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Original Article

Comparative Assessment of Artificial Intelligence Readiness, Digital Competency, and Evidence-Based Nursing Practice Among Nurses Working in Public and Private Hospitals of Multan

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ABSTRACT

Background: Nurses require artificial intelligence readiness, digital competency, and evidence-based practice competency to engage effectively with technology-supported healthcare. Comparative evidence regarding these competencies across Pakistan's public and private hospital sectors remains limited. Objective: To compare AI readiness, digital competency, and EBP competency among nurses working in public and private hospitals in Multan and to examine relationships among these competencies and perceived barriers. Methods: This comparative cross-sectional study included 340 registered nurses, with 170 participants from each hospital sector. Standardized 0–100 scores were derived from adapted AI-readiness, digital-competency, and EBP-competency instruments. Group differences were evaluated using independent-samples t-tests and chi-square tests, while relationships were examined using Pearson correlations. Results: Private-hospital nurses had higher AI-readiness scores than public-hospital nurses (72.4 ± 11.2 versus 61.8 ± 13.5; mean difference, 10.6; 95% CI, 8.0–13.2; d = 0.85), digital-competency scores (68.7 ± 10.8 versus 56.3 ± 14.1; mean difference, 12.4; 95% CI, 9.7–15.1; d = 0.99), and EBP-competency scores (65.9 ± 12.4 versus 54.7 ± 15.2; mean difference, 11.2; 95% CI, 8.2–14.2; d = 0.81). Digital competency correlated with AI readiness (r = 0.64) and EBP competency (r = 0.68), while AI readiness correlated with EBP competency (r = 0.52; all $p < 0.001$). Lack of training (85.9%), limited infrastructure (67.9%), and heavy workload (65.6%) were the most frequently reported barriers. Conclusion: Private-hospital nurses reported higher competency scores across all three domains. The observed relationships suggest that AI readiness, digital competency, and EBP competency are interconnected, although causal conclusions cannot be drawn. Keywords: Artificial Intelligence Readiness; Digital Competency; Evidence-Based Practice; Nurses; Public Hospitals; Private Hospitals; Pakistan.

INTRODUCTION

Digital transformation is increasingly reshaping healthcare delivery, clinical decision-making, documentation, professional education, and communication with patients. Nurses require appropriate technological knowledge and skills because they routinely interact with electronic health records, clinical decision-support systems, telehealth platforms, digital monitoring technologies, and other health-information systems. The growing use of artificial intelligence in healthcare has further expanded these competency requirements by introducing predictive analytics, automated documentation, risk-stratification systems, virtual assistants, and AI-supported clinical decision tools

into healthcare practice (1,2). Nevertheless, nurses' use of digital-health technologies remains inconsistent, and inadequate digital-health literacy has been identified as an important barrier to their effective implementation (3). Digital competence is therefore becoming an essential component of contemporary nursing practice because it enables nurses to access, evaluate, communicate, and apply health information through digital technologies (1,4).

Artificial intelligence readiness refers to the extent to which individuals possess the knowledge, willingness, confidence, and ethical awareness required to engage appropriately with AI-enabled technologies. In nursing, readiness involves more than familiarity with AI terminology; it includes understanding potential clinical applications, recognising professional and ethical responsibilities, evaluating AI-generated information, and maintaining accountability for patient-care decisions. The Nursing Artificial Intelligence Readiness Scale was developed to assess knowledge and awareness, willingness to use AI, self-efficacy, and ethical awareness among nursing populations (5). Previous research has shown that nurses and nursing students generally express positive attitudes toward AI but frequently demonstrate deficiencies in technical knowledge, practical exposure, and formal preparation (2,5,6). These deficiencies may restrict nurses' ability to evaluate AI-supported recommendations critically and integrate emerging technologies safely into clinical workflows.

Digital competency is closely related to AI readiness because the effective use of AI generally depends on foundational skills in digital communication, information retrieval, data interpretation, privacy protection, and the operation of clinical information systems. Digitally competent nurses are better positioned to identify reliable health information, interact with electronic systems, and adapt to technology-supported models of care (3,4). Digital competency may also support evidence-based practice by enabling nurses to search bibliographic databases, retrieve clinical guidelines, critically evaluate online information, and access research evidence at the point of care. Consequently, inadequate digital skills may limit both nurses' readiness to use AI and their capacity to incorporate research evidence into clinical decision-making.

