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Original Article

Teaching the Future: AI Awareness, Attitudes, and Curriculum Readiness among Healthcare Students and Faculty in Pakistan.

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Abstract

Background:
Artificial intelligence (AI) is rapidly transforming healthcare delivery, creating new demands for AI literacy and curriculum readiness in health professions education. Yet, in Pakistan, structured integration of AI into medical and allied health curricula remains limited. This study assessed awareness, perceptions, and attitudes toward AI among healthcare students and faculty in Pakistan, highlighting similarities, differences, and barriers to curricular integration.

Methodology:
A descriptive cross-sectional survey was conducted among 105 students and 50 faculty members from medical, dental, pharmacy, nursing, and physiotherapy institutions across Pakistan. A structured online questionnaire, adapted from a validated instrument, was used to collect data on demographics, AI awareness, and attitudes. Descriptive statistics, Chi-square tests, and Mann–Whitney U tests were employed, with effect sizes reported.

Results:
Both groups reported high awareness of AI, primarily through social media (84.8% students, 86.0% faculty). A basic understanding of AI was acknowledged by 65.7% of students and 74.0% of faculty. Students were slightly more positive about AI's role in improving healthcare (median=5 vs. 4; p=0.04, small effect). Faculty placed significantly greater importance on AI for clinical decision support (median=5 vs. 4; p=0.01, moderate effect). Divergence was observed in training priorities, with students favoring patient-centered applications and faculty emphasizing teaching applications. Despite these differences, both groups strongly supported AI inclusion in medical education.

Conclusion:
Students and faculty in Pakistan recognize the relevance of AI in healthcare and education, but subtle differences in emphasis highlight the need for tailored training strategies. The findings underscore the importance of structured AI literacy initiatives, faculty development, and policy-level curriculum integration to bridge gaps in preparedness for an AI-enabled healthcare system.

Keywords:
Artificial Intelligence, Healthcare Education, Curriculum Readiness, Faculty Development, Pakistan, AI Literacy

Introduction

Artificial intelligence (AI) and health information technologies are increasingly embedded in clinical workflows, influencing diagnosis, treatment, and patient outcomes [1,2]. As these technologies reshape healthcare practice, there is a growing demand for AI literacy among health professionals. However, evidence suggests that healthcare curricula remain underprepared for this digital transformation, with limited institutional mandates and unsystematic adoption of AI-related content [3].

Faculty members often report limited confidence and expertise in AI, with integration hampered by insufficient training, lack of national standards, and fragmented institutional efforts [4,5]. Students, meanwhile, show strong awareness of AI's growing role in healthcare but rely largely on informal or self-guided learning. Their understanding is often fragmented, leaving them less confident about applying AI in clinical decision-making [6,7]. Both groups also face broader ethical and professional challenges related to data privacy, algorithmic bias, and the transparency of AI decision-making [8,9].

In Pakistan, these challenges are particularly pressing. AI education in healthcare remains minimal, with few institutions offering structured learning opportunities. Faculty often lack technological training, and students rely heavily on online or peer-shared resources. The absence of national-level strategies further contributes to inconsistencies in AI-related teaching and learning.

This study addresses these gaps by exploring the current state of AI awareness and attitudes among healthcare students and faculty in Pakistan. Specifically, it examines (1) the level of AI awareness and exposure across groups, (2) perceptions of AI's role in healthcare and education, and (3) training priorities and perceived curricular needs. By analyzing similarities and differences between students and faculty, the study provides evidence to inform tailored curriculum design, faculty development initiatives, and policy-level recommendations for integrating AI into healthcare education in Pakistan.

Methodology

Study Design

This study employed a descriptive cross-sectional survey design to investigate the awareness, perceptions, and attitudes of healthcare students and faculty members toward artificial intelligence (AI) in medical and allied health education across Pakistan. The cross-sectional approach was selected to capture a snapshot of current understanding and viewpoints during a defined data collection period, without intervention or follow-up.

Ethics

Ethical approval for this study was obtained from the Committee on Ethics of the Advance Educational Institute & Research Centre (AEIRC), Karachi, Pakistan. Participation was voluntary, and all respondents provided electronic informed consent before accessing the survey. No identifying information was collected, and anonymity and confidentiality were maintained throughout.

Setting

The study was conducted across higher education institutions in Pakistan, including medical, dental, pharmacy, nursing, and physiotherapy programs. Participants were recruited from both public and private sector universities and colleges. Data collection was carried out online, allowing wide geographical coverage across different provinces and institutional settings.

Participants

The target population consisted of undergraduate students actively enrolled in academic programs and faculty members involved in teaching at the aforementioned institutions. Inclusion criteria required participants to be either current students or faculty members engaged in teaching. Individuals not directly affiliated with teaching or studying at these institutions were excluded. In total, 155 individuals participated, comprising 105 students and 50 faculty members.

Variables

The survey assessed three primary categories of variables:

- Demographic and background variables – age, gender, academic year (students), and academic rank (faculty).
- Awareness and familiarity with AI – self-reported exposure to AI through different sources (e.g., social media, academic literature, professional talks) and perceived level of understanding.
- Attitudes and perceptions – beliefs about AI's potential to improve healthcare, its role in education, concerns about career impact, and preferences for AI training domains.

