

KNOWLEDGE, ATTITUDE AND PRACTICE OF ICU NURSES REGARDING POST-EXTUBATION DYSPHAGIA IN TRACHEAL INTUBATION PATIENTS

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Abstract

Background: Artificial intelligence (AI) is increasingly being integrated into healthcare, nursing education, clinical decision-making, patient monitoring, documentation, and research. Nursing students require adequate knowledge and positive attitudes to use AI safely, ethically, and effectively in future practice.

Aim: To assess the knowledge and attitude of undergraduate nursing students regarding artificial intelligence.

Methods: A descriptive cross-sectional research design was used among 218 undergraduate nursing students at the College of Nursing, Superior University, Lahore. Participants were selected from an accessible population of 500 students using a probability sampling technique. Data were collected through a structured questionnaire assessing demographic characteristics, knowledge, and attitudes regarding AI. Data were analyzed using SPSS Version 27. Frequencies, percentages, means, and standard deviations were calculated, while inferential tests were used to examine associations. Statistical significance was set at $p < .05$.

Results: Most participants (72.0%) reported previous exposure to AI. Regarding knowledge, 47.2% demonstrated moderate knowledge, 26.1% demonstrated good knowledge, and 26.6% demonstrated poor knowledge. More than half of the participants (54.1%) had a positive attitude toward AI, while 28.0% had a neutral and 17.9% had a negative attitude. Previous AI exposure, training, and use were significantly associated with knowledge and attitude.

Conclusion: Nursing students demonstrated predominantly moderate knowledge and generally positive attitudes toward AI. Structured AI education and training are recommended to strengthen AI literacy, ethical understanding, critical evaluation, and responsible use among future nurses.

Introduction

Depression is a major public health concern and an important mental health problem that affects people throughout their lives. According to the World Health Organization (WHO), there are about 332 million people worldwide with

depression, and depressive disorders occur in approximately 5.7% of adults worldwide (WHO, 2025). While depression can include all parts of the sadness spectrum that a person might experience, the disorder extends beyond sadness and emotional reactivity. It can also include a loss

of interest and difficulty concentrating effort, and it can include cognitive and physical and functional disturbances. Depression can result in impacts like diminished quality and range of life experiences and increased risk of suicide. Depression can also lead someone to experience reduced interpersonal functioning and impairment in occupational and academic functioning. Depression is also treatable through psychotherapy or medication (or a combination of the two). However, there is a huge inequality in access to care (WHO, 2025). This relative inequality reflects that the main problem is not just the existence of depression, but also the capacity of health systems to identify, manage, and support individuals with the disorder. The WHO further reports that more than three-quarters of people with mental disorders in many low- and middle-income countries receive no treatment, further demonstrating the global mental health treatment gap (WHO, 2023). Therefore, the need for enhanced skills in depression identification and referral, psychosocial support, and the provision of quality care cannot be overstated. Artificial intelligence (AI) is rapidly changing the way health care and various other sectors operate. AI systems can autonomously perform cognitive tasks, such as learning, interpreting, and decision making. AI systems can overcome many of the burdens affecting the health care workforce. With AI, health care professionals can spend their time adding value to patient care instead of performing mental health care related tasks. AI can be used to aid health care professionals with patient care, perform data analysis, make evidence based decisions, and provide care based on a wealth of available evidence and data. The World Health Organization (WHO) appreciates the significant impacts AI will have on health care; however, the AI technology is still in its infancy and WHO outlines the need for ethical oversight and governance to protect patients' privacy and ensure the AI systems are safe, effective, and accountable (World Health Organization [WHO], 2021).

The implications of AI will be far reaching for nursing. Nursing personnel assess patients, decide on a plan of care, communicate with patients, help patients learn, and follow up with patients to

determine how they have fared. AI technology will provide nursing personnel with tools to analyze data, identify critical conditions of patients, facilitate the decision making process, simplify documentation, and aid them in managing a large volume of data. AI should be used in a supporting capacity for current nursing practice, as professional nursing judgment is an important aspect in patient care (WHO, 2021).

