



Asses the Knowledge and Attitude of Undergraduate Nursing Students towards the Role of Artificial Intelligence in Healthcare

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ABSTRACT

Objective: To assess the knowledge and attitude of undergraduate nursing students towards the role of artificial intelligence (AI) in healthcare, aiming to understand their readiness and perception of integrating AI into clinical practice. **Methods:** A descriptive cross-sectional study was conducted to assess the knowledge and attitude of nursing students toward the role of Artificial Intelligence (AI) in healthcare. A total of 208 students were selected using non-probability convenience sampling technique. Informed consent was obtained from all the participants prior to the data collection. The study consisted of two parts: a 10-items knowledge questionnaire and a 10-items attitude questionnaire, designed to evaluate students' understanding of AI technologies and their perspectives on its integration into healthcare settings. The questionnaires were close-ended, focusing on basic knowledge about AI. **Results:** There was a significant difference in AI knowledge and attitudes between various groups. Male's demonstrated significantly higher AI knowledge (82.1%) compared to females (69.8%) with a p-value of 0.003. Participants who attended formal AI training exhibited better knowledge, with 41.9% showing adequate knowledge, compared to 25.4% of non-attendees (p = 0.010). Prior exposure to AI workshops significantly influenced attitudes, with attendees showing a more positive attitude toward AI (67.4%) compared to non-attendees (35.8%), with a p-value of <0.001. Gender and formal AI training were found to significantly impact both knowledge and attitude towards AI in healthcare. **Conclusion:** The study highlights significant differences in AI knowledge and attitude among undergraduate nursing students, with males, participants with formal AI training, and those exposed to AI workshops demonstrating higher levels of knowledge and more positive attitude. These findings underscore the importance of incorporating AI education and training into nursing curricula to better prepare students for the integration of AI in clinical practice.

INTRODUCTION

Artificial Intelligence (AI) is the machines that have intelligence like humans that can perform different tasks including identification of speech, fast judgment, the ability to perceive images, and translation of language, machine learning is the part of AI that includes teaching algorithms for performing the task through the use of data to identify the structure and features. Deep learning is a form of AI that uses a sophisticated neural network containing various levels of mathematics (1). Initially, it was only the study of computers. However, it has found its way into health sciences, and potentially the role in raising the standard of health care service is significant (2). With the advancement of technology, AI has also transformed the nursing practice in nursing roles, clinical care, and nurse-patient relationships (3). The successful

applications of AI in the nursing domain are mobile health (mHealth) and sensor-based technologies such as face tracker software which assesses the nurse student's emotions during training, wearable armbands evaluating a person's hand washing techniques, virtual avatar apps, including virtual patient gaming apps and virtual tutor chat bots used by nurse educators in the academic side in replications of medical situations for better understanding of nursing students (4). Clinical decision support systems and social robots have abilities to understand the natural language (5). There is an immense need to understand the interaction of AI in Nursing. Although nurses represent the largest group about 50% of healthcare workers worldwide (International Council of Nurses 2017), nursing profession is most and regularly confronted with AI technologies (6). In the

nursing discipline, a set of concepts that address the patient as a whole are the person or client, the environment, health, and nursing. In Idhe’s philosophy, the effect of AI technologies was explored, and in the conclusion, there were variabilities in the relationship between patients, nurses, technology, and the environment. Various technologies are working in our daily lives and their usage can be investigated (7). Several studies advised the implementation of AI technologies in the health care system is the challenge of the 21st century (8). It increased the opportunities for employment and professional development for nurses (9). To overcome these challenges, it is necessary to prepare nurse students to utilize AI technology and accept it which will maintain the same rate of progress with AI technology (10). Delivering patients with reliable sympathetic, deserving, and ethical nursing care is a fundamental principle of the nursing profession that is mentioned in various international nursing practices (11). Undergraduate nurses have little exposure to AI technologies which makes them anxious for future utilization due to poor knowledge has negatively impacted their abilities. However, we could not find out any previous research that was carried out to assess the knowledge and attitude about artificial intelligence among BSN Nursing students in Karachi.

METHODOLOGY

This cross-sectional study was performed at three private nursing colleges of Karachi over the span of four weeks. The primary goal of the study was to evaluate the knowledge and perceptions pertaining to the application of AI technology in healthcare among undergraduate nursing students. Using a non-probability convenience sampling method, a total of 208 nursing students were recruited as study participants. Open Epi software was utilized to compute the sample size based on a 95% confidence level, 5% margin of error, and the assumption of attitude compliance rate of 37%. The sample population consisted of Generic BScN students, with exclusion of Post RN-BSN students and diploma nursing students. Participation in the study were voluntary, and consent was appropriately provided by all the respondents. The Institutional Review Board approval was taken after ethically reviewing the proposal granted research ethical approval. Participants were assured about privacy and confidentiality and that they could withdraw from the study at any point. Data was collected through an online questionnaire created on Google Forms and shared with the participants through mobile phone applications. The questionnaire contained two sections, first part was about knowledge which had 10 questions, and another part assessing attitudes which also had 10 questions, and all questions were multiple choice targeting the basic concepts and opinions about AI technologies.