Data Sources/Measurement

Data were collected using a structured online questionnaire created in Google Forms. The instrument was adapted from a previously validated survey on AI awareness in healthcare education and tailored into two versions: one for faculty and one for students. Both versions included parallel sections covering demographics, awareness, and attitudes. Items were primarily close-ended, with Likert-scale questions (5-point) used to measure perceptions and levels of agreement. An introductory section explained the study's purpose and confirmed informed consent.

Bias

To minimize response bias, the survey was distributed through multiple academic channels, including institutional emails, professional WhatsApp groups, and educational networks. Participation was anonymous to reduce social desirability bias. However, the use of non-probability convenience sampling introduced potential selection bias, and the relatively small faculty sample size may limit generalizability.

Study Size

A total of 155 complete responses were analyzed (105 students, 50 faculty). No formal sample size calculation was performed due to the exploratory nature and time constraints of the study. The achieved sample was considered sufficient for descriptive and inferential comparisons, though not intended to be nationally representative.

Quantitative Variables

Categorical variables (e.g., gender, academic year, sources of AI awareness) were summarized as frequencies and percentages. Ordinal variables measured on Likert scales (e.g., attitudes toward AI integration, perceived importance of AI in different domains) were summarized as medians and interquartile ranges (IQR), consistent with their distribution.

Statistical Methods

Data were analyzed using descriptive and inferential statistics. Chi-square tests were applied to compare proportions between groups (students vs. faculty) for categorical variables, with Cramer's V used to estimate effect sizes. Mann–Whitney U tests were employed to

compare group differences. A p<0.05 was considered statistically significant.

Results

Participants

A total of 155 individuals participated in the study, comprising 105 students and 50 faculty members. All survey responses were complete and valid for analysis, yielding a 100% response rate for those enrolled. The student group represented different stages of medical education, while the faculty group was primarily early-career professionals.

Descriptive Data

Among students, 42.9% were in the early academic years (Years 1–3). The majority were female (81.9%), with the largest age cluster being 21–23 years (43.8%). In contrast, the faculty cohort consisted of 40% lecturers, with most participants aged 25–30 years (68%). Female representation was lower among faculty (60%) compared with students. These findings highlight the predominantly young and female student population, alongside a relatively junior faculty profile.

Outcome Data

When asked about awareness and exposure to artificial intelligence (AI), both groups reported high familiarity. Social media emerged as the most frequently cited source of AI information (84.8% of students and 86.0% of faculty), followed by professional talks and discussions with colleagues or family members. A self-rated "basic understanding" of AI was acknowledged by 65.7% of students and 74.0% of faculty, though the difference was modest and not statistically significant.

Attitudinal data suggested generally positive views toward AI integration. Students scored slightly higher in their belief that AI will improve healthcare (median=5 [IQR 4–5]) compared with faculty (median=4 [IQR 4–5]), reflecting a small but statistically significant difference. Both groups strongly supported the inclusion of AI in medical education, though proportions differed somewhat (77.1% students vs. 66.0% faculty). Regarding the preferred focus of AI training, students showed a slightly greater inclination toward patient-centered applications (19%) compared to faculty (18%), while teaching-focused applications were preferred by 6.5% of students and 4% of faculty. A small proportion of both groups (4%) favored a combined focus on patient care and teaching (p = 0.74). Concern that AI could pose a career threat was relatively low overall, with no meaningful differences between groups.

In evaluating AI's perceived importance across medical domains, both groups rated AI as especially relevant in radiology and imaging, disease prediction, and genomics. Faculty rated AI significantly higher for clinical decision support (median=5 [IQR 4–5]) compared with students (median=4 [IQR 3–5]), indicating moderate effect size. Other domains, including clinical trials and device/data monitoring, showed high ratings across groups without statistically significant differences.

Main Results

Overall, the analysis revealed more similarities than differences between students and faculty regarding AI awareness, attitudes, and perceived applications. While faculty tended to report slightly greater exposure and understanding, these differences were generally small and not statistically robust.

The most consistent divergence emerged in training priorities, where students favored patient-focused applications and faculty emphasized pedagogical uses. Another notable difference was the higher value faculty placed on AI in clinical decision support, underscoring potential disciplinary perspectives. Taken together, these results suggest that both groups recognize AI's relevance to medicine and education, though subtle differences in emphasis highlight opportunities for tailored training approaches.

Table 1: Participant demographics.

Variables		Students (N=105)	Faculty (N=50)	p-value	Effect size (Cramer's V)
Gender	Female	86 (81.9)	30 (60.0)	0.004*	0.24 (small–moderate)
	Male	19 (18.1)	20 (40.0)		
Age Group	21–23 years	46 (43.8)	–	< 0.001*	0.73 (large)
	25–30 years	–	34 (68.0)		

*p < 0.05 indicate statistically significant differences.

Table 2: Previous history with COVID-19.

