

Perception and Attitudes of Critical Care Nurses Regarding Artificial Intelligence at Intensive Care Unit

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Abstract

Background: Acceptance of artificial intelligence technologies in ICU facilitate practice nurses and make it possible for them to give their patients the best possible care. **Aim:** to assess perception and attitude of critical care nurses regarding artificial intelligence at intensive care unit. **Study design:** A descriptive research design was used to collect data of the present study. **Setting:** The present study was carried out in ICU of Assiut university Hospital and at Assiut General Hospital. **Sample:** All available nurses in ICU at Assiut university Hospital and at Assiut General Hospital. **Tools: tool one:** critical care nurse's perception of AI scale **tool two:** nurses' attitudes towards artificial intelligence scale. **Results:** The results showed that 83.3% of critical care nurses had moderate perception toward usage of AI in ICU and 86.7% of nurses had positive attitude toward usage of AI in ICU. A greatly significant positive connection between of critical care nurses' perception and attitude toward usage of AI in ICU was found. **Conclusions:** The majority of nurses of critical care had moderate perception and positive attitude toward usage of artificial intelligence in ICU. **Recommendations:** Performing a scientific researches concentrated on artificially intelligent in ICU at Egypt and to give different findings. preparing training programs for ICU nurses to Inform them of the possible uses of AI.

Keyword: *Artificial Intelligence, Attitude, Critical care Nurses, Intensive care unit & Perception.*

Introduction:

In several sectors, artificial intelligence (AI) has already replaced the manual health system with an automated one; in certain applications, people are now only needed to handle more basic tasks like patient and medical resource management (Bernardini et al., 2021). Leaving AI components to handle or rely on for complex procedures. AI-based healthcare systems are developing quickly, especially in the areas of diagnostics and early detection (Merhi et al., 2022). These days, artificial intelligence (AI) technology can monitor, detect, and quantify risks and benefits in the healthcare industry using massive data, machine learning algorithms, and robotics (Dharani & Krishnan, 2021). Artificial intelligence lowering the cost of clinical trials in terms of lost human time during the development of new medications, artificial intelligence benefits the healthcare industry. Past the diagnostic, clinical, and therapeutic decisions made from a medical perspective. (Ali et al., 2023)

Artificial intelligence (AI) is becoming more prevalent in the healthcare setting. It can be defined as a collection of technologies that assist machines in acting, understanding, and learning in order to perform clinical and administrative tasks, as well as participate in research and clinical learning activities. AI has boosted productivity for the first time in

history, and its pervasiveness in everyday life is expanding quickly (Taei et al., 2020). Global hospital disruption will be brought about by growing consumerism and new technologies, as well as shifts in the demographic and economic landscape.

Home care and outpatient services are replacing the expanding number of medical inpatient institutions. Additionally, critically ill patients will continue to require inpatient acute care services (Commins et al., 2019). Due to its potential applications in numerous medical fields, artificial intelligence (AI) in healthcare has garnered significant attention in recent years. Artificial Intelligence (AI) comprises technologies that leverage data to optimize their operations and accomplish their objectives. (Topol et al., 2019).

The progress of technology and digital transformation has facilitated the growth of AI to support health care systems. AI technologies have been used in nursing profession for long years, but not recognized as AI. AI implements in nursing such as; scientific decision support, mobile health and sensor-based technologies, and voice helpers and robotics. However, the rising interest in AI in healthcare setting is associated with new discussions on the relationship between AI and nursing. Nurses' must be involved in directing the growth and usage of AI technologies at health care settings. So, there is a necessity for the nursing

profession to participate and well understand of AI (He et al., 2019 & European Commission, 2019). Perception of nurses is a powerful pointer of organizational willingness and requirements consideration in this novel years of technological progress. Discovered awareness as a pointer of applies and acceptance which was valuable for designers to develop technology features and purpose (Alami et al., 2020).