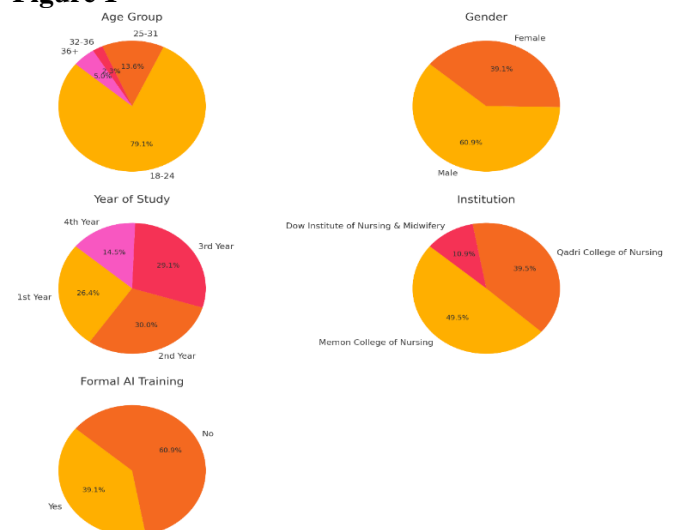
RESULTS

A total of 220 nursing students participated in the study. The majority of participants (79.1%) were aged between 18 and 24 years, and most were male (61%). Students were primarily in their second (30%) or third year (29.1%) of study. Nearly half (49.5%) were enrolled at Memon College of Nursing, while others came from Qadri College of Nursing (39.5%) and Dow Institute of Nursing & Midwifery (10.9%). Approximately 39.1% had received formal training in artificial intelligence (AI) during their nursing education. The demographic characteristics are illustrated in the charts above, providing a visual breakdown of age distribution, gender, academic year, institutional affiliation, and prior AI-related education.

Table 1
Summary of Participants’ Socio-Demographic Features

Variables		Frequency (%)
Age groups	18-24 years	174(79.1)
	25-31 years	30(13.6)
	32-36 years	5(2.3)
	36 years and above	11(5)
Gender	Male	134(61)
	Female	86(39.1)
Year of study	First year	58(26.4)
	Second year	66(30)
	Third year	64(29.1)
	Fourth year	32(14.5)
Institution	Memon college of nursing	109(49.5)
	Qadri college of nursing	87(39.5)
	Dow institute of nursing & Midwifery	24(10.9)
Received formal training related AI during nursing education	Yes	86(39.1)
	No	134(60.9)

Figure 1



Knowledge about AI

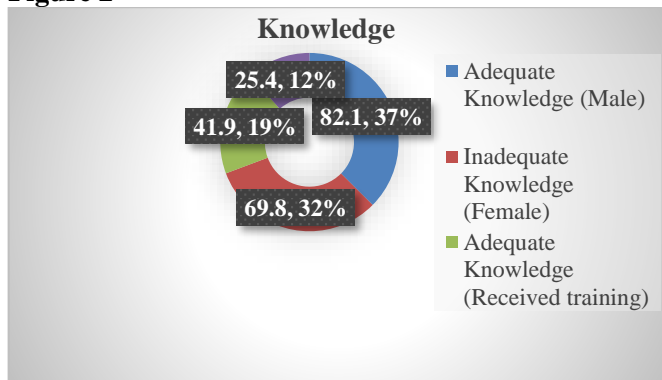
Table 2 highlights that over 80% of participants agreed or strongly agreed on the utility of AI in healthcare

(85.9%), usefulness of speech recognition (86.8%), benefits of AI in nursing (86.3%), and AI applications in healthcare operations (86.9%). A notable proportion (74.5%) recognized privacy concerns associated with AI, and 79.5% differentiated between machine learning and deep learning.

