



Artificial Intelligence Technology and its Relation to Staff Nurses' Professional Identity and Problem Solving Abilities

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ABSTRACT:

Background: Artificial intelligence technologies have the ability to advance nursing practice and make it possible for nurses to give their patients more individualized, evidence-based care through enhancing nurses' professional identity and supporting in solving the problems. **Aim:** This study aimed to assess artificial intelligence technology and its relation to staff nurses' professional identity and problem solving abilities **Research Design:** Descriptive correlational research design was used. **Setting:** Medical and Surgical units at Benha University Hospital. **Subjects:** Simple random sample of staff nurses (295) who are working in the previous study setting. **Tools:** Three main tools namely (I) Artificial Intelligence Technology Questionnaire, (II) Nurses' Professional Identity Questionnaire and (III) Problem Solving Abilities Questionnaire. **Results:** Nearly two-thirds (66.1%) of staff nurses had high level of perception toward artificial intelligence technology and less than three quarters (72.2%) of them had high perception level of professional identity while more than three fifth (63.8%) of them reported high level of problem-solving abilities. **Conclusion:** There was highly statistically significant correlation between staff nurses' perception toward artificial intelligence technology, professional identity and their problem solving abilities. **Recommendations:** Hospital administration should conduct workshops and training programs to increase nurses' knowledge about the benefits, challenges, and problems concerning implementation of artificial intelligence in health care settings, and head nurses should provide staff nurses with greater autonomy at work to foster their professional identity. Further study is recommended to identify barriers affecting utilization of artificial intelligence in health care settings.

Keywords: Artificial intelligence technology, Professional identity, Problem solving abilities, Staff nurses.

Introduction

Nowadays, The development of artificial intelligence (AI) and information technology are increasingly prevalent in different organizations and society sectors, one of these sectors is healthcare where, these technologies have the ability to make transformation on many aspects of patient care. In addition, AI will be used more and more in the health care as a result of the complexity and growth of data in these activities (**Abdullah & Fakieh, 2020**). The replication of cognitive abilities in humans is a common aspect of AI. From the health care perspective, AI is a "paradigm change in health care, propelled by

rising availability of health care data and quick progress of analytics techniques. The main categories of applications include diagnosis and treatment (**Davenport & Kalakota, 2019; Elsayed & Sleem, 2021**).

Artificial intelligence technology (AIT) is a branch of computer science designed to resemble health care team members intelligence with computer systems by achieving tasks or solving problems are used in health care also, automating various processes, including learning and decision-making (**Maddox et al., 2019**). There are three types of AIT in health care include machine learning; refers to set of statistical techniques for problem solving, the other is deep learning that refers to a type of machine learning approach and extension of neural networks, The last one is natural language processing that refers to confluence of AI and linguistics and involve

intelligent analysis of written language (**Dash et al., 2019**).

AI could be used in nursing information systems through monitoring client' information, helping to remember patient data, reporting forms, managing quality and minimizing hospitalization time, enhancing care efficacy and performing interventions in its correct time, cost-effective and time saving, and helping in documentation of patient information. However, there are many barriers facing AI systems application for nursing as elevated costs of the system, and the continuous updates (**Mehdipour, 2019**). Nursing managers play a very important role in advocating for the objective and the most efficient application of AI health solutions. To accomplish this role and duty, nurses with strong professional identity must be aware of the extensive spread of AI and the effect of development, deploying and evaluation of these technologies (**Risling & Low, 2019**).

Nurses' professional identity is a representation of oneself that is developed gradually over time as a person internalizes the traits, standards, and norms of the nursing profession. As a result, the person begins to think, act, and feel like a nurse. PI is the sense of self as a professional nurse that evolves overtime and is related to workplace group dynamics and how individuals distinguish between themselves and other professional groups (**Rasmussen et al., 2018**). Self-esteem and self-evaluation are results of professional identity, which is the particular opinion a nurse has of her work. According to psychological definitions and viewpoints, this

makes professional identity a key component of identity and of paramount importance (**Landis et al., 2020**).

The internalization of professional knowledge, skills, attitudes, values, and standards of ethics, as well as the subsequent integration of these traits into one's personal identity and behavior within nursing education and practice are what lead to the development of professional identity. A nurse with a strong sense of professional identity understands his or her position as completely fulfilling these in accordance with professional ideals and ethical standards (**Kabeel and Eisa, 2017**). There are many factors affecting professional identity development includes; educational preparation, critical thinking, clinical practice and perceptorship, personal characteristics, societal & environmental characteristics and public image (**Rani, Hussain Afzal, and Gillani, 2019**).

Moreover, professional identity has three main dimensions named professional image, self-responsibility and assertiveness according to these dimensions we can categorize professional identity (**Sun, Gao, Yang, Zang, and Wang, 2016**). The first dimension which is professional image refers to have the sensation of having the knowledge and responsibility necessary to perform nursing. It also denotes being conscious of one's own resources and restrictions.

