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Original Article

Perceptions Towards Artificial Intelligence Among Allied Health Sciences Students in Islamabad and Rawalpindi

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ABSTRACT

Background: Artificial intelligence is being incorporated into diagnostic, therapeutic, and rehabilitative workflows, yet evidence on how allied health trainees in low- and middle-income settings perceive these technologies remains limited. Objective: To assess perceptions of artificial intelligence in healthcare among undergraduate Allied Health Sciences students and to examine whether perception scores differed by gender, academic year, and academic discipline. Methods: A cross-sectional observational study was conducted over six months among 145 undergraduate Allied Health Sciences students aged 19 to 26 years recruited by convenience sampling from four institutions in Islamabad and Rawalpindi, Pakistan. Perceptions were measured using the 10-item Shinners Artificial Intelligence Perception scale (range 10–50; Cronbach's alpha 0.766). Analyses used independent-samples t-test, one-way analysis of variance, and chi-square test in IBM SPSS Statistics version 26.0, with significance at $p < 0.05$. Results: Moderate perception predominated (77.2%, n = 112), with 20.7% (n = 30) high and 2.1% (n = 3) low. Male students scored higher than female students (35.87 ± 6.21 versus 31.98 ± 5.18; mean difference 3.89, 95% CI 2.01–5.77; $p < 0.001$; Cohen's d = 0.69). Scores increased with academic year (F = 2.531; p = 0.043), rising from 32.12 to 35.67. Discipline was not associated with perception ($p > 0.05$). Conclusion: Perceptions were cautiously favourable but constrained by limited formal instruction, with differences by gender and academic seniority supporting structured integration of artificial intelligence education into Allied Health curricula. Keywords: Artificial intelligence; Attitude of health personnel; Allied health personnel; Students, health occupations; Cross-sectional studies; Curriculum; Pakistan

INTRODUCTION

Artificial intelligence (AI) is an umbrella term for computational systems that perform tasks conventionally requiring human cognition, encompassing machine learning, natural language processing, and computer vision, and enabling machines to learn from data, recognise patterns, and support decision-making (1). Within healthcare, these technologies have moved from conceptual promise to routine infrastructure, contributing to diagnostic support, clinical decision-making, workflow automation, and the individualisation of treatment planning (2). The scale of this shift has prompted commentators to characterise AI as the stethoscope of the twenty-first century, a framing that captures its anticipated centrality to clinical practice rather than its present maturity (3).

The rehabilitation and allied health domains are directly implicated in this transition. Machine learning models have been applied to wearable and robotic systems supporting upper-limb recovery (4), and AI-assisted approaches have been described across gait training, motor recovery, and functional mobility in stroke rehabilitation and physical therapy (5). Diagnostic imaging services have likewise begun to incorporate algorithmic tools into routine workflows, with practitioners reporting both efficiency gains and unresolved uncertainties about their role alongside these systems (6). Across these settings, the practical benefit of AI depends less on algorithmic performance in isolation than on whether the professionals expected to use it possess the competence and confidence to do so.

That dependence has focused attention on how clinicians and trainees perceive these technologies. Physiotherapists surveyed on their readiness for AI have reported measurable anxiety alongside limited preparedness (7), and concerns about professional displacement have been documented among healthcare workers who anticipate that accumulated expertise may be devalued by automated systems (8). Comparable ambivalence has been reported among clinicians in ophthalmology, dermatology, radiology, and radiation oncology, where enthusiasm for diagnostic support coexists with reservations about accountability and oversight (9). Among students specifically, systematic evidence indicates that positive attitudes towards AI are widespread but are frequently accompanied by limited knowledge and minimal practical exposure (10, 11).

A principal explanation for this gap lies in curriculum design. Reviews of AI education in health professional programmes have found that structured, evidence-based instruction remains uncommon, and that where teaching exists it is often elective, fragmented, or delivered without alignment to clinical application (12). Ethical content is similarly underdeveloped, despite students identifying accountability for algorithmic error as a central concern (13). Institutional and organisational barriers compound the problem, including faculty capacity, competing curricular demands, and the slow pace at which professional programmes can be restructured (14). More broadly, digital health competencies remain unevenly distributed across the health workforce, with no consistent standards embedded in professional education (15).

