# ARTIFICIAL INTELLIGENCE AWARENESS AND ACCEPTANCE AMONG NURSES IN PAKISTAN: IMPLICATIONS FOR NURSING PRACTICE

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## Abstract

**Background**

*Artificial intelligence (AI) is increasingly being integrated into healthcare systems worldwide, with the potential to enhance clinical decision-making, improve patient outcomes, and reduce workload. Nurses, as frontline healthcare providers, play a critical role in the adoption and effective use of AI technologies. However, limited evidence exists regarding nurses' knowledge and acceptance of AI in developing healthcare settings such as Pakistan.*

**Aim**

*The aim of this study was to assess the level of knowledge and acceptance of artificial intelligence among nurses and to examine the association between AI knowledge, AI acceptance, and selected demographic variables at Sheikh Zayed Hospital, Lahore.*

**Methods**

*A descriptive cross-sectional study was conducted among 235 registered nurses using a structured self-administered questionnaire. Data were collected on demographic characteristics, AI knowledge, and AI acceptance. Descriptive statistics were used to summarize the data, while chi-square tests examined associations between variables. Pearson correlation analysis was applied to assess the relationship between AI knowledge and acceptance. Statistical significance was set at $p < .05$.*

**Results**

*The majority of nurses demonstrated a moderate level of AI knowledge (43.4%) and acceptance (46.4%). AI knowledge and acceptance were significantly associated with educational level and clinical experience ($p < .05$). No significant association was found with gender. A strong positive correlation was observed between AI knowledge and AI acceptance ($r = 0.61$, $p < .001$), indicating that higher knowledge was associated with greater acceptance of AI in nursing practice.*

**Conclusion**

*The study concludes that while nurses exhibit moderate awareness and acceptance of AI, significant knowledge gaps remain. Integrating AI education into nursing curricula and providing continuous professional training may enhance nurses' readiness for effective AI adoption in healthcare.*

## Introduction

Artificial intelligence (AI) is a type of computer system that can deliver services related to human cognition patterns recognition, prediction, language processing, and decision support. Awareness defines basic knowledge of AI concepts, uses, advantages, and disadvantages in practice among nurses. Acceptance defines the readiness of nurses to trust, adopt and regularly use AI-enabled devices in patient care, education, documentation, and workflow. Implications in nursing practice explain how AI is expected to affect clinical decision-making, patient safety, workload, professional responsibilities, ethics, and competencies requirements upon being incorporated into a regular nursing care (Habib et al., 2024).

Pakistan has been experiencing a conducive prevalence load of restricted nursing skill and scarcity of AI preparedness. According to the national sources, as reported in the recent Pakistani literature, low nurse-to-patient ratios are observed in most of the settings, attributable to the high workloads and insufficient time to be spent on training and digital upskilling (Pakistan Economic Survey 20202021 cited by recent syntheses). In the single recent study of Pakistan-based nursing-oriented AI found in the peer-reviewed literature, 59.1% of nursing students said that they had poor AI awareness and that 52.6% of nursing students had poor perceptions, although more than half said that they had positive intentions to use AI (Sheraz et al., 2025). A larger national survey of Pakistani healthcare students and professionals has shown that 78.7% had never attended any formal courses or trainings on AI in the course of studies or employment, indicating a significant lack of preparation which probably also covers the nursing workforce (Habib et al., 2024). The density of nursing and midwifery staff in Pakistan has been heralded as a fundamental health-system limitation registered in the international datasets on the workforce, thus supporting the necessity of innovations aimed at efficiency without affecting the quality of the care (World Health Organization, 2020.).

AI is gradually becoming a clinical support function as opposed to a substitute of nurses.

Among the applications that are applicable in nursing practice, there are early warning and deterioration prediction, risk screening, support of triage, medication safety, workload forecasting, support of documentation, personalization of patient education, and quality improvement analytics (Habib et al., 2024). The necessity to involve nurses in a digital strategy, system design, governance, and evaluation has become a topic of international discourse in nursing informatics since the workflows of frontline nurses determine the safety and utility of digital tools (Cummings, 2021).

