

ORIGINAL ARTICLE

USE OF ARTIFICIAL INTELLIGENCE TOOLS AMONG MEDICAL AND DENTAL STUDENTS AT AYUB MEDICAL COLLEGE, ABBOTTABAD

Najia Sajjad Khan, Ayesha Rafiq*, Sobia Ali**, Farhan Aman***,
Laila Ihsan[†], Shahbaz Waseem Gul***

Department of Community Dentistry, *Medical Education, **Community Medicine,
***MBBS Student, [†]BDS Student, Ayub Medical College, Abbottabad, Pakistan

Background: Artificial intelligence (AI) is increasingly being used for education. The objectives of this study were to determine the usage of artificial intelligence tools for academic purposes among the students of Ayub Medical College and comparison of AI use between medical and dental students. **Methods:** This comparative cross-sectional study was conducted at Ayub Medical College from 15 Aug to 20 Nov 2023. The sample size was 304 comprising of 209 medical and 95 dental students. A self-designed questionnaire on Google Forms was electronically distributed to participants for data collection. The questionnaire included questions about demographic variables, information about usage of artificial intelligence tools for different purposes and their disadvantages. Frequencies and percentages were calculated. Mean and standard deviation was calculated for age. Comparisons between medical and dental students were done using Chi-square and Fischer Exact tests. **Results:** The most frequently used artificial intelligence tool was ChatGPT, 81.3% in medical students and 84.2% in dental students. In comparing medical and dental students, there were statistically significant differences in use of AI for developing research project ($p < 0.001$), its different steps ($p = 0.002$), and prescription writing ($p = 0.026$). **Conclusions:** The greater use of ChatGPT among medical and dental students was highlighted. The students used the artificial intelligence tools for many purposes but were primarily used for acquiring information about medical and dental knowledge. They were also aware about the limitations of artificial intelligence.

Keywords: Artificial Intelligence, AI, Dentistry, Medicine, Education, Undergraduate, Trends

Pak J Physiol 2025;21(1):92–5, DOI: <https://doi.org/10.69656/pjp.v21i1.1718>

INTRODUCTION

Artificial intelligence (AI) is the science of the creation of systems for the performance of intelligent tasks like decision-making, learning and judgment.¹ It has applications within healthcare in all specialties² especially in the developed world and has the potential to revolutionize medicine in the developing countries.³ It is also increasingly being used for the betterment of medical and dental education.⁴ One such open-source freeware AI Chatbot which is being increasingly utilized by healthcare students and healthcare professionals alike is Chat Generative Pre-trained Transformer (ChatGPT).⁵ Another AI software used is Microsoft Copilot.⁶

The importance of incorporating AI into the curriculum in medical schools has been highlighted by piloting it in the curriculums of University of Toronto and Harvard Medical School as acquiring information about AI use is beneficial to medical students.⁷ ChatGPT can have advantages in medical education such as quick access to information, clinical reasoning, better personalized learning, comprehension of complex concepts, and improvement of clinical skills by teaching medical and dental procedures through simulations.⁸ It helps the teachers in scoring papers and providing teaching assistance.⁶ Therefore, ChatGPT and other AI software have presented a

paradigm shift in education⁵ and have the ability to potentially modernize the educational system¹.

The AI software also have their limitations. ChatGPT causes decreased logical and critical thinking in students.⁵ It often gives biased and inaccurate information.⁶ Its use has caused greater dependency on AI.⁵ Students might also be tempted to cheat more and it challenges academic integrity.⁹ There are confidentiality, transparency and privacy concerns about the information given to such software.² So use of AI in medical education has to be done carefully while monitoring its use, and its purpose should be to enhance human abilities not to replace them.¹⁰

The objectives of this study were to determine the frequencies of AI tools usage in medical and dental students and to compare the usage between them in Ayub Medical College. This study will help the medical teachers to understand the patterns of AI usage in the medical and dental students, and the academic purposes they are using them for. With this information they can better develop strategies for the correct and safe use of AI tools by the students in their curricular activities.

METHODOLOGY

The study was a comparative cross-sectional study conducted at Ayub Medical College, Abbottabad, Pakistan from 15th August to 20th November 2023.