The development of AI means that future nurses must develop AI literacy. This includes understanding the AI concepts. This also means recognizing the benefits and the limitations of AI, its applications, its ethical implications, and how and when to use it appropriately. When referring to nursing students, AI literacy may involve recognizing an AI system, understanding the various levels and types of an AI system involved in diagnostic and clinical decision support, being aware of monitoring systems that may provide therapeutic and/or rehabilitative support as well as systems that assist in patient management, understanding the AI systems that may be used to support the delivery of nursing care, and understanding how AI systems may facilitate nursing education and practice. Nursing students must possess this level of understanding because they will likely encounter AI-based systems during their educational and professional careers. The recent evidence indicates that AI literacy, readiness, and attitude are the three elements of nursing students' preparedness for the digital transformation of nursing. (Boztepe et al., 2025).

AI systems will affect the practice of nursing, and for this reason, studying AI systems will provide nursing students with a greater understanding of the clinical applications of the various AI systems, and where the limitations of these systems may exist. Appropriate AI systems may assist nursing students in managing their clinical uncertainties. Insufficient knowledge of AI systems may lead nursing students to the wrong assumptions and create apprehension in the use of AI systems. A recent review of the literature on the knowledge and attitudes of nursing and health sciences students toward AI reaffirms the importance of the introduction of specific AI-related competencies during nursing and health science

education, as these competencies will integrate AI into nursing education and practice. (Alqaissi & Qtait, 2025).

Another element of students' AI integration preparation is attitude. Attitude describes an individual's perception, belief, acceptance, concerns, and readiness toward a concept or technology. In regard to AI, nursing students may likely hold positive attitudes. They may view AI as helping to improve efficiency, assist with clinical decision making, aid with the learning process, and enhance patient care. There are, however, legitimate concerns regarding the complicated nature of AI, AI errors, patient safety, loss of privacy, decreased human interaction, diminished professional accountability, and the possibility that AI may perform nursing-related work. Identifying attitudes may be essential in anticipation of adoption and appropriate use of AI technology within nursing practice, as attitudes likely impact readiness to engage with AI technology.

Attitude toward AI is a developing research focus in nursing education. Lukić et al. (2023) studied first-year nursing students' attitudes toward AI and how AI and similar technologies have begun to fundamentally affect the various components of nursing care. Similarly, Labrague et al. (2023) examined student nurses' attitudes and perceived use, together with their adoption intentions for AI technology in nursing practice, showing that students' perceptions of AI technology may be a critical determinant of their attitude toward using that technology.

The relationship between knowledge and attitude are important components of this model. AI knowledge may help students form reasonable expectations concerning what AI can and what AI cannot do. Students who understand the pros and cons of AI may develop a balanced attitude rather than simply a blanket acceptance or resistance. However, just having knowledge will not ensure a balanced attitude or responsible use. Students may have a basic understanding of AI but can still express concerns about the ethical implications, the profession and the patient. Evaluating both knowledge and attitude provides a better understanding of nursing students'™

preparedness towards AI use within a healthcare context.

The use of AI within the nursing discipline raises ethical dilemmas, as nursing professionals have ethical obligations to the patient, of ensuring autonomy, privacy, and the dignity of every patient, as well as the safety and the informed decision-making of the patient, to name a few. AI systems can challenge the privacy and safety of the patient, as well as introduce bias, transparency, explainability, and accountability issues within AI systems, to name a few. The use of AI in health by the WHO hinges on these principles: protection of human autonomy, human safety and well-being, and the principle of sustainability (WHO, 2021). For this reason, nursing students should have sufficient knowledge that AI recommendations should also be assessed by the profession.

Artificial intelligence tech is affecting nursing education as well. A nursing student may access information, prepare assignments, and learn how to summarize educational content all using AI tech. They may practice virtual simulations and use adaptive learning, clinical decision support, and generative AI. These may be beneficial for individualized learning and improve the accessibility of learning technologies. Unregulated use suggests a threat to academic integrity, a bigger issue of misinformation, plagiarism, overreliance on automated responses, and decreased ability to independently think critically. Rather than being too pro-technology, nursing education should focus on the responsible, ethical use of AI.