The level of awareness and acceptance among nurses has an impact on the outcomes of adoption since AI tools need proper understanding, proper dependence, and regular use. Poor conceptual comprehension heightens the chances of automation bias, improper overrides or lack of utilization of useful tools. Well-meaning but incompetent intention may lead to unsafe practice when personnel use the output of AI without knowing the limits to the model, data quality concerns, and mismatch of context. Data indicates that the interest in AI education on undergraduate level is high and exposure to training is low in Pakistan, which indicates that motivation is high but structured capacity building is still lacking (Habib et al., 2024).

In Pakistan, the nursing AI would be presented in an environment that is influenced by the lack of digital health adoption. The use of health information technology has been associated with resource limitations, staffing demands, and weak system-level coverage, which have generated unequal implementation experiences in facilities (Asif et al., 2021). The nature of nursing workforce in the face of rapidly increasing digital transformation reveals the lack of training, exhaustion in face of change, and the necessity to have a supportive leadership and competency building in order to maintain a digital tool integration (Drennan & Ross, 2022). The adoption of AI in nursing practice is based on the same prerequisites, and additional requirements of data literacy, governance and ethical safeguards must be met.

The aspect of ethical, legal, and socio-technical consideration is the main factor of acceptability of AI among the nurses since it is the responsibility of nurses to advocate on behalf of the patients and to safeguard them at the point of care. According to a national survey of Pakistan, numerous respondents predicted that AI would lead to ethical dilemma in healthcare and showed concern with privacy, accountability, bias, transparency, and trust in patients (Habib et al., 2024). The nursing practice needs transparent accountability channels where AI influences the decision-making process, transparent channels of escalation of the conflicting output, and patient-driven communications around the use of technology in the care. The lack of staff also increases vulnerability when decision-support tools are implemented without proper training, oversight, and time to confirm the results during high-traffic shifts (World Health Organization, 2020.).

The discrepancy between the rapid diffusion of AI in healthcare and the lack of documented preparedness of nurses in Pakistan reflects the need to identify what AI awareness and acceptance are among nurses in Pakistan. Evidence-based in Pakistan already shows that nursing learners are poorly aware of AI and that there is little formal training in AI in healthcare professions, with a desire to work with AI when conditions are favorable (Sheraz et al., 2025; Habib et al., 2024). The implications of nursing practice comprise the necessity of organized AI literacy courses, lifelong learning, role-specific ability frameworks, as well as local rule that aligns with the resource reality of Pakistan. The results can inform the nursing leadership, educators, regulators, and hospital administrators to integrate AI safely and context-appropriately to enhance care quality instead of increasing risks (Cummings, 2021; Drennan and Ross, 2022).

## Methodology

A descriptive comparative cross-sectional research design was employed to assess and compare the level of knowledge and acceptance of artificial intelligence among nurses working at Sheikh Zayed Hospital, Lahore. The cross-sectional design was appropriate as it allowed measurement of the study variables at a single point in time without manipulation. The comparative component enabled identification of differences across selected nurse-related characteristics. The study was conducted at Sheikh Zayed Hospital, Lahore, a tertiary care teaching hospital providing a wide range of clinical services.

The study population comprised registered nurses employed at Sheikh Zayed Hospital, Lahore, who were directly involved in patient care. Nurses with at least one year of clinical experience were included to ensure adequate exposure to clinical workflows and healthcare technologies. Nurses working in purely administrative roles or those on extended leave during the data collection period were excluded to maintain homogeneity of the sample. Based on hospital records, approximately 600 nurses met the eligibility criteria. The required sample size was calculated using the Raosoft online sample size calculator with a 5% margin of error and a 95% confidence level, resulting in a sample size of 235 participants. Simple random sampling was used to ensure representativeness and reduce selection bias.

## Data Collection Procedure

Data collection was initiated after obtaining formal approval from the hospital administration of Sheikh Zayed Hospital, Lahore. The purpose and objectives of the study were clearly explained to all participants prior to data collection. Written informed consent was obtained from each participant. Participation was voluntary, and confidentiality and anonymity were assured throughout the study.

Data were collected using a structured self-administered questionnaire designed to assess nurses' knowledge, awareness, and acceptance of artificial intelligence in nursing practice. The researcher personally distributed and collected the questionnaires from the nursing staff across different clinical units of the hospital. Clear instructions were provided, and participants' queries were addressed during the data collection process. Completed questionnaires were reviewed on-site to ensure completeness and accuracy. The

collected data were coded and entered into SPSS for statistical analysis.

