



Artificial Intelligence and Nurse' s Innovative Behavior

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Abstract

Background: Incorporation of artificial intelligence into healthcare is changing clinical practice, requiring nurses to adapt to new technologies that enhance patient care. As key frontline providers, nurses' innovative behavior characterized by their readiness to embrace and implement novel concepts essential to the successful application of AI. **The aim of this study** was to assess the relation between artificial intelligence and nurse's innovative behavior at Zagazig University Hospitals.

Methods: Research design: A descriptive correlational design was used. **Setting:** This study was conducted at Zagazig University Hospitals.

Study subjects: A proportionate stratified random sample of 400 nurse were included. **Tools of data collection:** Two tools were used to conduct the study, Artificial Intelligence questionnaire and Innovative Behavior scale. **Results:** In the light of the main study results; it was found that the 70.8% of nurses had moderate level of perception toward artificial intelligence and 52.3% of them had moderate level of innovative behavior. **Conclusion:** there was statistically significant and direct correlation between artificial intelligence and Nurse's innovative behavior.

Recommendation: Ensure funding and infrastructure for AI readiness, conduct workshops and training on AI's benefits, challenges, and applications, provide access to emerging technologies to support innovation.

Keywords: *Artificial intelligence, Innovative behavior, Nurses*

Introduction

At the rapidly evolving area of technological innovation, artificial intelligence is grabbing attention of worldwide competitors, business executives, and legislators alike. AI technologies are increasingly prevalent in different organizations and society sectors, one of these sectors is healthcare. Where, these technologies have the power to revolutionize administrative procedures in payer, provider, and pharmaceutical organizations as well as other facets of patient care (Romero et al., 2024).

There are three primary forms of AI in the healthcare industry: machine learning, deep learning, and natural language processing. AI is the simulation of human intelligence in machines such as computers or robots that are programmed to mimic cognitive functions that humans associate with other human minds, such as learning, decision making, problem solving, reasoning, and communicating. (Al-Sabawy, 2023).



AI-based technologies have the potential to transform healthcare by extracting novel and significant insights from the enormous volume of data produced daily during the provision of healthcare. Early disease detection, more precise diagnosis, the discovery of novel discoveries or patterns in human physiology, and the creation of individualized diagnostics and treatments are examples of high-value applications. (Mahdi et al., 2023).

Although not officially acknowledged, AI technologies have been used in the nursing profession for many years. AI is used in nursing through voice assistants, robotics, sensor-based technology, mobile health, and scientific decision support. However, fresh conversations on the relationship between AI and nursing are linked to the growing interest in AI in healthcare settings (Sabra et al., 2023). As prospective AI users, nurses are in a unique position to influence and spearhead the advancement of contemporary technology. The adoption and popularity of AI technology are aided by nurses' creative behavior, which may also spur innovation and change in the nursing profession (Huo et al., 2024).

Innovation is an important way to obtain a competitive edge in the fast-paced workplace of today. Health care organizations must outperform creative rivals and foster innovation in order to thrive in the face of rapidly evolving technology, aggressive domestic and international competition, an unpredictable and extremely tumultuous economic climate (DeMarco, 2023).

Innovative behavior in nursing is a developing a concept, gaining support, and putting the idea into action are its three phases. Nurses consider how AI might be enhanced or changed in light of work experience, patient demands, and current circumstances in order to optimize AI nursing's efficacy (Li et al., 2024).

To optimize AI's effectiveness in nursing, it's important to realize the gap between nurses and technology (Buchanan et al., 2020). Thus, this study aimed to assess the relation between artificial intelligence and nurse's innovative behavior. providing new perspective for innovation in nursing profession.

Significance of the study

Artificial Intelligence's incorporation into healthcare systems has revolutionized the way care is delivered, decisions are made, and innovation is fostered within clinical environments (Alenezi et al., 2024) In particular, the nursing profession stands at the forefront of this digital shift, as nurses are required not only to adapt to new technologies but also to rethink and innovate their daily practices to ensure safe, effective, and patient-centered care (Elkholy, and Elshrief 2024).

