

Do Perceptions and Usage of AI Tools Differ Across Genders, Academic Level, and Fields of Study? A Cross-Sectional Study of Health Sciences Students

Muteb Alshammari*

Department of Health Informatics, School of Public Health and Health Informatics, Hail University, Hail, Saudi Arabia.

*Correspondence to: Muteb Alshammari (E-mail: muteb.h.alshammari@gmail.com)

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Abstract

Objective: The research examines differences in the perception, awareness, and utilization of AI tools among health sciences students in the Kingdom of Saudi Arabia (KSA). These differences are examined by gender, academic level, and field of study.

Methods: A cross-sectional quantitative survey study was conducted among Health sciences students. The study used a close-ended questionnaire at the University of Hail (UOH), KSA. The results examined general perceptions of AI and its association with learning and performance. The study also addressed ethics and academic integrity related to AI, and AI usage concepts. Data were collected from a total sample of 392 students. Descriptive statistics summarized participant characteristics and construct scores. Mann Whitney U tests were used to compare gender differences, while Kruskal Wallis H tests were adopted to assess differences across academic levels and programs.

Results: The analysis found significant differences in AI perception, ethical awareness, and use based on gender and academic level (P -value < 0.01). Additionally, ethical awareness and AI use differed across academic programs. However, general perceptions of AI showed weak but statistically significant differences among academic fields. Overall, demographic and academic factors were associated with how students perceive, evaluate ethically, and use AI technologies.

Conclusion: The study suggests the importance of incorporating of structured AI education with ethics training in health sciences curricula. The results may inform curriculum development and educational planning in KSA.

Keywords: Artificial intelligence, perception, attitude to computers, health occupations, students, Saudi Arabia

Introduction

AI has gone global in education, practice, and healthcare delivery. In health science education, AI applies natural language processing and machine and deep learning.¹ AI helps in virtual patients, adaptive learning.² Additionally, it is being used in intelligent tutoring, and automated assessment along with clinical reasoning.³ Future healthcare practitioners will employ AI in technology-based and data-driven healthcare services.⁴ Thus, AI-based learning should be incorporated into health science education.

However, incorporating AI skills into health sciences education also raises some educational and ethical issues that could impede the integration process. These issues include issues of opaque decision-making and bias in algorithms,⁵ data privacy,⁶ and accountability for decisions made with the assistance of AI. In the health sciences, ethics are very important because of the implications for patient safety. Literacy in ethics has emerged as an essential skill for health science students, which includes ethical knowledge, critical assessment of AI outputs, and informed decision-making.⁷

The perception, awareness, and usage of AI among students shape the future of AI in healthcare. Perception drives acceptance, trust, and engagement with AI tools.⁸ However, ethical awareness informs the evaluation of AI limits, risks, and responsibilities.⁹ Furthermore, early exposure to AI during training is associated with long-term attitudes, clinical judgment, and professional behaviour in the years to come.¹⁰ Students holding balanced, well-informed views are much more likely to use AI appropriately.¹¹ It is a supportive aid—rather than a replacement for clinical reasoning—that will foster safe, effective integration of technology into patient care.

While international work related to AI knowledge, attitudes, and ethics among health students is increasing,

regional gaps persist. Evidence from the Middle East is scant; Saudi Arabia-specific studies are very few. Moreover, limited research has examined differences by gender, academic level, and field of study, despite evidence that demographics and education influence perception of technology and ethical sensitivity. These gaps in region-specific and comparative data undermine contextually appropriate education strategies and policy frameworks for local healthcare systems.

This study investigates Health Science students at the UOH, KSA. The university offers a range of health disciplines and training levels. A cross-sectional, closed-ended survey measured students perceptions, ethical awareness, and use of AI tools at one point in time, following standard educational research methods. Comparisons based on gender, level of education, and discipline of study helped identify differences. It helps in guiding the development of curricula, ethics education, and future research on the integration of AI in health sciences education. In medical education, the adoption of AI has been more rapid than the development of frameworks for ethical competence and use and integration into curricula.

The research aims to investigate how gender, academic level, and field of study differs for health sciences students in KSA. For this purpose, their AI perceptions, ethical awareness, and usage of AI tools are empirically examined. Accordingly, this study addresses the following research questions:

- (i) Do perceptions of AI tools differ by gender, academic level, and field of study among health sciences students?
- (ii) Are there differences in ethical awareness related to AI tools across these groups?
- (iii) Does the use of AI tools vary according to demographic and academic characteristics?