**Data Analysis Procedure**

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics and levels of AI knowledge and acceptance among nurses. Inferential statistics were applied to examine associations between nurses' demographic variables and their levels of AI awareness and acceptance. Chi-square tests were used to analyze relationships among categorical variables, while correlation analysis was conducted to explore the relationship between AI knowledge

and acceptance. Statistical significance was determined at a 95% confidence level. The results were presented in tables and narrative form for clarity and ease of interpretation.

**Results & Analysis**

The majority of participants were female nurses (77.9%), while males accounted for 22.1% of the sample. Most nurses were aged between 20–29 years (46.0%), followed by those aged 30–39 years (36.6%). More than half of the nurses held a Bachelor of Science in Nursing degree (54.9%), and 40.9% had 1–5 years of clinical experience. Nearly half of the participants were working in medical and surgical units (47.7%), with the remainder employed in ICU/emergency and other units.

**Table 1**

**Demographic Characteristics of Nurses at Sheikh Zayed Hospital, Lahore (N = 235)**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 52 | 22.1 |
| | Female | 183 | 77.9 |
| **Age (years)** | 20–29 | 108 | 46.0 |
| | 30–39 | 86 | 36.6 |
| | ≥40 | 41 | 17.4 |
| **Educational Level** | Diploma | 74 | 31.5 |
| | BSN | 129 | 54.9 |
| | MSN | 32 | 13.6 |
| **Clinical Experience** | 1–5 years | 96 | 40.9 |
| | 6–10 years | 79 | 33.6 |
| | >10 years | 60 | 25.5 |
| **Working Unit** | Medical/Surgical | 112 | 47.7 |
| | ICU/Emergency | 81 | 34.5 |
| | Other | 42 | 17.8 |

The results showed that most nurses had a moderate level of knowledge regarding surgical site infections (43.4%). More than one-third of the participants demonstrated poor knowledge

(37.0%), while only a small proportion had a good level of knowledge (19.6%). Overall, the findings indicate that nurses' knowledge about surgical site infections was suboptimal.

**Figure 1**

**Level of Artificial Intelligence Knowledge Among Nurses**
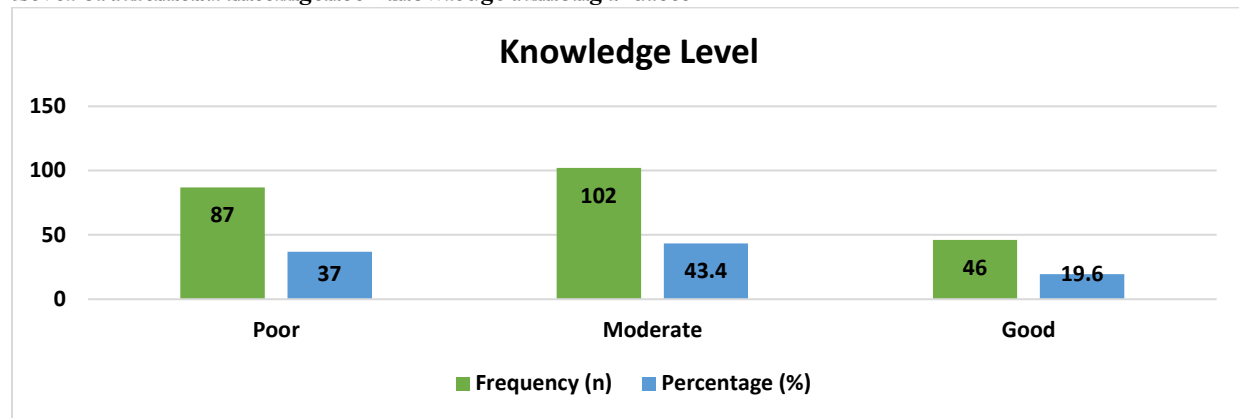


The findings revealed that nearly half of the nurses demonstrated a moderate level of acceptance (46.4%). A considerable proportion showed low acceptance (28.9%), while less than one-quarter of the participants reported a high level of acceptance (24.7%). Overall, acceptance of the studied concept among nurses was moderate.

