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Original Article

Perceptions among Student Nurses Regarding the Role of Artificial Intelligence in Healthcare, in Pakistan

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ABSTRACT

Objective: To determine the perceptions of undergraduate student nurses regarding the role of Artificial Intelligence (AI) in healthcare.

Study Design: Cross-sectional study.

Place and Duration of Study: Foundation University College of Nursing Rawalpindi and Institute of Nursing Wah Medical College, Pakistan from Jan 2024 to 25 Apr2024.

Methodology: A total 162 BSc student nurses from two nursing colleges were selected as the sample based on the predetermined inclusion criteria. A pre-validated questionnaire modified from Ahmad et al. (2023) was used to gather data. The study evaluated demographic data and perceptions regarding Artificial Intelligence, such as its use, dependability, and diagnostic capability. Data analysis was performed utilizing descriptive statistics for demographic variables and responses of the perception of students.

Results: According to the demographic statistics, females constituted a slight majority of the sample (53.7%, n=87). The application of artificial intelligence (AI) in healthcare was positively perceived (67%) by the majority of undergraduate student nurses. However, (53%) of students were skeptical that AI could replace human judgement and empathy.

Conclusion: Student nurses expressed mixed perceptions regarding the application of Artificial Intelligence in nursing practice. While they recognized the potential of AI to enhance patient care and diagnostic accuracy, concerns regarding job security, ethical considerations, and thorough training were also identified. Addressing these issues is crucial for future nurses to utilize benefits of AI.

Keywords: Artificial Intelligence; Cross-Sectional Studies; Health Care; Perceptions; Student nurses.

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INTRODUCTION

Artificial intelligence (AI) refers to computer systems designed to accomplish tasks that traditionally require human intellect, such as visual perception, natural language processing and decision making.[1] Artificial intelligence is increasingly becoming an integral component in the global healthcare system, transforming both educational sector and clinical practices.[2] Consequently, the field of nursing benefits from AI integration into hospital informatics system, assistive devices sensors, telehealth, and monitoring system etc.[3] Accordingly, participants in a study conducted in Anatolia turkey in 2025 perceived that AI can be used in medical diagnoses, planning and follow-ups.[4]

Despite these considerations, the effective utilization of AI in the healthcare depends on trust and acceptance of healthcare professionals.[5] In this context, a cross-sectional study carried out in Islamabad, evaluated medical students' knowledge and perceptions of artificial intelligence where a significant majority (56.7%), agreed that primary benefit of AI in healthcare stems from its ability to expedite processes.[6] Hence, the previous researchers in Pakistan emphasize to maintain complete understanding of the views and perceptions of healthcare workers.[7] Therefore, perceptions of nurses regarding future technologies should be explored for identification of their need and address the current issues.[8]

Student nurses represent the future healthcare workforce and are crucial for the upcoming innovative medical technologies. Numerous studies conducted worldwide have demonstrated that student nurses exhibit varying perspectives and hold limited comprehension of the application of AI in healthcare.[9]

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Similarly, the prior local literature suggests that empirical data is limited regarding student nurses' knowledge and attitude toward AI in Pakistan.[10] In this context, the findings of the study may provide valuable evidence to inform future curriculum development, particularly regarding the systematic integration of Artificial Intelligence (AI) competencies into nursing education, as AI has not yet been systematically incorporated into existing nursing curricula. Additionally, the study will inform policy-makers and institutions regarding the barriers and training needs and will provide contextual data for future research studies.

Therefore, this study aims to assess student nurses' perceptions regarding the role of artificial intelligence in healthcare.

METHODOLOGY

A cross-sectional study design was used. Study was conducted at AFPGMI College of Nursing Rawalpindi. The study collected data from 15 January 2024 to 25 April 2024. OpenEpi tool was utilized to calculate a sample size of 162 student nurses based on a previous study's 27.3% awareness level, 95% confidence interval and 5% margin of error, and total population 274.[11]

All Generic BSc student nurses enrolled in Pakistan's two nursing institutions, Wah Medical College's Institute of Nursing and Foundation University College of Nursing Rawalpindi Pakistan constituted the target group. Proportionate stratified random sampling technique was used to determine the sample from each stratum (institute and year of study), followed by simple random sampling within each stratum to select the individual participants.

