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Original Article



Perceptions of Artificial Intelligence in Medical Education: A Cross-Sectional Study Among Students and Faculty at HBS Medical and Dental College, Islamabad

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ABSTRACT

As artificial intelligence (AI) continues to transform healthcare, its integration into medical education is increasingly critical. However, many institutions lack formal Al curricula, leaving students and faculty underprepared for the digital demands of clinical practice. **Objectives:** To assess awareness, familiarity, perceived benefits, and concerns regarding Al among medical students and faculty, and to explore training preferences and barriers to Al integration in academic settings. Methods: A descriptive cross-sectional survey was conducted at HBS Medical and Dental College, with a total of 100 participants (76 students and 24 faculty). A questionnaire assessed demographic characteristics, Al familiarity, perceived benefits and concerns, and interest in formal training. Chi-square tests and logistic regression were used to analyse group differences and predictors of training interest. Results: Most participants (60%) were under 25 years old, and 76% were students. While 68% had heard of AI, only 43% reported basic familiarity. Interest in AI training was high (87%). Commonly cited benefits included faster knowledge access and personalized learning, while concerns focused on ethical issues and misinformation. A significant association was found between academic role and perceived lack of training (p=0.041). Logistic regression showed a non-significant trend linking prior Al exposure with interest in training (p=0.125). Conclusions: It was concluded that there is strong enthusiasm for Al in medical education among both students and faculty. However, limited familiarity and perceived barriers highlight the need for structured training and targeted curriculum reforms to build digital competence in future healthcare professionals.

INTRODUCTION

The rapid advancement of artificial intelligence (AI) is revolutionizing healthcare, introducing innovations in diagnostics, therapeutics, and education that were once the domain of science fiction. AI technologies such as image recognition, predictive analytics, natural language processing, and intelligent tutoring systems are now being applied across various healthcare sectors, including radiology, pathology, and surgical planning, to enhance

clinical accuracy and efficiency [1, 2]. Al-based models like Deep Mind's diagnostic tools have demonstrated performance comparable to human radiologists in detecting eye disease [3], while chatbots such as ChatGPT are increasingly explored for virtual patient simulation and self-directed learning in medical education [4, 5]. As healthcare becomes more digitally integrated, medical professionals need to understand and ethically engage

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with these technologies. However, despite global momentum, the incorporation of Al into undergraduate medical curricula remains inconsistent and underdeveloped. According to recent surveys, fewer than 20% of medical schools globally have formal Al instruction, and the majority of students report inadequate training in digital competencies [6]. The gap is particularly notable in low- and middle-income countries (LMICs), including Pakistan, where infrastructural limitations and lack of faculty readiness present additional barriers [7]. Most prior research has focused on clinical applications of Al or physician attitudes, with limited exploration of how medical students and educators perceive its role in teaching and learning. Moreover, faculty-specific challenges such as resistance to digital tools, concerns over role redundancy, and lack of training opportunities have received minimal attention [8, 9]. In South Asian contexts, cultural and systemic factors further compound the gap in understanding how educators and learners are preparing for an Al-integrated future [10]. To address this knowledge gap, the present study assesses the familiarity, attitudes, perceived benefits, and concerns regarding Al among medical students and faculty at a private institution in Pakistan. This dual-perspective approach enables a nuanced understanding of both learner readiness and institutional barriers. The study also aims to identify interest in Al training as a key outcome variable, to inform future educational strategies and curriculum development tailored to the local context.

This study aims to explore the familiarity, attitudes, and concerns related to artificial intelligence in medical education, focusing on both learners and educators. It seeks to bridge the gap between technological innovation and educational readiness, ensuring that future healthcare professionals are equipped not just with clinical skills, but with digital competence as well.