Concerns about artificial intelligence (AI) in the nursing setting have sparked public debate. Some nurses worry that AI will replace them, while others fear that AI would replace interactions between humans and compromise the ethics of care (Stokes & Palmer, 2020). The moral application of these technologies, including controlling data bias in algorithms used to train them, is another important area of concern (Robert et al., 2019). Some of these worries would be allayed if end users were given adequate knowledge about artificial intelligence (AI), if they were aware of the state of the research on these technologies, and if there was open communication on the morality of AI in the nursing profession (Stokes & Palmer, 2020). Nursing should be able to employ AI-based technology with ease and intuition. By relieving them of administrative tasks, these technologies enable nurses to focus their attention on the essential components of professional care. Finding the areas in which AI truly adds value to nursing is a must for nurses to reap the greatest benefits from the technology. (Robert et al., 2019).

Nurses will potentially gain the most from artificial intelligence among healthcare practitioners. According to (Pepito et al., 2019), the application of artificial intelligence (AI) in nursing is still relatively new, and nurses generally adopt new technologies quite slowly. The use and advancement of AI in nursing and medicine currently differs. The fact that there are fewer articles and insufficient summaries on the subject of nursing AI serves as proof for this. This stands in stark contrast to the abundance of published works and specialized scholarly publications, including AI in Medicine. While it seems sense that AI has a number of uses for doctors, such diagnosing conditions and interpreting imaging data, there are still a number of important AI healthcare technologies that nurses may take use of (Mintz & Brodie, 2019). Nurses will be able to precisely and individually deliver evidence-based treatment that aligns with patients' preferences and goals thanks to artificial intelligence (AI). The integration of many forms of pertinent data, such as environmental, genetic, health, and sociodemographic information, would be made possible by AI technology for nurses, enhancing their capacity to deliver comprehensive care. Furthermore, a recent scoping review revealed that the majority of

studies on artificial intelligence in healthcare have focused on secondary and tertiary care, leaving a significant amount of room to investigate how nurses use AI in primary care (Abbasgholizadeh et al., 2020). It is evident from the above instances that nurses are not immune to the widespread use of artificial intelligence (AI) within healthcare systems. AI is frequently marketed as a means of revolutionizing healthcare delivery and enhancing patient wellbeing. (Clancy et al., 2020)

The study's significance

Health organizations need to adapt quickly to new developments in technology, legal requirements, and patient needs. AI in healthcare can help with proactive patient care, lower risks in the future, and streamline workflows. Cost, quality, and treatment outcomes drive the further growth of AI technology to new levels of use and value in healthcare. Large-scale data analysis and instructional support are also effectively supported by computer systems (Shaik et al., 2020).

Researchers believe that no one has made an effort to investigate nurses' perception and attitudes toward AI technology in ICU at Assiut university Hospital and at Assiut General Hospital So, that the goal of this study is to assess the perception and attitudes of critical care nurses toward using AI technology in ICU at Assiut university Hospital and at Assiut General Hospital.

Aim of the study:

This research sought to evaluate perception and attitude of critical care nurses regarding artificial intelligence at intensive care unit.

Subjects and Method:

Research Design:

The study employed a descriptive research design for the purpose of data collection.

Research questions:

- Q1:** What is the degree of perception of nurses' toward using artificial intelligence technologies in ICU at Assiut university Hospital and at Assiut General Hospital?
- Q2:** What is the degree of attitudes of nurses' toward using AI technologies in ICU at Assiut university Hospital and at Assiut General Hospital?
- Q3:** Q3. Do nurses' attitudes and perceptions about utilizing AI technologies correlate with one another?
- Q4:** Does there a correlation among the socio-demographic traits of nurses and their perceptions in the ICUs of Assiut University Hospital and Assiut General Hospital?

Setting:

The research was carried out in (Trauma ICU, Thoracic ICU, General ICU, Neurological ICU, Heart ICU, gynecological ICU) of Assiut university Hospital and at Assiut General Hospital.

Subject/sample:

All available nurses in ICU at Assiut university Hospital and at Assiut General Hospital chosen through convenient sample to share in this research and accept to share in the research in the settings stated before.