Contribution to Medical Education

This research makes important contributions to the literature on medical education. It examines the associations between perception, awareness, and usage of AI, and how these are gender, progress, and discipline-specific. It also offers empirical insights into the relatively unexamined context of KSA. This region has a different cultural context to Western countries, and which impacts a readiness to adopt AI responsibly. It also supports the need for longitudinal AI education that is discipline-specific.

Material and Methods

Study Design

The research design is cross-sectional, and it is quantitative in nature. The survey is closed-ended and structured. The research investigates the association between perceptions, awareness of ethics, and the use of AI tools among Health Science students in KSA. Moreover, the research selected a cross-sectional methodology. This methodology is widely used in educational and behavioural research. It captures attitudes and self-reported practices at a single point in time.¹² This design allows for efficient data collection from a large population and facilitates comparative analyses across demographic and academic subgroups.¹³

Study Population and Setting

The researcher considered health science students from different health colleges in UOH in KSA. UOH is a public sector institute that provides health related education by attracting a diverse student population from Hail and surrounding regions. Only those students were considered for participation who are enrolled in different health science programs in UOH. A non-probability, voluntary response sampling approach was applied, in which eligible students were invited to participate through official academic communication channels.

Survey Instrument

The researchers used a closed-ended, structured survey questionnaire for data collection. The questionnaire consisted of five sections. The first section includes questions related to the personal attributes of the participants like their gender, age, academic programs, study levels, frequency of AI tool use, and the purpose of use. The remaining sections comprised items/statement the study constructs: AI perception (8 items), AI awareness (3 items), and AI usage (3 items). All items were measured using a five-point Likert scale ranging from 1 to 5. Example items included: I believe AI tools contribute positively to my academic performance, I am aware of the ethical considerations in using AI in healthcare education, I use AI tools for academic purposes on regular basis. These items were adapted from existing literature.¹⁴ As a part of establishing content validity, seven experienced researchers review the questionnaire items. Furthermore, the internal validity and reliability of each construct was established using Cronbach's alpha coefficients.

Data Collection Procedure

In order to ensure broader participation, the researchers collected structured responses online. Official academic channels

were used to ensure that only eligible students can respond this survey. Moreover, the respondents were informed that their participation is voluntary without any penalty. They can leave the survey at any time if they wish to. Furthermore, the respondents were ensured that their responses would remain confidential and anonymous which minimizes the risk of response bias. The researchers used only fully completed responses for final data analysis.

Statistical Analysis

The data collected using structured survey responses was analysed using SPSS version 27. It is a powerful software application for analysing group differences.¹⁵ The personal attributes of respondents were analysed using demographic summary. Similarly, the summary of constructs was reported using descriptive statistics, reliability analysis, and Pearson correlation. Because data were non-parametric, the Mann-Whitney U test compared gender differences, and Kruskal-Wallis H test compared academic levels and fields of study. Normality testing indicated non-normal data distribution, justifying the use of non-parametric statistical tests.

Ethical Considerations

Ethical approval (H-2025-88315/9/2025) was obtained from the UOHs institutional research ethics committee. Informed consent was provided by all participants, and clear notes regarding the purpose of the study, consideration of voluntary participation, and data confidentiality were taken. No identifiable information was collected, and data were securely stored and used for research in accordance with ethical guidelines.

Results

Responses collected from a total of 392 Health Science students were analysed. As shown in Table 1, the distribution showed 62.5% females and 37.5% males. Additionally, most of the respondents belongs to an age category of 20 to 25 years (approximately 82%). Moreover, most of these respondents belongs to Nursing (approximately 22.7%), as well as Medicine (approximately 31%). However, the distribution of academic level in terms of years was fairly even. Finally, majority of these respondents indicated that they regularly use AI tools on daily basis (approximately 48%).

Table 2 indicates the summary, reliability, and correlation statistics of main constructs of this study. The summarized statistics in the form of means and standard deviations indicated moderated levels for all constructs. For example, the AI's general perception, the AI's learning and performance effects, ethical aspect and integrity, and AI usage indicated 3.25, 3.27, 3.32, and 2.85 as their average values. They also indicated 1.54, 1.49, 1.53, and 1.12 as standard deviations. Moreover, the Cronbach alpha (α) confirmed internal consistency of these constructs by meeting a higher value as compared to minimum threshold of 0.70.¹⁶ Moreover, the table also indicated significant positive Pearson correlation between variables. However, the issue of multicollinearity is not found as the value of Pearson correlation between variables is less than 0.80.¹⁷

Finally, Tables 3–6 report the group differences for the variables of this study. The groups include gender, academic levels, and programs of study. Normality assumption was