Understanding how AI influences nurses' innovative behavior is crucial for several reasons. First, it adds to the growing corpus of information on the use of technology in nursing., highlighting the role of AI as more than just a tool for automation, but as a catalyst for creative problem-solving, professional growth, and improved patient outcomes (Bodur et al., 2025) Second, provides valuable insights for healthcare leaders and policymakers to foster a culture of innovation in hospitals and other medical settings.

So, this study demonstrates strong potential to bridge the gap between emerging technologies and human-centered care. Thereby, the aim of this study was to assess the relation between artificial intelligence and nurse's innovative behavior at Zagazig university hospitals



Aim of the Study

The aim of study was assess the relation between artificial intelligence and nurse's innovative behavior at Zagazig university hospitals.

Research Questions

1. What is the level of perception toward artificial intelligence among nurses?
2. What is the level of innovative behavior among nurses?
3. What is the relation between artificial intelligence and nurse's innovative behavior?

Subjects and Methods

Research-design

A descriptive correlational research design was applied.

Setting

The study was conducted at Zagazig university hospitals (academic hospitals), which include two sectors (emergency sector and El -Salam sector) involving nine teaching hospitals. The total bed capacity of the hospitals is 2027 beds and 16 incubations.

Study Subjects

inclusion criteria,

- three types of nurses' education were included (bachelor, diploma, and technical nurses).
- Both sexes.
- Consented to take part in the study.
- Had at least a year of experience.

Participants:

A proportionate stratified random sample of 400 staff nurse were included determined using a simplified method ($n=N/1+N(e)^2$) published by **Yamane (1967)**. The overall population size is 2770 nurses employed in the study environment. $P = 0.05$ and a 95% confidence level are assumed for the equation, the following method was used to estimate the necessary number of nurses from each hospital

(Number of nurses in each hospital x required sample size)

Total number of nurses in all hospital

Tools of data collection: Two tools were used to conduct the study

Tool I: Artificial Intelligence Questionnaire: consists of two parts as follows:

Part I: Personal and job characteristics of nurses, as age, gender, residence, years of experience, educational qualifications, marital status, Hospital affiliation and two questions (Have you ever attended courses on artificial intelligence, courses on computer)?

Part II: Perception toward Artificial Intelligence, this part was developed by **Abdullah and Fakieh (2020)** and aimed to assess nurses' perception toward artificial intelligence. It consisted of 14 items with three dimensions, perception toward artificial intelligence, advantages of using artificial intelligence, problems regarding the application of artificial intelligence in healthcare.

Scoring System:

The original questionnaire used 5-point Likert scale (5 = agree to 1= strongly disagree) was recoded into a 3-point scale for analytical clarity agree (combining agree and strongly agree=3), (neutral =2), and disagree (combining disagree and strongly disagree=1). according to **Abdullah and Fakieh (2020)**, was considered:

-Low perception $\leq 40\%$

-Moderate perception $40\% \leq 80\%$

-High perception $\geq 80\%$



Tool II: Innovative behavior scale:

It was developed by **De Jong and Den Hartog (2010)** to measure innovative behavior level of nurses. It consists of 16-items divided into five dimensions, problem recognition idea generation, idea promotion, Idea application, innovation output.

Scoring system:

The questionnaire originally used a 5-point Likert scale (1 = never to 5 = always) to assess nurses' responses. For analytical purposes, it was recoded into a 3-point scale: never (1), sometimes (2), and always (3). The scores of each domain were summed and the total divided by numbers of items. These scores were converted into percent score. The total level of innovative behavior among nurses was considered:

-Low $\leq 50\%$.

-Moderate 50%to75%.

-High $\geq 75\%$ (**De Jong and Den Hartog, 2010**).

Tools validity and reliability

After the questionnaire was translated into Arabic, a panel of five experts in the field of nursing administration from Zagazig University (3 assistant professors and 2 professors) established its face validity and substance. Experts were asked to share their thoughts and feedback on the tool. In their view, the researcher carried out all suggested changes.

The reliability of the questionnaire was measured through Cronbach's Alpha coefficient for assessing its internal consistency, and it was as the following:

Dimensions	Cronbach's Alpha	No of Items
Perception toward Artificial Intelligence	0.736	14
Innovative Behavior scale	0.965	16

Field work description

The collection phase lasted for 3 months during the period from the beginning of May 2025 to the end of July2025. In the first phase, nurses were individually, informed about the study, and those who gave verbal consent received a self-administered questionnaire with instructions.