New studies show that nursing students may not have positive views of AI. One study showed ambivalent and even adaptive behaviors, perceived barriers to adoption, and positive expectations towards AI and how it could affect nursing education. There is no clear answer to what negatively affects nursing students' relationship with AI and other integration technologies. We have to consider the context of the student's education, whether they perceive AI integration technologies positively, and the relationship confidence and knowledge have with AI.

AI technologies gain equity in resource poor settings as developing healthcare systems integrate them. Differences in digital infrastructures, access

to digital technology, digital skills, training, and digital literacy affect the adoption of AI. Nursing students from certain institutions will have exposure to AI while others may not. Information obtained from more developed health care systems may not apply to nursing students from different settings. Because of these differences, context-specific assessment is necessary to understand the nursing students' level of awareness and attitudes.

The evidence from Pakistan is especially applicable in this situation. A recent study involving nursing schools in Khyber Pakhtunkhwa and Islamabad evaluated the perception and awareness of undergraduate nursing students regarding the use of AI in nursing practice. Of the 168 surveyed students, 59.1% demonstrated poor awareness toward AI, whereas 56.9% of the surveyed students demonstrated a positive intention toward AI and 52.6% of the surveyed students had a poor perception of AI (Sheraz et al., 2025). From observations, there is a willingness among the students toward AI, but this is coupled with a poor perception and lack of knowledge toward AI. From these observations, students appear interested in AI and technology and perhaps even positive toward AI incorporation, but are still lacking the necessary knowledge toward its incorporation and its implications. Failure to understand the implications could limit AI incorporation.

This distinction is important because having a positive outlook toward AI may encourage students to rely on it too much, and having a negative outlook may make students avoid beneficial AI technologies. Therefore, the nursing curriculum must focus on the cognitive and the attitudinal aspects of AI. Some examples of educational approaches include presented brief orientation to the basic concepts of AI, its clinical applications and ramifications of using that AI, its ethical issues, the privacy of the data, critiquing AI-generated information, demonstrations of AI, and simulations combined with discussions on the limits of AI in nursing.

The integration of AI should be considered part of the overall depiction of the transforming competency of nursing. Modern nursing requires

much more beyond the typical clinical and technical know-how. It also requires digital skills, critical and creative thinking, evidence-based practice, ethical reasoning, and flexibility or adaptability. Due to the pervasive nature of AI in health systems, the future of nursing may require the ability to work alongside AI to sustain caring, healing relationships. This will require the ability to critically assess AI-based technology to identify output inaccuracies or biases, the ability to articulate to patients the nature of technology-based care and personal caring, and most importantly the ability to prioritize professional clinical judgment.

New evidence shows the need to alter nursing curricula to help students prepare for the new professional world. One of these changes could include teaching students about AI. A 2024 study on nursing students' attitudes towards AI shows how nursing students' attitudes about AI relate to their openness towards interacting with AI. The study shows that it is imperative to consider AI in nursing education (2024). Similarly, other studies focusing on nursing students' attitudes and AI literacy stress the importance of looking at all of these elements to understand the nursing students' preparedness for medical AI (Boztepe et al., 2025).

Although there is a clear growth for artificial intelligence in both the healthcare and education sectors, an appreciation for where nursing students stand is still necessary. In Pakistan especially, the evidence points to some level of nursing students' acceptance toward AI and AI's future use; however, this evidence also points to a serious lack of understanding regarding AI. The studies undertaken in Khyber Pakhtunkhwa and Islamabad show the first level of understanding, but also point toward the need for further study to assess attitudes and knowledge toward AI using measurement techniques that are both systematic and broader, or specific to educational institutions (Sheraz et al. 2025).

Evaluating nursing students' AI knowledge and their attitudes toward AI is important and relevant to their education and profession. Knowledge and attitudes assessments help understanding of students' current knowledge of AI as well as how

students perceive and are willing to interact and engage with AI technologies and what areas of AI they may be willing to accept. It is also helpful in school of nursing planning and development of pedagogical curriculum, CPD, workshops, and clinical activities in AI that are compatible to the needs of the nursing profession. Lastly, it also helps in nursing students' AI literacy and responsible AI adoption that is grounded on principles of evidence-based, patient-centered, safe, ethical, and professional practice of nursing.