**Figure 2**

**Level of Acceptance of Artificial Intelligence Among Nurses**
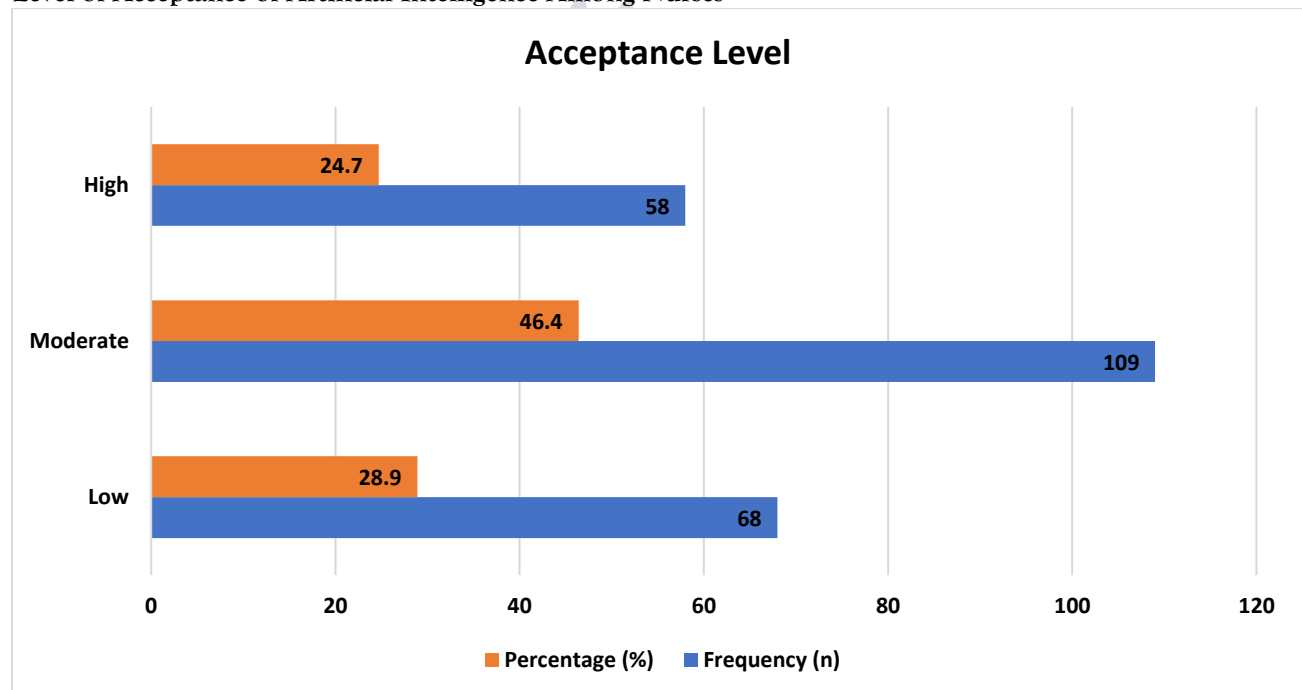


The chi-square analysis showed no statistically significant association between gender and acceptance level ($\chi^2$ = 4.21, df = 2, p = 0.122). In contrast, educational level was significantly associated with acceptance ($\chi^2$ = 18.36, df = 4, p = 0.001). Additionally, clinical experience demonstrated a significant relationship with acceptance level ($\chi^2$ = 12.47, df = 4, p = 0.014), indicating that acceptance varied according to nurses' experience.

Table 2

**Association Between AI Knowledge Level and Demographic Variables**

| Variable | χ² value | df | p-value |
|---|---|---|---|
| Gender | 4.21 | 2 | 0.122 |
| Educational Level | 18.36 | 4 | **0.001** |
| Clinical Experience | 12.47 | 4 | **0.014** |

**Chi-square test applied; p < .05 considered statistically significant.**

The chi-square test indicated no statistically significant association between gender and knowledge level ($\chi^2$ = 3.89, df = 2, p = 0.143). However, educational level showed a highly significant association with knowledge level ($\chi^2$ = 21.05, df = 4, p < 0.001). Similarly, clinical experience was significantly associated with knowledge level ($\chi^2$ = 15.62, df = 4, p = 0.004), suggesting that higher education and greater experience were linked to better knowledge.