The study tools:

Tools of data collection: To collect study data two tools was used:

Tool (I): Perception toward artificial intelligence questionnaire adopted from (Abdullah & Fakhieh, 2020), (Oh et al.,2019) and aimed to assess critical care nurse's Perception regarding AI It consisted of two parts:

Part one: socio demographic data of critical care nurses as:

age, job type, years of experience, and the level of education.

Part two: perception of critical care nurse's regarding artificial intelligence:

Formed from fourteen items total, divided into 3 sections. Section 1: Perception of Artificial Intelligence consists of 4 items. There are five item in the second section, which discusses the benefits of using artificial intelligence. Five things were included in the third section, which addressed problems with using artificial intelligence in the intensive care unit. With a five-point Likert scale that includes 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree) it is aimed to assess nurses' perception toward artificial intelligence.

Scoring System:

Depends on 40% of a cutting value. The nurses' perception is considered low $\leq 40\%$, moderate from 41% to $\leq 80\%$ and elevated at $\geq 81\%$.

Tool (II): critical care nurse's attitudes towards artificial intelligence questionnaire.

This tool was adopted from (Schepman & Rodway, 2020). It uses a five-point Likert scale, ranging from 1 to 5, to evaluate nurses' general attitudes about artificial intelligence. The points are 1 for (strongly disagreeing), 2 for (agreeing), 3 for (neutral), 4 for (agreeing), and 5 for (strongly agreeing).

Scoring System:

Depends on 60% of a cutting value. The nurses' attitude is considered negative ≤ 60 and positive attitude ≥ 61 .

Methods:

A descriptive research design used to achieve the study's goal on 60 nurses in ICU at Assiut university Hospital and at Assiut General Hospital through a

convenient sample through the use of two questionnaires, Perception toward AI questionnaire and General attitudes towards AI questionnaire.

Validity:

The study tools underwent assessments of their face and content validity by five experts from Assiut University. These experts included two medical professors of anesthesia and three assistant professors of critical care nursing. They evaluated the items and the entire instrument to ensure that it was relevant, comprehensive, and appropriate for testing the desired outcomes. Following this, modifications were made to the instrument.

Reliability

The developed tools were tested for reliability by using the Cronbach's alpha to assess reliability of the tools

Pilot Study:

A Pilot Study conducted on (10 %) of the research population to assess the applicability and visibility of the tools and allow time for any necessary correction before running the research study.

Ethical considerations

Research proposal was approved by Ethical Committee at Faculty of Nursing, Assiut University, there is no risk for study participants during application of the research, oral agreement was taken from the participants in the study, Study participants have the right to refuse or to participate and/or withdraw from the study without any rational at any time, confidentiality and anonymity of obtained data were assured, the study was followed common ethical principles in clinical research and study participants' privacy was considered during collection of data.

Technique for data collection:

The researcher introduced herself to the study sample, explained the aim of the study, and how to fill in the questionnaire, approval was taken orally and asked them for their cooperation with them. The researcher met the study sample either individually or groups during shifts to distribute the questionnaires during these meetings. The study sample filled in the tools individually at once and some of them read the questionnaires and fixed another time to fill them, filling the questionnaire sheet acquired from 20-30 minutes. The researcher were available during data collection to answer any question from the study sample.

Statistical design:

SPSS Inc., Chicago, IL, USA's Statistical Package for the Social Sciences, version 22, was used to gather, analyze, arrange, and tabulate the data. For the quantitative data, the range, mean, and standard deviation were computed.

Result

Table (1): Distribution of socio demographic data of critical care nurses for Study sample (n=60)

	No	%
Hospital		
Assiut University hospital	40	66.7
Assiut General hospital	20	33.3
Occupation		
Head Nurse	29	48.3
Staff Nurse	31	51.7
Department		
Trauma Care	4	6.7
Thoracic care	3	5.0
General Care	15	25.0
Neurological Care	12	20.0
Heart Care	6	10.0
Intensive Care	13	21.7
gynecological care	7	11.7
Age group		
Less than 25 year	19	31.7
From 25-30 years	26	43.3
More than 30 years	15	25.0
Mean ±SD(range)	27.80±3.84(20-36)	
Gender		
Male	6	10.0
Female	54	90.0
Experience year		
Less than 5 years	31	51.7
From 5-10 years	22	36.7
More than 10 years	7	11.7
Mean ±SD(range)	5.76±3.59(1-17)	
Education Level		
Nursing Diploma	2	3.3
Bachelor	29	48.3
Technical institute	29	48.3