The second dimension is self-responsibility which refers to the nurse's need to improve their capacity for self-care by awareness of their own patterns of self-care and selection of health-

promoting tactics. Because of this, nurses who deeply value and dedicate to themselves have higher self-esteem. The third dimension is assertiveness which refers to nurses being able to believe in their own abilities and self-belief, which is assumed to make nurses care about solving problems and contribute to increased levels of professional and personal empowerment (**Ehsani Farid, Peikari, & Golshiri, 2019**).

The way nurses view their work affects how they approach helping patients with their challenges. Additionally, the traits and skills of specific nurses can affect the standard of care and help them comprehend patients, find solutions to issues, and give holistic care, which is the ultimate objective of the nursing process (Kim & Sim, 2020). The capacity to come up with appropriate and efficient answers to problems that arise in daily life is referred to as problem solving. The problem-solving strategy enables a person or group to concentrate on something in order to gain a skill (**Altas, 2020**).

Problem solving ability is nurse's proficiency in quickly and accurately mediating the health problems a patient faces, even if it is the nurse's first patient. This is due to the fact that problem-solving skills can enhance one's critical and creative thinking, and they are a necessary talent to recognize and address patients' health issues in a challenging nursing setting. Additionally, it has been noted that the capacity to solve problems effectively influences a nurse's (**Seobuk-gu 2014 ; Kim & Sohn, 2019**).

Problem-solving abilities are connected to a number of other skills, including: analytical skills, innovative and creative thinking, a lateral mindset, adaptability and flexibility, level-headedness, initiative, resilience (in order to reevaluate when your first idea doesn't work), team working (if problem solving is a team effort) and influencing skills (to persuade coworkers, clients, and bosses to adopt your solutions (**McMahon, 2020**). There are three dimensions underlying the problem-solving abilities based on **Heppner, 1988 and Fayed (1999)**. These dimensions include (a) self-efficacy in one's capacity for problem-solving (Problem-Solving Confidence), (b) a tendency to approach or avoid challenging situations or problems (Approach Avoidance Style), and (c) a person's confidence in his or her capacity to control emotions and behaviors while solving problems (Personal Control) (**Hassan, El Sayed, El-Sherbini, 2020**).

Since hospital condition is constantly unpredictable and emergency site, nurse's problem solving ability is crucial function in order to identify patient's needs and to solve patient's health problem. In this respect, massive amounts of patient data can be stored using artificial technology solutions, but proper use of this data is required to raise the standard of care and improve decision-making. and problem solving abilities, and reduce costs(**Lovis,2019; van Hartskamp et al., 2019**).

Significance of the study

To achieve a competitive advantage in the labor market, there is a need to radical change to digitalize healthcare sectors. From this point, artificial intelligence has succeeded to grasp the attention of key healthcare top managers and providers who are currently experiencing a dilemma of whether or not to fully or partially integrate it into their work (**Erguzel & Ozekes, 2019; Elsayed & Sleem, 2021**). The advancement of artificial intelligence technology to additional adoption and value across healthcare is perpetuated by cost, quality, care outcomes, helps to analyze large amounts of data efficiently. However, few studies have investigated employee perceptions of artificial intelligence technology (**Shaik, 2020**).

Moreover, artificial intelligence technology assists in proactive patient care, lowered risk in the future, and streamlined operations. Thus, incorporating artificial intelligence technology into the nursing workflow facilitates clinical decision making and problem-solving abilities for nurses to create nursing care plans that are more seamless and personalized, shorten the time required for documentation, while boosting accuracy and completeness (**Joseph et al., 2020**). In this respect, nurses need to have adequate professional knowledge and skills regarding artificial intelligence technology to develop their professional identity. So, this study was conducted to assess the relation between artificial intelligence technology, professional identity and problem solving abilities among staff nurses.

Aim of the Study

The present study aimed to assess artificial intelligence technology and its relation to nurses' professional identity and problem solving abilities

Research questions:

1. What are the staff nurses' levels of perception about artificial intelligence technology?
2. What are the staff nurses' levels of perception toward professional identity?
3. What are the levels of problem solving abilities as reported by the staff nurses?
4. Is there a relation between artificial intelligence technology professional identity and problem solving abilities among staff nurses?

3. Subjects and Methods

Research Design:

A descriptive correlational design was utilized to accomplish the aim of the present study.

Setting:

The current study was carried out in medical and surgical units at Benha University Hospital.

1) Medical units: Distributed as the following: General medical units, Hepatic unit, Cardiac unit, Thoracic unit, pediatric units, Psychiatric unit, Dermatological unit, Rheumatology unit and Cardio thoracic unit.

2) Surgical units: Distributed as the following: Female surgical unit, Male surgical unit, Urology unit, ENT unit, Operations, Neurology unit Orthopedic and Obstetrics and Gynecology units.

Subjects:

Included a simple random sample of staff nurses with at least three years of experience who are working in the study setting described above and sample was calculated using the following equation (Tejda & Punzalan, 2012).

$$n = \frac{N}{1 + N(e)^2}$$

(n) is sample size

(N) is total sample of staff nurses.