Table 3

**Association Between AI Acceptance and Demographic Variables**

| Variable | χ² value | df | p-value |
|---|---|---|---|
| Gender | 3.89 | 2 | 0.143 |
| Educational Level | 21.05 | 4 | **<0.001** |
| Clinical Experience | 15.62 | 4 | **0.004** |

The correlation analysis revealed a **strong positive relationship** between AI knowledge and AI acceptance among nurses (r = 0.61, p < 0.001). This finding indicates that higher levels of AI knowledge were associated with greater acceptance of AI, and the relationship was **statistically significant**.

Table 4

**Correlation Between AI Knowledge and AI Acceptance Among Nurses**

| Variables | r value | p-value |
|---|---|---|
| AI Knowledge & AI Acceptance | 0.61 | **<0.001** |

**Pearson correlation applied; significance level set at p < .05.**

## Discussion

The results of the current research are useful in terms of understanding the knowledge and acceptance of the artificial intelligence (AI) among nurses in the Lahore tertiary care hospital. On the whole, the level of AI knowledge and acceptance among the majority of nurses was moderate, implying that, although the mastery of AI concepts and their trust in AI use are present, there is still little deep knowledge and confidence in the use of AI. This trend indicates the in-between phase of AI adoption in the medical sector with changes towards technological advances becoming more pronounced yet the formal training and systematization of this change remain in development. The same tendencies are observed in the nursing research in the developing healthcare systems, where AI is identified as helpful without its complete implementation in the daily clinical process.

In this research, the level of knowledge regarding AI among nurses is quite low with a significant percentage of them having inadequate knowledge and only a small percentage of them had good knowledge. The results are also aligned with the past studies that were carried out among nurses in Asia and the Middle East, where insufficient formal education and institutional training were discovered as key obstacles to AI literacy (Booth et al., 2021; O'Connor et al., 2022). Conversely,

high-income regions have recorded a greater level of AI knowledge in nurses and attribute this to the introduction of health informatics and digital health materials into the nursing curriculum at the undergraduate and postgraduate levels (Topol, 2019). This juxtaposition demonstrates the role of educational facilities and access availability to resources in the readiness of nurses towards new technologies.

The degree to which AI was accepted between nurses in the current study was mostly moderate with few nurses indicating high levels of acceptance. This result is consistent with the results of Blease et al. (2020) and Castagno and Khalifa (2020), who have found a limited level of optimism among healthcare professionals regarding AI. The nurses recognized the opportunity of AI to enhance efficiency, patient safety, and clinical judgments, but raised their doubts regarding the job security, ethical aspect of AI, and the deprivation of human touch in managing patients. On the other hand, other studies that were held in technologically-sophisticated healthcare environments recorded higher acceptance rates, indicating that there are possibilities of increased levels of trust and readiness to employ AI tools due to familiarity and successful application.

The substantial correlation between AI knowledge and educational level presented in this research can be considered as the evidence of the current literature that highlights the importance of education as one of the key factors of technological competence. The nurses with advanced academic credentials were found to be more knowledgeable about AI and more accepting, which aligns with the results provided by Nguyen et al. (2021). Research, informatics, and evidence-based practice are often exposed to higher education, and they can lead to positive attitudes toward innovation. Nonetheless, other studies have reported no strong relationship between education and AI acceptance, which could be because of low chances of having practical exposure despite academic qualification in resource-limited settings.

Both the AI knowledge and acceptance were also significantly related to clinical experience in this study. Nurses who had more years of experience showed an increased likelihood of showing higher acceptance, which might be explained by their wider perception of the problems of the healthcare system and the value of those tools that can decrease workload and enhance efficiency. This observation aligns with the research conducted by Davenport and Kalakota (2019), who proposed that professional clinicians can find AI as an effective assistant and not a competitor. Conversely, younger nurses or less experienced nurses have been reported as more accepting, which may be explained by their higher familiarity with digital technologies and a higher degree of comfort with technology, which suggests that the experience and AI acceptance relationship may be different in different settings.