Medical and dental students of Ayub Medical College were included in the study. The students who had not used AI tools were excluded. The sample size of 304 was calculated using OpenEpi sample size calculator using confidence level of 95%, population size of 1,450, and 51% percentage frequency of outcome factor in the population.¹¹ The dental students comprised 1/3rd of the total sample size. The sampling technique used was non-probability quota sampling where two groups of medical and dental students were devised and sampling performed. Ethical approval was taken from the Medical Teaching Institution Abbottabad Institutional Ethical Review Committee Approval Code/Ref. No. RC-EA-2023/121. Informed written consent was taken from the participants. A questionnaire designed on Google Forms was electronically distributed to them via WhatsApp to collect the data. It included questions about demographic variables, information about usage of AI tools for different purposes and their disadvantages.

Data analysis was performed on SPSS-21. Frequencies and percentages were calculated. Mean and standard deviation was calculated for the variable of age. Comparisons between the medical and dental students were done with Chi-square test, and $p \leq 0.05$ was considered statistically significant.

RESULTS

The sample size was 304 comprising of 209 medical students (137 males and 72 females) and 95 dental students (27 males and 68 females) belonging to all professional years. Mean age of participants was 22.1 ± 1.7 years. The most frequently used AI tool was ChatGPT (81.3% in medical students and 84.2% in dental students). Other AI software used included Microsoft Copilot, Gamma AI, Grammarly, AI Chat, Ask AI, Ideogram, Midjourney, Adobe AI, Leonardo AI, Snapchat AI, WhatsApp AI, DALL-E, Stable Diffusion, Pebble AI, Gemini, Tome AI, Pi, Poe, and Quillbot.

Comparing questions for pattern of usage of AI tools for academic tasks, there were no significant differences between medical and dental students (Table-1).

Statistically significant differences were seen in Questions 1 ($p < 0.001$) and 2 ($p = 0.002$) when comparing questions for pattern of usage of AI tools for research tasks (Table-2).

Comparing questions for pattern of usage of AI tools for clinical learning, there were statistically significant differences in Questions 4 ($p = 0.026$) regarding use of AI in prescription writing. (Table-3).

There were no statistically significant differences in medical and dental students regarding limitations/disadvantages of AI. (Table-4).

Table-1: Use of AI tools for academic purposes

| Questions/Answers | Medical students | | Dental students | | p |
|--|------------------|------|-----------------|------|-------|
| | n | % | n | % | |
| 1. Use of AI tools for updated medical/dental knowledge | | | | | |
| Yes | 123 | 58.9 | 55 | 57.9 | 0.900 |
| No | 86 | 41.1 | 40 | 42.1 | |
| 2. Use of AI tools for understanding of complex medical/dental concepts | | | | | |
| Yes | 95 | 45.5 | 44 | 46.3 | 0.902 |
| No | 114 | 54.5 | 51 | 53.7 | |
| 3. Use of AI tools for writing assignments | | | | | |
| Yes | 104 | 49.8 | 57 | 60.0 | 0.108 |
| No | 105 | 50.2 | 38 | 40.0 | |
| 4. Use of AI tools for doing which assignments' steps | | | | | |
| For ideas generation about assignment | 104 | 49.8 | 43 | 45.3 | 0.145 |
| For grammar check and sentence structuring | 15 | 7.2 | 9 | 9.5 | |
| For providing feedback or scoring your assignment | 3 | 1.4 | 1 | 1.1 | |
| Commanding AI tools to do the whole assignment for you | 6 | 2.9 | 9 | 9.5 | |
| Not using AI tools at all for assignments | 81 | 38.8 | 33 | 34.7 | |
| 5. Use of AI tools for drawing medical/dental diagrams | | | | | |
| Yes | 13 | 6.2 | 12 | 12.6 | 0.072 |
| No | 196 | 93.8 | 83 | 87.4 | |
| 6. Use of AI tools to solve question papers | | | | | |
| Yes | 434 | 16.3 | 23 | 24.2 | 0.11 |
| No | 175 | 83.7 | 72 | 75.8 | |
| 7. Use of AI tools to make PowerPoint presentations | | | | | |
| Yes | 144 | 21.1 | 26 | 27.4 | 0.24 |
| No | 165 | 78.9 | 69 | 72.6 | |

Table-2: Use of AI tools for research purposes

| Questions/Answers | Medical students | | Dental students | | p |
|---|------------------|-------|-----------------|------|-------|
| | n | % | n | % | |
| 1. Use of AI tools as an aid for developing a research project | | | | | |
| Yes | 80 | 38.3 | 14 | 14.7 | 0.000 |
| No | 129 | 61.7 | 81 | 85.3 | |
| 2. Use of AI tools for which step of research project | | | | | |
| Outline of research project | 48 | 60.0 | 9 | 64.3 | 0.002 |
| Questionnaire development | 4 | 5.0 | 1 | 7.1 | |
| Data analysis | 21 | 26.25 | 4 | 28.6 | |
| Write-up | 7 | 8.75 | 0 | 0 | |