In the second phase, questionnaires were distributed in the nurses' work settings three days a week (Sunday, Tuesday, Thursday) in various shifts. Nurses completed the forms on-site within 10–15 minutes, and the researcher checked each for completeness

Pilot study:

An exploratory pilot study was conducted with 10% of the intended sample ($n = 40$ nurses) to evaluate the clarity, applicability, feasibility, and practicality of the tools, and to estimate the time needed to complete the questionnaires. The pilot took place one week before the main data collection. Nurses were randomly selected for this phase and were included in the final study sample. The time consumed in answering the questionnaires about (10 -15 min).

Administrative and ethical considerations:

The dean of Zagazig University's Faculty of Nursing granted official permission, and each hospital's medical and nursing directors granted permission to carry out the study after being informed of its purpose. The study was approved by the Ethics Committee, (Code M.D.ZU. /248/10/9/2024). An official letter outlining the study's purpose was sent to the medical and nursing administration of Zagazig University Hospitals to obtain permission for data collection. Verbal informed consent was obtained from all participants after explaining the study's aim. Participation was voluntary, and confidentiality of the data was assured.



Statistical analysis

IBM SPSS Statistics 23.0 was used to examine the data. Qualitative data are displayed as percentages and frequencies, whereas quantitative data are displayed as mean \pm SD, median, and range. Chi-square was used to compare categorical variables. Stronger correlations were indicated by values closer to ± 1 in Pearson's correlation, which evaluated links between variables. Relationships between dependent and independent variables were investigated using multiple linear regression, which reported β and R^2 . A p-value of less than 0.05 was regarded as significant.

Results:

Table (1): Indicates that the highest percentage of nurses were female. under 30 years with mean 32.5 ± 10.0 , 41.5 % of them had technical institute of nursing respectively, two thirds of them were married, with over half of them living in rural areas and having more than five years of experience with mean 6.78 ± 3.70 , 11.8% of them had attended courses on AI, while 36.5% of them had received computer training. Additionally, 20% of them were affiliated with the new surgical hospital.

Figure (1): Demonstrates that the majority of nurses 70.8% had moderate level of artificial intelligence perception, while 16.2% had a low level, otherwise 13.0% had a high perception level.

Table (2): Reveal that the highest mean score was for the advantages of using artificial intelligence dimension 71.0%, while the lowest subscale was problems regarding the application of artificial intelligence in health care dimension 55.1%.

Figure (2): The figure depicts that 52.3% of nurses demonstrated moderate level of innovative behavior, followed by 39.5% of them had high level and 8.2% had low level of innovative behavior.

Table (3): Notifies that the highest mean score was for idea generation dimension 71.4%, while the lowest subscale was problem recognition dimension 66.6%

Table (4): Displays that artificial intelligence, was a significant predictor for nurses' innovative behavior.

Table (5): Confirms that there was significant and direct association between total perception toward artificial intelligence and innovative behavior



Table (1): Frequency and percentage distribution of the studied nurses according to personal and job characteristics (n=400).

Variables	No	%
Gender		
• Male	143	35.8
• Female	257	64.2
Age		
• <30 years	240	60.0
• 30-45 years	80	20.0
• >45 years	80	20.0
Mean ± S.D 32.5 ± 10.0		
Educational Qualification		
• Nursing Diploma	90	22.5
• Technical Institute of Nursing	166	41.5
• Bachelor of Nursing	144	36.0
Marital Status		
• Married	267	66.8
• Single	133	33.2
Residence		
• Rural	220	55.0
• Urban	180	45.0
Years of Experience		
• ≤5 years	172	43.0
• >5 years	228	57.0
Mean ± S.D 6.78 ± 3.70		
Attended courses on artificial intelligence?		
• Yes	47	11.8
• No	353	88.2
Attended courses on computers?		
• Yes	146	36.5
• No	254	63.5
Hospital affiliation		
• El -Salam hospital	43	10.8
• Delivery and premature hospital	28	7.0
• New surgical hospital	80	20.0
• El- Sadat hospital	7	1.8
• Pediatric hospital	38	9.5
• Cardiac and chest hospital	52	13.0
• Emergency hospital	50	12.5
• Out-patient hospital	27	6.8
• Internal medicine hospital	75	18.8

