

## **Nurses' Knowledge and Attitude Regarding Application of Artificial Intelligence in Hemodialysis Unit at Benha University Hospital**

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### **Abstract:**

**Context:** Artificial intelligence (AI) has a significant role on our daily life, understanding the perspectives of nurses regarding application of AI with hemodialysis patients is necessary. **Aim:** the study aimed to assess nurses' knowledge and attitude regarding application of artificial intelligence in hemodialysis unit, Benha university hospital. **Design:** A descriptive research design was used. **Subject:** Convenience sample of 61 nurses who are working in hemodialysis unit were recruited from August first 2024 till October end 2024, **the study utilized the following two tools:** Tool I: Self-administered Questionnaire to assess nurses' knowledge about application of artificial intelligence in hemodialysis unit. Tool II: Nurses' attitude assessment scale toward AI. **Results:** illustrated that 52.5% of the studied nurses had poor level of total knowledge about applying artificial intelligence in hemodialysis unit, 77% of them had positive attitude toward AI, as well as there was a statistically significant correlation between total knowledge of the studied nurses and their attitude toward AI. **Conclusion:** The result concluded deficiency in nurses' level of knowledge about applying artificial intelligence in hemodialysis unit and positive attitude also there was a positive correlation between total level of their knowledge and attitude toward AI. **Recommendation:** Ongoing education and appropriate training of nurses for the new technology of artificial intelligence including the technical aspects and ethical consideration to acquire the necessary knowledge and skills to avoid medical errors

**Keywords:** Nurses, Knowledge, Attitude, Artificial Intelligence & Hemodialysis

### **Introduction:**

Artificial intelligence (AI) is a rapidly evolved field, increasingly prevalent in healthcare sector. AI technology has the ability to improve numerous facets of patient care, the increasing data in the process of healthcare indicates that AI can be more applied in that field, diagnosis and treatment were the prevailing applications (**Romero et al., 2024**).

Artificial intelligence-based technology has the potentiality to change the healthcare through proceed new perception from the huge data which produced while providing the daily health services. Valuable

applications including; prediction of the disease, appropriate diagnosis, recognition of newly observation on physiology and developing individualized diagnosis and treatment (**Mahdi et al., 2023**).

Artificial intelligence has various applications in healthcare and nursing including assessment and diagnosis of the disease, clinical problems solving, decreasing data lost, enhancing good communication skills for nurses, improving management of patient care, diminish workload of the nurse, and improve patient safety (**Hussein et al., 2023**). However, routine applications of AI in hemodialysis are rare. Hesitancy of the care givers to apply AI model in field of dialysis

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through daily work is predictable; improvement and applying AI methods in the dialysis unit like other areas shares common challenges, such as considerations of data confidentiality and deficiency of obvious reason and analysis the output, it rarely allows users to know how reached to the specific outcomes (**Chan et al., 2020**).

Artificial intelligence usually requires vast amounts of training data. As a result, dialysis will be an attractive field for applications of AI as caring of dialysis patients require high standard care, which produces huge of longitudinal patient' data including prescriptions for dialysis such as time of treatment, volume of ultrafiltration, rates of flow and administration of the medical treatment like agents stimulate the erythropoiesis, and documented in the patients' electronic records. (**Lee et al., 2021**).

The results of rising application of AI in nursing field had positive and negative aspects. Artificial intelligence may cause damage to nurses, patients and the career. Also, there are many possible benefits for AI to the nursing profession, act as a great influential tool for nurses, advance quality of care, improve outcomes of patient, increase nurses' efficiency and decrease healthcare costs, help make decisions through analysis of huge data and giving individualized caring for patients, identifying potentiality risks, awake the nurses to the possibility problems and decrease the potentiality of faults and misconduct. (**Wilson et al., 2023**).

Nurses mostly agree that AI can support health and well-being of the patients, but there are many issues resulted from using AI in healthcare settings; problems with using health data, concerns about cyber security, the

problem of responsibility, and the combination of AI tools into current practice, ethical considerations and the decreased nurses' ability to full comprehend how decision made by AI is attained. Still, the primary issues which should be overcome include; privacy, protecting the data, and assuring that AI will be implemented in an ethical and unbiased method (**Samad et al., 2024**).

The uses of AI-based technology in nursing practice have elevated fears, and public debate, with many fearing that this technology can substitute nurses. While, other major worries focused around the ethical use of these technologies, such as management data bias and the necessity to grow new perspectives on technology implementation and identifying barriers in technology approval between nurses is equally as important today. Some of these fears could be relieved by offering sufficient information about AI for users, comprehending the existing research on these technologies, and through providing information regarding ethics of AI in providing nursing care (**Kanekar, 2023**).