Table-3: Use of AI tools for clinical learning

| Questions/Answers | Medical students | | Dental students | | p |
|--|------------------|------|-----------------|------|-------|
| | n | % | n | % | |
| 1. Use of AI tools for enhancement of problem solving and clinical reasoning skills | | | | | |
| Yes | 72 | 34.4 | 40 | 42.1 | 0.203 |
| No | 137 | 65.6 | 55 | 57.9 | |
| 2. Use of AI tools for practicing communication techniques and skills | | | | | |
| Yes | 60 | 28.7 | 24 | 25.3 | 0.582 |
| No | 149 | 71.3 | 71 | 74.7 | |
| 3. Use of AI tools for practicing virtual simulated patient interactions | | | | | |
| Yes | 14 | 6.7 | 11 | 11.6 | 0.177 |
| No | 195 | 93.3 | 84 | 88.4 | |
| 4. Use of AI tools for medical/dental prescription writing | | | | | |
| Yes | 20 | 9.6 | 18 | 18.9 | 0.026 |
| No | 189 | 90.4 | 77 | 81.1 | |
| 5. Use of AI tools for generating history-taking questions for patients | | | | | |

| | | | | | |
|--|-----|------|----|------|-------|
| Yes | 24 | 11.5 | 17 | 17.9 | 0.148 |
| No | 185 | 88.5 | 78 | 82.1 | |
| 6. Use of AI tools for generating health education information for patients | | | | | |
| Yes | 38 | 18.2 | 21 | 22.1 | 0.437 |
| No | 171 | 81.8 | 74 | 77.9 | |
| 7. Use of AI tools for interpreting radiographs | | | | | |
| Yes | 18 | 8.6 | 11 | 11.6 | 0.407 |
| No | 191 | 91.4 | 84 | 88.4 | |
| 8. Use of AI tools for learning clinical procedures | | | | | |
| Yes | 31 | 14.8 | 17 | 17.9 | 0.501 |
| No | 178 | 85.2 | 78 | 82.1 | |

Table-4: Opinion about disadvantages of AI tools

| Questions | Medical students | | Dental students | | p |
|---|------------------|------|-----------------|------|-------|
| | n | % | n | % | |
| 1. Do you think AI tools provide the right kind of information and resources related to your medical/dental search? | | | | | |
| Yes | 114 | 54.5 | 49 | 51.6 | 0.072 |
| No | 26 | 12.4 | 5 | 5.3 | |
| Not Sure | 69 | 33.0 | 41 | 43.2 | |
| 2. Do you feel you are getting too dependent on AI tools for academics? | | | | | |
| Yes | 31 | 14.8 | 23 | 24.2 | 0.124 |
| No | 154 | 73.7 | 64 | 67.4 | |
| Not Sure | 24 | 11.5 | 8 | 8.4 | |
| 3. Do you feel the frequent use of AI tools decreases your critical thinking ability and creative skills? | | | | | |
| Yes | 108 | 51.7 | 56 | 58.9 | 0.207 |
| No | 67 | 32.1 | 21 | 22.1 | |
| Not Sure | 34 | 16.3 | 18 | 18.9 | |
| 4. Do you feel that AI tools should be allowed in institutions as an additional source of learning without replacing human teachers? | | | | | |
| Yes | 140 | 67.0 | 62 | 65.3 | 0.945 |
| No | 47 | 22.5 | 23 | 24.2 | |
| Not Sure | 22 | 10.5 | 10 | 10.5 | |
| 5. Do you feel privacy concerns while using AI tools? | | | | | |
| Yes | 81 | 38.8 | 34 | 35.8 | 0.647 |
| No | 79 | 37.8 | 34 | 35.8 | |
| Not Sure | 49 | 23.4 | 27 | 28.4 | |

DISCUSSION

This study demonstrated the pattern of AI use among the medical and dental students of Ayub Medical College. The most used AI tool by students was ChatGPT (81.3% in medical students and 84.2% in dental students). This is in contrast to two studies where frequencies were 11.3%¹² and 15.9%¹³. A systematic review¹⁴ mentioned AI tools usage in medical students from 11.3–45%. Previous studies assessed familiarity and knowledge about an overall concept of AI in medical education, and not just about ChatGPT like in this study. Knowledge about AI ranged from 47%¹⁵, 70%¹⁶, 56.7%¹⁷ and 68.8%¹⁸ in four studies, last two of which were local studies. In a systematic review¹⁴ AI knowledge ranged from 5.9–92%.