Evidence specific to allied health is comparatively sparse. Where it exists, it suggests that knowledge deficits are not confined to any single discipline: physical therapists have reported limited familiarity with AI applications relevant to their own practice (16), and a cross-sectional survey of allied health professionals in a clinical setting found that unfamiliarity with AI was distributed broadly across professional groups rather than concentrated in particular specialties (17). This pattern raises the possibility that AI literacy in allied health is shaped less by discipline than by exposure, seniority, and the presence or absence of formal instruction.

In Pakistan, the evidence base is narrower still. A national survey of healthcare students and professionals reported generally favourable attitudes towards AI accompanied by restricted formal training (18), and preliminary findings among pharmacy trainees in Karachi described a comparable combination of receptiveness and unpreparedness (19). A further Pakistani cross-sectional study of healthcare professionals and medical students similarly documented awareness that exceeded applied competence (20). These studies establish that the phenomenon is present in the Pakistani context, but they draw predominantly on medical, nursing, and pharmacy populations. Allied Health Sciences students, who will constitute a substantial proportion of the rehabilitation and diagnostic workforce, have not been examined as a defined group, and the demographic and academic factors that might differentiate readiness within this population remain uncharacterised.

Adoption also depends on conditions beyond individual attitudes. Implementation research has emphasised that the introduction of health information technologies is an organisational and social process rather than a purely technical one, unfolding non-linearly and shaped by institutional context (21). Practical constraints reported by clinicians include information overload, time pressure, and system limitations that can offset anticipated efficiency gains (22), while imaging professionals have described a parallel set of opportunities and challenges arising from integration into established workflows (23). Among students, generative AI tools have already entered routine academic use ahead of any formal instruction in their appropriate application (24), which makes the absence of structured curricular guidance a present concern rather than an anticipated one.

Understanding how future allied health professionals perceive AI, and identifying which student characteristics are associated with greater or lesser readiness, is therefore a prerequisite for curriculum planning. Accordingly, this study assessed perceptions of AI in healthcare among undergraduate Allied Health Sciences students in Islamabad and Rawalpindi, and examined whether perception scores differed by gender, academic year of study, and academic discipline.

MATERIALS AND METHODS

This cross-sectional observational study was conducted over a six-month period among undergraduate students enrolled in Allied Health Sciences programmes in the twin cities of Islamabad and Rawalpindi, Pakistan. Data were collected at four institutions offering such programmes: Rawal Institute of Rehabilitation Sciences, Riphah International University, Iqra University, and Abasyn University. The study was designed to characterise perceptions of artificial intelligence in healthcare within this population and to examine whether these perceptions varied by gender, academic year, and academic discipline. Reporting follows the STROBE recommendations for cross-sectional studies.

Participants were recruited by non-probability convenience sampling. Eligibility was restricted to students aged 19 to 26 years who were currently enrolled in an undergraduate Allied Health Sciences programme at one of the participating institutions and who provided voluntary written consent. The required sample size was calculated using the Raosoft sample size calculator at a 95% confidence level and a 5% margin of error, informed by proportions reported in the preceding literature, yielding a target of 145 participants. This target was met, and 145 students were included in the analysis.

Data were collected using a self-administered questionnaire comprising a demographic component and the Shinners Artificial Intelligence Perception (SHAIP) scale. The demographic component recorded gender, academic year of study, and academic discipline. The SHAIP scale consists of 10 items, each rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), producing a summated score with a possible range of 10 to 50, in which higher scores indicate more favourable perceptions of and greater preparedness for artificial intelligence in healthcare. Internal consistency in the present sample was acceptable, with a Cronbach's alpha of 0.766. Summated scores were additionally classified into low, moderate, and high perception categories for descriptive reporting.

Data were coded, tabulated, and analysed using IBM SPSS Statistics version 26.0. Participant characteristics were summarised descriptively, with categorical variables expressed as frequencies and percentages and the summated SHAIP score expressed as mean ± standard deviation. Individual Likert-scale items, being ordinal, were summarised using measures of central tendency appropriate to ordinal data. For inferential analysis, the summated SHAIP score was treated as a continuous variable. Mean perception scores were compared between male and female participants using an independent-samples t-test, and the corresponding mean difference, 95% confidence interval, and Cohen's d were derived. Differences in mean perception scores across academic years of study and across academic disciplines were examined using one-way analysis of variance. A chi-square test of association was used to examine the relationship between gender and categorical perception level. A two-sided p-value below 0.05 was considered statistically significant.