Inclusion Criteria: Second-year, third-year, and fourth-year students enrolled in BSc nursing programs were included in the study.

Exclusion Criteria: First-year students were not included as they had not attended clinical at this stage while Students on extended absence, such as maternity or sick leave were excluded from study. On January 4, 2024, the Ethical Review Committee of the Armed Forces Post Graduate Medical Institute (AFPGMI), Rawalpindi, approved the study protocol and methodology (Ref. No. 421-AAA-ERC-AFPGMI). Prior to data collection, written informed consent was obtained from all participants after providing them with adequate information regarding the purpose and procedures of the study. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any time. Participant confidentiality and privacy were strictly maintained throughout the study. All collected data were securely stored and encrypted, and the information was used solely for research purposes.

Prior to gathering data, the researcher visited classes of two participating institutions and briefed student nurses of the study's aim and objective. The questionnaires were administered to the students in person for completion. Upon completion, each questionnaire was reviewed for completeness, accuracy, errors, and missing data before being collected for analysis. The study achieved a 100% response rate. Following the initial completion of the questionnaires, the researcher reviewed each questionnaire for completeness and contacted participants to clarify or complete any missing responses, where appropriate. On the second day of data collection, questionnaires were administered to students who had been absent during the initial data collection session.

Data were collected using a pre validated questionnaire modified from Ahmad *et al*. (2023), (attached as supplementary material).[10] The questionnaire consisted of 28 items divided into three sections. The first part (4 items) evaluated demographic data, the 2nd section (15 items) addressed perceptions about AI, and the 3rd section (9 items) addressed awareness of AI. Items 5 through 19 of the Ahmad *et al*. (2023) validated questionnaire were used to assess perceptions since they were particularly relevant to the primary objectives of the study while 9 items of awareness has been published already in a separate article.[12] Therefore, only the items related to perception were analyzed and reported in the current study. A content validity score of 0.82 for clarity and 0.92 for relevance was obtained when five expert researchers collaborated to establish validity. Three nurses with expertise in artificial intelligence and two physicians from the medical department constituted the expert panel. Although the original instrument was validated in Qatar, content validity was reassessed after adapting the demographic section to ensure its contextual appropriateness for Pakistani undergraduate student nurses. The acceptable internal consistency (a=0.70) was computed. Following data collection, the "Statistical Package for Social Science" (SPSS), Version 27, was used to tabulate, and analyze the data.

Frequencies and percentages were computed for data analysis.

RESULTS

Of the 162 participants, 88(54.3%) of students were associated with Institute A (Foundation University College of Nursing Rawalpindi), whereas 74(45.7%) of participants belonged to Institute B (Institute of Nursing Wah Medical College Wah Cantt) (Table-I).

Table-I: Demographic Characteristics of the Participants(n=162)

Variables	Frequenciesn (%)		
Institute Name			
Institute A	88(54.3)		
Institute B	74(45.7)		
Age			
19-21 Years	76(46.9)		
22-25 Years	86(53.1)		
Total	162(100.0)		
Gender			
Female	87(53.7)		
Male	75(46.3)		
Total	162(100.0)		
Participants' academic year			
Participants' academic year	2nd year	3rd year	4th year
Institute A	30(34.09)	30(34.09)	28(31.81)
Institute B	34(45.94)	19(25.67)	21(28.37)

Most participants expressed agreement regarding the usefulness of AI in medical application (somewhat agree, 40.74%, agree 47.53 %). Majority showed disagreement that AI would replace their job (disagree 24.07%, somewhat disagree 18.52%) (Table-II).

Of the participants, 61(37.7%) described that biopharmaceutical research and development has the strongest support for AI's capacity to improve healthcare, while just 32(19.8%) believed it might help underdeveloped areas. Other noteworthy areas include treatment decisions 18(11.1%) and social insurance schemes 28(17.3%), with diagnoses 15(9.3%) and direct treatment 8(4.9%) receiving less attention. According to 59(36.3%) of respondents, the primary worry is that AI is not flexible enough to be applied to every patient. Another significant concern raised by 39(23.8%) of respondents is that AI has insufficient ability to show empathy. Furthermore, 31(19.3%) of respondents think that lack of information prevents AI from drawing conclusions in uncertain circumstances. Of the participants, 21(13.1%) are concerned that AI is being created by experts with little clinical expertise, and 12(7.5%) think that it is challenging to apply AI to controversial issues (Table-III).