Successful application of AI in clinical practice demands careful comprehend of behavior and attitude of nurses toward the existing and the future applications of AI and assessing their current knowledge about AI is necessary to recognize the future learning needs, as nurses uses technology and dealing directly with patients. (**Abuzaid et al., 2022**). The integration of AI could deliver a completely new method for analysis of data, allowing future advancement in individualized patient therapy. Data analysis delivered by AI is likely to play a crucial effect on monitoring of patient for efficacy and safety of dialysis. (**Hueso et al., 2018**).

**Significance of the study:**

Egypt has begun to adopt AI and technology in various branches, the government is becoming greatly intrusive in encouraging of AI through initiatives which aimed at boost and develop research within its borders, the government has put 7.7% from Egypt's gross domestic products as a general target to arise from AI and robotic by the year 2030. **(Egypt's Artificial Intelligence Future, 2020).**

Artificial intelligence has the potential to transform the nursing industry and has a great influence on healthcare delivery, through using AI technology, professionals in nursing can improve patient care, improve decision making, optimize workflows, and transform ways of delivering healthcare. Artificial intelligence is expected to help provide proactive care and reduce future risks for patients, nurses and the entire profession. **(Tursunbayeva & Renkema, 2023).** The consequence, research into using of AI technology with hemodialysis patients is important.

**Aim of the study:**

Assess nurses' knowledge and attitude regarding application of artificial intelligence in hemodialysis unit at Benha university hospital.

**Research questions:**

**Q1.** What is the level of nurse' knowledge about applying artificial intelligence in hemodialysis unit at Benha University Hospitals?

**Q2.** What is the nurses' attitudes toward applying artificial intelligence in hemodialysis unit at Benha University Hospitals?

**Q3.** What is the correlation between nurses' knowledge and attitude toward applying artificial intelligence in hemodialysis unit at Benha University Hospitals?

**Subjects and Method:**

**The study design:** A descriptive research design was used to conduct the present study. The descriptive design is concerned with gaining information about characteristics within selected or particular field of study and providing pictures of situations, it occurs in natural setting without any interference **(Indu & Vidhukmar, 2020)**

**The study setting:**

The study was conducted in hemodialysis unit at Benha University Hospital, Qalyubia Governorate, Egypt. The unit located on the second- floor and included two rooms for dialysis. Total hemodialysis machines were 36 used for hemodialysis process.

**Subjects**

**Sample type:** Convenience sample of all working nurses in hemodialysis unit and tasked to provide care to patient who undergoing hemodialysis process, all were recruited to the study. The total number were 61 after exclusion of pilot study nurses.

**Data collection tools:**

**Tool I: Self-administered Questionnaire:** Designed by the researchers based on a thorough reviewing recent and related literatures ( **Lennartz et al., (2021), Shimon et al., (2021), Mohamed s. et al., (2023) & Elderiny S. et al., (2024)** ) to assess nurses' knowledge about application of artificial intelligence in hemodialysis unit, written in multiple-choices questions form and

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consisting of 2 parts:

**Part (I): Nurses' personal data:** Included seven questions about gender, age, educational level, marital status, years of experience in nursing field, years of experience in hemodialysis unit and received training about artificial intelligence in hemodialysis unit.

**Part (II): Nurses' knowledge assessment;** contained (22 questions) divided into three sections to assess knowledge of nurses about:

1) Artificial intelligence; included meaning, advantage, disadvantages, characteristics, components, and how it works.

2) Specific application of artificial intelligence in hemodialysis unit included 12 questions about; the primary goal of using AI in a hemodialysis unit, potential benefits, practical application in a hemodialysis unit, how can AI assist in optimizing treatment schedules for patients undergoing hemodialysis, patient monitoring, dialysis treatment, personalized care, predicting and improving patient outcomes, how can AI improve operational efficiency in a hemodialysis unit, ways that can AI support medication management and diagnostic processes in hemodialysis unit.

3) Challenges and solutions for application of artificial intelligence in hemodialysis unit included, primary challenges in implementing AI in a hemodialysis unit, how can nurses overcome the challenge, potential solution and reducing operational costs.

### **Scoring systems:**

One score allotted to each correct answer and zero score for each incorrect answer. Total knowledge scores were summed up "22 score" converted to percentage and

categorized into: Poor < 11, Average 11- 16 and Good > 16.

**Tool II: nurses' attitude assessment scale toward AI:** It is a likert Scale consisted of five responses that utilized to assess attitudes of nurses toward applying artificial intelligence in hemodialysis unit. It adapted from **Schepman & Rodway (2020)**, it included (10 questions) measuring their agreement.