Methods

A descriptive cross-sectional research design was used to assess the knowledge and attitude of undergraduate nursing students regarding artificial intelligence (AI). The study was conducted at the College of Nursing, Superior University, Lahore, Pakistan. The accessible population consisted of 500 undergraduate nursing students. A sample of 218 students was determined using the Raosoft sample size calculator at a 95% confidence level, 5% margin of error, and 50% response distribution. A probability sampling technique was used to select eligible participants from student enrollment records. Students were included if they were officially enrolled, available during data collection, willing to participate, and provided informed consent. Data were collected using a structured questionnaire developed or adapted according to the study objectives and relevant literature. The questionnaire comprised demographic characteristics, knowledge regarding AI, and attitude toward AI. Knowledge items assessed basic AI concepts, healthcare and nursing applications, benefits, limitations, ethical considerations, privacy, confidentiality, patient safety, and responsible use. Attitude items assessed perceptions, acceptance, confidence, concerns, and willingness to use AI in nursing education and clinical practice.

Data Collection Procedure

After obtaining the required administrative and ethical approvals, the researcher approached eligible undergraduate nursing students at the study site. The purpose, objectives, procedures, and importance of the study were explained clearly to the participants. Written informed consent was obtained before administering the questionnaire. Participants were informed that participation was voluntary and that they had the right to withdraw at any stage without academic or other consequences. The questionnaire was distributed to the selected participants and sufficient time was provided for completion. The researcher remained available to clarify procedural questions while avoiding any influence on participants' responses. After completion, questionnaires were collected and checked for completeness. Completed questionnaires were coded systematically and prepared for data entry and statistical analysis. Confidentiality and anonymity were maintained throughout the data collection process.

Data Analysis Procedure

The collected data were coded and entered into the Statistical Package for the Social Sciences (SPSS), Version 27. Descriptive statistics were used to summarize participants' demographic characteristics and the main study variables. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were calculated for continuous variables and overall knowledge and attitude scores where appropriate. Knowledge and attitude scores were categorized according to the predefined scoring criteria of the questionnaire. Inferential statistical tests were applied, where appropriate, to determine associations between selected demographic characteristics and students' knowledge and attitudes toward AI. The selection of statistical tests was based on the type and distribution of the variables. A p -value of $< .05$ was considered statistically significant.

Results

Demographic Analysis

Table 1: Demographic Characteristics of Nursing Students (n = 218)

Variable	Category	Frequency (f)	Percentage (%)
Age	18–20 years	68	31.2
	21–23 years	102	46.8
	24–26 years	36	16.5
	≥27 years	12	5.5
Gender	Male	82	37.6
	Female	136	62.4
Academic year	1st Year	51	23.4
	2nd Year	57	26.1
	3rd Year	54	24.8
	4th Year	56	25.7
Previous exposure to AI	Yes	157	72.0
	No	61	28.0

The findings showed that the largest proportion of participants (46.8%) were aged 21–23 years, while 31.2% were aged 18–20 years. Female students constituted 62.4% of the sample, compared with 37.6% males. Regarding academic year, 26.1%

were second-year students, followed by fourth-year students (25.7%), third-year students (24.8%), and first-year students (23.4%). Most participants (72.0%) reported previous exposure to AI.

Table 2: Previous Exposure and Use of Artificial Intelligence Among Nursing Students

Variable	Category	Frequency (f)	Percentage (%)
Heard about AI before	Yes	194	89.0
	No	24	11.0
Used an AI application	Yes	168	77.1
	No	50	22.9
Frequency of AI use	Daily	42	19.3
	Weekly	67	30.7
	Occasionally	59	27.1
	Never	50	22.9
AI used for academic purposes	Yes	151	69.3
	No	67	30.7
Received formal AI training	Yes	49	22.5
	No	169	77.5

The majority of students (89.0%) had previously heard about AI, while 77.1% reported having used at least one AI application. Approximately one-third (30.7%) reported weekly AI use, followed by occasional use (27.1%) and daily use (19.3%).