Table 1. Participant summary

| Categories | Sub-categories | Frequency | Percentage |
|---------------------|------------------------|-----------|------------|
| Gender | Male | 147 | 37.5% |
| | Female | 245 | 62.5% |
| Age | < 20 | 52 | 13.3% |
| | 20–25 | 322 | 82.1% |
| | 26–30 | 2 | 0.5% |
| | > 30 | 16 | 4.1% |
| | | | |
| Academic Programs | Medicine | 122 | 31.1% |
| | Nursing | 89 | 22.7% |
| | Pharmacy | 29 | 7.4% |
| | Laboratory Sciences | 18 | 4.6% |
| | Physical Therapy | 26 | 6.6% |
| Academic Years | Public Health | 60 | 15.3% |
| | Others | 48 | 12.2% |
| | Year 1 | 68 | 17.3% |
| | Year 2 | 81 | 20.7% |
| | Year 3 | 86 | 21.9% |
| Frequency of AI Use | Year 4 | 77 | 19.6% |
| | Year 5 | 80 | 20.4% |
| | Daily | 188 | 48.0% |
| | Weekly | 106 | 27.0% |
| | Occasionally | 77 | 19.6% |
| Purpose of Using AI | Rarely | 21 | 5.4% |
| | Analysing data | 9 | 2.3% |
| | Understanding Language | 32 | 8.2% |
| | Summarizing content | 136 | 34.7% |
| | Exam preparation | 87 | 22.2% |
| | Academic writing | 128 | 32.7% |

tested and revealed a non-parametric distribution; therefore, non-parametric tests were applied. Mann Whitney U test was used to examine group differences based on gender, with effect sizes calculated to assess the magnitude of differences. Furthermore, group differences were assessed for academic levels and programs of study using Kruskal-Wallis H test, and effect sizes were estimated using eta squared (η^2). The findings revealed a statistically significant group differences ($P < 0.001$) for all the constructs. Significant differences across academic years were found in Kruskal-Wallis H tests for all constructs ($P < 0.001$). It indicates variation in AI perception, ethical awareness, and usage across stages of academic progressions. Post hoc mean rank patterns showed generally higher scores among senior academic years. It suggests greater engagement and awareness at advanced levels of study.

In contrast, differences across academic programs varied by construct. However, the finding reported no statistically significant differences across programs for general perception of AI ($P = 0.08$). Additionally, perceived effects of AI on learning and performance, ethical aspects and academic integrity, and AI usage provides significant differences ($P < 0.001$). These results are accompanied by corresponding effect sizes indicating meaningful variability across disciplines. These results suggest that students from different health science programs differ in how they engage with, evaluate and apply AI tools in their academic contexts in KSA.

Discussion

The research evaluates the perception and awareness of health science students towards AI tools. The results indicate that there are statistically significant differences among the groups (e.g., such as gender, academic level, and programs of study). In general, personal characteristics and support factors are associated with AI readiness among health science students in KSA.

The differences that were observed across the levels of academia indicate that there is an association between the development of AI-related ethical awareness and use. This skill appears to increase with the level of academic maturity and clinical experience. Instead of indicating a failure in the curriculum, the results suggest that continued exposure can increase competency. Similarly, the female students always performed better in perception, ethical awareness, and the use of AI. This could be attributed to statistical differences between the two gender groups. It could be a result of differences in engagement levels and risk perception when it comes to ethical issues in AI-assisted healthcare.

Table 2. Descriptive, Reliability, and Correlation Analysis

| | Descriptive statistics | | | | | | | | | Pearson correlation | | | |
|-------------|------------------------|------|------|-------|----------|------|------|-------|-------|---------------------|--------|--------|--------|
| | N | Min | Max | Items | α | Mean | STD | SKW | KRT | GPAI | EAIP | EAAI | AIU |
| GPAI | 392 | 1.00 | 5.00 | 3.00 | 0.756 | 3.25 | 1.54 | -0.28 | -1.63 | 1 | .516** | .423** | .200** |
| EAIP | 392 | 1.00 | 5.00 | 5.00 | 0.770 | 3.27 | 1.49 | -0.32 | -1.57 | .516** | 1 | .474** | .688** |
| EAAI | 392 | 1.00 | 5.00 | 3.00 | 0.764 | 3.32 | 1.53 | -0.34 | -1.55 | .423** | .474** | 1 | .62** |
| AIU | 392 | 1.00 | 4.00 | 3.00 | 0.739 | 2.85 | 1.12 | -0.48 | -1.55 | .200** | .688** | .62** | 1 |

"GPAI = General Perception of AI, EAIP = Effect of AI on Learning and Performance, EAAI = Ethical Aspects and Academic Integrity, AIU = AI usage, N = Number of responses, Min = Minimum value, Max = Maximum value, Items = number of statements in a construct, α = Cronbach Alpha, Mean = Average response value, STD = Standard Deviation, SKW = Skewness, KRT = Kurtosis". ** P-value < 0.01.