(E) is coefficient factor = 0.05

The total number of staff nurses in the Medical and Surgical units at Benha University Hospital are (1688) staff nurses during the period of data collection. The total number of staff nurses in the Medical and Surgical units at Benha University Hospital with at least three year of experience is (1117) so a random sample is (295) according to the pre mentioned equation and distributed as the following; Medical units (158) and Surgical units (137).

Tools of data collection:

Three tools were used for data collection as follows:

First tool: Artificial Intelligence Technology Questionnaire:

A Structured questionnaire developed by researchers after reviewing the related literature (Oh, et al., 2019 ; Abdullah& Fakiehan, 2020; Kumari & Hemalatha, 2021). It was used to assess perception of staff nurses toward artificial intelligence technology. It consisted of two parts:

Part (1); it included personal data about staff nurses as age, gender, marital status, work department, educational qualification, years of experience and working in private hospitals working with artificial intelligence technology.

Part (2): It consisted of 34 items separated into the following five dimensions:

Dimensions	Number of items	Example
1-Concept of artificial intelligence technology	11	I have a good knowledge of how using AI technology in the health field.
2-Advantages of using artificial intelligence technology	8	AI technology can help expedite the nursing and medical care process.
3-Economic expectation with using artificial intelligence technology in the work	2	The use of AI technology will reduce financial costs to patients.
4-Performance expectancy with using artificial intelligence technology in the work	8	The use of AI technology on my job could improve the delivery of direct patient care.
5-Barriers for artificial intelligence technology application in nursing care	5	AI technology is not flexible enough to be applied to every patient.
Total	34	

Scoring system:

Subjects' responses were scored on a three point Likert Scale as the following: (3) for agree, (2) for neutral and (1) for disagree. The score of items was summed-up and converted into percent scores and the total divided by the number of the items, giving the mean score. The perception level of staff nurses was considered low: if the percentage < 60% (< 67 points), moderate if percentage 60 - < 75 % (64-82 points) and high if percentage ≥ 75 % (≥ 83 points).

Second tool: Nurses' Professional Identity

Questionnaire:

It was developed by **Kabeel (2010)** and was adapted by the researchers (modifying some words in some statements in order to properly interpret the sentence which did not understood clearly). It was used to assess staff nurses' perception levels toward professional identity and consisted of 37 items divided under three dimensions as following:

Dimensions	Number of items	Example
Professional image	20	I am proud of being in nursing career.
Assertiveness	13	I am concerned to be a good model in front of colleagues
Self-responsibility	4	I respect nursing career that makes me concern with my work uniform.
Total	37	

Scoring system:

Subjects' responses were measured on a three point Likert Scale as the following (3) for agree, (2) for neutral and (1) for disagree. The score of items was summed-up and converted into percent scores and the total divided by the number of the items, giving the mean score. The level of organizational innovativeness was considered low: if the percentage: if the score < 60 % (< 61 points) and considered moderate if percentage 60 - < 75 % (61-76 points) and high if percentage $\geq 75\%$ (≥ 77 points).

Third tool: Problem Solving Abilities

Questionnaire:

This tool was developed by **Fayed (1999)** based on **Heppner (1988)** and used by the researchers. It aimed

at assessing problem solving abilities as reported by the staff nurses and included 27 items grouped into three domains as following:

Domains	No. of items	Example
Problem-solving confidence	9	I frequently come up with original solutions that work to fix problems.
Approach avoidance style	14	When a solution to a problem was unsuccessful, I don't look into why it didn't work.
Personal control	4	When my initial attempts to tackle a problem fail, I start to doubt my ability to control the circumstance.
Total		27

Scoring system:

Subjects' responses were measured on a three point Likert Scale as the following (3) for agree, (2) for neutral and (1) for disagree. The score of items was summed-up and converted into percent scores and the total divided by the number of the items, giving the mean score. The level of problem solving abilities was considered low: if the percentage: if the score < 60 % (< 49 points) and considered moderate if percentage 60 - < 75 (49-60 points) and high if percentage $\geq 75\%$ (≥ 61 points).

Procedures

Preparatory phase:

Reviewing the national and international related literature using journals, periodicals, textbooks, internet and theoretical knowledge of the various

aspects concerning the topic of the study for developing the tools and translating the tools into Arabic language.

Tools validity and reliability: The three tools' contents were adapted and tested for their content validity by juries of five experts in nursing administration .Based on their recommendations, the necessary modifications were made. Also, the reliability of the tools was measured by Cronbach's Alpha test. The internal consistency of the artificial intelligence technology questionnaire was $\alpha = 0.91$, nurses' professional identity questionnaire was $\alpha = 0.89$, and problem solving abilities questionnaire was $\alpha = 0.86$.

Administrative Approval:

Official letter from the Faculty of Nursing before the study began was sent to director of Benha University Hospital after explaining the aim of the study.

Ethical considerations: Prior to the conduction of the study, ethical approval was obtained from the Scientific Research and Ethics Committee at Benha University Hospital. All participants were interviewed to explain the purposes and procedures of the study and they had the right to withdraw from the study at any time. Besides, the anonymity and confidentiality of the subjects were considered through the coding of all data. The staff nurses gave verbal consent to participate by filling out the questionnaire.