Most students (69.3%) reported using AI for academic purposes. However, only 22.5% had received formal training related to AI, indicating that exposure to AI was substantially more common than formal AI education.

Table 3: Level of Knowledge Regarding Artificial Intelligence Among Nursing Students

Knowledge Level	Frequency (f)	Percentage (%)
Poor knowledge	58	26.6

Moderate knowledge	103	47.2
Good knowledge	57	26.1
Total	218	100.0

Nearly half of the nursing students (47.2%) demonstrated a moderate level of knowledge regarding AI. More than one-quarter (26.6%) had poor knowledge, while 26.1% demonstrated good knowledge. Overall, the findings suggest that

although most students possessed some understanding of AI, a considerable proportion had insufficient knowledge and may require additional AI-related education.

Table 4: Level of Attitude Toward Artificial Intelligence Among Nursing Students

Attitude Level	Frequency (f)	Percentage (%)
Negative attitude	39	17.9
Neutral attitude	61	28.0
Positive attitude	118	54.1
Total	218	100.0

More than half of the participants (54.1%) demonstrated a positive attitude toward AI, while 28.0% had a neutral attitude and 17.9% demonstrated a negative attitude. These findings

indicate that although knowledge was predominantly moderate, the majority of nursing students appeared receptive to the integration of AI into nursing education and practice.

Table 5: Association of Selected Characteristics with Knowledge and Attitude Regarding Artificial Intelligence (n = 218)

Variable	Knowledge Test	p-value	Attitude Test	p-value
Age	$\chi^2 = 8.42$	.038	$\chi^2 = 6.17$	.103
Gender	$\chi^2 = 4.91$	.027	$\chi^2 = 2.84$	.242
Academic year	$\chi^2 = 14.63$	.023	$\chi^2 = 11.76$	.068
Previous exposure to AI	$\chi^2 = 12.84$	<.001	$\chi^2 = 9.31$	.009
Previous AI training	$\chi^2 = 16.72$	<.001	$\chi^2 = 13.48$	<.001
AI use	$\chi^2 = 10.56$	.005	$\chi^2 = 8.27$	.016

A statistically significant association was observed between knowledge level and age ($p = .038$), gender ($p = .027$), academic year ($p = .023$), previous exposure to AI ($p < .001$), previous AI-related training ($p < .001$), and AI use ($p = .005$). Regarding attitude, significant associations were found with previous exposure to AI ($p = .009$), previous AI-related training ($p < .001$), and AI use ($p = .016$). However, attitude was not significantly associated with age ($p = .103$), gender ($p = .242$), or academic year ($p = .068$).

Discussion

The nursing students in this study were mainly between the ages of 21 and 23 years (46.8%) and

between the ages of 18 and 20 years old (31.2%), while a minority, only 5.5%, were 27 years or older. Female students accounted for 62.4% of the sample, and male students accounted for 37.6%. There was a relatively even distribution across the different academic years, with the most students being in their second year (26.1%). Similar patterns have been reported in previous studies on nursing students and AI. For example, Salem et al. (2025) studied a sample of undergraduate female nursing students. Likewise, the most recent study focusing on the AI literacy and attitudes of nursing students has also shown a predominantly female sample. The balanced representation across the different academic years in this study offers a

chance to study the AI knowledge and attitudes of nursing students at different stages of their academic journey.

Three-fourths of students said AI was familiar to them before this study due to previous exposure to AI. The remaining 28.0% of students said that AI was new to them. These results represent a clear trend of AI saturation in everyday digital and educational environments. Al Omari et al. (2024) found that 1,713 nursing students in a multicenter study in 10 Arab countries had knowledge about AI but possessed less expertise about AI for nursing. The result of this study indicates that students who have been introduced to AI may not have knowledge about its role in the profession. General AI exposure may be linked to general use of digital media, whereas AI in nursing may need to be studied in a formal manner.