METHODS

This descriptive cross-sectional survey was conducted to examine the challenges and opportunities associated with the use of artificial intelligence (AI) in medical education. The study took place at HBS Medical and Dental College, Islamabad, which offers undergraduate and postgraduate programs in medical and dental sciences. The study was conducted over six months, from March to August 2024, following ethical approval. The Institutional Review Board (IRB) of HBS Medical and Dental College approved the research protocol under Reference No. App#ECO2/4. Participation was voluntary, and written informed consent was obtained from all participants. Anonymity and confidentiality were maintained throughout. The target population included both faculty members and students currently affiliated with the institution. Participants were selected through convenience sampling. Inclusion criteria required participants to be aged 18 years or older, currently enrolled or employed at the institution, and willing to participate. Administrative staff and those with incomplete responses were excluded. The final sample comprised 100 participants, including 76 students and 24 faculty members. This distribution allowed for groupbased comparisons. The primary outcome variable for this study was interest in receiving formal Al training, assessed using a binary (Yes/No) response item. The sample size was calculated using the standard formula for estimating a single population proportion: $n = (Z^2 \times p \times (1-p))/d^2$. Where: n = required sample size, Z = 1.96 (corresponding to 95% confidence level), p = estimated proportion (0.06), based on Civaner et al., [11], who reported 6% of medical students felt confident in communicating Al-related risks to patients and d = desired margin of error (0.05) Thus, theminimum required sample was 87 participants. To allow for potential non-response or incomplete data, the target was increased by approximately 15%, yielding a final sample size of 100 participants. The structured questionnaire used in this study was adapted from previously validated tools, including the needs assessment framework by Civaner et al., [11], titled "Artificial Intelligence in Medical Education: A Cross-Sectional Needs Assessment". The questionnaire consisted of 28 structured items distributed across five key domains: Demographics (4 items): age group, gender, academic role (faculty/student), and prior exposure to Al. Awareness and Familiarity with AI (5 items): including binary questions like "Have you heard about AI?" and multilevel self-reported familiarity (None, Basic, Intermediate, Advanced). Perceived Benefits of AI (5 items): Likert-style and Yes/No questions on benefits such as faster access to knowledge, personalized learning, diagnostic support, engagement, and grading assistance. Concerns Regarding AI (5 items): binary (Yes/No) items assessing ethical dilemmas, misinformation, job replacement, and devaluation of clinical judgment. Training Interest and Perceived Barriers (9 items): questions on preferred learning modes (workshops, online, curriculum-based), interest in formal AI training (primary outcome variable), and barriers such as lack of training, infrastructure, and resistance. The primary outcome variable was interest in formal AI training, measured by a binary item: "Are you interested in receiving formal training in Al applications for medical education?" The questionnaire was reviewed by three experts for content validity and underwent pilot testing with 10 participants (excluded from final analysis). Reliability was assessed using Cronbach's alpha, which yielded a value of 0.81, indicating high internal consistency. To ensure content validity, the questionnaire was reviewed by a panel of three medical education and informatics experts. Their feedback was used to refine language clarity, item relevance, and domain coverage. A pilot test was conducted on 10 participants, and results informed

minor revisions (rewording unclear terms). These pilot responses were excluded from the final data analysis. Internal consistency reliability was assessed using Cronbach's alpha, which yielded a score of 0.81, indicating high reliability of the instrument across domains. Data analysis was performed using IBM SPSS Statistics version 23. Descriptive statistics (frequencies and percentages) summarized participant characteristics and survey responses. Inferential statistics included Chi-square (χ^2) tests to assess associations between academic role (faculty vs. student) and other categorical variables. Cramér's V was used to evaluate effect size. A p-value of < 0.05 was considered statistically significant. Binary logistic regression was used to identify predictors of interest in formal AI training. Independent variables included gender, role, Al exposure, familiarity level, awareness of AI, and use of AI tools. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Model fit was assessed using the Hosmer-Lemeshow test and Nagelkerke R². This approach allowed for both group-wise comparisons and multivariate analysis to assess independent predictors of the primary outcome.