Table 2
Responses Distribution of Participants for Each Knowledge Item

Knowledge Items	Strongly Agree count (%)	Agree count (%)	Neutral count (%)	Disagree count (%)	Strongly Disagree count (%)
Artificial intelligence is useful application in healthcare	83 (37.7)	105 (47.7)	20 (9.1)	9 (4.1)	3 (1.4)
Liabile for the legal problems caused by Artificial Intelligence	36 (16.4)	114 (51.8)	44 (20)	21 (9.5)	5 (2.3)
There is any difference between machine learning and deep learning	75 (34.1)	97 (44.1)	38 (17.3)	9 (4.1)	1 (0.5)
Speech recognition or transcription is helpful applications in healthcare	71 (32.3)	116 (52.7)	20 (9.1)	9 (4.1)	4 (1.8)
Serious privacy issues can be possible with the use of AI in healthcare	53 (24.1)	106 (48.2)	27 (12.3)	30 (13.6)	4 (1.8)
The benefits of using artificial intelligence in nursing	90 (40.9)	94 (42.7)	16 (7.3)	16 (7.3)	4 (1.8)
AI could be useful in healthcare	80 (36.4)	100 (45.5)	23 (10.5)	12 (5.5)	5 (2.3)
AI will get all relevant information about a patient medical history	60 (27.3)	108 (49.1)	29 (13.2)	18 (8.2)	5 (2.3)

Figure 2



The median knowledge score was 7 (IQR=6–8). Using a threshold score of ≥ 6 , 77.3% of students demonstrated adequate AI knowledge. Males had significantly higher knowledge than females (82.1% vs. 69.8%, $p=0.033$). Furthermore, students with formal AI training showed significantly greater knowledge than those without (44.7% vs. 20%, $p=0.002$).

Attitude toward AI

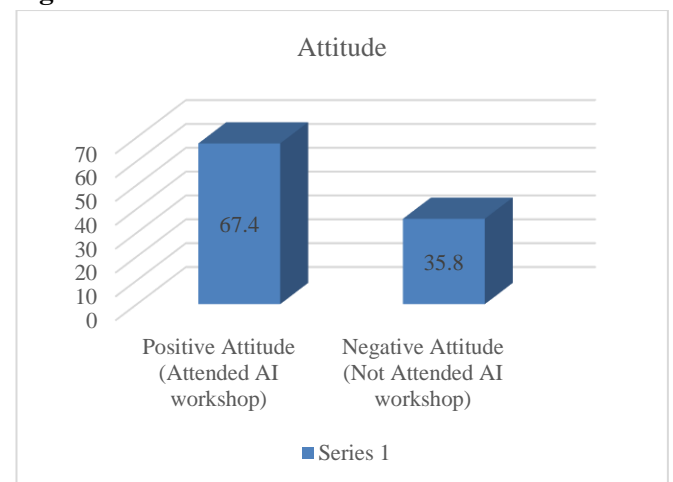
Table 3 outlines that 85.9% of students agreed or

strongly agreed that society will benefit from AI in the future, while 81.4% believed AI could offer economic opportunities. A large majority supported AI integration into undergraduate nursing education (77.3%) and acknowledged its potential positive impact on patient care (71.8%). However, concerns were also expressed—67.7% considered AI more dangerous than nuclear weapons, and 61.8% feared job replacement by AI.

Table 3
Responses Distribution of Participants for Each Attitude Item

Attitude items	Strongly Agree Count (%)	Agree Count (%)	Neutral Count (%)	Disagree Count (%)	Strongly Disagree Count (%)
Society will take benefit from a future full of Artificial Intelligence	101 (45.9)	87 (39.5)	14 (6.4)	15 (6.8)	3 (1.4)
AI should be taught in the undergraduate program	70 (31.8)	98 (44.5)	30 (13.6)	20 (9.1)	2 (0.9)
Artificial Intelligence is exciting field	64 (29.1)	98 (44.5)	40 (18.2)	18 (8.2)	0 (0)
Artificial Intelligence can provide new economic opportunities for this country	79 (35.9)	96 (43.6)	27 (12.3)	14 (6.4)	4 (1.8)
Artificial Intelligence can have positive impacts on patients' well being	56 (25.5)	97 (44.1)	35 (15.9)	29 (13.2)	3 (1.4)
Nurses should have good familiarity with AI	49 (22.3)	101 (45.9)	44 (20)	23 (10.5)	3 (1.4)
Do you agree with the following statement: "AI is more dangerous than nuclear weapons"	65 (29.5)	77 (35)	34 (15.5)	40 (18.2)	4 (1.8)
AI can replace you at your job	60 (27.3)	68 (30.9)	47 (21.4)	38 (17.3)	7 (3.2)
Artificially intelligent systems can perform better than humans	43 (19.5)	77 (35)	41 (18.6)	51 (23.2)	8 (3.6)
Foreseen drawbacks of using artificial intelligence in nursing in education	35 (15.9)	100 (45.5)	58 (26.4)	20 (9.1)	7 (3.2)

Figure 2



The median attitude score was 7 (IQR=6–9), with about

half of the students holding a positive attitude toward AI. Those who had attended formal AI training had a significantly more positive attitude (67.4%) compared to those who had not (35.8%, $p < 0.001$). Other demographic variables did not significantly influence attitude.