In the present study, 67% medical students and 65.3% dental students agreed that AI knowledge should be taught as part of curriculum. Previous studies showed a similar high percentage trend with 82.1%¹¹, 59.7%¹³, 68.4%¹⁵, 85.3%¹⁶, 74.1%¹⁸, 78.1%¹⁹, 77.7%²⁰, and 64.1%²¹ in eight studies, last three of which were local studies. A study by Bisdas *et al*³ showed a frequency of

85.6% and compared the medical and the dental students, and like this study ($p=0.945$) the difference was statistically insignificant ($p=0.747$).³

Some medical schools piloted AI inclusion in curriculum like Harvard Medical School, University of Toronto, Ulsan University, and Yonsei University. Teaching competencies of AI in medical education in their respective curriculums were all different with a lack of a standard curriculum, and so a need was felt for such a curriculum.²²

In the current study, 58.9% medical students and 57.9% dental students used AI tools to keep themselves updated about their medical knowledge. This was similar to a study by Kalaimani *et al*¹³ where 53.4% dental students did this. In our study, 11.6% dental students used AI to interpret radiographs and this was unlike the study by Kalaimani *et al*¹³ where 44.1% used it for this purpose.

In this study, 38.8% medical students and 35.8% dental students felt privacy concerns with AI use. A general awareness among medical students about the limitations of AI was depicted with frequencies of 67.6%¹¹, 63.4%¹⁵, and 48.3%¹⁹ in three studies. In a study by Al Saad *et al*¹⁵, 61.6% medical students had privacy concerns in contrast to this study.

There were significant differences between the medical and dental students regarding use of AI as an aid to research project development, the usage in the various steps of research and in the usage for prescription writing. The medical students (38.3%) used AI more than the dental students (14.7%) in developing a research project. Both categories of students (59.5% medical, and 64.3% dental) used AI for developing an outline of the research project. This could be because undergraduate students are not well trained in AI use for research so can mostly use it for the easiest task of making an outline. The dental students (18.39%) used AI more than the medical students (9.6%) in writing prescriptions. This could be so because in Ayub Medical College, dental students are dealing directly and independently with patients earlier than medical students and so write more prescriptions for which they can use AI to help them with.

A scoping review by Lee *et al*²² gave some recommendations for the incorporation of AI in the curriculum. These include teaching students the basics of AI and use of its tools, its uses and its effect on clinical reasoning, advantages and dangers and communicating AI findings to patients.

It is recommended that awareness about AI use in medical education should be spread through educational activities in medical and dental students. The curriculum should be enriched by incorporating AI topics within it. Teachers can help students to use AI as a means of gathering medical information. The performance of the students should be assessed in

collecting medical information.²³

The limitations of the study included using a non-random sampling technique and not including participants from other medical and dental colleges.

CONCLUSION

The mostly frequently used AI tool among medical and dental students was ChatGPT. A greater proportion of the students used them for finding information about medical and dental topics. AI tools were mostly used for idea generation. In developing a research project they were used mostly for crafting an outline. The majority of the students were also concerned about the consequences of limitations of AI. Future studies should focus on interventional studies when piloting an AI educational program in the curriculum.