Variable	Students (N=105)	Faculty (N=50)	p-value	Effect size (Cramer's V)
Tech-savvy (Yes)	47 (44.8)	30 (60.0)	0.09	0.12
Awareness of AI in medicine (Yes)	74 (70.5)	41 (82.0)	0.13	0.10
Awareness via social media (Yes)	89 (84.8)	43 (86.0)	0.86	<0.01*
Awareness via professional talks (Yes)	51 (48.6)	29 (58.0)	0.28	0.08
Awareness via family/friends (Yes)	45 (42.9)	24 (48.0)	0.53	0.05*
Basic understanding of AI (Yes)	69 (65.7)	37 (74.0)	0.31	0.07

*χ^2 tests; effect size reported as Cramer's V. p < 0.05; p < 0.01 indicate statistical significance.

Table 3. Attitudes toward AI integration.

Variable		Students Median [IQR]	Faculty Median [IQR]	p-value[1]
AI will improve healthcare (1–5)		5 [4–5]	4 [4–5]	0.04*
AI should be part of medical education (1–5)		4 [3–5]	4 [4–5]	0.11
Preferred AI training focus	Patient	19%	18%	0.74
	Teaching	6.5%	4%	
	Both	4%	4%	
AI threatens career (1–5)		3 [2–4]	3 [2–3]	0.39

[1] Mann–Whitney U for ordinal items; χ^2 for categorical item (training focus).
*$p < 0.05$ indicate statistically significant differences.

Table 4. Perceived importance of AI in medical domains.

Domain	Students Median [IQR]	Faculty Median [IQR]	p-value[1]
Radiology & imaging	4 [3–5]	4 [4–5]	0.27
Disease prediction	4 [3–5]	4 [3–5]	0.13
Genomics	4 [3–5]	5 [4–5]	0.21
Clinical trials	4 [3–4]	4 [4–5]	0.12
Clinical decision support	4 [3–5]	5 [4–5]	0.01*
Device/data monitoring	4 [3–5]	4 [4–5]	0.10

[1]Mann–Whitney U
*$p < 0.05$ indicate statistically significant differences.

Discussion

This study explored the awareness, perceptions, and attitudes of healthcare students and faculty in Pakistan toward the integration of artificial intelligence (AI) in medical and allied health education. The findings reveal that while both groups recognize the importance of AI in healthcare and education, their priorities and emphases differ.

Students generally expressed a more positive belief that AI will improve healthcare, reflecting enthusiasm for its clinical applications. Their preference for patient-centered uses such as diagnostics, treatment planning, and personalized care aligns with global reports highlighting students' interest in clinically relevant technologies [6,10]. Faculty, by contrast, emphasized the role of AI in teaching and training, and rated AI significantly higher for clinical decision support. This divergence suggests that while students focus on direct patient outcomes, faculty view AI as a pedagogical and decision-support tool, reflecting their professional responsibilities.

Both groups reported high levels of awareness of AI, with social media emerging as the most common source of exposure. This reliance on informal learning mirrors findings in international literature where structured curricular content is often lacking [4,5]. The modest proportion of participants who reported only a "basic understanding" of AI underscores the need for formal education to build deeper competencies.

Notably, neither group demonstrated strong concern that AI poses a direct career threat. This neutrality may indicate uncertainty, suggesting that clear discussions about professional roles, ethics, and workforce adaptation will be essential to prevent misconceptions. Ethical considerations such as data privacy, algorithmic bias, and accountability should therefore form a central part of AI education [8,9].

Overall, these results provide an important needs assessment for Pakistan. Both students and faculty support AI integration into the curriculum, but their different emphases point toward the necessity of tailored strategies: patient-focused applications for students and pedagogical/decision-support applications for faculty. Structured faculty development, multidisciplinary teaching, and gradual integration of AI concepts into existing curricula can bridge these gaps and foster a workforce better prepared for an AI-enabled healthcare system.

Limitations

This study has several limitations. First, the use of non-probability convenience sampling introduces the possibility of selection bias, as individuals already interested in AI may have been more likely to participate. Second, the relatively small sample of faculty (n=50) limits the generalizability of subgroup comparisons and may have underpowered some analyses, leading to non-significant results where trends were observed. Third, no formal sample size calculation was conducted, as the study was exploratory. Finally, as a cross-sectional survey, the findings represent a snapshot in time and cannot establish causality between exposure and attitudes. Despite these limitations, the study provides valuable preliminary insights into AI awareness and curriculum readiness in Pakistan.

Conclusion

This study highlights that both healthcare students and faculty in Pakistan recognize the relevance of AI in healthcare and strongly support its inclusion in medical and allied health education. While similarities in overall attitudes were observed, key differences emerged in priorities: students favor patient-centered applications, while faculty emphasize teaching and clinical decision support. These differences underscore the need for tailored curriculum strategies that address the distinct needs of each group.

The findings reinforce the importance of developing structured AI literacy initiatives, faculty training programs, and policy-level strategies to systematically integrate AI into health education. A gradual, flexible approach incorporating both technical skills and

ethical considerations will be essential to ensure that future healthcare professionals are adequately prepared for the realities of an AI-enabled healthcare system.

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