Pilot Study:

A pilot study was conducted in November 2021 to ensure the study tools' clarity and applicability. It was held on 34 staff nurses who

represented 10% of total studied subjects. Additionally, it was used to determine the time needed for filling the three tools. The average time spent filling out the questionnaires was between 25 and 30 minutes. No modifications were done during the pilot study, so the pilot study was included in the main sample.

Field of work: The actual field work was conducted at December 2021 to February 2022. The researchers gathered data by their own through interviewing staff nurses and explaining the study's aim to them. The data was collected from staff nurses before and after work hours based on their availability for two days each week. The number of staff nurses interviewed daily ranged from 20 to 30. The completed forms were gathered on time and double-checked for accuracy to ensure that no data was missing.

Statistical Design:

The collected data were revised, coded, tabulated and verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 25.0) was used. Descriptive statistics were applied in the form of mean and standard deviation for quantitative variables and frequency & percentages for qualitative variables. Test of significance, correlation coefficient (r) was used. A significant level value was considered when $p < 0.05$ and a highly significant level value was considered when $p < 0.001$. No statistical significance difference was considered when $p > 0.05$.

Results:

Table (1): Illustrates that more than three fifth (61.0%) of staff nurses were working at medical department. As regarding to their age more than two fifth (42.0) of staff nurses had age ranged between 25 :< 30 years old with mean age 28.63 ± 7.21 years. While, the majority (92.2%, 89.5%) of them were females and married respectively. In relation to their educational qualification, more than one third (35.2%) of staff nurses had associated degree of nursing. As far as their years of experience slightly less than two fifth (39.7%) of staff nurses had 5:< 10 years of experience with mean 9.64 ± 8.11 years and the majority of them (92.6 %) didn't work in private hospitals applying artificial intelligence technology

Figure (1): clarifies that nearly two-thirds (66.1%) of staff nurses had high perception level toward artificial intelligence technology, whenever, one-third (33.3%) of them had moderate perception level.

Table (2): Shows that the highest mean percent (86.4%) with the first ranking was related to conception of artificial intelligence technology, while the lowest mean percent (80.7%) with the last ranking was related to barriers for artificial intelligence technology application in nursing care.

Figure (2): Demonstrates that the less than three quarters (72.2%) of studied staff nurses had high perception level of professional identity, whenever, more than one quarter (27.8%) of them had moderate perception level.

Table (2): Illustrates that the highest mean percent (86.5%) with the first ranking was related to self-

responsibility, while the lowest mean percent (83.0%) with the last ranking was related to professional image.

Figure (3): Clarifies that more than three fifth (63.8%) of studied staff nurses had high level of problem-solving abilities, while, the lowest percent (4.7%) of them had low level.

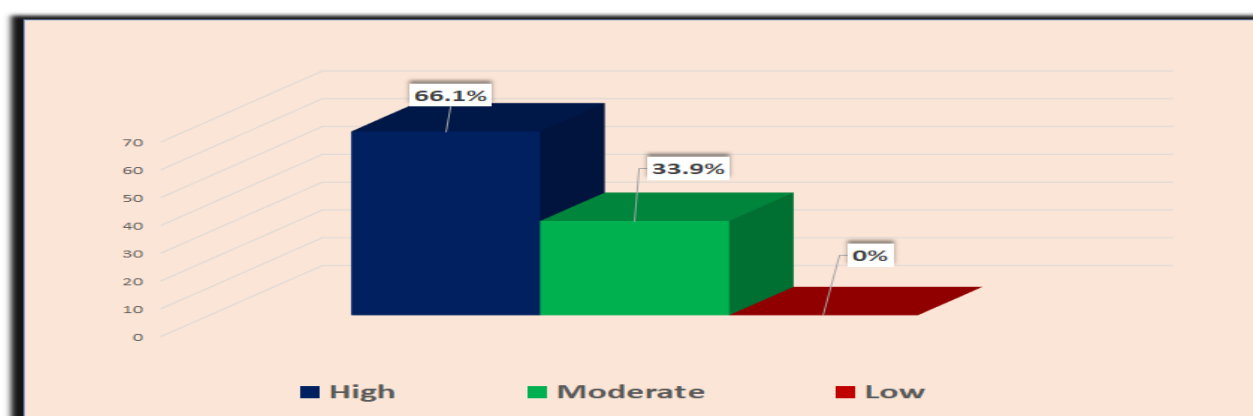
Table (4): Illustrates that the highest mean percent (81.7%) with the first ranking was related to problem-solving confidence, while the lowest mean percent (80.0%) with the last ranking was related to personal control.

Table (5): Indicates that there was highly Statistically significant correlation between staff nurses' perception toward artificial intelligence technology, professional identity and their problem solving abilities.

Table (6): Indicates that there was highly statistically significant correlation between dimensions of artificial intelligence technology and dimensions of professional identity and problem solving abilities among staff nurses.