REFERENCES

1. Farrokhnia M, Banihashem SK, Noroozi O, Wals A. A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innov Educ Teach Int* 2023;61(3):460–74.
2. Ghorashi N, Ismail A, Ghosh P, Sidawy A, Javan R. AI-powered chatbots in medical education: potential applications and implications. *Cureus* 2023;15(8):e43271.
3. Bisdas S, Topriceanu CC, Zakrzewska Z, Irimia AV, Shakallis L, Subhash J, *et al*. Artificial intelligence in medicine: a multinational multi-center survey on the medical and dental students' perception. *Front Public Health* 2021;9:795284.
4. Friederichs H, Friederichs WJ, März M. ChatGPT in medical school: how successful is AI in progress testing? *Med Educ Online* 2023;28(1):2220920.
5. Sallam M, Salim NA, Barakat M, Al-Tammemi AB. ChatGPT applications in medical, dental, pharmacy, and public health education: A descriptive study highlighting the advantages and limitations. *Narra J* 2023;3(1):e103.
6. Khan RA, Jawaid M, Khan AR, Sajjad M. ChatGPT-Reshaping medical education and clinical management. *Pak J Med Sci* 2023;39(2):605–7.
7. McCoy LG, Nagaraj S, Morgado F, Harish V, Das S, Celi LA. What do medical students actually need to know about artificial intelligence? *NPJ digit Med* 2020;3(1):86.
8. The pros and cons of using ChatGPT in medical education: a scoping review. *Healthcare Transformation with Informatics and Artificial Intelligence*. 2023;305:644–7.
9. Thurzo A, Strunga M, Urban R, Surovková J, Afrashtehfar KI. Impact of artificial intelligence on dental education: a review and guide for curriculum update. *Educ Sci* 2023;13(2):150.
10. Jeyaraman M, K SP, Jeyaraman N, Nallakumarasamy A, Yadav S, Bondili SK. ChatGPT in Medical Education and Research: A Boon or a Bane? *Cureus* 2023;15(8):e44316.
11. Buabbas AJ, Miskin B, Alnaqi AA, Ayed AK, Shehab AA, Syed-Abdul S, *et al*. Investigating students' perceptions towards artificial intelligence in medical education. *Healthcare* 2023;11(9):1298.
12. Sallam M, Salim NA, Barakat M, Al-Mahzoum K, Al-Tammemi AB, Malaeb D, *et al*. Assessing health students' attitudes and usage of ChatGPT in Jordan: Validation Study. *JMIR Med Educ* 2023;9:e48254.
13. Kalaimani G, Sivapathasundharam B, Chockalingam RM, Karthick P. Evaluation of knowledge, attitude, and practice (KAP) of artificial intelligence among dentists and dental students: a cross-sectional online survey. *Cureus* 2023;15(9):e44656.
14. Baigi SFM, Sarbaz M, Ghaddarpouri K, Ghaddarpouri M, Mousavi AS, Kimiafar K. Attitudes, knowledge, and skills towards artificial intelligence among healthcare students: A systematic review. *Health Sci Rep* 2023;6(3):e1138.
15. Al Saad MM, Shehadeh A, Alanazi S, Alenezi M, Eid H, Alfaouri MS, *et al*. Medical students' knowledge and attitude towards artificial intelligence: An online survey. *Open Public Health J* 2022;15:e187494452203290.
16. Swed S, Alibrahim H, Elkalagi NKH, Nasif MN, Rais MA, Nashwan AJ, *et al*. Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Syria: a cross-sectional online survey. *Front Artif Intell* 2022;5:1011524.
17. Ahmer H, Altaf SB, Khan HM, Bhatti IA, Ahmad S, Shahzad S, *et al*. Knowledge and perception of medical students towards the use of artificial intelligence in healthcare. *J Pak Med Assoc* 2023;73(2):448–51.
18. Ahmed Z, Bhinder KK, Tariq A, Tahir MJ, Mehmood Q, Tabassum MS, *et al*. Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Pakistan: A cross-sectional online survey. *Ann Med Surg (Lond)* 2022;76:103493.
19. Sit C, Srinivasan R, Amlani A, Muthuswamy K, Azam A, Monzon L, *et al*. Attitudes and perceptions of UK medical students towards artificial intelligence and radiology: a multicentre survey. *Insights Imaging* 2020;11(1):14.
20. Sabah NU, Fazal F, Khan A, Arooj H, Rafiq I, Dar MA, *et al*. Artificial intelligence in the healthcare system; A cross-sectional study involving medical students. *Pak J Med Dent* 2023;12(3):16–22.
21. Abid S, Awan B, Ismail T, Sarwar N, Sarwar G, Tariq M, *et al*. Artificial intelligence: medical students' attitude in district Peshawar Pakistan. *Pak J Public Health* 2019;9(1):19–21.
22. Lee J, Wu AS, Li D, Kulasegaram KM. Artificial intelligence in undergraduate medical education: a scoping review. *Academic Medicine* 2021;96(11S):S62–70.
23. Li Q, Qin Y. AI in medical education: medical student perception, curriculum recommendations and design suggestions. *BMC Med Educ* 2023;23(1):852.

Address for Correspondence:

Dr Ayesha Rafiq, Department of Medical Education, Ayub Medical College, Abbottabad, Pakistan. **Cell:** +92-336-8431766

Email: asho243@yahoo.com

Received: 5 Jul 2024

Reviewed: 20 Jan 2025

Accepted: 21 Jan 2025

Contribution of Authors:

NSK: Concept, data collection, data analysis, write-up

AR: Concept, data collection, data analysis, write-up

SA: Concept, data analysis

FA: Data collection

LI: Data collection

SWG: Data collection

Conflict of interest: None to declare

Funding: No funding received from any agency