Evidence-based practice integrates the best available research evidence with clinical expertise, patient preferences, and contextual considerations. It is recognised as an important approach for improving the consistency, safety, and quality of nursing care (7). However, nurses frequently encounter barriers to EBP implementation, including insufficient research knowledge, limited critical-appraisal skills, restricted access to scientific literature, time constraints, staffing shortages, heavy workloads, and inadequate organisational support (7,8). These barriers may be particularly influential in healthcare environments where access to databases, digital systems, continuing professional education, and research mentorship is limited. The relationship between digital competency and EBP is therefore important because nurses must possess both research-related and digital-information skills to locate, appraise, and apply contemporary evidence effectively (4).

Studies conducted in Pakistan indicate that healthcare professionals generally hold favourable attitudes toward AI and digital-health technologies, but many have received little formal training and report limited access to appropriate technological infrastructure (9,10). Research among nurses in tertiary-care hospitals has similarly identified variation in digital-health knowledge, practical skills, and attitudes, with notable weaknesses in advanced digital problem-solving and content-development abilities (11,12). Evidence-based nursing practice also remains constrained by limited access to research literature, insufficient research competencies, workload pressures, and variable institutional support (13). These findings suggest that technological and evidence-based competencies may be influenced not only by individual education and experience but also by the organisational environment in which nurses practise.

Pakistan's healthcare system includes public and private hospitals that may differ in staffing patterns, educational opportunities, technological resources, access to research information, and institutional investment in professional development. Such differences may contribute to variation in nurses' AI

readiness, digital competency, and EBP competency. Nevertheless, the available Pakistani literature has generally examined these constructs separately, and comparative evidence examining all three competencies among nurses working in public and private hospitals remains limited. The relationships among these competencies in clinical nursing populations are also insufficiently understood.

This study therefore aimed to assess and compare artificial intelligence readiness, digital competency, and evidence-based practice competency among registered nurses working in public and private hospitals in Multan, Pakistan. It also aimed to examine the relationships among the three competency domains, identify individual and organisational factors associated with EBP competency, and describe the principal barriers to AI adoption, digital competency development, and EBP implementation. It was hypothesised that nurses working in private hospitals would demonstrate higher competency scores than nurses working in public hospitals and that AI readiness, digital competency, and EBP competency would be positively correlated.

MATERIALS AND METHODS

A comparative cross-sectional study was conducted among registered nurses working in public and private hospitals in Multan, Punjab, Pakistan, between January and June 2026. The participating public-sector institutions were Nishtar Hospital and CPEIC, while the participating private-sector institutions were Medicare Hospital and City Hospital. The public and private sectors were compared because differences in technological resources, professional-development opportunities, and institutional support could potentially be associated with nurses' preparedness for digitally enabled and evidence-based clinical practice.

The target population comprised registered nurses involved in direct patient care at the participating hospitals. Nurses were eligible when they held valid national nursing registration, were currently employed in a participating public or private hospital, had completed at least six months of clinical experience in their current setting, and voluntarily agreed to participate. Nurses who were on extended leave, held exclusively administrative positions without direct patient-care responsibilities, or were working as students or interns were excluded.

A stratified sampling approach was used, with hospitals initially classified into public and private strata. Equal sector allocation was adopted to support direct comparison, with a target of 170 participants from each sector. Within the two sectors, participant allocation across the selected hospitals was based on the available nursing workforce, and eligible nurses were selected from departmental staff lists. An a priori sample-size assessment was performed using G*Power with an anticipated effect size of 0.30, a two-sided significance level of 0.05, and statistical power of 80%. To compensate for potential nonresponse and incomplete questionnaires, 380 nurses were approached. A total of 340 nurses returned completed questionnaires and were included in the analysis, producing an overall response rate of 89.5%.

Data were collected using a structured questionnaire comprising demographic information, three competency instruments, and a checklist of perceived barriers. The demographic section recorded age, gender, educational level, years of clinical experience, hospital sector, clinical department, and previous formal training in AI, digital health, or evidence-based practice. Hospital sector was treated as the principal grouping variable, while AI readiness, digital competency, and EBP competency were the principal study outcomes.