Table (1): Distribution of the studied staff nurses regarding their personal data (n=295)

Personal data	No.	%
Department		
Medical	180	61.0
surgical	115	39.0
Age (years)		
< 25	47	15.9
25:< 30	124	42.0
30:< 35	63	21.4
≥ 35	61	20.7
M±SD	28.63±7.21	
Gender		
Female	272	92.2
Male	23	7.8
Marital status		
Married	264	89.5
Unmarried	31	10.5
Educational qualification		
Nursing diploma	100	33.9
Associated degree of nursing	104	35.2
Bachelor of nursing science	67	22.7
Others	24	8.2
Years of experience in working units		
< 5	67	22.7
5:< 10	117	39.7
10:< 15	32	10.8
≥ 15	79	26.8
M±SD	9.64±8.11	
Working in private hospitals working with artificial intelligence technology		
Yes	22	7.4
No	273	92.6



M=mean

SD= standard deviation

Figure (1): Total staff nurses' perception levels toward artificial intelligence technology.

Table (2): Ranking with mean scores of staff nurses' perception toward artificial intelligence technology dimensions (n=295).

Artificial intelligence technology dimensions.	Max score	staff nurses (n= 295)			
		Range	Mean \pm SD	Mean %	Ranking
Concept of artificial intelligence technology.	33	22	28.50 \pm 6.06	86.4	1
Advantages of using artificial intelligence technology.	24	12	19.83 \pm 3.61	82.6	3
Economic expectation with using artificial intelligence technology in the work.	6	4	4.89 \pm 1.09	81.5	4
Performance expectancy with using artificial intelligence technology in the work.	24	12	20.18 \pm 3.81	84.0	2
Barriers for artificial intelligence technology application in nursing care.	15	5	12.10 \pm 2.16	80.7	5
Total	102	37	85.50\pm11.79		

X = Mean SD= Standard deviation

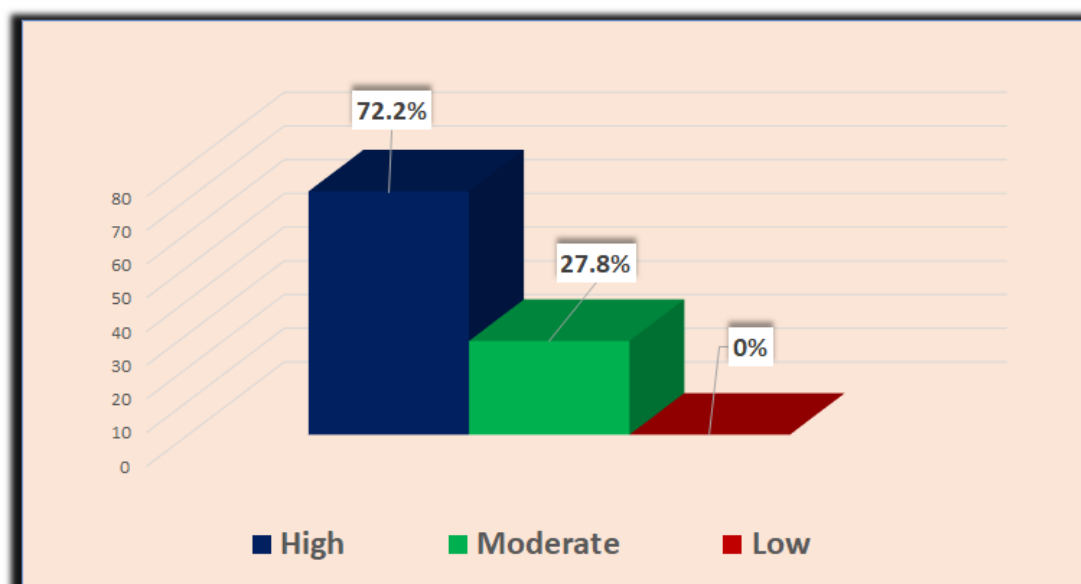


Figure (2): Total levels of staff nurses' perception of professional identity.

Table (3): Ranking with mean scores of professional identity dimensions as perceived by staff nurses (n=295)

Professional identity dimensions	Maximum scores	Staff nurses (n= 295)			
		Range	M±SD	Mean%	Ranking
Professional image	60.00	35.00	49.83±9.43	83.0	3
Assertiveness	39.00	16.00	32.97±4.92	84.5	2
Self-responsibility	12.00	4.00	10.38±1.77	86.5	1
Total	111.00	40.00	93.18±12.49		

Table (4): Ranking with mean scores of problem solving abilities dimensions among staff nurses (n=295)

Problem solving abilities dimensions	Maximum scores	Staff nurses (n= 295)			
		Range	M±SD	Mean%	Ranking
Problem-solving confidence	27.00	17.00	22.05±4.29	81.7	1
Approach avoidance style	42.00	18.00	34.16±5.57	81.3	2
Personal control	12.00	8.00	9.60±2.69	80.0	3
Total	81.00	35.00	65.81±9.98		