RESULTS

The study included 100 participants, with the majority (60%) under 25 years, 31% aged 25–30, and 9% over 30. Females slightly outnumbered males (54% vs. 46%). Most respondents were students (76%), while faculty comprised 24%. Only 30% reported prior exposure to Al tools or concepts, indicating limited hands-on familiarity. The demographic profile shows that younger individuals, particularly students, formed the bulk of the sample. The near-equal gender distribution and low overall exposure to Al highlight a foundational gap in digital preparedness among future and current medical educators (Table 1).

Table 2: Familiarity with AI by Academic Role (n=100)

| Variables | Frequency (%) | | | | | |
|-------------------------|---------------|--|--|--|--|--|
| Age Group | | | | | | |
| <25 | 60 (60.0%) | | | | | |
| 25-30 | 31(31.0%) | | | | | |
| >30 | 9(9.0%) | | | | | |
| G | ender | | | | | |
| Female | 54 (54.0%) | | | | | |
| Male | 46 (46.0%) | | | | | |
| Role | | | | | | |
| Student | 76 (76.0%) | | | | | |
| Faculty | 24(24.0%) | | | | | |
| Previous Exposure to Al | | | | | | |
| Yes | 30(30.0%) | | | | | |
| No | 70 (70.0%) | | | | | |

Study compares faculty and students' awareness and engagement with Al. The proportion of those who had heard about Al was similar across both groups (p=0.872), indicating no significant difference in general awareness. When evaluating familiarity levels, students showed greater representation in intermediate and advanced familiarity; however, the difference was not statistically significant (χ^2 =6.382, df=3, p=0.094). Regarding actual use of Al tools such as ChatGPT, faculty and students differed slightly, but the difference was not statistically significant (p=0.304)(Table 2).

| Variables | | Faculty (n=24) | Student (n=76) | χ² (df) | p-Value | Cramér's V |
|-------------------|--------------|----------------|----------------|----------|---------|------------|
| Heard About Al | Yes | 16 | 52 | 0.026(1) | 0.872 | 0.016 |
| | No | 8 | 24 | 0.026(1) | | |
| Familiarity Level | Advanced | 0 | 4 | | 0.094 | 0.253 |
| | Intermediate | 1 | 18 | 6.382(3) | | |
| | Basic | 13 | 30 | 0.362(3) | 0.034 | |
| | Non | 10 | 24 | | | |
| Use of Al Tools | Yes | 13 | 50 | 1.057(1) | 0.304 | 0.103 |
| | No | 11 | 26 | 1.057(1) | 0.304 | 0.103 |

Findings summarise participants' perceptions of Al's potential benefits in medical education. Overall, both faculty and students strongly agreed on the positive impact of Al. The most commonly endorsed benefits were faster access to information, personalized learning, and diagnostic support. However, none of the comparisons between faculty and students reached statistical significance. The closest was in the area of personalized learning, suggesting a trend toward stronger endorsement by faculty, but the difference was not statistically significant (χ^2 =1.170, p=0.279). These results reflect a shared optimism about Al's value, regardless of academic role. Results explore the concerns expressed by faculty and students regarding Al integration in medical education. While concerns such as ethical dilemmas, misinformation, and the

threat to traditional teaching roles were common, no statistically significant differences were found between faculty and students. The concern that came closest to significance was the risk of misinformation, although students expressed slightly higher concern, the difference was not statistically significant (χ^2 =2.602, p=0.107). The overall similarity in concern levels points to shared anxieties (Table 3).