The study protocol was approved by the Institutional Review Board of the Rawal Institute of Health Sciences prior to the commencement of data collection. All participants were informed of the study objectives before enrolment, and written informed consent was obtained from each participant. Responses were collected without personal identifiers, and anonymity and confidentiality were maintained throughout data collection, analysis, and reporting.

RESULTS

A total of 145 undergraduate Allied Health Sciences students were included. Female students comprised 58.6% (n = 85) of the sample and male students 41.4% (n = 60), a distribution consistent with prevailing enrolment patterns in Allied Health Sciences programmes in the study setting. The sample was multidisciplinary, with Doctor of Physical Therapy students forming the largest single group at 40.7% (n = 59), followed by Nursing at 17.2% (n = 25) and Medical Laboratory Technology at 12.4% (n = 18); the remaining 29.7% (n = 43) were enrolled in radiology, anaesthesia technology, and psychology programmes. Participant characteristics are presented in Table 1.

Table 1. Characteristics of participating Allied Health Sciences students (N = 145)

Characteristic	n (%)
Gender	
Female	85 (58.6)
Male	60 (41.4)
Academic programme	
Doctor of Physical Therapy	59 (40.7)
Nursing	25 (17.2)
Medical Laboratory Technology	18 (12.4)
Radiology, anaesthesia technology, and psychology	43 (29.7)

Perceptions of artificial intelligence in healthcare were predominantly moderate. Categorised summated Shinners Artificial Intelligence Perception (SHAIP) scores placed 77.2% (n = 112) of participants in the moderate category, 20.7% (n = 30) in the high category, and 2.1% (n = 3) in the low category (Table 2, Figure 1). The distribution was therefore concentrated in the intermediate range, with neither strong endorsement nor pronounced reservation characterising most respondents.

Table 2. Distribution of categorised SHAIP perception scores (N = 145)

Perception category	n (%)
Low	3 (2.1)
Moderate	112 (77.2)
High	30 (20.7)
Total	145 (100.0)

SHAIP, Shinners Artificial Intelligence Perception scale (10 items; summated score range 10–50; higher scores indicate more favourable perception).

Item-level responses showed the strongest convergence on professional accountability, with the modal response indicating agreement that responsibility for errors arising from artificial intelligence rests with the healthcare professional (mode = 4). The item concerning professional displacement produced the least convergence, with a neutral modal response (mode = 3) and a divided distribution in which 35.8% of participants agreed that artificial intelligence could replace part of their professional role, an identical 35.8% disagreed, and 27.6% expressed neutrality (Table 3, Figure 2). Concern regarding displacement was therefore neither uniform across the sample nor predominant within it.

Table 3. Response distribution for selected SHAIP items

Item	Modal response	Agree (%)	Neutral (%)	Disagree (%)
Responsibility for artificial intelligence errors rests with the healthcare professional	4 (agree)			
Artificial intelligence could replace part of my professional role	3 (neutral)	35.8	27.6	35.8

Responses were recorded on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Modal values are reported for ordinal item-level data.

Table 4. Comparison of mean SHAIP scores by gender

Gender	n	Mean ± SD	Mean difference (95% CI)	t	p	Cohen's d
Male	60	35.87 ± 6.21	3.89 (2.01 to 5.77)	4.10	< 0.001	0.69
Female	85	31.98 ± 5.18				

SD, standard deviation; CI, confidence interval. Comparison by independent-samples t-test; reference category female.

Mean summated perception scores differed significantly between male and female participants. Male students scored higher than female students (35.87 ± 6.21 versus 31.98 ± 5.18), a mean difference of 3.89 points on the 10 to 50 point scale (95% CI 2.01 to 5.77; $t = 4.10$; $p < 0.001$), corresponding to a Cohen's d of 0.69 and indicating a moderate-to-large magnitude of difference (Table 4, Figure 3).

Table 5. Comparison of mean SHAIP scores by academic year of study and academic discipline

Comparison	Mean	F	p
Academic year of study		2.531	0.043
First year	32.12		
Fourth year	35.67		
Academic discipline			> 0.05

Comparisons by one-way analysis of variance.