**Scoring system:** Nurses were given five scores if they strongly agree, four scores if they agree, three scores if neutral, if disagree were given two scores and one score if they were strongly disagreed. Then calculate the total scores for each nurse by summing up the scores from their responses. Total scores were ranged from 1 to 50 score. It converted to percentage and categorized as:

- Scores less than 60% indicated negative attitude towards artificial intelligence.
- Scores from 60% and more indicate positive attitude towards artificial

### **Tools validity and reliability:**

Tools were revised and evaluated by panel of 5 experts in the medical surgical nursing department, two professors and three assistant professors, Benha Nursing Faculty to assess face and content validity and ensure their clarity, comprehensiveness, and applicability.

Reliability of knowledge questionnaire was determined by Cronbach's alpha coefficient which was 0.763. Attitude scale was 0.791. This proves that the tools are instruments with good reliability.

**Ethical consideration:**

Approval from the committee of scientific research ethics at Nursing Faculty, Benha University for conduction of the study was obtained with code **REC-MSN-P83**, and official letters gained from the dean of Nursing Faculty and hemodialysis unit director at Benha University Hospital. Verbal and written consent taken from the participated nurses; the study aim was clarified to nurses along with freedom to discontinue their participation without rationalization. Throughout study phases, researchers ensured the privacy, anonymity and confidentiality of the participant data.

**Pilot study:**

Six nurses (ten percent) of the total number of the study nurses shared in a pilot study to test the tools' clarity and applicability. Data were analyzed and modified, then the result was excluded from the study and declined from the original number (67 nurse).

**Fieldwork:**

Starting with orientation visit to the hemodialysis unit at Benha university hospital before conducting the study to determine the nurses' number who will participate in the study and the time needed. Then interviewing with the nurses to clarify aims of the study and provided their consent for participations.

Data were collected from August first 2024 till October end 2024, starting with meeting the nurses in dialysis unit in groups at their free times which appropriate to them to collect their personal data as: Age, marital status, gender, level of educational, years of experience in the nursing field, years of experience in hemodialysis unit and received training about artificial intelligence in hemodialysis unit, then distributed knowledge assessment questionnaire to evaluate nurses'

knowledge about artificial intelligence and its application in hemodialysis unit and attitude assessment scale to assess their attitudes toward applying artificial intelligence in hemodialysis unit.

The tools of data collection required from 15-20 minutes for filling it, the researchers interpreted it to nurses through many visits to the dialysis unit.

**Statistical analysis:**

Data collected were put in tables and analyzed statistically utilizing an IBM computer and statistical package for social science (SPSS) an advanced statistic, version 25 (SPSS Inc., Chicago, IL). Numerical data expressed as mean and standard deviation. Qualitative data expressed as frequency and percentage. Chi-square tests were utilized to inspect differences among qualitative variables. Pearson correlation method utilized to test the correlations between numerical variables. P-value less than 0.05 considered significance, and less than 0.001 considered highly significance.

**Results:**

**Table 1.** The studied nurses' personal data reveals that 68.9% their age within  $20 \leq 30$  years old with a mean  $29.39 \pm 0.64$  years and 54.1% were married. Related to gender and educational level, 63.9% of the nurses were females and got bachelor's degree of nursing, concerning years of experience, 72.1%, 85.2% of nurses had < 5 years in nursing field and hemodialysis unit respectively. The result reported 88.5% of nurses had not receive any training regarding artificial intelligence in hemodialysis unit.

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**Table 2.** Shows the studied nurses' knowledge level about application of artificial intelligence in hemodialysis unit, related to their level of general knowledge about artificial intelligence, the result revealed that 62.3% of the studied nurses had average level of knowledge while 47.5 % and 50.8% had poor knowledge regarding specific application of artificial intelligence in hemodialysis unit and about challenges and solutions for application of artificial intelligence in hemodialysis unit respectively.

**Figure 1.** Shows Percentage distribution of total level of knowledge among the studied nurses about application of Artificial Intelligence in hemodialysis unit, it illustrated that 52.5% of the studied nurses had poor level of knowledge, 39.3% had average level of knowledge and 8.2% had good level.

**Table 3.** Illustrates attitudes of the studied nurses toward applying artificial intelligence in hemodialysis unit, the result shows that 39.3% were agreed that artificial intelligence can improve diagnostic accuracy for patient monitoring and they understand its role in improving functional efficacy, 45.9% of the studied nurses agreed that artificial intelligence can help in increasing availability of more specialized care and it can make change in patient care through improving decision making and data analysis and they agreed that it can help in reducing health care costs through improving efficacy and using resources also 50.8% agreed that it can help in predicting patients' outcomes and complications during hemodialysis and 49.2% felt confident in explaining concept and applications of artificial intelligence for

patients and families and, also 36.1% think that AI can play important role in patients future, 34.4% of nurses need sufficient training and education regarding artificial intelligence and they were interested to know about artificial intelligence application for improving hemodialysis patients' outcomes among 32.8% of the studied nurses.