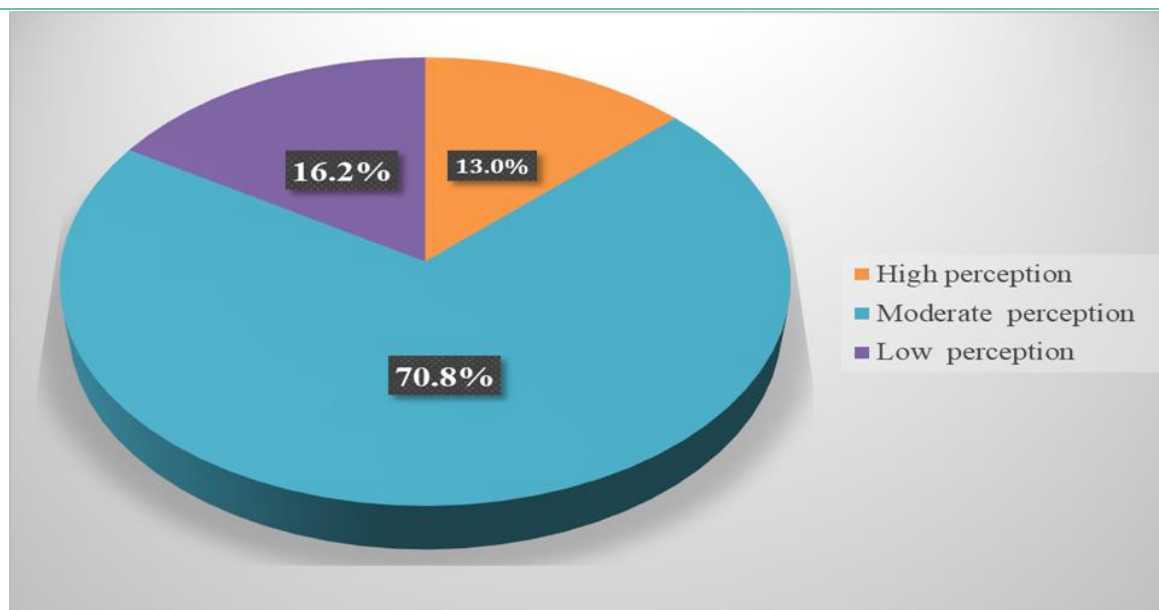


Figure (1): Total level distribution of studied nurses' according to their Perception toward artificial intelligence (n=400)

Table (2): Distribution of artificial intelligence dimensions mean scores as reported by studied nurses (n=400).

Dimensions	Maximum score	Mean \pm SD	Median (Range)	Mean percent
• Perception of artificial intelligence	20	11.62 \pm 2.55	12(4-18)	58.1%
• The advantages of using artificial intelligence	25	17.75 \pm 4.06	19 (7-25)	71.0%
• Problems regarding the application of artificial intelligence in health care	25	13.77 \pm 4.02	15 (5-22)	55.1%
Total	70	43.14 \pm 10.63	46 (16–65)	61.6%