Artificial intelligence readiness was assessed using the Nursing Artificial Intelligence Readiness Scale developed by Kılıç et al. (5). The 20-item instrument assesses four domains: knowledge and awareness, willingness to use AI, self-efficacy, and ethical awareness. Each item is rated on a five-point Likert scale ranging from 1, strongly disagree, to 5, strongly agree, with higher scores representing greater AI readiness. The original instrument demonstrated strong internal consistency and test–retest reliability. For the present study, minor wording modifications were made to ensure applicability to practising

nurses rather than nursing students. The relevance and clarity of the adapted items were reviewed by a panel of five nursing experts before data collection.

Digital competency was measured using an 18-item adaptation of the Digital Competence Questionnaire for Nurses (14). The questionnaire evaluates familiarity with digital tools, confidence in using digital applications, and attitudes toward digital-health technologies. Items are rated on a five-point Likert scale, with higher scores indicating greater digital competency. Cultural adaptation was undertaken through expert review, and the adapted questionnaire was pilot-tested among 30 nurses before administration in the main study. Nurses participating in the pilot assessment were not included in the final analytic sample.

Evidence-based practice competency was assessed using the 25-item Evidence-Based Practice Competence Questionnaire, which evaluates EBP knowledge, attitudes, and skills (7). Items are scored using a five-point Likert response format. Higher scores indicate greater perceived competency in identifying clinical questions, locating relevant research evidence, critically appraising scientific literature, and applying evidence in nursing practice.

To provide a common reporting metric across instruments with different numbers of items and possible score ranges, total and domain scores were standardised to a scale from 0 to 100, with higher values indicating greater competency. For descriptive presentation, standardised scores below 50 were classified as low, scores from 50 to 74 as moderate, and scores of 75 or higher as high. These categories were used as investigator-defined descriptive groupings rather than diagnostic or clinically validated thresholds.

Perceived barriers to AI adoption, digital competency development, and EBP implementation were assessed using a structured multiple-response checklist developed from the relevant literature. The checklist addressed lack of training, limited technological infrastructure, heavy workload, insufficient access to research resources, limited access to scientific literature, concerns regarding data privacy, inadequate organisational support, and insufficient research skills. Participants could identify more than one barrier.

Following ethical and administrative approval, eligible nurses selected from the participating hospitals were approached during shift changes. The purpose and procedures of the study were explained, and written informed consent was obtained before questionnaire administration. Participation was voluntary, and nurses were informed that they could decline or withdraw without any employment-related consequences. Questionnaires were completed independently and required approximately 25–30 minutes. Completed questionnaires were collected immediately and handled without personal identifiers to protect participant confidentiality. The final analysis included 340 completed questionnaires with sufficient information for calculation of the principal competency scores.

Data were analysed using IBM SPSS Statistics version 26.0. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were calculated for continuous variables. Distributional assumptions for the principal continuous outcomes were assessed before inferential analysis. Independent-samples t-tests were used to compare mean AI-readiness, digital-competency, and EBP-competency scores between public- and private-hospital nurses. Cohen's d was used to quantify the magnitude of between-group differences. Categorical characteristics and investigator-defined competency levels were compared using Pearson's chi-square test.

Pearson correlation coefficients were calculated to examine the relationships among AI readiness, digital competency, and EBP competency in the total sample and separately within the public and private hospital groups. Multiple linear regression analysis was performed to examine factors independently associated with EBP competency. The model included digital competency, AI readiness, hospital sector, previous training, educational level, age, gender, and years of clinical experience. Regression coefficients,

standard errors, standardised coefficients, 95% confidence intervals, and p-values were estimated. All statistical tests were two-sided, and $p<0.05$ was considered statistically significant.

Ethical approval was obtained from the relevant institutional review board before participant recruitment, and administrative permission was secured from the participating hospitals. All participants provided written informed consent. Questionnaire data were anonymised, stored securely, and made accessible only to the research team.

RESULTS

A total of 340 registered nurses completed the study, including 170 nurses from public hospitals and 170 from private hospitals. Nurses working in public hospitals were older than those working in private hospitals, with mean ages of 33.8 ± 9.2 and 31.0 ± 8.1 years, respectively (mean difference, 2.8 years; $p = 0.003$). Public-hospital nurses also had more clinical experience than private-hospital nurses (9.7 ± 6.7 versus 6.9 ± 5.2 years; $p < 0.001$).