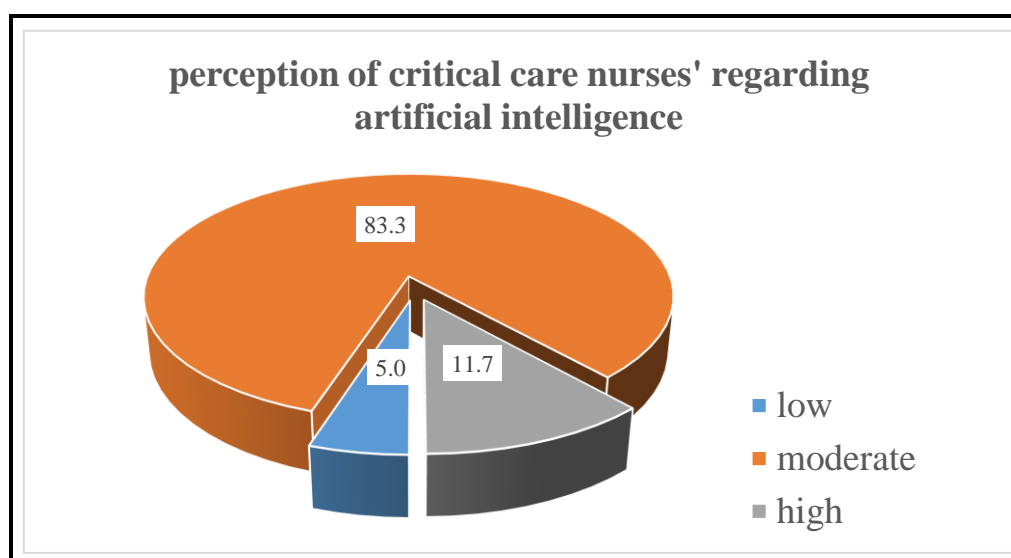


Figure (1): Levels of critical care nurses' Perception toward using Artificial Intelligence Technology in ICU.