**Figure 2.** Illustrates percentage distribution of the total attitudes among the studied nurses about applying artificial intelligence in hemodialysis unit, the result showed that 77% of nurses had positive attitude

**Table 4.** Shows Relationship between the studied nurses' personal data and total knowledge level regarding artificial intelligence application, it revealed significance relation between educational level, with their knowledge level regarding artificial intelligence application at  $p < 0.05$ .

**Table 5.** Shows relationship between studied nurses' personal data and total attitude level about applying artificial intelligence in hemodialysis unit, the result revealed that there was a significance relation between nurses' ages, marital status and experience years with their attitude level about applying artificial intelligence in hemodialysis unit at  $p < 0.05$ .

**Table 6.** The result showed a statistically significance positive correlation between the studied nurses' total knowledge and their attitude towards artificial intelligence application in hemodialysis unit  $r = 0.318$

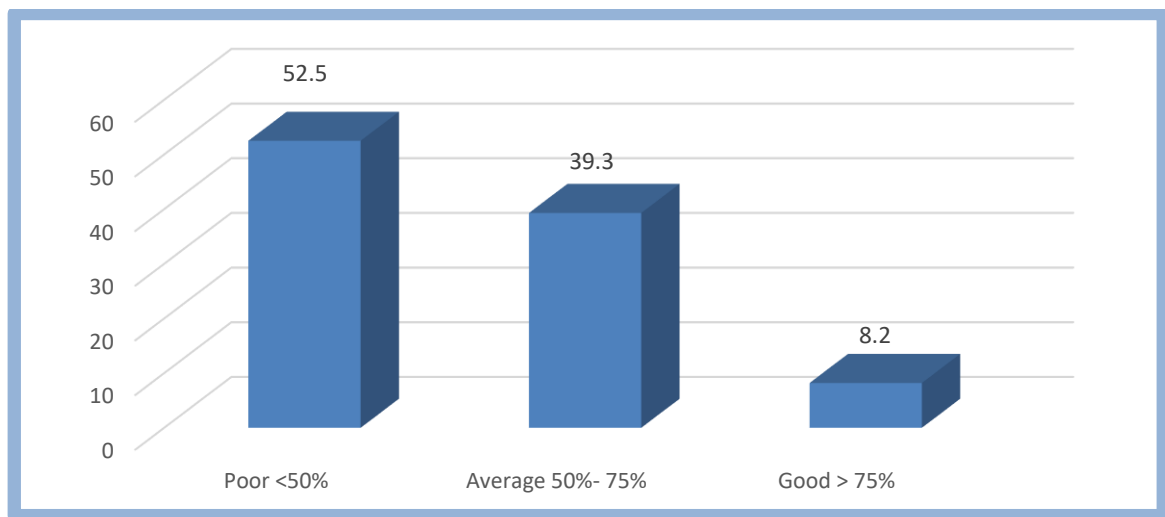
**Table 1: Frequency and percentage distribution of the studied nurses according to their personal data (n = 61)**

Nurses' personal data	(n = 61)	
	No.	%
<b>Age / years</b>		
20 -<30	42	68.9
30 -< 40	14	23.0
40-50	5	8.1
<b>Mean ± SD</b>	<b>29.39 ± 0.64</b>	
<b>Gender</b>		
Male	22	36.1
Female	39	63.9
<b>Marital status</b>		
Single	26	42.6
Married	33	54.1
Widowed	2	3.3
<b>Educational level</b>		
Nursing Diploma	7	11.5
Technical Nursing Institute Diploma	12	16.7
Nursing Bachelor	39	63.9
Post Graduate Studies	3	4.9
<b>Experience years in nursing field</b>		
<5 years	44	72.1
5-< 10 years	7	11.5
≥10 years	10	16.4
<b>Experience years in the hemodialysis unit</b>		
<5 years	52	85.2
5-< 10 years	4	6.6
≥10 years	5	8.2
<b>Received training regarding artificial intelligence in hemodialysis unit</b>		
No	54	88.5
Yes	7	11.5

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**Table 2: Frequency and Percentage distribution of knowledge among the studied nurses about general knowledge and application of artificial intelligence in hemodialysis unit (n=61)**