Gender and departmental distributions were comparable between the two sectors. Educational attainment differed significantly, with postgraduate qualifications reported by 40 private-hospital nurses (23.5%) compared with 18 public-hospital nurses (10.6%). Previous training in AI, digital health, or evidence-based practice was also more common among private-hospital nurses than public-hospital nurses (45.3% versus 23.5%; $p < 0.001$).

Table 1. Participant Characteristics According to Hospital Sector

Characteristic	Public Hospitals (n = 170)	Private Hospitals (n = 170)	Total (N = 340)	Test Statistic	p-Value
Age, years, mean ± SD	33.8 ± 9.2	31.0 ± 8.1	32.4 ± 8.7	t = 2.98	0.003
Gender				$\chi^2 = 0.06$	0.808
Male	48 (28.2)	46 (27.1)	94 (27.6)		
Female	122 (71.8)	124 (72.9)	246 (72.4)		
Educational level				$\chi^2 = 16.67$	<0.001
Diploma in Nursing	54 (31.8)	28 (16.5)	82 (24.1)		
Bachelor of Science in Nursing	98 (57.6)	102 (60.0)	200 (58.8)		
Postgraduate nursing qualification	18 (10.6)	40 (23.5)	58 (17.1)		
Clinical experience, years, mean ± SD	9.7 ± 6.7	6.9 ± 5.2	8.3 ± 6.1	t = 4.30	<0.001
Clinical department				$\chi^2 = 0.82$	0.976
Medical–surgical	52 (30.6)	48 (28.2)	100 (29.4)		
Critical care or intensive care	38 (22.4)	42 (24.7)	80 (23.5)		
Emergency	28 (16.5)	30 (17.6)	58 (17.1)		
Obstetrics and gynaecology	22 (12.9)	24 (14.1)	46 (13.5)		
Paediatrics	18 (10.6)	16 (9.4)	34 (10.0)		
Other	12 (7.1)	10 (5.9)	22 (6.5)		
Previous AI, digital-health, or EBP training				$\chi^2 = 17.84$	<0.001
Yes	40 (23.5)	77 (45.3)	117 (34.4)		
No	130 (76.5)	93 (54.7)	223 (65.6)		

Values are presented as n (%) unless otherwise indicated. EBP, evidence-based practice; SD, standard deviation.

Private-hospital nurses had higher standardized scores across all assessed domains. The mean total AI-readiness score was 72.4 ± 11.2 among private-hospital nurses and 61.8 ± 13.5 among public-hospital nurses. The mean difference was 10.6 points (95% CI, 8.0–13.2), corresponding to a large standardized effect (Cohen's $d = 0.85$; $p < 0.001$). The largest AI-readiness difference occurred in self-efficacy, for which the between-group difference was 12.4 points (95% CI, 9.5–15.3; $d = 0.92$).

The total digital-competency score was 68.7 ± 10.8 among private-hospital nurses compared with 56.3 ± 14.1 among public-hospital nurses. The mean difference of 12.4 points (95% CI, 9.7–15.1) represented the largest overall sector difference among the three principal competencies ($d = 0.99$; $p < 0.001$). Differences were consistently observed in familiarity with digital tools, confidence in digital applications, and attitudes toward digital health.

Private-hospital nurses also had higher total EBP-competency scores than public-hospital nurses (65.9 ± 12.4 versus 54.7 ± 15.2). The mean difference was 11.2 points (95% CI, 8.2–14.2; d = 0.81; p < 0.001). Among the EBP domains, the largest difference was observed for EBP skills (mean difference, 11.9; 95% CI, 8.9–14.9; d = 0.84).