The present study showed that 47.2% of nursing students had moderate knowledge regarding AI, 26.1% had good knowledge, and 26.6% had poor knowledge. The majority of students possessed moderate knowledge, meaning that although a basic level of knowledge was present, students had a considerable lack of understanding related to AI. This finding reinforces the literature as it indicated that nursing students usually have moderate AI literacy and not advanced AI competence. A systematic review of nursing and health sciences students reported that AI awareness was present, but formal AI education and comprehensive competence were lacking (Alqaissi & Qtait, 2025). A recent systematic review reported moderate AI literacy among nursing students, suggesting that more significant positive AI-related outcomes occurred for students who had prior training and more developed computer skills. The present study supports the notion that the rapid advancement of AI exceeds the formal educational preparation of AI.

The poor knowledge of AI (26.6%) in the present study is of interest as insufficient knowledge may result in students being unable to identify AI-based information and understand its limitations. Poor AI awareness was identified in 59.1% of undergraduate nursing students in Khyber Pakhtunkhwa and Islamabad (Sheraz et al., 2025). The present study may have produced lower poor

knowledge due to differences in study tools, educational context, participants exposed to digital tools, and two groups' differing levels of interaction with AI. The findings reconfirm the presence of a considerable knowledge gap in the area of AI in undergraduate nursing education.

Puts:

More than half of the respondents surveyed showed a positive attitude related to AI (54.1%). A neutral attitude related to AI was present in 28.0% of respondents and a negative attitude was present in 17.9% of respondents. The predominance of positive attitudes showed that participants were more likely to be positive towards the use of AI in their professional practice. The findings presented in this research are supported by the work of Boztepe et al. (2025) who reported medical AI positive attitudes of nursing students as being high and their negative attitudes as being low. According to their work, nursing students' attitudes were predicted by certain AI literacy dimensions, namely the evaluation and ethics dimensions. What was also supported was the work of Sarman and Tuncay (2025) who reported positive relationships among nursing students' attitude and AI literacy related to AI knowledge and AI use.

The positive attitude in this study toward AI was in direct opposition to the limited knowledge demonstrated by a majority of participants. This was an interesting finding as it presented the case that a positive attitude toward AI acceptance could exist in the absence of understanding. Similar findings were described by Sheraz et al. (2025) in their study of nursing students in Pakistan. In that study, 59.1% of participants were described as having low awareness and 56.9% of participants were described as being positive toward AI adoption. The important part of this comparison is that it suggests to the participants that having a positive attitude toward AI may be present when understanding AI is limited. Positive attitudes should not be interpreted as having an adequate understanding of AI. To address the lack of understanding, educational programs should incorporate the other aspects of understanding AI (i.e. evaluation, ethics, understanding of use) and not just attitude.

The present study found previous exposure to AI correlated to knowledge ($p < .001$) and attitude ($p = .009$). Students with previous exposure to AI demonstrated more positive knowledge and attitude. This finding is consistent with Salem et al. (2025), who reported nursing students with AI education had higher AI awareness, AI use, AI evaluation, and AI literacy. Positive attitudes toward AI also correlated to higher AI awareness, AI use, AI evaluation, and AI literacy. Sarman and Tuncay (2025) also identified positive correlations between AI literacy and attitudes and AI knowledge and AI use. It appears that meaningful exposure to and educational engagement with AI leads to increased confidence and more positive perceptions of AI.

Previous exposure to AI was significantly associated with knowledge ($p < .001$) and attitude ($p < .001$) in the present study. This finding demonstrates the gap caused by informal exposure of university students to AI. Without formal preparation, Boztepe et al. (2025) argued for the inclusion of AI education in nursing programs to promote the use of AI in nursing, with an emphasis on thinking critically, understanding ethically the implications of AI, and ensuring digital safety. Alqaissi and Qtait (2025) also placed insufficient AI-based curriculum and lack of faculty expertise in their ranking of barriers to AI inclusion in nursing and health science education. The present study's findings add to the need for formal, structured AI education in nursing at the undergraduate level.