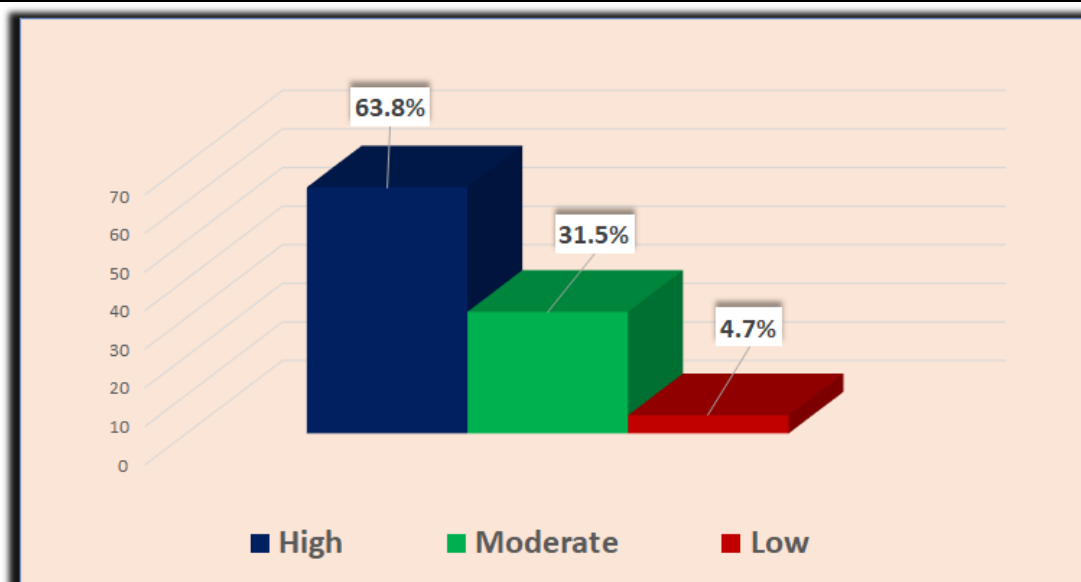


Figure (3): Total levels of problem-solving abilities as reported by staff nurses.

Table (5): Correlation matrix among overall score of artificial intelligence technology, professional identity and problem solving abilities among staff nurses (n=295).

Variables	Artificial intelligence technology		Professional identity		problem solving abilities	
	r	P- value	r	P -value	r	P- value
Artificial intelligence technology	-	-	0.866**	0.000	0.901**	0.000
Professional identity	0.866**	0.000	-	-	0.813**	0.000
Problem solving abilities	0.901**	0.000	0.813**	0.000	-	-

** Highly statistical significance (p<0.001)

Table (6): Correlation matrix between levels of artificial intelligence dimensions scores and professional identity and problem-solving abilities dimensions scores among staff nurses (n=295).

Artificial intelligence dimensions	Spearman's rank correlation coefficient						
	Professional identity dimensions			problem-solving abilities dimension			
	Professional image	Assertiveness	Self-responsibility	Problem-solving confidence	Approach avoidance style	Personal control	
Concept toward artificial intelligence technology.	r	0.953**	0.250**	0.263**	0.826**	0.817**	0.214**
	P- value	0.000	0.000	0.000	0.000	0.000	0.000
Advantages of using artificial intelligence technology.	r	0.923**	0.343**	0.336**	0.779**	0.869**	0.183**
	P- value	0.000	0.000	0.000	0.000	0.000	0.002
Economic expectation with using artificial intelligence technology in the work.	r	0.288**	0.541**	0.310**	0.208**	0.429**	0.208**
	P- value	0.000	0.000	0.000	0.000	0.000	0.000
Performance expectancy with using artificial intelligence technology in the work.	r	0.162**	0.890**	0.303**	0.222**	0.168**	0.960**
	P- value	0.005	0.000	0.000	0.000	0.004	0.000
Barriers for artificial intelligence technology application in nursing care.	r	0.842**	0.279**	0.442**	0.279**	0.312**	0.863**
	P- value	.000	.000	.000	.000	.000	.000

** Highly statistical significance ($p < 0.001$)

Discussion

Artificial intelligence comprises many healthcare technologies transforming nurses' roles and enhancing patient care. AI technology is beginning to work with nursing to quickly synthesize information, finish tasks, help with clinical problem-solving and decision-making, and enhance patient outcomes. Each of these new technologies has a great potential to advance healthcare on its own. Combining these approaches and educating nurses the best ways to work with technology will have an impact on their

professional identities and create limitless opportunities for future improvements in productivity, capacity, quality, and healthcare (Ronquillo, 2021).

The current study was designed to assess the relation between artificial intelligence technology, professional identity and problem solving abilities among staff nurses.

Concerning the personal characteristics of studied nurses, the findings of the present study revealed that more than three fifth of staff nurses were working at medical department. As regarding

to their age more than two fifth of staff nurses had age ranged between 25 to less than 30 years old. While, the majority of them were females and married respectively. Concerning to their educational qualification, more than one third of staff nurses had associated degree of nursing. As far as their years of experience slightly less than two fifth of staff nurses had 5 to less than 10 years of experience and the majority of them didn't work in private hospitals applying artificial intelligence technology.