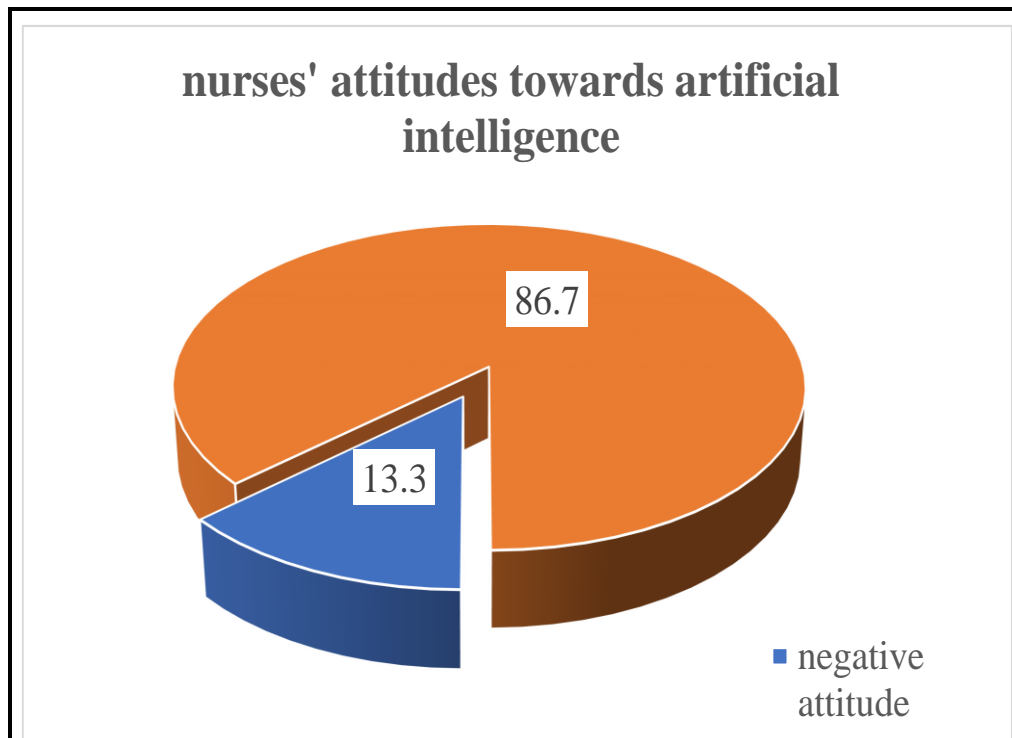


Figure (2): Levels of critical care nurses' attitude toward using Artificial Intelligence Technology in ICU.

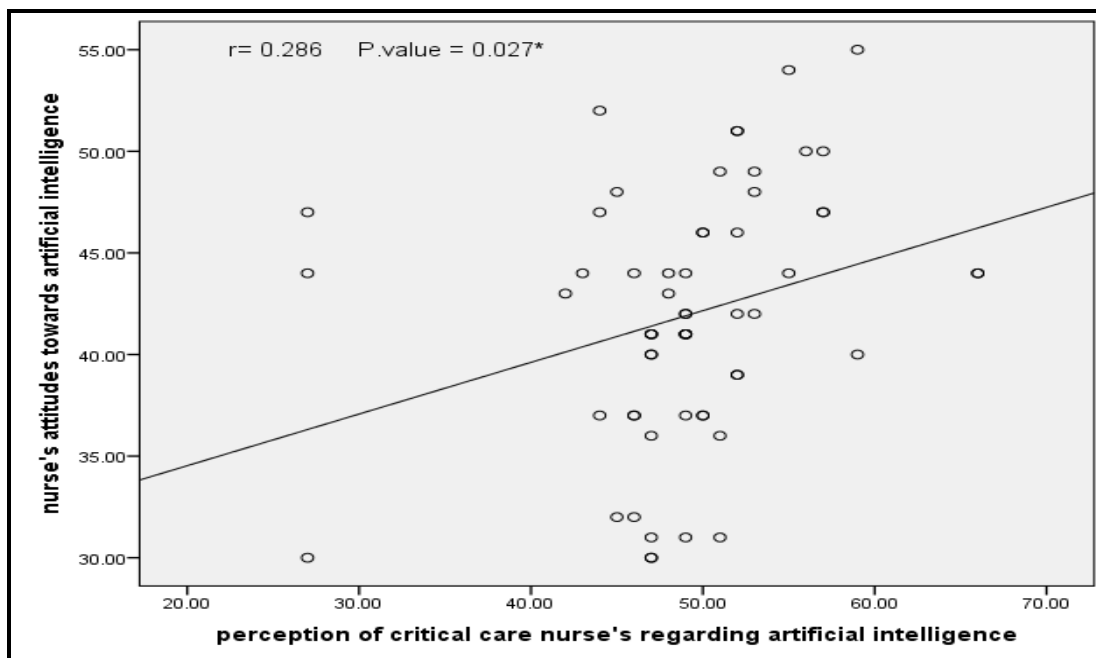


Figure (3): Correlation between of critical care nurses' perception and attitudes toward using AI in ICU.