When comparing AI technologies to conventional healthcare techniques, the participants highlighted serious issues regarding the unethical exploitation of patient data are noted. Out of all the respondents, approximately 63(39%) students think the chance is high, and 16(9.9%) students think it is extremely high. A notable number 55(33.9%) believed that AI technologies have higher likelihood of errors, while 40(24.6%) consider the error rates to be equivalent to traditional methods. Conversely, only 6(3.7%) perceive AI technologies as having very low error rates Table-III.

Table-II: Perceptions of Student Nurses Regarding AI(n=162)

Variables	Disagree n (%)	Somewhat disagree n (%)	Neither agree nor disagree n (%)	Somewh at agree n (%)	Agree n (%)
AI has useful applications in medical field	4(2.47)	7(4.32)	8(4.94)	66 (40.74)	77(47.53)
Diagnostic ability of AI is superior to the clinical experience of humans	50(30.86)	24(14.81)	33(20.37)	37(22.84)	18(11.11)
AI could replace your job	39(24.07)	30(18.52)	18(11.11)	53(32.72)	22 (13.58)
I would always use AI when making decisions in my field	61 (37.65)	27(16.67)	18 (11.11)	50(30.86)	06(3.70)
AI in healthcare is reliable	17(10.49)	19(11.73)	31(19.13)	87(53.70)	08(4.94)
AI can help relieve healthcare workers' stress	34(20.99)	15(9.26)	14(8.64)	54(33.33)	45(27.78)
AI can be useful to refer a patient to other health professionals	39(24.07)	30(18.51)	18(11.11)	53(32.71)	22(13.58)
AI will be able to formulate personalized medication for patients	52(32.09)	26(16.04)	33(20.37)	32(19.75)	19(11.73)
AI will provide empathetic care to patients	75(46.29)	24(14.81)	18(11.11)	31(19.13)	13(8.02)
AI results need to be verified by a human	10(6.17)	10(6.17)	17(10.49)	31(19.13)	94(58.02)

Table-III: Perceptions of Student Nurses Regarding AI (162)

S No	Item	Areas	Agreement n (%)
12	In which area of healthcare do you think AI will be most useful	Development of social insurance programs	28(17.3)
		Providing medical assistance in underserved areas	32(19.8)
		Biopharmaceutical research and development	61(37.7)
		Direct treatment	8(4.9)
		Making treatment decisions	18(11.1)
		Making a diagnosis	15(9.3)
13	Concerns regarding AI applications in healthcare	It cannot be used to provide opinions in unpredicted situations due to inadequate information	31(19.3)
		It is not flexible enough to be applied to every patient	59(36.3)
		It is difficult to apply to controversial subjects	12(7.5)
		The low ability to sympathize and consider the emotional well-being of the patient	39(23.8)
		It is developed by a specialist with little clinical experience in medical practice	21(13.1)
14	Possibility of unethical use of patient data with AI tools compared to traditional health practice.	Very high	16(9.9)
		High	63(39)
		Same rate of errors as traditional practice	52(32)
		Low	26(16)
		Very low	5(3)
15	Possibilities of errors with AI technologies in healthcare as compared to traditional healthcare practice.	Very high	21(12.9)
		High	55(33.9)
		Same rate of errors as traditional practice	40(24.6)
		Low	39(24)
		Very low	6(3.7)

DISCUSSION

The findings of the current study provided significant insight into the perceptions of student nurses regarding the utilization and integration of AI into the healthcare. A considerable proportion of the participants showed positive perception of AI, with 66 (40.5%) somewhat agreed and 77 (47.5%) agreed that AI enhances diagnostic accuracy and improves healthcare efficiency. This finding suggests favorable attitude among student nurses regarding AI integration into healthcare. However, the result also shows ambiguity among student nurses. Majority of student nurses expressed reservation regarding the superiority of AI in clinical diagnosis (74, 45.67%) and providing compassionate and patient-centered care (99, 61.1%). This concern highlights the perceived limitation of AI in addressing the humanistic dimension of nursing care. Furthermore, the participants of the study acknowledged the role of AI to augment the human efforts in clinical practice. Overall, they viewed AI as supplement rather than a replacement to human efforts. Reforms are required in the curriculum to incorporate AI training, address ethical issues and emphasize the role AI as a supportive tool.13