Table 2. Comparison of Standardized Competency Scores Between Hospital Sectors

Competency Domain	Public Hospitals, Mean ± SD	Private Hospitals, Mean ± SD	Mean Difference (95% CI)	t-Value	p-Value	Cohen's d
Artificial intelligence readiness						
Knowledge and awareness	56.2 ± 14.6	68.5 ± 12.8	12.3 (9.4–15.2)	8.26	<0.001	0.90
Willingness to use AI	63.8 ± 13.2	74.2 ± 10.5	10.4 (7.9–12.9)	8.04	<0.001	0.87
Self-efficacy	58.4 ± 14.8	70.8 ± 12.1	12.4 (9.5–15.3)	8.46	<0.001	0.92
Ethical awareness	68.8 ± 11.4	76.1 ± 9.8	7.3 (5.0–9.6)	6.33	<0.001	0.69
Total AI readiness	61.8 ± 13.5	72.4 ± 11.2	10.6 (8.0–13.2)	7.88	<0.001	0.85
Digital competency						
Familiarity with digital tools	58.7 ± 14.2	71.2 ± 11.4	12.5 (9.8–15.2)	8.95	<0.001	0.97
Confidence in digital applications	54.2 ± 15.3	66.8 ± 12.6	12.6 (9.6–15.6)	8.29	<0.001	0.90
Attitudes toward digital health	56.0 ± 13.8	68.1 ± 10.2	12.1 (9.5–14.7)	9.19	<0.001	1.00
Total digital competency	56.3 ± 14.1	68.7 ± 10.8	12.4 (9.7–15.1)	9.10	<0.001	0.99
Evidence-based practice competency						
EBP knowledge	52.4 ± 15.8	63.8 ± 13.1	11.4 (8.3–14.5)	7.24	<0.001	0.79
EBP attitudes	57.9 ± 14.3	68.2 ± 11.6	10.3 (7.5–13.1)	7.29	<0.001	0.79
EBP skills	53.8 ± 15.5	65.7 ± 12.8	11.9 (8.9–14.9)	7.72	<0.001	0.84
Total EBP competency	54.7 ± 15.2	65.9 ± 12.4	11.2 (8.2–14.2)	7.44	<0.001	0.81

Scores are reported on a standardized 0–100 scale. Mean differences were calculated as private-hospital score minus public-hospital score. Positive values therefore indicate higher scores among private-hospital nurses. CI, confidence interval; EBP, evidence-based practice; SD, standard deviation.

Competency-level distributions differed significantly between the sectors. High AI readiness was observed in 65 private-hospital nurses (38.2%) compared with 30 public-hospital nurses (17.6%). Conversely, low AI readiness was reported for 51 public-hospital nurses (30.0%) and 18 private-hospital nurses (10.6%; p < 0.001). Low digital competency was present in 58 public-hospital nurses (34.1%) compared with 22 private-hospital nurses (12.9%). High digital competency was identified in 30 public-hospital nurses (17.6%) and 50 private-hospital nurses (29.4%; p < 0.001).

A similar distribution was observed for EBP competency. Low EBP competency was reported for 62 public-hospital nurses (36.5%) and 28 private-hospital nurses (16.5%), whereas high competency was identified in 26 public-hospital nurses (15.3%) and 44 private-hospital nurses (25.9%; p < 0.001).

Table 3. Distribution of Investigator-Defined Competency Levels by Hospital Sector

Competency	Public Hospitals, n (%)	Private Hospitals, n (%)	Total, n (%)	χ^2	p-Value
AI readiness				28.70	<0.001
Low	51 (30.0)	18 (10.6)	69 (20.3)		
Moderate	89 (52.4)	87 (51.2)	176 (51.8)		
High	30 (17.6)	65 (38.2)	95 (27.9)		
Digital competency				22.62	<0.001
Low	58 (34.1)	22 (12.9)	80 (23.5)		
Moderate	82 (48.2)	98 (57.6)	180 (52.9)		
High	30 (17.6)	50 (29.4)	80 (23.5)		
EBP competency				18.90	<0.001
Low	62 (36.5)	28 (16.5)	90 (26.5)		
Moderate	82 (48.2)	98 (57.6)	180 (52.9)		
High	26 (15.3)	44 (25.9)	70 (20.6)		

Low, moderate, and high categories correspond to standardized scores below 50, 50–74, and 75 or higher, respectively. These categories are descriptive, investigator-defined groupings and are not diagnostic thresholds.

All three competencies were positively correlated. In the total sample, digital competency had the strongest relationship with EBP competency (r = 0.68; 95% CI, 0.62–0.73), followed by the relationship between AI readiness and digital competency (r = 0.64; 95% CI, 0.57–0.70). AI readiness was also

positively correlated with EBP competency (r = 0.52; 95% CI, 0.44–0.59). All correlations were statistically significant at p < 0.001. The same pattern was observed within each hospital sector. The correlation between digital competency and EBP competency was r = 0.62 among public-hospital nurses and r = 0.71 among private-hospital nurses.

