Kurdish Studies
May 2024
Volume: 12, No: 4, pp. 1385-1389
ISSN: 2051-4883 (Print) | ISSN 2051-4891 (Online)
www.KurdishStudies.net

DOI: 10.53555/ks.v12i4.3159

Impact Of Artificial Intelligence In The Field Of Medicine And Dentistry In Pakistan

Dr Ambreen Khurshid[1*], Dr Hina Hammad[2], Dr Fatimah Kamran[3], Dr Shumaila Khan[4], Dr Syeda Arzoo Azeem[5], Dr Shazia Sarwat Iqbal[6], Dr Zubia Begum[7]

[1*]Assistant Professor, Department of Oral Biology, Shifa College of Dentistry, Islamabad, Pakistan
[2]Assistant Professor, Department of Operative and Endodontic Dentistry, Hamdard University Dental Hospital, Karachi, Pakistan
[3]Baqai Medical University, Karachi, Pakistan
[4]Lecturer, Department of Biochemistry, Baqai Medical University, Karachi, Pakistan
[5]Assistant professor, Department of Maxillofacial Surgery, Karachi Medical and Dental College, Karachi, Pakistan
[6]Assistant professor, Department of Community Dentistry, Karachi Medical and Dental College, Karachi, Pakistan
[7]Lecturer, Department of Pharmacology, Faculty of Pharmacy, Jinnah University for Women, Karachi

***Corresponding Author:** Dr Ambreen Khurshid
[*]Assistant Professor, Department of Oral Biology, Shifa College of Dentistry, Islamabad, Pakistan
Email: annietanoli@gmail.com

Abstract

Background

The evolving field of artificial intelligence is poised to alter the practices in the field of medicine and dentistry of future physicians significantly.

Objective

To assess the impact of artificial intelligence in the field of medicine and dentistry in Pakistan.

Methodology

From June to December 2023, a cross-sectional survey was conducted among 300 medical and dental faculty members in a Karachi-based private medical institution, using convenience sampling. The survey comprised five sections. Approval was obtained from the ethical review board, with informed consent from all participants. Data analysis involved SPSS version 21, utilizing histograms to analyze data distribution and employing the Mann-Whitney U-test for non-normally distributed categorical data comparisons. Pearson's Chi-squared test was utilized for other comparisons, with statistical significance set at $p < 0.05$.

Results

A total of 300 participants revealed a predominant moderate comprehension of AI and its present applications. Notably, higher concurrence levels were observed among males and pre-clinical students, The majority of students perceive AI as a collaborator rather than a competitor, especially in medical fields, with students from affluent countries exhibiting stronger beliefs in AI's transformative potential. Most students anticipate AI's integration into medical training and future practice, expressing enthusiasm for its role in shaping the future of medicine and dentistry.

Conclusion

Artificial intelligence drives growth and innovation, especially in personalized healthcare, leading to better treatment outcomes. It is set to play a key role in advancing medicine and dentistry.

Keywords: Artificial intelligence, Dentistry, Field, Medicine, Pakistan

Introduction

Over the past few decades, artificial intelligence (AI) has grown significantly, and its application in dentistry and medicine is expanding throughout the world. However, developing countries like Pakistan are still lagging in artificial intelligence research, education, and application, notably in healthcare, whether it be medical or dentistry, despite government efforts to encourage technology (1). The phrase "artificial intelligence" (AI), which dates back to the 1950s, refers to the idea of building robots that can perform tasks that are normally performed by people (2). The term artificial intelligence (AI) describes the potent learning algorithms made feasible by developments in machine learning techniques. Go, Shogi, and Chess are just a few of the games that show off the strong capabilities that a subcategory of AI that employ learning of techniques deeply (3). Deep learning's success in these areas has sparked a great deal of interest across a wide range of industries, including healthcare. Artificial intelligence (AI) has gained considerable traction in healthcare, especially in computer vision, driven by several factors (4). First, AI enhances diagnostic imaging, reducing variability in individual assessments and streamlining routine tasks to cut costs. Second, the vast amount of digital health data being collected is becoming more structured, allowing AI to integrate diverse data sources like medical history, clinical records, imaging, and biomolecular data. Third, AI offers new avenues for research by enabling virtual experimentation alongside traditional