The current findings are consistent with the findings of a study conducted in Greece by Tsiara et al. where the participants showed positive attitude with mean score of 3.22/5.00.14 Similarly, another study conducted in Pakistan revealed 83.8% medical students considered that AI application is useful in healthcare.6 This indicates that there is consensus among students that AI has useful impact on healthcare system.

Of the participants 45.67 % (disagree/somewhat disagree) showed disagreement that AI is superior to human in diagnostic ability. In a study conducted in Pakistan, majority of the students disagreed to the notion that AI is superior in the diagnostic ability over the human intelligence.6 Similarly, another study among medical students reported a very small number (20.2%) of participants considered that AI could be diagnostically superior to human.15 Although AI can be highly beneficial, human involvement remains essential for addressing patients' individual needs and concerns.

There were mixed feelings among the participants regarding the replacement of the job by the AI in the current study. A Study conducted in the Kingdom of Saudi Arabia (KSA) among medical students, confirms that 60% of the participants viewed AI as a supportive tool rather than a replacement.16 The perception prevails among the student that AI could assist them but may not replace their role in the healthcare system.

Nearly 34% of our participants, indicated that they will ask AI for decision making. Most of them (61, 37.75%) showed disagreement. Similar mixed feelings were reported by a qualitative study conducted in Turkey among student nurses.4 The students have emphasized the need for human supervision of AI. Majority of our participants (95, 58%, somewhat agree + agree) that AI in healthcare is reliable. These findings are consistent with previous literature where 74.7% of the student nurses viewed that AI in healthcare is safe and reliable.[17] It reflects the perception that AI will have a positive impact on the healthcare delivery system.

The finding that 99(61.1%) of participants expressed doubts about AI's ability to provide compassionate care is another significant finding. According to a study conducted in Qatar, 57.9% of medical students doubted AI's capacity to treat patients with compassion.[10] The participants of another study noted (56.1%) that it is unlikely that AI would provide empathetic care to patients and ethical challenges will be created (70.3%).[7] All of these findings demonstrate that while AI is recognized for its technological advantages, its impersonal nature remains a significant barrier to its widespread use in nursing practice. Of the participants when asked about the errors, 34.2 view that AI could commit errors. The finding has been noted by another study, where 62% of the participants perceived that AI could make errors.[18] These findings indicate that students perceive AI as important tool but it will not be free of errors. Therefore, healthcare professional will require training for the efficient utilization of AI.

The study is important because it has explored the perceptions of students in the institutions, students came from different parts of the country, which adds some variety to the sample Therefore, the sample may include participants from various areas of the country. Secondly, the data collected represent perception of both genders.

LIMITATIONS OF STUDY

The study has various limitations which includes use of self-reported perceptions may introduce bias and only two institutions may limit generalizability of findings. The cross-sectional design precludes establishing causal

relationships. Additionally, the awareness section was reported separately, and the absence of inferential statistics limited the ability to determine associations between study variables.

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CONCLUSION

The results suggest that students' perceptions on the application of AI in nursing practice differ, exhibiting both caution and hope. While many students agree that AI might improve patient care, speed and accuracy of diagnosis, worries about job security, ethical issues, and the requirement for intensive training remain. This study also emphasizes how crucial it is to incorporate AI education into nursing courses from an early age in order to guarantee that trainees acquire the requisite skills and moral frameworks. This proactive strategy can enable nurses to accept AI technology confidently and morally, improving healthcare service and patient outcomes. Nursing practitioners need to be equipped with the skills and knowledge necessary to succeed in the digital era, which means that continuing research and educational programs must adapt as the healthcare sector changes due to technology breakthroughs.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under:

MN & SS: Data acquisition, critical review, approval of the final version to be published.

SN & AK: Conception, study design, drafting the manuscript, approval of the final version to be published.

MFA & AAK: Data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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