Nurses' knowledge about application of artificial intelligence in hemodialysis unit	Knowledge level					
	Poor < 50%		Average 50%-75%		Good > 75%	
	(No.)	%	(No.)	%	(No.)	%
General knowledge about artificial intelligence	23	37.7	38	62.3	0	0.0
Knowledge about specific application of artificial intelligence in hemodialysis unit	29	47.5	25	41.0	7	11.5
Knowledge about challenges and solutions for application of artificial intelligence in hemodialysis unit	31	50.8	27	44.3	3	4.9

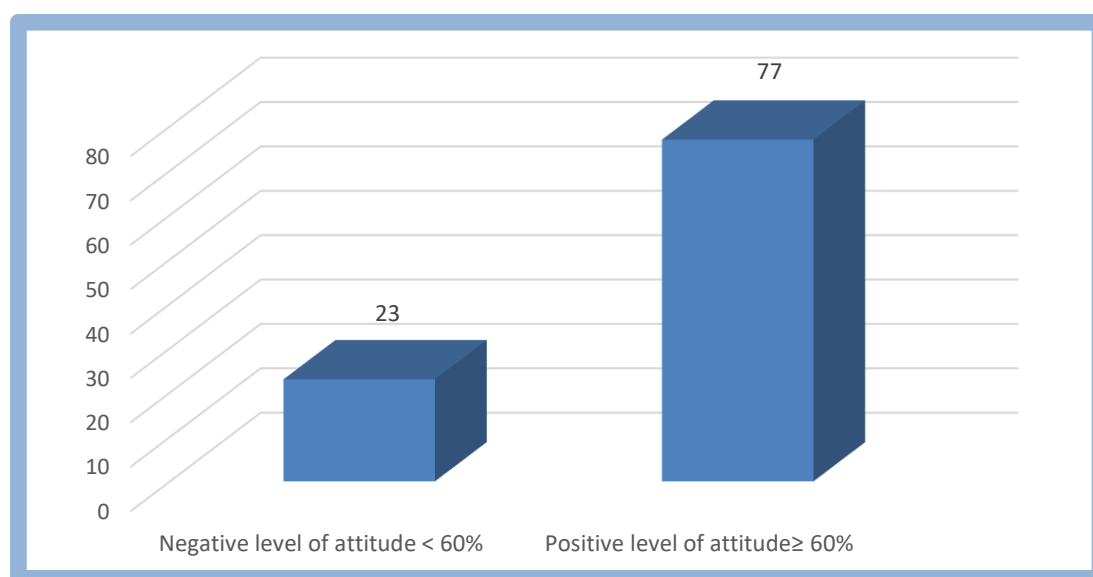


**Figure 1: Percentage Distribution of total level of knowledge among the studied nurses about applying Artificial Intelligence in hemodialysis unit (n=61)**



**Table 3: Frequency and Percentage Distribution of the Studied nurses' attitude toward applying Artificial Intelligence in hemodialysis unit (n=61)**

Nurses' attitude towards artificial intelligence application	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Can improve diagnostic accuracy for patient monitoring	2(3.3)	11(18.0)	10(16.4)	24(39.3)	14(23.0)
Help in increasing availability of more specialized care	1(1.6)	5(8.2)	15(24.6)	28(45.9)	12(19.7)
Help in predicting patients' outcomes and complications during hemodialysis	3(4.9)	5(8.2)	7(11.5)	31(50.8)	15(24.6)
Understand its role in improving functional efficacy	3(4.9)	4(6.6)	19(31.1)	24(39.3)	11(18.0)
Can make change in patient care through improving decision making and data analysis	2(3.3)	11(18.0)	9(14.8)	28(45.9)	11(18.0)
Feel confident in explaining concept and applications of artificial intelligence for patients and families	1(1.6)	15(24.6)	8(13.1)	30(49.2)	7(11.5)
Help in reducing health care costs through improving efficacy and using resources	4(6.6)	7(11.5)	15(24.6)	28(45.9)	7(11.5)
think that artificial intelligence plays important role in patients' future	2(3.3)	6(9.8)	14(23.0)	22(36.1)	17(27.9)
Need sufficient training and education regarding artificial intelligence	2(3.3)	9(14.8)	9(14.8)	21(34.4)	20(32.8)
Interested to know about artificial intelligence application for improving hemodialysis patients' outcomes	10(16.4)	17(27.9)	10(16.4)	20(32.8)	4(6.6)



**Figure 2: Percentage Distribution of total attitude among the studied nurses about applying Artificial Intelligence in hemodialysis unit (n=61)**

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**Table 4: Relationship Between the studied nurses' personal data and total knowledge level about applying artificial intelligence in hemodialysis unit (n=61).**