Table 4. Correlations Among AI Readiness, Digital Competency, and EBP Competency

Variable Pair	Total Sample, r (95% CI)	Public Hospitals, r (95% CI)	Private Hospitals, r (95% CI)
AI readiness and digital competency	0.64 (0.57–0.70)	0.59 (0.48–0.68)	0.67 (0.58–0.75)
AI readiness and EBP competency	0.52 (0.44–0.59)	0.48 (0.36–0.59)	0.55 (0.44–0.65)
Digital competency and EBP competency	0.68 (0.62–0.73)	0.62 (0.52–0.70)	0.71 (0.63–0.78)

All correlations were statistically significant at p < 0.001. CI, confidence interval; EBP, evidence-based practice.

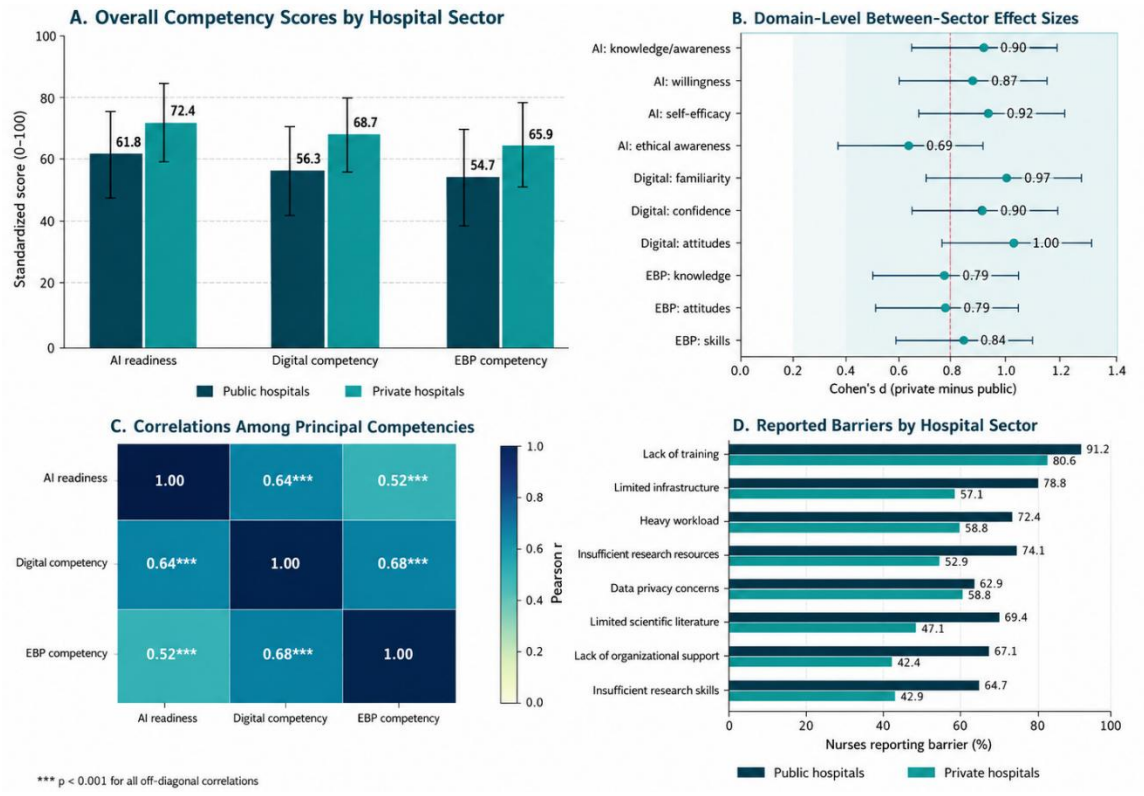

Figure 1 Comparative profile of artificial intelligence readiness, digital competency, and evidence-based practice competency among nurses working in public and private hospitals. Panel A presents standardized mean scores with standard-deviation error bars, showing higher AI readiness (72.4 vs 61.8), digital competency (68.7 vs 56.3), and EBP competency (65.9 vs 54.7) among private-hospital nurses. Panel B displays consistently large domain-level differences favouring private hospitals, with Cohen's d ranging from 0.69 for ethical awareness to 1.00 for attitudes toward digital health. Panel C demonstrates positive correlations among AI readiness, digital competency, and EBP competency, with the strongest association observed between digital competency and EBP competency (r = 0.68; all p < 0.001). Panel D shows that lack of training was the most frequently reported barrier in both sectors (91.2% public and 80.6% private), while public-hospital nurses more frequently reported infrastructure limitations, workload, restricted research access, insufficient organisational support, and inadequate research skills.