Table 3: Perceived Benefits and Concerns Regarding Al by Academic Role

| Perceived Benefits | Faculty (Yes/No) | Student (Yes/No) | χ² (df) | p-Value | Cramér's V | | |
|---|------------------|------------------|-----------|---------|------------|--|--|
| Perceived Benefits | | | | | | | |
| Faster Knowledge Access | 21/3 | 60 / 16 | 0.867(1) | 0.352 | 0.093 | | |
| Personalized Learning | 20 / 4 | 55 / 21 | 1.170 (1) | 0.279 | 0.108 | | |
| Enhanced Diagnostics | 16 / 8 | 51 / 25 | 0.002(1) | 0.968 | 0.004 | | |
| Student Engagement | 13 / 11 | 38 / 38 | 0.127(1) | 0.722 | 0.036 | | |
| Grading Assistance | 9 / 15 | 26 / 50 | 0.087(1) | 0.768 | 0.029 | | |
| Concerns Regarding AI in Medical Students | | | | | | | |
| Ethical Dilemmas | 14 / 10 | 56 / 20 | 2.047(1) | 0.153 | 0.143 | | |
| Threat to Teaching Roles | 14 / 10 | 36 / 40 | 0.877(1) | 0.349 | 0.094 | | |
| Risk of Misinformation | 6 / 18 | 33 / 43 | 2.602(1) | 0.107 | 0.161 | | |
| Al Replacing Teachers | 10 / 14 | 27 / 49 | 0.295(1) | 0.587 | 0.054 | | |
| Devaluation of Clinical Judgement | 12 / 12 | 47 / 29 | 1.057(1) | 0.304 | 0.103 | | |

Results compare faculty and student perspectives regarding Al training preferences and perceived barriers to integration. A large majority in both groups expressed interest in Al training, but the difference was not statistically significant (p=0.191). Most participants preferred workshops or curricular integration over online modules. Among perceived barriers, only "lack of training" showed a significant difference (χ^2 = 4.176, p=0.041), with faculty members more frequently citing it as a constraint. Other barriers, including infrastructure limitations and faculty resistance, did not show meaningful differences between groups. These findings suggest a general openness to Al training, with targeted faculty development needed to address capacity gaps (Table 4).

Table 4: Al Integration Preferences and Barriers by Academic Role (n=100)

| Variables | | Faculty | Student | χ² (df) | p-Value | Cramér's V |
|-------------------------|------------|---------|---------|------------|---------|------------|
| Interested in Training | Yes | 19 | 68 | 1.713 (1) | 0.191 | 0.131 |
| | No | 5 | 8 |] 1./13(1) | | |
| Preferred Learning Mode | Curriculum | 9 | 20 | | 0.573 | 0.106 |
| | Online | 6 | 23 | 1.113 (2) | | |
| | Workshops | 9 | 33 |] | | |
| Lack of Training | Yes | 21 | 50 | 4.176 (1) | 0.041 | 0.204 |
| | No | 3 | 26 | 4.170(1) | | |
| Limited Infrastructure | Yes | 15 | 44 | 0.160(1) | 0.689 | 0.040 |
| | No | 9 | 32 | 0.160(1) | | |
| Faculty Resistance | Yes | 7 | 29 | 0.640(1) | 0.424 | 0.080 |
| | No | 17 | 47 | 0.040(1) | 0.424 | |

Findings present a logistic regression analysis assessing predictors of interest in formal AI training. Although several variables showed elevated odds, none reached statistical significance (p>0.05). Participants with prior AI exposure had higher odds of expressing interest in training (OR=2.80, 95% CI: 0.75-10.47, p=0.125). Similarly, those who had heard about AI were more likely to be interested (OR=2.08, p=0.361), though not significantly so. Familiarity level also showed trends: intermediate familiarity was associated with increased interest (OR=3.08, p=0.187), while basic familiarity showed decreased odds (OR=0.15, p=0.168) compared to those with no familiarity. Gender, academic role, and AI tool usage were not significant predictors. The model demonstrated acceptable fit (Hosmer-Lemeshow p=0.54) and explained 12% of the variance in training interest (Nagelkerke $R^2=0.12$)(Table 5).