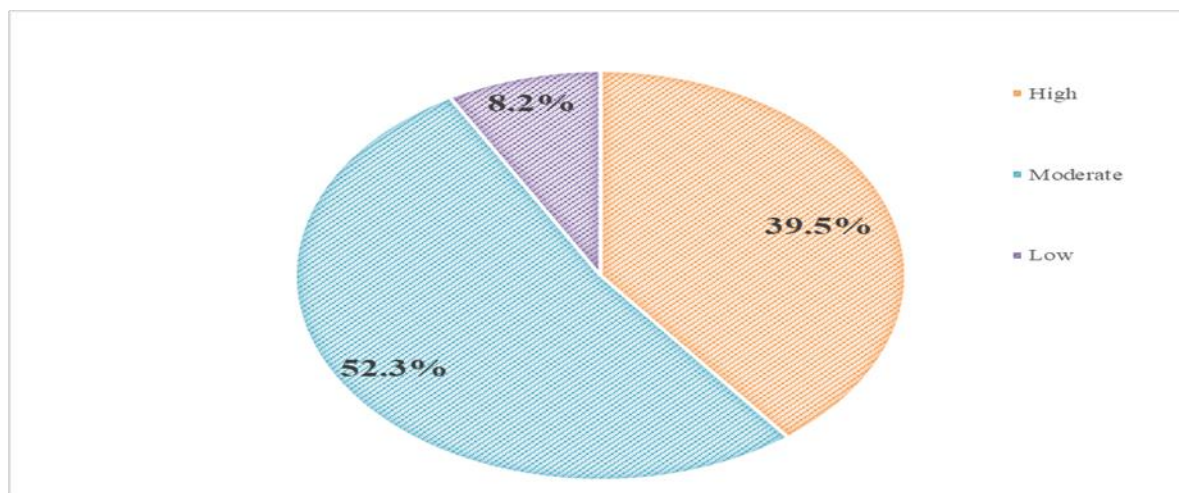


Figure (2): Total level distribution of studied' nurses' regarding their innovative behavior (n=400)

Table (3): Distribution of innovative behavior dimensions mean scores as reported by studied nurses (n=400).

Dimensions	Maximum score	Mean ±SD	Median (Range)	Mean percent
• Problem recognition	10	6.66±1.79	6(2-10)	66.6%
• Idea generation	15	10.71±2.72	10(3-15)	71.4%
• Idea promotion	10	6.94±1.83	6(2-10)	69.4%
• Idea application	15	10.47±2.93	10(3-15)	69.8%
• Innovative output	30	21.24±5.93	20(6-30)	70.8%
Total	80	56.02 ± 7.6	52 (16–80)	70%

Table (4): Correlation matrix between perception toward artificial intelligence and innovative behavior (n.400)

Variable	Perception toward artificial intelligence	
	r	P
Innovative behavior	0.423**	0.0001

Pearson' correlation coefficient(r), ** Correlation is significant at the <0.001



Table (5): Multivariate linear regression for predicting innovative behavior score among studied' nurses (n=400)

Predictors	Unstandardized Coefficients		T	sig
	(β)	SE		
(Constant)	5.14			
Artificial Intelligence	.383	.074	5.175	.0001*
Model	R 0.50 R ² 0.25 F= 26.7 p=0.0001			

β = regression coefficients, SE: standard error, R2: R square, f test *significant $p < 0.0$

Discussion

The fast-developing discipline of artificial intelligence (AI) is becoming well-known for its capacity to revolutionize healthcare by producing insights from massive amounts of everyday health data (**Hablass, Abdelsamad & Mohamed, 2025**). Nurses are in a good position to encourage the implementation of these innovations in clinical practice, as they can improve several facets of nursing (**Cho & Seo, 2024**). So, this study was conducted to assess the relation between artificial intelligence, and nurses' innovative behavior at Zagazig university hospitals.

Personal and job characteristics of the studied nurses:

In the present study, the majority of nurses were female and under 30 years of age, and had technical institute, two-thirds were married, with over half of them residing in rural areas and having more than five years of experience. more than one-third had received computer training, and one-fifth of them were worked at new surgical hospital.

This could be because more female students enroll in nursing faculties or schools, and feminists make up the core of the nursing profession, the majority of nurses who were studied were under 30 years old, which may be because this age range falls within the productive age range in the hospital workforce.

This result consistent with study carried out in Assiut, Egypt, by **Mohammed et al., (2025)**, found that the majority of nurses were females, belong to age group average of 21 to 30 years, furthermore two-thirds of them were married, and more than one half living in rural areas.

The majority of the nurses in the current study had a technical institute of nursing, according to the educational level, this might be interpreted as technical institutes often providing a more accessible and quicker pathway into the nursing profession, appealing to those eager to start working sooner. in the same line a study conducted at Suez-Canal and Ain Shams University Hospital, by **Ahmed and Elderiny (2024)**, found that the majority of nurses had technical institute.

Conversely, a study that was carried out disputed these findings. at El Mansoura International Hospital, by **Mohammed et al., (2023)**, found that all nurses age ranges from 40 to less than 50 years, most of nurses had a bachelor's degree in nursing, with fifteen years of expertise.