Mean perception scores also differed significantly across academic years of study ($F = 2.531$; $p = 0.043$), increasing with academic seniority from 32.12 among first-year students to 35.67 among fourth-year students (Table 5, Figure 4). Analysis of variance across academic disciplines identified no statistically significant difference in mean perception scores ($p > 0.05$); mean scores were highest among anaesthesia technology students and lowest among nursing students, but these differences did not reach statistical significance. Academic discipline was therefore not associated with perception score in this sample to the extent observed for gender and academic seniority.

DISCUSSION

Perceptions of artificial intelligence among Allied Health Sciences students in this sample were predominantly moderate, with 77.2% falling into the intermediate category and only 20.7% expressing strongly favourable views. This pattern is best described as cautious receptiveness rather than either enthusiasm or resistance, and it coexisted with meaningful variation by gender and academic seniority but not by academic discipline. Systematic evidence across health professional students has repeatedly described this same configuration, in which broadly positive attitudes are accompanied by restricted knowledge and minimal applied exposure (10, 11). The present findings extend that observation to a population, and a national context, in which it had not previously been characterised as a defined group.

The Pakistani studies closest in setting provide the most informative comparison. Habib et al. surveyed healthcare students and professionals nationally and reported favourable attitudes alongside limited formal training (18), while Maqbool et al. found comparable receptiveness among pharmacy trainees in Karachi (19), and Fatima et al. documented awareness exceeding applied competence among healthcare professionals and medical students (20). The direction of the present findings is concordant with all three, but the populations differ in a way that matters for interpretation: those samples were predominantly medical, nursing, and pharmacy, whereas the present sample was drawn from rehabilitation and diagnostic disciplines in which the anticipated point of contact with artificial intelligence differs. In physical therapy and rehabilitation, algorithmic tools have been described principally in gait training, motor recovery, and functional mobility (5) and in wearable and robotic systems for upper-limb recovery (4), applications that are assistive rather than substitutive in character. That the present sample nonetheless produced a divided response on displacement suggests that concern in this group may be shaped more by general narratives about automation than by familiarity with the specific applications relevant to their own future practice.

The absence of any significant difference across academic disciplines is consistent with the cross-sectional survey of allied health professionals reported by Hoffman et al., in which unfamiliarity with artificial intelligence was distributed broadly across professional groups rather than concentrated in particular specialties (17), and with the limited familiarity reported among physical therapists by Alsobhi et al. (16). The most plausible interpretation is that the determinant of perception in these populations is exposure to instruction rather than disciplinary identity, and that where no discipline provides structured teaching, no discipline distinguishes itself. This interpretation is supported by systematic review evidence that artificial intelligence education in health professional programmes remains uncommon, elective, and inconsistently aligned to clinical application (12), and by the finding that digital health competencies are unevenly distributed across the health workforce without consistent educational standards (15). It should be noted, however, that the discipline comparison in the present study was underpowered for the smaller programmes, and a null result under these conditions is weaker evidence of equivalence than the concordance with prior work might suggest.

The most substantial finding was the gender difference, which reached a mean difference of 3.89 points with a Cohen's d of 0.69 — a moderate-to-large magnitude that exceeds what much of the prior literature has reported for demographic predictors of artificial intelligence attitudes. Several explanations are plausible, though none can be tested with the present data. Differential prior engagement with digital technologies may generate differences in technological self-efficacy that transfer to novel clinical tools, a mechanism consistent with the readiness and anxiety profile reported among physiotherapists by Bozdemir Özel and Yakut Ozdemir (7). Response style may also contribute, since instruments relying on agreement-scaled self-report are susceptible to systematic differences in willingness to endorse confident positions. A third possibility is confounding by discipline: Doctor of Physical Therapy students constituted 40.7% of the sample, and because the gender composition of each disciplinary group was not analysed, a gender effect and an unmeasured disciplinary or institutional effect cannot be separated in this dataset. This last consideration warrants particular caution, and the gender finding should be regarded as an association requiring replication with stratified analysis rather than an established characteristic of the population.