Table 5: Logistic Regression Predicting Interest in Al Training (n=100)

| Predictor Variables | В | OR (Exp B) | 95% CI for OR | p- Value |
|-----------------------------|--------|------------|------------------|-------------|
| Gender (Male vs Female) | -0.367 | 0.69 | 0.16-3.05 | 0.627 |
| Role (Student vs Faculty) | -1.016 | 0.36 | 0.08-1.58 | 0.177 |
| Previous Exposure to Al | 1.030 | 2.80 | 0.75-10.47 | 0.125 |
| Heard About Al | 0.730 | 2.08 | 0.43-9.92 | 0.361 |
| Familiarity Level (overall) | _ | _ | _ | 0.237 |
| L Basic vs None | -1.875 | 0.15 | 0.01-2.20 | 0.168 |
| L Intermediate vs None | 1.125 | 3.08 | 0.58-16.41 | 0.187 |
| L Advanced vs None | 0.319 | 1.38 | 0.19-9.78 | 0.750 |
| Use of Al Tools (Yes vs No) | -0.970 | 0.38 | 0.10-1.52 | 0.170 |
| Constant | 1.714 | 5.55 | _ | 0.117 |

DISCUSSION

This study examined the perceptions, familiarity, and attitudes of medical students and faculty toward artificial intelligence (AI) in medical education. Despite the increasing integration of AI technologies in healthcare, findings indicate limited hands-on experience and moderate familiarity among participants, particularly among faculty members. This trend aligns with previous research highlighting a general awareness of Al but a lack of deep understanding and practical application among educators [12, 13]. While this study revealed most participants reported having heard of Al, the difference in awareness between faculty and students was not statistically significant. Students showed slightly higher self-reported familiarity and usage of tools like Chat-GPT, though these differences were not statistically significant. Comparable results were noted in studies by Buabbas et al., and Sami et al., which highlighted that while students are more open to AI, both groups lack structured training and often use AI informally without institutional guidance [8, 14]. Respondents across roles recognized Al's benefits, including faster access to knowledge, personalized learning, and diagnostic support. These perceptions align with findings from Civaner et al., and Yañez et al., who reported general optimism toward AI integration among learners and educators alike [11, 15]. Nonetheless, the present study, like others, found no statistically significant role-based differences in perceived benefits, which may reflect a shared but superficial engagement with Al's potential. Concerns such as ethical dilemmas, misinformation, and the potential erosion of traditional teaching roles were frequently cited by both groups, with no statistically significant differences observed. This mirrors the observations of Saleh et al., and Abouammoh et al., who documented widespread concern about Al's implications for teaching quality, academic integrity, and professional boundaries [16, 17]. Faculty in particular noted the threat of being replaced or undervalued, a sentiment echoed by Nevárez Montes and Elizondo-Garcia, who emphasized faculty apprehension in integrating generative

Al tools into their educational practices [18]. A statistically significant association was found between academic role and perceived lack of training, with faculty more likely to cite this as a barrier. This suggests a need for faculty development programs tailored to digital competencies. Although logistic regression analysis did not identify any statistically significant predictors of interest in formal Al training, participants with prior exposure to Al were nearly three times more likely to show interest. Similar trends were observed by Kong et al., and Yilmaz et al., suggesting that even limited interaction with Al may enhance motivation to pursue structured learning [19, 20]. It is also worth noting that the model explained 12% of the variance in training interest, suggesting other unexplored factors may contribute. This aligns with findings from Al-Qahtani et al., and Khlaif et al., who underscored the complexity of Al adoption in educational settings and recommended multilevel frameworks for successful integration [21, 22].

CONCLUSIONS

Alis widely recognized as a transformative force in medical education. Our study showed that familiarity, practical use, and structured training remain limited among both students and faculty. There was a clear enthusiasm for Al's potential benefits, but also shared concerns and barriers, particularly the lack of formal training. Structured curriculum development, targeted faculty workshops, and more widespread exposure to practical Al tools may bridge this gap and foster responsible integration of Al in medical education.

Authors Contribution

Conceptualization: SA Methodology: SA, RF, KA, SAK Formal analysis: SA, SS, RF, KA Writing review and editing: SS, KA, RS

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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