Furthermore, concerning artificial intelligence and computer training, the present study indicated that the highest percentage of nurses had not received any AI or computer training. This could be explained by the scant incorporation of artificial intelligence topics into nursing education courses and programs. Also, limited integration of artificial intelligence into nursing practice.

This finding was in agreement with a study conducted by **Abuzaid, Elshami and Fadden, (2022)** in the United Arab Emirates (UAE) to study the integration of artificial intelligence into nursing practice, revealed that the highest percentage of nurses reported that they had not been trained or educated on artificial intelligence. Additionally, study conducted at Cairo University hospitals, by **Abdel- Moaty, El-Molla and Abdel-Wahab (2024)**, found that the majority did not receive any training in artificial intelligence.

Concerning total level of perception toward artificial intelligence, the current study revealed that, more than two-thirds of nurses had moderate perception level toward artificial intelligence, while less than one fifth of them had low level of perception. According to the researchers, this could be because artificial intelligence technology has become widely used in many facets of society in response to Egypt's Vision 2030, which emphasizes the use of AI in a range of professional contexts, including the healthcare industry.

This result matched with study conducted at Saudi Arabia by **Alanazi et al., (2024)**, found that nurses' Perception level regarding artificial intelligence and its role in nursing care was at moderate level. Additionally, the present study results supported by **Ahmed and Elderiny (2024)**, indicated that more than two-thirds of nurses had moderate perception level about artificial intelligence applications in ICU, while, slightly one-fifth of nurses had low level of perception. In the same line, a study conducted at Qena University Hospitals, by **sabra et al., (2023)**, found that the studied nurses had moderate perception level toward using artificial intelligence.

Furthermore, a study conducted in Saudi Arabia by **Abdullah and Fakieh (2020)** demonstrated that the overall perception of health care employees toward AI was moderate. Moreover, a study conducted at Menoufia University Hospital, by **Ghazy, Diab and Shokry (2023)**, reported that, the majority of nurse managers had moderate level of perceptions towards artificial intelligence.

On contrary, these findings were contradicted with study conducted at Benha University Hospital, by **Abd El-Monem, Rashed and Hasanin (2023)**, indicated that nearly two-thirds of nurses had high perception level toward AI technology whereas, slightly more than one-third of them had moderate level of perception

In regards to mean scores of nurses' perception toward artificial intelligence, the findings of the current study indicated that the highest mean score was for the advantages of using artificial intelligence dimension while the lowest subscale was problems regarding the application of artificial intelligence in health care dimension. From point of view, this may be due to nurses are aware of the importance and advantages of using AI in nursing settings, especially as AI can hasten health care process, decision making, decrease medical errors, perform usual tasks, and deliver real time, clinically relevant, huge amounts of high-quality data.

Similarly, a study conducted by **Ghazy, Diab and Shokry (2023)**, indicated that the highest mean percent was related to advantages of using artificial intelligence. Also, a study by **Elsayed and Sleem, (2021)**, agreed with this result and found that, advantages toward using artificial intelligence achieved the highest mean score then problems concerning artificial intelligence application in healthcare among nurse managers.

Otherwise, **Abdullah and Fakieh, (2020)**, reported that the highest score was regarding problems of artificial intelligence application in healthcare followed by advantage toward using artificial intelligence among health care employees. In addition, a study by **Abd El-Monem, Rashed and Hasanin (2023)** incongruent with the study result, demonstrated that the highest mean percent was related to perception of artificial intelligence technology, while the lowest mean percent was related to barriers for artificial intelligence technology.



Concerning total level of innovative behavior, the recent study depicted that half of nurses demonstrated moderate level, while approximately two-fifths of them had high level of innovative behavior. From point of view, the predominance of moderate engagement suggests that there are still structural, motivational, and contextual barriers that need to be addressed to foster higher levels of innovation across the health care setting.

This result was reinforced by **Abdellatif et al., (2024)**, conveyed that nurses had a moderate level of innovative behavior. Also, a study in China was congruent with the present study finding, conducted by **qin Niu, Sirakamon and Akkadechanunt, (2022)**, exposed that nurses' innovative behavior was at a moderate level.

This result also reflects what was emphasized by **Elsayed, Gaber and Mohamed (2022)**, exposed that the most of nurses had a moderate level of innovative work behavior. Additionally, a study in China by **Li et al., (2022)**, found that nurses' innovative behavior was moderate.