In contexts of staff nurses' perception levels toward artificial intelligence technology, the present study findings indicated that nearly two-thirds of staff nurses had high perception level toward artificial intelligence technology, while, slightly more than one-third of them had moderate level of perception. This may be due to the widespread of artificial intelligence technology applications into every aspect of society in response to Egypt's Vision 2030 which focus on using artificial intelligence in a variety of working settings including health care sector.

This study finding was supported by **Gherheş (2018)** who conducted a study entitled “Artificial Intelligence: Perception, expectations, hopes and benefits” and reported that There were positive perceptions about the emergence and development of artificial intelligence entities/devices, the advantages it could bring in the future by creating advanced robots, surpassing human intelligence, allowing humans to control intelligent weapons, the emergence of new trades,

the improvement of healthcare and human health, and the optimization of material resources.

In the same line, **Kumari & Hemalatha (2021)** held a study about “Perception towards Artificial Intelligence in Human Resources Management Practices-With Reference to IT Companies in Chennai” and demonstrated that employees don't view AI systems as a treat for them, and they have a very good image of the technology.

On the other hand, this study finding was in disagreement with **Elsayed & Sleem (2021)** who reported that the more than three-quarters of studied sample had moderate perception towards using AI in nursing setting. While the minority of them had high perception. Also, **Abdullah & Fakieh (2020)** who conducted a study entitled “Health Care Employees' Perceptions of the Use of Artificial Intelligence Applications: Survey Study” mentioned in his study that the overall perception of health care employees toward AI was moderate. Additionally, the majority of respondents were uninformed about the benefits and most frequent obstacles associated with using artificial intelligence in the health sector, indicating a need for training.

Moreover, **Castagno, & Khalifa (2020)** in their study about “Perceptions of Artificial Intelligence among Healthcare Staff: A Qualitative Survey Study” reported that the majority of respondents have never encountered AI applications in the workplace and were unaware of

the differences between machine learning and deep learning. They confirmed that AI to be successfully incorporated into clinical practice, the support of healthcare professionals is essential. This highlights the necessity of clear regulatory frameworks and improved education.

Regarding mean scores of staff nurses' perception toward artificial intelligence technology, the findings of the present study indicated that the highest mean percent with the first ranking was related to (concept) of artificial intelligence technology. This may be due to the staff nurses use artificial intelligent technology in their daily life in the form of smart phones and other devices and they became aware of the concept and importance of using AI in nursing settings, especially at the present time, after the existence of covid 19 pandemic. While the lowest mean percent with the last ranking was related to barriers for artificial intelligence technology application in nursing care. From the researchers' point of view, nurses consider AI technology is flexible enough to be used to every patient. Because this technology was developed by specialists with clinical experience in nursing practice.

This result was inconsistent with **Elsayed & Sleem (2021)** who found that perception of advantages toward using artificial intelligence achieved the highest mean score followed by the problems concerning artificial intelligence application in healthcare among nurse managers. While, **Abdullah & Fakieh (2020)** reported that the highest score was regarding problems

concerning artificial intelligence application in healthcare followed by advantage toward using artificial intelligence among health care employees.

Regarding **levels of professional identity as perceived by staff nurses**, the findings of the present study illustrated that less than three quarters of studied staff nurses had high level of perception toward professional identity, whenever, more than one quarter (27.8%) of them had moderate perception level. This may be due to nurses feel proud of being in nursing career consider themselves as part of health team and they feel that they are responsible for improving quality of nursing.

This finding was supported by **Philippa et al., (2021)** who held a study about " Professional identity in nursing: A mixed method research study" and found that the results provide a deeper understanding about professional identity and the work that nurses perform.

This result was in agreement with **Caza and Creary, (2016)** who conducted a study named; "The construction of professional identity" and found that nearly half of staff nurses had high perception level about professional identity, more than one third had moderate level. While, the lowest number of the studied nurses had low perception level regarding nurses' professional identity. Also, **Khazal (2020)** held a study about "Nurses' Perception toward Professional Identity and its Effect on Quality of Nursing Care" showed that, three quarters of staff nurses had high

perception level while, the lowest percentage of them had low perception level regarding total professional identity.

Concerning mean scores of professional identity dimensions as perceived by staff nurses, the current study arrayed that the highest mean percent with the first ranking was related to self-responsibility. This may be due to nurses respect nursing career that makes them feel of responsibility through working efficiently, making respectable relations with colleagues, patients, doctors and workers at hospital and gaining experience from ex-colleagues. In addition the findings of this study showed that the lowest mean percent with the last ranking was related to professional image. This may be due to people impression about nursing and they didn't have the opportunity to express their opinions freely. Also, workload hinder nurses participation in medical and nursing conferences or training program

This result was in agreement with **Khazal (2020)** who reported that the highest mean score of nurses' perception toward professional identity was self-responsibility but the lowest mean percent with the last ranking was related to assertiveness. While, **Kabeel and Eisa, (2017)** whose study was about "Relationship between job satisfaction and professional identity among psychiatric nurses " reported that assertiveness obtained the highest mean score, whereas self-responsibility showed the lowest mean score.