Table (2): Relationship Between perception of critical care nurse's regarding artificial intelligence with Their Socio demographic data (n=60)

	perception of critical care nurse's regarding artificial intelligence						Chi square test	
	Low (n=3)		Moderate (n=50)		High (n=7)		X2	P. value
	No	%	No	%	No	%		
Hospital								
Assiut University hospital	3	100.0	33	66.0	4	57.1	1.80	0.407
Assiut General hospital	0	0.0	17	34.0	3	42.9		
Occupation								
Head Nurse	0	0.0	25	50.0	4	57.1	3.08	0.214
Staff Nurse	3	100.0	25	50.0	3	42.9		
Age group								
Less than 25 year	2	66.7	15	30.0	2	28.6	2.75	0.601
From 25-30 years	0	0.0	23	46.0	3	42.9		
More than 30 years	1	33.3	12	24.0	2	28.6		
Gender								
Male	1	33.3	4	8.0	1	14.3	2.18	0.336
Female	2	66.7	46	92.0	6	85.7		
Experience year								
Less than 5 years	2	66.7	26	52.0	3	42.9	2.58	0.631
From 5-10 years	1	33.3	19	38.0	2	28.6		
More than 10 years	0	0.0	5	10.0	2	28.6		
Education Level								
Bachelor	0	0.0	25	50.0	4	57.1	6.70	0.153
Nursing Diploma	0	0.0	1	2.0	1	14.3		
Technical institute	3	100.0	24	48.0	2	28.6		

*Significant level at P value < 0.05

**Significant level at P value < 0.01

Table (3): Relationship Between nurses' attitudes towards artificial intelligence with Their Socio demographic data (n=60) nurse's

	nurse's attitudes towards artificial intelligence				Chi square test	
	negative attitude (n=8)		positive attitude (n=52)		X2	P. value
	No	%	No	%		
Hospital						
Assiut University hospital	7	87.5	33	63.5	1.80	0.179
Assiut General hospital	1	12.5	19	36.5		
Occupation						
Head Nurse	4	50.0	25	48.1	0.01	0.919
Staff Nurse	4	50.0	27	51.9		
Age group						
Less than 25 year	2	25.0	17	32.7	0.22	0.894
From 25-30 years	4	50.0	22	42.3		
More than 30 years	2	25.0	13	25.0		
Gender						
Male	0	0.0	6	11.5	1.03	0.311
Female	8	100.0	46	88.5		
Experience year						
Less than 5 years	4	50.0	27	51.9	1.75	0.416
From 5-10 years	2	25.0	20	38.5		
More than 10 years	2	25.0	5	9.6		
Education Level						
Bachelor	4	50.0	25	48.1	0.32	0.853
Nursing Diploma	0	0.0	2	3.8		
Technical institute	4	50.0	25	48.1		

*Significant level at P value < 0.05

**Significant level at P value < 0.01

Table (1): It shows that females were 90.0% of the studied sample, 43.3% of studied sample aged from 25-30 years, 51.7% had less than 5 experience years, 51.7% were nurses, 48.3% had technical institute and 48.3% had bachelor's degree of nursing, 66.7% were from Assiut University hospital.

Figure (1): Demonstrates that 83.3% of critical care nurses had a moderate perception of AI use in ICU while, 11.7% of nurses their perception was high.

Figure (2): Shows that 86.7% of critical care nurses their attitude was positive toward using AI in ICU.

Figure (3): Demonstrates the strong positive association between critical care nurses' attitudes and perceptions of implementing AI in the ICU.

Table (2): Illustrates that there is no statistical significant relation between Personal characteristics of the studied sample and critical care nurses' perception toward using AI (P value < 0.05).

Table (3): Illustrates that there's no statistically significant relation among the tested samples' personal characteristics and critical care nurses' attitude toward using AI (P value < 0.05).

Discussion

Artificial intelligence is beneficial to healthcare facilities on many levels, from the individual to the organizational and sectoral for hospital administrators, to the level of medical personnel and patients, including physicians and nurses. By reducing the expense of clinical trials in terms of lost human hours during the development of new medications, artificial intelligence benefits the healthcare facility (Ali et al., 2023). Healthcare practitioners' perceptions will influence future societal applications of artificial intelligence in healthcare and are a critical aspect in deciding its effective deployment. (Vinueza et al., 2020)

As regard the results of the current study demonstrated that over three-quarters of the studied ICU nurses were female, over than half of studied sample were nurses, over than third of them were from 25 to 30 years old, more than half of nurses their years of experience were less than 10 years, and most of studied nurses had a bachelor's degree and technical institute. These results were in agreement with the study by Abdullah & Fakieh., (2020), who revealed the majority of healthcare workers were female. Most of the participants were nurses, with ages ranging from 20 to 40. In addition, a bachelor's degree was held by close to half of the sample. According to a study conducted by Khalaf et al., (2022), two thirds of the healthcare workers under study were female staff nurses, under 30 years old, with a diploma, and three quarters had less than ten years of experience. These results were consistent with that study.