In the contrary, a study carried out by **Elkholy, Ageiz and Elshrief, (2024)**, disclosed that more than half of the nurses had high levels of innovative behaviors. In addition, a study conducted at Suez Canal University Hospitals, by **Ghonem and Abdrabbuh, (2023)**, reported that two thirds of nurses had high level of innovative behavior. Also, the findings of **Elsheshtawy, Abdalla and Abdelmonem (2024)**, reported that 91.6% of nurses demonstrated high levels of innovative behavior.

Concerning the mean score of innovative behavior dimensions; the highest mean score was for idea generation dimension, while the lowest subscale was Problem recognition dimension. This may be attributed to their direct involvement in daily patient care, which allows them to frequently observe challenges and think of ways to enhance outcomes. Additionally, exposure to diverse clinical scenarios can naturally stimulate innovation.

This finding aligns closely with study that conducted at Suez Canal University Hospitals by **Ghonem and Abdrabou (2023)**, reported that the highest mean score was for idea generation dimension. As well a study conducted in China, by **qin Niu, Sirakamon and Akkadechanunt (2022)**, aimed to examine the level of innovative behavior among nurses in tertiary hospitals, found that Idea Generation scored highest mean compared to exploration, championing, and implementation.

Inversely a by **Mahgoub, Shazly and Elsayed (2019)**, aimed to assess the relationship between work environment and innovative behavior among staff nurses., indicated that the highest mean score as perceived by staff nurses was related to problem recognition dimension.

The existing study demonstrated that there was significant and direct association between total perception toward artificial intelligence and nurses' innovative behavior. This might be attributed to the fact that positive perceptions enhance openness, confidence, and motivation toward technology-driven change, thereby stimulating nurses' innovation. This result agreed with study conducted at Alexandria Main University Hospital by **Atalla et al., (2024)**, concluded that nurses' AI perceptions were positively associated with their innovative behavior.

In addition, a study conducted in Assiut by **Mohammed et al., (2025)**, found that there was a significant and positive correlation between nurses' perception to artificial intelligence and their innovative behavior. In the opposite line a study conducted in China a by **Fan et al., (2025)**, found that AI readiness is negatively correlated with nurses' innovative behavior.

Multivariate linear regression for predicting innovative behavior among studied nurses, the present study displayed that artificial intelligence was a significant predictor for nurses' innovative behavior. this may be owing to the combination of artificial intelligence technologies in nursing has been shown to improve clinical outcomes and operational efficiency, highlighting the importance of AI in fostering innovation (**Hassanein et al., 2025**).

This result was concurred with **Elkholy, Ageiz and Elshrief, (2024)**, who proved that artificial intelligence has a significant impact on innovative behavior, this meant that there was a proven connection between artificial intelligence and the innovative behavior of nurses. Additionally, A study conducted in China by **Li et al., (2024)**, indicated that AI significantly influenced nurses' innovative behavior.



Conclusion

Based on the findings of the current study, it can be concluded that nurses had a moderate level of artificial intelligence and innovative behavior. Furthermore, there was statistically significant and direct correlation between artificial intelligence, and nurses' innovative behavior.

Recommendations

- Update nursing curricula for including all new trends in artificial intelligence technologies.
- Create structured innovation initiatives, such as thinking workshops, or innovation challenges.
- Make emerging technology, such automation, artificial intelligence, and data analytics, accessible to nurses.

Opportunities for Future Research:

- Further studies are recommended to investigate the effect of educational programs on improving nurses' perception and attitudes toward the integration of artificial intelligence in nursing practice.
- Additional studies are necessary to examine nurses' creative and innovative use of artificial intelligence in clinical practice.
- Future research should involve larger and more diverse samples to enhance the generalizability of findings across different healthcare settings.

Authors' contributions

E.H.A.A.; created the thesis, provided an explanation, collected information, produced the first manuscript. A.E.M. made significant contributions to the goal and research hypothesis, introduction, review of the study's significance, debate, conclusion, and recommendations. reviewed, edited, and offered critical feedback on the text. F.G.M. participated in every phase of the research process, oversaw everything, and provided the manuscript's initial draft for publication. All authors revised and approved the final manuscript.

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