With regard to levels of problem-solving abilities as reported by staff nurses, the results of

the present study revealed that more than three fifth of studied staff nurses had high level of problem-solving abilities, while, the lowest percent of them had low level. From the researchers' point of view, nurses acquired the ability to solve most problems through their work with patient who need their help and care in different situations resulting in thinking up creative and developing effective alternatives to solve a problem.

This study finding was matched with **El-Demerdash et al.(2021)** who held a study about " Problem solving skills and clinical decision making among nursing interns " and revealed that more than half of the participants had a sufficient level of problem-solving skills. Also, These results were similar to the results of in a study conducted by **Durmaz et al.(2018)** entitled " Determination of Problem-Solving and Communication Skills of Nursing/Midwifery Students" where most of participants scored satisfactory level of problem-solving.

In contrary, **Elsayed et al.(2020)** held a study entitled " The Critical Thinking Dispositions and Problem Solving Abilities among Nurse Management in Port-Said Hospitals " and found that the majority of nurse managers had a poor attitude toward critical thinking and had difficulty solving problems, so it was suggested that training programs be held to improve nursing manager critical thinking attitude and problem-solving skills. Also, **Altas (2020)** conducted a study about "The Relationship between Critical Thinking Disposition and Problem Solving Skills in Nurses" and found that Critical thinking disposition of

nurses were low level and their problem solving skills were moderate level.

Regarding mean scores of problem solving abilities dimensions among staff nurses, the results showed that the highest mean percent with the first ranking was related to problem-solving confidence. This may be due to nurses have the capacity to solve many problems even though initially no solution is immediately apparent and this is acquired from their work experience which give them confidence to make plans to solve a problem and take decisions effectively. While the lowest mean percent with the last ranking was related to personal control. This may be due to some nurses become fear of failure so they ignore problem and refuse to address it; they are unsure of their capacity to handle these issues resulting in weak personal control.

This result was in agreement with **Kim and Chio, (2014)** who studied "the relationship between problem solving ability, professional self-concept and critical thinking disposition of nursing students" found that the participants perceived they had middle level problem solving ability. In the subscale of problem solving, problem solving confidence was the highest subscale and personal control was the lowest subscale. Also, **Elsayed et al. (2020)** reported that nurse teachers had high level of problem solving confidence.

Concerning correlation among staff nurses' perception toward artificial intelligence technology, professional identity and their problem solving abilities, the current study findings

indicates that there was highly statistically significant correlation between staff nurses' perception toward artificial intelligence technology, professional identity and their problem solving abilities. In addition, there was highly statistically significant correlation between dimensions of artificial intelligence technology, and dimensions of professional identity and problem solving abilities among staff nurses.

In this regard, **Trunk et al. (2020)** in their study about " the current state of combining human and artificial intelligence for strategic organizational decision making" confirmed that AI techniques are increasingly extending and enriching decision support and problem solving through such means as organizing data delivery, analyzing data trends, providing forecasts, developing data consistency, measuring uncertainty, anticipating the user's data needs, providing information to the user in the most appropriate forms, and recommending a plan of action.

Moreover, **Douthit et al. (2020)** who conducted a study entitled" How artificial intelligence is transforming the future of nursing" reported that through the application of AI, nurses may now collect data on a completely new level. By recognizing trends or patterns in the data that regular humans frequently miss, AI computer algorithms may now review data to give more precise answers to inquiries and make predictions about patient outcomes. Patients' illnesses and symptoms can be more accurately identified and diagnosed by expert AI-powered systems that are

utilized to uncover anomalies and address difficulties. Therefore, AI technology can enhance nurses' capacities and help them operate more efficiently, and this is a crucial aspect of developing their professional identities as working nurses.

Conclusion

About two-thirds of staff nurses had high perception level toward artificial intelligence technology and the majority of them perceived high levels of professional identity, while the majority of them reported high level of problem-solving abilities. Moreover there was a highly statistically significant correlation between staff nurses' perception toward artificial intelligence technology, professional identity and their problem solving abilities. Otherwise, there was highly statistically significant correlation between dimensions of artificial intelligence technology, and dimensions of professional identity and problem solving abilities among staff nurses.

Recommendations:

Based on the findings of the current study, the researchers suggested the following recommendations:

- Hospital administration should conduct workshop and training programs to increase nurses' knowledge about the benefits, challenges, and problems concerning implementation of artificial intelligence in health care settings.

- Head nurses should provide the opportunity for nurses' to participate in nursing conferences or training programs to improve their professional image.
- Periodic meeting of staff nurses with the nursing director and encourage them express their opinions freely to develop professional identity.
- Head nurses should provide staff nurses with greater autonomy at work to foster their professional identity.
- Nurse Managers should pay attention to the needs of nurses for recognition, encouragement, appreciation and professional development that help them in solving facing problems.
- In-service training should be organized to foster problem solving skills of nurses in the clinical environment.
- Further study is recommended to identify barriers affecting utilization of artificial intelligence in health care settings.

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