Lack of training was the most frequently reported barrier, identified by 292 nurses (85.9%). It was reported by 155 public-hospital nurses (91.2%) and 137 private-hospital nurses (80.6%; p = 0.005). Limited infrastructure was reported by 231 nurses (67.9%), while heavy workload was reported by 223 nurses (65.6%). Both barriers were more frequently reported in public hospitals. Insufficient access to research resources, limited access to scientific literature, lack of organisational support, and insufficient research skills were also more prevalent among public-hospital nurses. Concerns about data privacy were reported by 207 nurses (60.9%), with no statistically significant difference between public and private hospitals (62.9% versus 58.8%; p = 0.437).

Table 5. Perceived Barriers to AI Adoption, Digital Competency Development, and EBP Implementation

Barrier	Public Hospitals, n (%)	Private Hospitals, n (%)	Total, n (%)	χ^2	p-Value
Lack of training	155 (91.2)	137 (80.6)	292 (85.9)	7.86	0.005
Limited infrastructure	134 (78.8)	97 (57.1)	231 (67.9)	18.49	<0.001
Heavy workload	123 (72.4)	100 (58.8)	223 (65.6)	6.89	0.009
Insufficient access to research resources	126 (74.1)	90 (52.9)	216 (63.5)	16.45	<0.001
Concerns about data privacy	107 (62.9)	100 (58.8)	207 (60.9)	0.61	0.437
Limited access to scientific literature	118 (69.4)	80 (47.1)	198 (58.2)	17.46	<0.001
Lack of organisational support	114 (67.1)	72 (42.4)	186 (54.7)	20.94	<0.001
Insufficient research skills	110 (64.7)	73 (42.9)	183 (53.8)	16.20	<0.001

Participants could report more than one barrier. Percentages use the respective hospital-sector denominators.

DISCUSSION

This study found consistent differences in self-reported AI readiness, digital competency, and EBP competency between nurses working in public and private hospitals in Multan. Private-hospital nurses had higher mean scores across all three principal competencies, with large standardized differences. The greatest overall difference was observed for digital competency, while the strongest relationship among the measured constructs was between digital competency and EBP competency. Training deficiencies, infrastructure limitations, workload, restricted access to research resources, and insufficient organisational support were common barriers, particularly in public hospitals.

The observed sector difference in AI readiness is consistent with evidence indicating that nurses' preparedness for AI is shaped by knowledge, confidence, exposure to technology, ethical awareness, and the availability of formal learning opportunities. Previous research has identified moderate AI readiness among practising nurses despite generally favourable perceptions of technology, suggesting that willingness to engage with AI may develop more rapidly than the technical and evaluative skills required for its safe use (6). Studies involving nursing students have similarly found positive attitudes toward AI alongside deficiencies in formal training and institutional preparedness (2,9). In the present study, private-hospital nurses were more likely to have received previous training, which may partly explain their higher knowledge, willingness, and self-efficacy scores. Nevertheless, hospital sector should be interpreted as a contextual marker rather than an independent causal determinant because institutional resources and technology exposure were not measured directly.

Digital competency showed the largest between-sector difference. This finding is important because digital knowledge, skills, and attitudes provide the operational foundation for using electronic documentation, clinical information systems, digital communication platforms, and emerging AI-supported applications. International evidence indicates that nurses' digital-health literacy varies substantially and is influenced by education, training, access to technology, organisational support, and opportunities for practical use (1,3). A study of nurses in Peshawar also reported variation in digital-health knowledge and practice, despite generally favourable attitudes toward digital technologies (11). The current findings extend this evidence by suggesting that substantial differences may exist between hospital sectors within the same geographical setting.