DISCUSSION

This study aimed to assess the knowledge and attitude of undergraduate nursing students toward the role of AI in healthcare, revealing significant insights into their readiness for AI integration in clinical practice. The findings demonstrated that a majority of nursing students possess adequate knowledge (77.3%) and moderately positive attitude (around 50%) toward AI. These outcomes align with global trends, suggesting a growing awareness of AI among future healthcare professionals. Our results showed that males and students with formal AI training exhibited significantly higher levels of knowledge and more favorable attitude towards AI. These results align with prior studies highlighting the effectiveness of customized educational programs in improving healthcare students' AI literacy and acceptance. For example, Jiang et al. indicated that medical students' understanding and concern toward AI technologies were greatly improved with the provision of structured AI teaching (12). Equally, Topaz and Pruinelli (2020) stressed the importance of incorporating AI into the nursing curriculum to enhance digital competency (13). The data suggested that a great number of participants (more than 80%) recognized the value of AI in healthcare, especially in its use for speech, clinical, and administrative functions. However, some remarkable concerns were noted—over two-thirds of students reported worrying that AI might be more dangerous than nuclear weapons, and many feared loss of employment. This blend of eagerness and concern highlights the contradiction posed by AI in healthcare—while there is potential for novel innovation and efficiency, there is also disruption to established roles and professional identities (14). Moreover, students who had attended AI workshops or training demonstrated greater knowledge and also showed more openness and positivity toward AI adoption in healthcare settings. This underscores the transformative potential of education and practical exposure in shaping constructive attitude. Consistent with these findings, a study by Chan et al. (2022) revealed that integrating AI modules into undergraduate nursing programs can foster confidence and mitigate fears associated with AI's perceived threat to human employment in healthcare^[15]. Interestingly, the perception of AI's role in nursing education was largely positive, with 77.3% supporting its inclusion in undergraduate programs. This reflects an emerging consensus among students that AI literacy is not merely optional but a necessity in modern clinical practice. The

AI's supported the integration into curricula aligns with international recommendations from bodies such as the International Council of Nurses (ICN), which advocates for digital fluency as a core nursing competency (16). Despite these promising findings, several challenges remain. Gender disparities in knowledge and attitude highlight the need for more inclusive and equitable training approaches. Furthermore, the fear of AI replacing human jobs suggests a gap in understanding AI's intended role as a supportive tool rather than a substitute for nursing care. Addressing these misconceptions through transparent, contextually relevant education is essential to alleviate resistance and promote ethical AI adoption.

Implications for Nursing Education and Practice

This study reveal critical implications for nursing education, clinical practice, and policy development. Educators must prioritize AI competency as an integral part of nursing curricula to prepare students for the evolving landscape of healthcare delivery. Simulation-based training, interactive AI modules, and interdisciplinary workshops could serve as effective pedagogical tools to enhance digital literacy and critical thinking. From a policy perspective, there is a need for institutional investment in AI resources and faculty development to ensure sustainable integration. Nurse leaders and administrators should advocate for supportive learning environments where students can engage with AI technologies confidently and ethically.

Limitations and Future Direction

Non-probability convenience sampling may limit the generalizability of the findings. Additionally, the study relied on self-reported measures, which could be subject to bias. Future research should consider longitudinal designs and incorporate qualitative methods to explore the underlying beliefs, challenges, and facilitators influencing AI adoption in nursing education. Moreover, cross-institutional comparisons could help identify contextual barriers and opportunities for AI implementation. Investigating faculty preparedness, organizational culture, and infrastructural support would provide a more holistic view of AI readiness in nursing academia.

CONCLUSION

The changing dynamics of clinical practice today, particularly in delivering care through AI technology tailored for individual patients, is bound to have an impact on every discipline of medicine, and thus necessitates adequate knowledge and favorable perceptions from the nursing students. In fact, evidence suggests that most nursing students are relatively positive about the introduction of AI and its application. However, it is clear that their actual comprehension and insight pertaining to its use is much less than desired. In

order to bridge this gap, reliable sources suggest the need for structured education focused on the teaching of AI technology in nursing schools. Such measures will most certainly ease the challenge posed by contemporary healthcare systems. Furthermore, developing a

curricular framework that integrates practical components alongside theoretical lessons using AI for freshman nursing students will greatly enhance their competence, enabling their implementation in clinical settings.

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