The present study revealed correlations of knowledge with age, gender, academic year, exposure to AI, AI training, and AI use. Attitude was correlated with AI use, AI training, and exposure to AI, none of which were correlated with age, gender, and academic year, respectively. The findings are partially in line with the existing literature. Al Omari et al. (2024) reported that nursing students in 10 Arab countries differed in their intention to use AI based on demographic characteristics, familiarity with AI, knowledge, attitude, and perception. A systematic review indicated that senior students had a more positive outlook toward AI and that prior AI training and better computer skills were related to more

positive attitudes and greater intention to use AI. Due to a number of factors, including the rapidly changing availability of AI, survey instruments, and the educational and AI exposure systems, some pertinent correlations in this study may not have been reported in other studies.

The findings suggest the students surveyed had an overall positive attitude towards AI, but had knowledge gaps that required further development. Moderate knowledge and positive attitudes present an opportunity for teaching. Students may be willing learners, but may lack the knowledge required for safe, critical, and ethical AI based nursing practices. Sheraz et al. (2025) arrived at similar conclusions in Pakistan stating the creation of supportive artificial intelligence environments is required for increasing students' preparedness and improving perception towards AI. Preparation for AI in the international context also highlights the importance of considering integration of ethics and AI, critical appraisal, digital citizenship, and security. The positive attitudes highlighted in the current study present the required opportunity for nursing schools to integrate AI systems and Practices with ethics and to ensure the AI is used in a socially responsible manner.

CONCLUSION:

The present study assessed the knowledge and attitude of undergraduate nursing students regarding artificial intelligence. The findings indicated that a substantial proportion of students had previous exposure to AI, with 72.0% reporting that they had previously encountered or used AI-related technologies. The overall level of knowledge was predominantly moderate, with 47.2% of students demonstrating moderate knowledge, 26.1% demonstrating good knowledge, and 26.6% demonstrating poor knowledge. Despite these knowledge gaps, more than half of the participants (54.1%) demonstrated a positive attitude toward artificial intelligence, while 28.0% had a neutral attitude and 17.9% had a negative attitude. Previous exposure to AI, AI-related training, and AI use were significantly associated with students' knowledge and attitudes. The findings suggest that

nursing students are generally receptive to AI but require further structured education and training to develop adequate knowledge and responsible skills for its use. Integrating AI literacy, ethical considerations, critical evaluation of AI-generated information, privacy, patient safety, and practical applications into nursing education may enhance students' preparedness for an increasingly technology-driven healthcare environment.

6.2. RECOMMENDATIONS OF THE STUDY:

Based on the outcomes of this study, the following recommendations have been made:

1. **Integration of AI into the nursing curriculum:** Nursing institutions should incorporate fundamental concepts, applications, limitations, and ethical considerations of artificial intelligence into undergraduate nursing curricula.
2. **AI-related training programs:** Regular seminars, workshops, and short training programs should be organized to improve nursing students' knowledge and practical understanding of AI.
3. **Development of AI literacy:** Nursing students should be trained to critically evaluate AI-generated information rather than relying on AI outputs without professional verification.
4. **Ethical and privacy education:** Educational activities should address patient confidentiality, data protection, informed consent, algorithmic bias, accountability, and ethical challenges associated with AI in healthcare.
5. **Practical learning opportunities:** Nursing institutions should provide demonstrations, simulations, and practical learning activities involving appropriate AI applications in nursing education and clinical practice.
6. **Faculty development:** Nursing faculty members should receive appropriate professional development and training to enable them to teach AI-related concepts effectively.
7. **Responsible use of generative AI:** Students should be educated regarding the appropriate academic and professional use of generative AI, including the risks of misinformation, plagiarism, overdependence, and inaccurate AI-generated content.

8. **Clinical integration:** Healthcare institutions and nursing schools should explore appropriate AI-supported clinical learning opportunities that allow students to understand how AI can complement, rather than replace, professional nursing judgment.

9. **Further research:** Future studies should be conducted with larger samples and multiple nursing institutions to improve the generalizability of findings. Interventional studies should also evaluate whether structured AI education improves students' knowledge, attitudes, confidence, and practical competency.

10. **Longitudinal research:** Longitudinal studies should be conducted to determine how nursing students' knowledge and attitudes toward AI change as they progress from undergraduate education into professional nursing practice.

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