The positive correlation between AI readiness and digital competency supports the conceptual relationship between general digital capability and preparedness for AI-enabled practice. Nurses who are familiar and confident with digital systems may be better positioned to understand, assess, and adopt AI-supported tools. Similar relationships have been demonstrated among nurse educators, among whom digital competence and AI readiness were positively associated with technology-supported educational innovation (13). The cross-sectional nature of the present study does not establish the direction of this relationship, however, and higher AI readiness may itself motivate nurses to develop additional digital skills.

Private-hospital nurses also reported higher EBP competency. The difference was evident across knowledge, attitudes, and skills, with the largest standardized difference occurring in EBP skills. Previous studies have demonstrated that nurses' EBP competency is affected by access to research literature, confidence in critical appraisal, workload, organisational expectations, mentorship, and self-efficacy (8). Evidence from Pakistan has also identified persistent barriers to EBP adoption, including resource limitations, insufficient research preparation, and variable institutional support (12). The present findings are compatible with this evidence, particularly because public-hospital nurses more frequently reported limited access to scientific literature, research resources, organisational support, and research skills.

Digital competency had the strongest correlation with EBP competency. This relationship is plausible because contemporary EBP requires nurses to search electronic databases, navigate digital repositories, evaluate online evidence, retrieve clinical guidance, and use information systems to support clinical decisions. Digital competency should not be regarded as equivalent to EBP competency, however. Evidence-based practice also requires formulation of answerable clinical questions, critical appraisal, integration of evidence with patient preferences and clinical expertise, and evaluation of practice outcomes. The observed relationship therefore suggests complementarity between the two competencies rather than interchangeability.

Lack of training was the most prevalent barrier in both sectors. This finding indicates that nurses may have limited structured opportunities to develop AI literacy, digital skills, and EBP competencies during employment. Infrastructure limitations and restricted access to research resources were also common, especially in public hospitals. Training initiatives are unlikely to be effective when nurses do not have reliable access to computers, internet connectivity, clinical information systems, scientific databases, or protected time for learning. Competency-development strategies should therefore combine education with practical access to the technologies and information resources nurses are expected to use.

Data-privacy concerns were common but did not differ significantly between sectors. This suggests that ethical and confidentiality concerns are not confined to institutions with lower technological resources. As digital and AI-supported systems become more prominent, professional-development programmes should address patient confidentiality, data governance, algorithmic limitations, bias, professional accountability, and appropriate human oversight alongside technical operation.

The study has several strengths. It included equal numbers of nurses from public and private hospitals, examined three related professional competencies within the same population, and evaluated both individual competencies and perceived contextual barriers. Reporting standardized scores also permitted comparison across instruments with different score ranges.

Several limitations should be considered. The cross-sectional design prevents causal interpretation, and the relationships among training, hospital sector, and competency scores may be bidirectional or influenced by unmeasured factors. The study was conducted in one city, limiting geographical generalisability. All competency measures were self-reported and may reflect confidence or perceived capability rather than objectively demonstrated performance. The instruments were adapted for the local context, and further psychometric testing is required among practising Pakistani nurses. The AI-readiness and EBP instruments were initially developed in student populations, which may affect their applicability to experienced clinical nurses (5,7). The low, moderate, and high score categories were investigator-defined and should not be interpreted as validated clinical thresholds. Hospital-level clustering was not incorporated into the analysis, and the unadjusted sector comparisons may be affected by differences in education and previous training. Finally, the barrier checklist captured perceived obstacles but did not objectively assess hospital infrastructure, access to databases, workload, or institutional policy.

These findings support the need for institution-specific assessment of nurses' learning requirements. Public hospitals may require particular attention because nurses in these settings reported lower competencies and more frequent structural barriers. Professional development should integrate digital-health skills, AI literacy, ethical use of technology, information retrieval, critical appraisal, and practical EBP application rather than addressing each competency in isolation. Prospective studies should determine whether such integrated interventions improve objectively measured competencies and clinical practice.

CONCLUSION

Nurses working in private hospitals in Multan reported higher AI readiness, digital competency, and EBP competency than nurses working in public hospitals, with large between-sector differences across the three constructs. Digital competency was strongly associated with both AI readiness and EBP competency, while training deficiencies, infrastructure limitations, workload, and restricted access to research resources were commonly reported barriers. These findings identify important competency and resource disparities but do not establish that hospital sector caused the observed differences.

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