursing curricula at undergraduate and postgraduate levels to prepare future nurses for technological advancements.
- Design specialized AI workshops and certification programs tailored to nursing roles to bridge knowledge gaps.
- Promote partnerships between nursing institutions and technology firms to provide hands-on AI training and exposure

Research Level:

- Conduct comprehensive studies to assess the long-term impact of AI integration on patient care, nursing efficiency, and clinical decision-making accuracy.
- Investigate nurses' concerns, perceived barriers, and facilitators in adopting AI technologies to guide future policy and program development.
- Explore ethical considerations and best practices for AI integration in nursing to address issues related to patient safety, privacy, and data security.

These recommendations provide a roadmap for healthcare institutions, educators, and policymakers to support AI adoption in nursing practice effectively. By addressing these key areas, healthcare systems can maximize the potential benefits of AI while ensuring safe, efficient, and patient-centered care.

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