As regard The results of this study about critical care nurse's perception regarding artificial intelligence presented that majority of nurses had moderate perception level toward using AI in ICU while only (5.0 %) had low perception level toward using AI in ICU. This result may be due to that artificial intelligence has become of great importance nowadays due to the tendency of the health sector to use it in its various fields and seeks to provide the necessary information on how to apply it.

This finding is in agreement with Möllmann et al., (2021) who reported that, the majority of subjects consider AI to be beneficial in the medical field. also, Krittanawong, (2018) mentioned that physicians predictable that AI useful in diagnoses and in preparation treatment by providing the latest clinically appropriate data and the growth of AI in healthcare will be pleasing for everyone in health care team. In addition, Funk et al., (2020) stated that in Singapore, about 72% believed that the growth of AI has mostly been a worthy mechanism for society and in Japan considers that AI has optimistic effect on society. In the same line Ahmed et al, (2022) found that, nearly two thirds of participants agreed that AI help health care provider in making daily to do list.

As regard the present study. Total nurses' attitudes toward using AI. The results illustrated more than two third of nurses had positive attitude toward AI while, only few of them had a negative attitude. the result of this study may be related to application of artificial intelligence in ICU leading to raise the level of health care, improve efficiency, reduce medical errors, give more chances for nurse to spend more time to give direct patient care and reduce workload. This result agreed with Vasiljeva et al., (2021) who discovered that almost half of the participants had a positive attitudes regarding AI. In addition, Mehdipour et al., (2019) discovered that the majority of nursing managers have a positive attitude toward the use of AI systems in the field of nursing.

As regard the present study. A greater significant positive connection between critical care nurses' perception and attitudes toward the use of AI in ICU. This result agreed with Elsayed & Sleem et al., (2021) That discovered a strong, positive association between nurse managers' perceptions and attitudes of the use of AI in nursing settings. These results might be connected to the recent Egyptian hospital trend of implementing AI in various work settings in response to Egypt's 2030 vision. In line with this vision, Egypt is integrating AI and technology into numerous areas of society. In the field of health, some of these sectors is essential.

As regard the present study, it demonstrates that there is no statistically significant connection between personal characteristics of studied sample and critical

care nurses' perception toward using AI in ICU. This result may be attributed to increase in awareness of new generations about the benefits from implementation of artificial intelligence in ICU to improve the quality of healthcare. This finding disagreement with **Khalaf et al., (2022)** who discovered a positive connection between the age and experience of healthcare personnel and their perceptions of AI applications. However, these results were agreed with **Elsayed & Sleem (2021)** who found that there was no statically significant positive connection between age and years of experience of nurse managers with nurse managers' perception toward the use of AI in health care.

Conclusion:

Considering the results of the study, it is possible to emphasize the following conclusions:

- In this study, the majority of critical care nurses showed a moderate degree of perception regarding artificial intelligence.
- Most of the critical care nurses' in this study had positive attitude toward usage of AI in ICU. However most of them had negative attitude that artificially intelligent can act better than human being.
- A greatly significant positive correlation between critical care nurses' perception and attitude toward the use of artificial intelligence in ICU were found.

Recommendations

- Performing a scientific researches concentrated on artificially intelligent in ICU at Egypt and to give different findings.
- Makers of Health policy must develop strategies that increase readiness of the institutions to apply AI, increase the abilities of nurses for appropriate use of AI through well trained.
- Preparing training programs for ICU nurses to inform them of the possible uses of AI.
- Preparing and distributing a brochure about the importance, barriers, and new trends including AI implementation in nursing.
- Reapply this research on a large sample size acquired from different geographical area in Egypt for generalization

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