Table 3. **Group differences for GPAI**

| Groups | Categories | Frequency | Test used | Means | Statistic | P-value |
|-------------------|---------------------|-----------|------------------|--------|-----------|---------|
| Gender | Male | 147 | Mann-Whitney-U | 84.34 | 1520.500 | 0.001 |
| | Female | 245 | | 263.28 | | |
| Academic Years | 1st | 68 | Kruskal-Wallis-H | 215.20 | 18.36 | 0.001 |
| | 2nd | 81 | | 156.40 | | |
| | 3rd | 86 | | 189.09 | | |
| | 4th | 77 | | 199.11 | | |
| | 5th | 80 | | 226.67 | | |
| Academic Programs | Medicine | 122 | Kruskal-Wallis-H | 193.72 | 10.97 | 0.089 |
| | Nursing | 89 | | 198.04 | | |
| | Pharmacy | 29 | | 207.50 | | |
| | Laboratory Sciences | 18 | | 164.64 | | |
| | Physical Therapy | 26 | | 226.96 | | |
| | Public Health | 60 | | 167.48 | | |
| Others | 48 | 225.77 | | | | |

Table 4. **Group differences for EAIP**

| Groups | Categories | Frequency | Test used | Means | Statistic | P-value |
|-------------------|---------------------|-----------|------------------|--------|-----------|---------|
| Gender | Male | 147 | Mann-Whitney-U | 85.47 | 1745 | 0.001 |
| | Female | 245 | | 262.88 | | |
| Academic Years | 1st | 68 | Kruskal-Wallis-H | 215.12 | 22.33 | 0.001 |
| | 2nd | 81 | | 162.91 | | |
| | 3rd | 86 | | 176.12 | | |
| | 4th | 77 | | 195.61 | | |
| | 5th | 80 | | 237.44 | | |
| Academic Programs | Medicine | 122 | Kruskal-Wallis-H | 183.47 | 19.72 | 0.003 |
| | Nursing | 89 | | 189.04 | | |
| | Pharmacy | 29 | | 210.00 | | |
| | Laboratory Sciences | 18 | | 172.89 | | |
| | Physical Therapy | 26 | | 279.04 | | |
| | Public Health | 60 | | 182.11 | | |
| Others | 48 | 217.42 | | | | |

Table 5. **Group differences for EAAI**

| Groups | Categories | Frequency | Test used | Means | Statistic | P-value |
|-------------------|---------------------|-----------|------------------|--------|-----------|---------|
| Gender | Male | 147 | Mann-Whitney-U | 83.56 | 1405 | 0.001 |
| | Female | 245 | | 264.27 | | |
| Academic Years | 1st | 68 | Kruskal-Wallis-H | 208.89 | 13.31 | 0.010 |
| | 2nd | 81 | | 170.47 | | |
| | 3rd | 86 | | 179.31 | | |
| | 4th | 77 | | 200.07 | | |
| | 5th | 80 | | 227.37 | | |
| Academic Programs | Medicine | 122 | Kruskal-Wallis-H | 185.34 | 21.96 | 0.001 |
| | Nursing | 89 | | 185.78 | | |
| | Pharmacy | 29 | | 202.02 | | |
| | Laboratory Sciences | 18 | | 213.61 | | |
| | Physical Therapy | 26 | | 268.62 | | |
| | Public Health | 60 | | 167.66 | | |
| Others | 48 | 231.97 | | | | |

Table 6. Group differences for AIU

| Groups | Categories | Frequency | Test used | Means | Statistic | P-value |
|-------------------|---------------------|-----------|------------------|--------|-----------|---------|
| Gender | Male | 147 | Mann-Whitney-U | 74 | 1087 | 0.001 |
| | Female | 245 | | 270 | | |
| Academic Years | 1st | 68 | Kruskal-Wallis-H | 206.55 | 15.77 | 0.003 |
| | 2nd | 81 | | 159.86 | | |
| | 3rd | 86 | | 193.69 | | |
| | 4th | 77 | | 196.75 | | |
| | 5th | 80 | | 227.84 | | |
| Academic Programs | Medicine | 122 | Kruskal-Wallis-H | 189.52 | 28.11 | 0.001 |
| | Nursing | 89 | | 190.03 | | |
| | Pharmacy | 29 | | 232.67 | | |
| | Laboratory Sciences | 18 | | 188.03 | | |
| | Physical Therapy | 26 | | 275.17 | | |
| | Public Health | 60 | | 153.11 | | |
| | Others | 48 | | 219.19 | | |