Nurses' personal data		Total knowledge level			X <sup>2</sup>	P-Value
		Poor (n=32)	Average (n=24)	Good (n=5)		
		(No.) %	(No.) %	(No.) %		
Age	20-<30	18(56.3)	19(79.2)	5(100.0)	7.912	0.095 <sup>NS</sup>
	30- < 40	9(28.1)	5(20.8)	0(0.0)		
	40-50	5(15.6)	0(0.0)	0(0.0)		
Gender	Male	14(43.8)	7(29.2)	1(20.0)	1.875	0.392 <sup>NS</sup>
	Female	18(56.2)	17(70.8)	4(80.0)		
Marital status	Single	14(43.8)	9(37.5)	3(60.0)	2.920	0.571 <sup>NS</sup>
	Married	16(50.0)	15(62.5)	2(40.0)		
	Widowed	2(6.2)	0(0.0)	0(0.0)		
Educational Level	Nursing diplom	6(18.8)	1(4.2)	0(0.0)	16.093	<b>0.013<sup>S</sup></b>
	Technical nursing institute diploma	11(34.4)	1(4.2)	0(0.0)		
	Bachelor in nursing	14(43.8)	20(83.3)	5(100.0)		
	Post graduate studies	1(3.1)	2(8.3)	0(0.0)		
Experience years in hemodialysis unit	< 5 years	25(78.1)	22(91.7)	5(100.0)	4.524	0.340 <sup>NS</sup>
	5 -< 10 years	4(12.5)	0(0.0)	0(0.0)		
	≥ 10 years	3(9.4)	2(8.3)	0(0.0)		
Received training regarding artificial intelligence in hemodialysis unit	No	31(96.9)	19(79.2)	4(80.0)	4.623	0.099 <sup>NS</sup>
	Yes	1(3.1)	5(20.8)	1(20.0)		

NS means no significance

S means significance

**Table 5: Relationship between studied nurses’ personal data and total attitude level about applying artificial intelligence in hemodialysis unit (n=61).**

Nurses’ personal data		Total attitude level		X <sup>2</sup>	P-Value
		Negative level (n=14)	Positive level (n=47)		
		(No.) %	(No.) %		
Age	20- <30	6(42.8)	36(76.6)	11.236	<b>0.004<sup>S</sup></b>
	30- < 40	4(28.6)	10(21.3)		
	40-50	4(28.6)	1(2.1)		
Gender	Male	3 (21.4)	19(40.4)	1.688	0.194 NS
	Female	11 (78.6)	28(59.6)		
Marital status	Single	3(21.4)	23(48.9)	8.978	<b>0.011<sup>S</sup></b>
	Married	9(64.3)	24(51.1)		
	Widowed	2(14.3)	0(0.0)		
Level of education	Nursing diplom	1(7.1)	6(12.8)	3.409	0.333 NS
	Technical nursing institute diploma	5(35.8)	7(14.9)		
	Bachelor in nursing	7(50.0)	32(68.1)		
	Post graduate studies	1(7.1)	2(4.2)		
Years of experience in hemodialysis unit	< 5 years	10 (71.4)	42(89.4)	3.837	<b>0.050<sup>S</sup></b>
	5 -< 10 years	1(7.1)	3(6.4)		
	≥ 10 years	3(21.5)	2(4.2)		
Received training regarding artificial intelligence in hemodialysis unit	No	14(100.0)	40(85.1)	2.355	0.125 NS
	Yes	0(0.0)	7(14.9)		

NS means no significance

S means significance

**Table 6: Correlation between total knowledge and attitude among the studied nurses regarding artificial intelligence application (n=61)**

Variable	Total knowledge	
	r	P. value
Total attitude	0.318	0.013*

\* Statistically significant

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### **Discussion:**

Evaluating the nursing knowledge and attitude regarding the application of AI in hemodialysis unit is crucial. Nowadays, AI is emerging as new innovations and becoming popular due to the ability of analyzing clinical data and patient details with more amounts of research evidences to enhance new knowledge and decision-making **Beevi S (2022)**. For the reason of these capabilities, AI can renew many aspects of health care systems in the coming future. These innovations of AI in nursing require training to convert the education of nursing and practice, nurses need knowledge and skills to incorporate knowledge of AI to clinical practice **Pepito JA and Locsin R. (2019)**. So, the current study aimed to assess nurses' knowledge and attitude regarding application of artificial intelligence in hemodialysis unit at Benha university hospital.

The findings of the current study reveal that more than two thirds of the studied nurses were between ages of 20 and less than 30 years with mean age  $29.39 \pm 0.64$  years. About two third of the nurses were females had bachelor's degree in nursing and more than half of them married. Moreover, findings show that majority of nurses had less than five years of experience in hemodialysis unit and had not previously participated in training programs or courses regarding artificial intelligence in hemodialysis unit. This finding explained by the fact that, critical wards in Benha University Hospital like hemodialysis unit depend on high qualified nurses who graduated from nursing college.