The present research did not show any significant difference between gender and AI knowledge and acceptance, which is consistent with a number of earlier studies that showed no gender difference in attitude toward the consumption of healthcare technology (Blease et al., 2020). This result indicates that training and institutional resources might be more important factors that influence the perception of nurses towards AI than demographic variables. Nevertheless, there are also reports of differences in favor of male participants, which is usually explained by the difference in exposure to technology, and it is necessary to provide everyone with equal training opportunities as a nurse.

The correlation between AI knowledge and AI acceptance was found strong and positive which suggests the higher the knowledge, the higher the willingness to use AI in nursing practice. This observation complies with technology acceptance models and is proven by previous research that has shown that the levels of understanding and familiarity decrease resistance to innovation (Venkatesh et al., 2016). All these discoveries imply the need to combine AI-specific education, lifelong learning, and institutional encouragement to increase the preparedness of nurses to utilize AI. The lack of knowledge and contextual issues can be addressed to help enhance the successful and moral implementation of AI in nursing care, especially in healthcare that is resource-limited.

## CONCLUSION:

This research evaluated how much nurses in Sheikh Zayed Hospital, Lahore, know and accept artificial intelligence in the healthcare industry. The results showed that most of the nurses had an intermediate knowledge and acceptance of artificial intelligence and it means that they are becoming more aware, but not much deeper. The percentage of nurses with poor knowledge was also significant, and it shows that there are some gaps in formal education and professional training regarding the new healthcare technologies. These results indicate that, although the relevance of artificial intelligence is becoming more evident in the clinical environment, its successful introduction into nursing practice is still limited by a lack of exposure and formal learning environments.

The paper also found out that there are significant correlations between the level of education and artificial intelligence knowledge and clinical experience, which highlights the importance of academic training in pre-professional education and professional exposure in training nurses towards technological innovation. Nurses who had a high educational background and clinically experienced more were more likely to demonstrate improved knowledge and acceptance of artificial intelligence. In comparison, the gender was not significantly correlated with either knowledge or acceptance, indicating that demographic factors have a minor role in comparison to educational and professional ones.

Besides, it was found that there is a positive correlation between the knowledge of artificial intelligence and its acceptance, which suggests that the higher the level of understanding, the higher the willingness to use artificial intelligence in nursing practice. This observation supports the need to enhance knowledge as a measure of promoting positive attitude towards technological changes. Altogether, the paper suggests that the educational intervention, institutional, and policy-level efforts are necessary to make nurses more ready to artificial intelligence, which will guarantee its ethical and effective implementation in healthcare delivery and ensure its patient-focused and successful introduction into practice.

## 6.2. RECOMMENDATIONS OF THE STUDY:

Based on the findings of the study, the following recommendations are proposed:

1. **Integration of Artificial Intelligence into Nursing Education**
Nursing curricula at diploma, undergraduate, and postgraduate levels should incorporate artificial intelligence, digital health, and health informatics content to enhance foundational knowledge and technological competence among nurses.

2. **Continuous Professional Development Programs**
Hospitals and healthcare institutions should organize regular workshops, seminars, and in-service training programs focused on the practical application of artificial intelligence in clinical settings to improve nurses' confidence and acceptance.

3. **Institutional Support and Policy Development**
Healthcare administrators should develop clear policies and guidelines regarding the use of artificial intelligence in nursing practice, ensuring ethical standards, data security, and patient safety are maintained.

4. **Hands-On Exposure to AI-Based Technologies**
Providing nurses with supervised exposure to AI-based tools, such as clinical decision-support systems and predictive analytics, may enhance familiarity and promote positive attitudes toward their use.

5. **Future Research**
Further studies should be conducted using mixed-methods or longitudinal designs to explore changes in nurses' perceptions over time and to assess the impact of educational interventions on knowledge and acceptance of artificial intelligence.

6. **Expansion to Diverse Healthcare Settings**
Replication of this study in multiple hospitals and across different regions of Pakistan is recommended to improve generalizability and provide a broader understanding of nurses' readiness for artificial intelligence adoption.

7. **Interdisciplinary Collaboration** Collaboration between nurses, information technology professionals, and policymakers should be encouraged to ensure that artificial intelligence systems are designed and implemented in ways that align with nursing workflows and patient care needs.

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