However, the differences across academic programs were observed for certain constructs. The findings show that AI exposure and ethical reasoning may differ by disciplinary curriculum and clinical practice. Additionally, disciplines that have more dependency on diagnostic technologies may provide more frequent opportunities for AI engagement. However, others encounter AI mainly in academic contexts. These results support consideration of discipline-sensitive approaches, rather than a uniform educational model, when designing AI-related education content. Collectively, these findings indicate that structure and contextually aligned AI education may be beneficial in health professions training. While the results do not establish causal effects, they suggest that staged and discipline-aligned AI education could support responsible AI engagement. These results warrant further investigation through longitudinal and intervention-based research.

The first personal attribute like gender supported significance difference for all constructs; perception, ethical awareness, and AI usage. Additionally, this finding indicates that female health science students reported a higher level of perception, awareness, and AI usage as compared to males, consistent with statistical results. The existing latest literature supported such evidence in healthcare and university settings.¹⁸ These studies argued that women tend to display higher level of ethical concerns with the usage of emerging technologies like AI. Moreover, such practices were supported in healthcare settings.¹⁹ In broader Middle East context as well as in KSA, such findings may also be partly explained by differential educational engagement, learning practices, and risk perception.²⁰ These interpretations should be viewed as explanatory rather than causal.

The second personal attribute is academic level. It also provided significant group differences in students' perception, ethical awareness, and AI usage. These findings are also aligned with prior studies. For example, seniors are most likely to engage in the concepts of AI due to increased maturity, more clinical exposure, and accumulated digital experience.²¹ These studies further indicated that advancement of students places them in contact with AI in clinical simulation, research, and courses. It may contribute to increased familiarity and critical awareness.

The third personal attribute includes Field-of-study differences. It confirmed that ethical awareness and AI use, likely due to a difference in curriculum, clinical exposure, and technology engagement by discipline. However, general AI perception did not differ significantly across programs. These findings are aligned with prior research²² suggesting that disciplines such as medicine and physical therapy more often require diagnostic machinery and clinical judgments. Therefore, the higher chance of exposure to AI; in other fields, AI is mostly encountered within academic or administrative contexts. These results suggest that discipline-specific competencies may be relevant, though further evidence is required.

The study has several strengths, including the large sample size and the geographical focus on an underrepresented region. This therefore provides a solid representation of perceptions and practices related to AI among health science students of KSA. These findings contribute region-specific insights into the international literature on AI in health education. Moreover, the empirical data is collected from KSA as a underexamined region. Therefore, this study extends the existing international literature.

However, the study also considered a number of limitations. Firstly, single-institution data may limit generalizability. Secondly, self-reported questionnaires risk response bias. Thirdly, the cross-sectional design precludes causal interpretation and limits the ability to examine changes over time. Therefore, future studies should move to multi-site designs involving universities and regions. Additionally, longitudinal designs would also be very informative in understanding how perception of AI and ethical awareness evolve through training. Finally, intervention-based studies with targeted AI ethics and literacy curricula inform educational policy and curriculum development. These studies would be better suited to examine explanatory mechanism and evaluate the effectiveness of AI-related educational initiatives.

Conclusion

This research concludes that there is a significant difference across groups for perception, awareness, and usage of AI tools among the health science students in KSA. Therefore, the

educational institutions in KSA requires an inclusive and structured education system of AI. Moreover, the incorporation of AI knowledge in the curriculum of health science student may enhance the responsible and ethical use of such technologies. Hence, the conclusive evidence supports policy efforts that will focus in rising AI based skills for the healthcare professionals in future. Such skills are necessary for effective, ethical, and safe transformation of AI knowledge into the professional healthcare practices in the region. These findings provide evidence to inform the design of structured, longitudinal, and ethically grounded AI education within health professions curricula.

Declarations

Ethical Approval

The author obtained an ethical approval H-2025-883 from Research Ethics Committee of University of Hail KSA. The data

collection was started after obtaining informed consents from the participants.

Financial Support and Sponsorship

None.

Data Availability

A reasonable request can be made to corresponding author for obtaining the dataset used in the analysis of this study.

Disclosure

No AI tools is used for language editing or drafting the manuscript.

Conflicts of Interest

None. ■

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