These results agreed with **Elderiny et al., (2024)** study who reported more than half of the nurses were females, their ages between 20 to < 25 year old, but they had nursing

technical institute and the majority had experience years less three years. And findings disagreed with **Mohamed et al. (2023)** finding, they found that ages of all nurses ranged between 40 to less than 50 years old with mean  $40.53 \pm 4.918$  and most of nurses had a bachelor of nursing, with 15 experience years.

The current study revealed that nearly two thirds of the studied nurses had average general knowledge about artificial intelligence, nearly half of the nurses had poor knowledge about its application in hemodialysis unit and more than half had poor knowledge about challenges and suggested solutions. It is concluded that more than half of nurses had poor level of total knowledge regarding application of artificial intelligence in hemodialysis unit. these findings may be because the routine and heavy work in hemodialysis unit may hinder nurses' attendance of training concerning AI to equip with the new advancement technology and its value of application in nursing and reveal the importance of ongoing educational meeting to increase their awareness towards the new technology.

These findings are answering the first research question

The results are congruent with **Abuzaid et al. (2022)** study who revealed deficiency of nurses' understanding and knowledge about AI principles and technical possibilities, and **Zhang et al. (2022)**, study which investigated using artificial intelligence in nursing between Chinese nursing staff and revealed great results that served using technology of artificial intelligence in nursing practice, and recommended developing effective measures for the application with the actual work. These

results agreed with **Lai, et al. (2020)**, study that results confirmed a general deficiency of knowledge in the participants of AI in a study.

Related to total attitude level among the studied nurses towards applying artificial intelligence in hemodialysis unit, the current findings indicated more three quarter of the nurses under study had positive attitude including; more than one third of them were agreed that artificial intelligence can improve diagnostic accuracy for patient monitoring and they understand its role in improving functional efficacy. From the researchers' view these results indicated a positive support from nurses' side to be aware about great effect of using and applying AI in clinical practice.

This results in accordance with **Sarwar, et al., (2019)** study, revealed positive attitudes of physicians regarding AI and three quarter of them were interested in using AI for diagnosis and enhance efficiency in pathology and predicted introducing technology of AI into laboratories.

Also, the result agreed with **Elsayed & Sleem (2021)** in their study about perception and attitude of nurse managers regarding technology of artificial intelligence in patient care, reported that more than half of nurses had positive attitude towards the use of AI in nursing. And **Mehdipour, (2019)** indicated positive attitude between majority of nurse managers towards AI application systems in nursing. and supported by **Kwak et al. (2022)**, study which reported positive attitude toward AI and expected its application. Moreover, **Abd El-Monem, et al, (2023)** mentioned that two thirds of nurses had high perception level toward technology of artificial intelligence and more than one third had moderate level of perception.

More than one third of the studied nurses think that AI can play important role in patients future, and agreed that they need sufficient training and education regarding artificial intelligence and they were interested to know about artificial intelligence application for improving hemodialysis patients' outcomes. In the same line **Rony, et al., 2024** exploring perspectives of nursing professionals about artificial intelligence in the future nursing practice, they indicated that the nurses' understanding the demand for comprehensive and continuous skills training and they had enthusiasm for AI to identify patient deteriorations.

Moreover, more than half of nurses agree that AI can help in predicting patients' outcomes and complications during hemodialysis, these results indicated nurses' awareness about benefits that will gain from application of AI with patients during hemodialysis session. Other study by **Yoo, et al., 2023** showed that care providers in emergency and ICU had increased expectation about integration of AI technologies will benefit the patients by helping in diagnosis and treatment. And study by **Burlacu et al. (2020)**, study about using resources of artificial intelligence with dialysis and kidney transplantation patients, they reported that methods of AI capable of expecting the risks for the unsatisfactory results of hemodialysis session.

Nearly half of the studied nurses agreed that AI can help in increasing availability of more specialized care and it can make change in patient care, and they felt confident in explaining concept and applications of artificial intelligence for their patients and agreed that it can help in reducing health care costs through improving efficacy and using resources. In contrast with **Sabra (2023)** reported that, less than half of nurses, agreed that AI have difficulties to apply due to

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its problems. Study by **Elderiny S. et al., 2024** showed that two third of the nurses agreed that using AI can improve their practice in health care setting, help to decrease medical errors and offer high quality data. In the same line **Vaananen et al. (2021)** revealed that using AI may prevent medication errors such as drug overdoses.