Perception scores were also higher among students in later years of study, rising from 32.12 in the first year to 35.67 in the fourth. The most intuitive interpretation attributes this to cumulative clinical and academic exposure, and it is consistent with the observation that generative artificial intelligence tools have already entered routine student use in advance of any formal instruction (24), such that senior students may accumulate informal familiarity through practice rather than curriculum. This interpretation must nonetheless be held loosely. Year of study is inseparable from age in a cross-sectional design, and cohort effects offer an equally plausible account: successive intakes enter their programmes having encountered these technologies at different stages of their prior education, and a rising cross-sectional gradient may reflect differences between cohorts rather than change within individuals. Distinguishing these explanations would require longitudinal follow-up, which the present design cannot provide.

The pattern of item-level responses is informative in a way the summary scores are not. The strongest convergence occurred on professional accountability, with participants agreeing that responsibility for algorithmic error rests with the healthcare professional. This indicates a developed ethical intuition that is not matched by corresponding technical preparation, and it aligns with the finding by Weidener and Fischer that students identify accountability as central while ethical content in curricula remains underdeveloped (13), and with the evidence-based review by Pupic et al. showing that where such teaching exists it is rarely systematically delivered (12). The practical concern is that students who accept responsibility for outputs they cannot evaluate are placed in an untenable position, and this represents a more immediate curricular priority than the displacement anxiety that typically dominates discussion of this topic.

On displacement itself, responses divided almost evenly, with 35.8% agreeing and an identical proportion disagreeing. This differs in tone from the pronounced concern documented by Rony et al. among practising healthcare workers who anticipated that accumulated expertise might be devalued (8), and from the ambivalence reported among clinicians in diagnostic specialties (9, 23). The discrepancy is readily explained by career stage: students without established professional investment have less to perceive as threatened, and the high proportion of neutral responses is more consistent with unfamiliarity than with settled reassurance. It would be an overinterpretation to conclude from these data that greater literacy reduces displacement concern, since artificial intelligence literacy was not measured in this study, and that proposition remains an inference drawn from external literature rather than a finding of the present work.

Any translation of these findings into curricular action must also account for conditions beyond individual attitudes. Implementation research has emphasised that adoption of health information technology is an organisational and social process shaped by institutional context rather than a purely technical one (21), and reported barriers include faculty capacity, competing curricular demands, and the slow pace of programme restructuring (14). Practical constraints described by clinicians, including information overload, time pressure, and system limitations (22), indicate that instruction confined to enthusiasm for capability without corresponding attention to limitation would be poorly matched to the settings graduates will enter.

The study has several strengths. It addresses a population that has not previously been examined as a defined group in the Pakistani context, it draws on four institutions rather than one, it uses a validated instrument with acceptable internal consistency in this sample, and it achieved its calculated target sample size. Its limitations are substantial and constrain interpretation accordingly. Non-probability convenience sampling within two adjacent cities restricts generalisability, and without a recorded response rate the extent of self-selection cannot be estimated, so students with pre-existing interest in the topic may be overrepresented. The cross-sectional design permits statements of association only and cannot establish temporal sequence, which bears directly on the interpretation of the year-of-study gradient. All data were self-reported perceptions rather than assessed competence, and social desirability may have influenced responses to the accountability item in particular. Disciplinary subgroups were unequal in size, leaving the discipline comparison underpowered, and the absence of stratified analysis leaves gender and discipline confounded. Reliance on a single instrument means that constructs adjacent to perception, including knowledge, applied skill, and specific ethical reasoning, were not captured.

Taken together, these findings indicate that Allied Health Sciences students in this setting approach artificial intelligence with qualified openness that is not underpinned by formal preparation, and that where perception varies it does so along lines of gender and academic seniority rather than discipline. The implication for curriculum development is that instruction should be introduced early, distributed across disciplines rather than concentrated in those perceived as most technological, and paired with explicit attention to the ethical responsibilities that students already recognise but are not yet equipped to discharge.

CONCLUSION

Among 145 undergraduate Allied Health Sciences students in Islamabad and Rawalpindi, perceptions of artificial intelligence in healthcare were predominantly moderate, with a minority expressing strongly favourable views and few expressing unfavourable ones. Perception scores were associated with gender and with academic year of study, but not with academic discipline, and item-level responses indicated clear recognition of professional accountability for algorithmic error alongside divided views on professional displacement. These cross-sectional findings, obtained from a convenience sample in a single metropolitan region, support the introduction of structured artificial intelligence education, including its ethical dimensions, across Allied Health curricula rather than within selected disciplines, and warrant confirmation in larger and more representative samples.

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