Study by **Elsayed & Sleem, (2021)**, found that highest mean score among nurse managers was related to advantages of the use of AI in patients care then problems associated artificial intelligence application. Also, **Oh et al. (2019)**, reported that, nurses perceived AI cannot be applied to each patient. Moreover, **Abdullah & Fakieh, (2020)**, revealed that the higher scores were related to problems related application of artificial intelligence in patient care then its advantages of using among health care workers.

These findings are answering the second research question

As regard to relationship between personal data of the nurses with total level of knowledge and attitude toward applying artificial intelligence in hemodialysis unit, the result revealed that there were significance relation between nurses' level of education and their total level of knowledge; the majority of the studied nurses with Bachelor degree in nursing had average level of knowledge, might be due to the fact that the educational level is positively affect the acquired knowledge and there were a significance relation between the studied nurses' ages, and years of experience with their attitude level, it could be explained by, this young age group are more interested about new technology and its application in nursing especially if it has many benefits for patient' care and outcomes.

Study by **Elsayed & Sleem, (2021)** mentioned that there were positive correlation between demographic characteristics of the nurse managers like experience years, education, job and position with attitudes toward AI using.

Related to relationship between total knowledge of nurses and their attitude towards applications of artificial intelligence in hemodialysis unit; the result shows a statistically significance relation between total knowledge of the studied nurses and their attitude towards artificial intelligence application in hemodialysis unit, as nurses' attitude positively affected by their level of knowledge even it is poor, this finding was congruent with **Elsayed & Sleem, 2021** results which reported positive relation between perceptions of the nurse managers and their attitudes toward artificial intelligence using in nursing practice. These findings are answering the third research question.

### **Conclusion:**

The result showed positive attitude toward applying artificial intelligence in hemodialysis unit, poor level of total knowledge, and a statistically significant correlation between total knowledge level of the studied nurses and their attitude towards applying artificial intelligence in hemodialysis unit.

### **Recommendations:**

Based upon the current study results, it is recommended conducting educational programs and appropriate training courses for hemodialysis nurses about the new technology of artificial intelligence including both the technical aspects and ethical consideration to acquire the necessary knowledge and skills for successful AI application and to avoid nursing errors. Applying another research about AI

including patients' perspectives and other health care team.

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## معرفة واتجاهات الممرضين فيما يتعلق بتطبيق الذكاء الاصطناعي في وحدة غسيل الكلى بمستشفى بنها الجامعي

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للذكاء الاصطناعي دور كبير في حياتنا اليومية، ومن الضروري فهم وجهات نظر الممرضين فيما يتعلق بتطبيق الذكاء الاصطناعي مع مرضى غسيل الكلى. لذا فإن هذه الدراسة هدفت إلى تقييم معرفة واتجاهات الممرضين فيما يتعلق بتطبيق الذكاء الاصطناعي في وحدة غسيل الكلى بمستشفى بنها الجامعي. التصميم: وقد تم استخدام تصميم البحث الوصفي لتحقيق هدف الدراسة. وتم إختيار عينة ملائمة من 61 ممرض يعمل في وحدة غسيل الكلى من الأول من أغسطس 2024 حتى نهاية أكتوبر 2024، واستخدمت الدراسة الأدوات التاليتين: الأداة الأولى: استبيان ذاتي الإدارة لتقييم معرفة الممرضين عن تطبيق الذكاء الاصطناعي في وحدة غسيل الكلى. الأداة الثانية: مقياس تقييم إتجاه الممرضين فيما يتعلق بالذكاء الاصطناعي. النتائج: أوضحت أن 52,5% من الممرضين تحت الدراسة لديهم مستوى ضعيف من إجمالي المعرفة عن تطبيق الذكاء الاصطناعي في وحدة غسيل الكلى، وكان لدى 77% منهم إتجاه إيجابي فيما يتعلق بالذكاء الاصطناعي، فضلاً عن وجود علاقة ذات دلالة إحصائية بين إجمالي المعرفة للممرضين تحت الدراسة وإتجاههم نحو الذكاء الاصطناعي. الاستنتاج: خلصت النتيجة إلى وجود نقص في مستوى معرفة الممرضين فيما يتعلق بتطبيق الذكاء الاصطناعي في وحدة غسيل الكلى وإتجاههم كان إيجابي كما كان هناك ارتباط إيجابي بين المستوى الإجمالي لمعرفتهم واتجاههم نحو الذكاء الاصطناعي. وقد أوصت الدراسة بالتعليم المستمر والتدريب المناسب للممرضين على التكنولوجيا الجديدة للذكاء الاصطناعي بما في ذلك الجوانب الفنية والاعتبارات الأخلاقية لإكتساب المعرفة والمهارات اللازمة لتجنب الأخطاء الطبية.