methods. Fourth, AI helps reduce administrative tasks, giving healthcare professionals more time for direct patient interaction, aided by speech and text recognition technologies (5). Fifth, AI fosters participatory healthcare, empowering patients through self-monitoring via wearables and other devices. Sixth, continuous data collection enables a deeper understanding of health conditions, moving away from intermittent "on-off" medical approaches (6). Finally, AI can reduce diagnostic and treatment costs, alleviating the strain on healthcare systems, especially as they cope with an aging population and workforce shortages. These benefits support global health initiatives like the World Health Organization's Sustainable Development Goals (7). Gaining a deeper understanding of Artificial intelligence and its applications in healthcare could help reduce workloads and diagnostic errors. Although Artificial intelligence is primarily used in radiology, they are also employed in a range of other medical fields, such as dermatology, ophthalmology, psychiatry, cardiology, oncology, neurosciences, pathology, and general medicine (8,9,10). The potential benefits of AI in medicine and dentistry are significant; it can offer a more thorough, authentic comprehension regarding the health of patients, enabling therapy assignments based on more accurate predictions. This can lead to more tailored, effective, and safer patient care. Additionally, AI could increase the scale and efficiency of healthcare services through a more varied workforce, aiding in alleviating global staffing shortages and expanding access. The necessity for cautious optimism is highlighted by the fact that, despite the great excitement surrounding AI technology, its past has also experienced failures and successes (11). The potential of AI in dentistry and medicine has not yet been fully realized. One major problem is that AI systems are frequently trained on tiny or non-representative datasets, which introduces bias and limits the scope of their use.
Additionally, much of the research in medical and dental AI tends to prioritize accuracy metrics over tangible proof of value and clinical benefits for patients, healthcare providers, and the overall system (12). This study is conducted to evaluate the effects of artificial intelligence in Pakistan's dental and medical fields

Objective

To assess the impact of artificial intelligence in the field of medicine and dentistry in Pakistan.

Material And Methods

From June to December 2023, a cross-sectional survey was carried out among 300 medical and dental faculties of a private medical institution situated in Karachi, Pakistan through a convenience sampling technique. An electronic survey was created with five subsections. The purpose of the first component was to collect generic demographic information. In the second component of the survey comprehension of AI fundamentals along with its practical applications, and private information sources, were asked. To better understand how AI is understood in medicine and dentistry, the third subsection asked the participants if they were aware of AI in medical and dental research. In the fourth subsection, the perceptions of medical and dental doctors were assessed regarding artificial intelligence (AI).
There were brief questions in the fifth component regarding artificial intelligence would they want to hear about AI either in dentistry or medical courses? After being informed about the nature and aim of the survey and all the participants had the option to withdraw at any moment, all respondents gave their informed consent. The study included only the medical and dental faculty of the institute while all other staff was excluded from the study. Statistical Package for Social Sciences (SPSS) version 21 was used to analyze and process the data. To analyze the distribution of data histograms were used. Since categorical data have a non-normal distribution, the Mann-Whitney U-test for every comparison was used. Pearson's Chi-squared test was used for comparisons. Statistical significance was considered at $p < 0.05$.

Results

Table 1-Details of Demographic Characteristics

Variables	n=300
Demographic characteristics of Participants	
Age	
Gender Males	20.34 ± 2.70
Pre-clinical Students	252 (84%)
Clinical Students	249 (83%)
Country	138 (46%)
	820 (27%)

Information regarding Artificial Intelligence	
Media	
Social Media	126 (42%)
Browsing	186 (62%)
Friends/Family	190 (63%)
Name of University	771 (25%)
	104 (34)
Applications of AI in Medicines and Dentistry	
Enhanced Diagnosis of Medicine	
Enhanced Prognosis of Disease	180 (60%)
Enhanced Medical Education	142 (47%)
Enhanced Workflow of Patients	185 (61%)

	148 (49%)
Concerns about Artificial Intelligence	
Privacy of Data	114 (38%)
Hacking	132 (44%)
Fear of Losing Job	120 (40%)
Lack of Interaction with The Patient	193 (64%)

Data is depicted as mean ± standard deviation or counts (%) as deemed suitable.

Table II- Details of Questionnaire

Variables	**The P-value for The Comparison Between Males and Females**	**The P-value for The Comparison Between Dental and Medical Students.**	**P-Value for The Comparison Between Pre-Clinical and Clinical Groups.**
Artificial Intelligence Serves as A Broad Term That Encapsulates Numerous Technologies.			
• "Do you possess a fundamental grasp of these technologies, such as Machine Learning?	**<0.0001***	0.437	**0.002***
• Currently, AI has many applications in medicine (e.g., AI-assisted robotic surgery). How familiar are you with these applications?	**<0.0001***	0.569	**0.005***
• Numerous applications integrated into our daily routines already utilize AI, such as speech/text recognition and email spam filters. How acquainted are you with these applications?	**<0.0001***	0.756	**0.001***
The Concept of AI			
• The evolution of AI in medical research is advancing swiftly. How informed are you about this trend?	0.077	**0.020***	**<0.0001***
• "Artificial Intelligence" and "Deep Learning" are currently topics of widespread discussion within the medical community. How knowledgeable are you about this?	0.056	**0.020***	**<0.001***
• How confident are you in your comprehension of the underlying technologies behind "Artificial Intelligence" and "Deep Learning"	**<0.0001***	0.158	**<0.0001***

Perceptions Regarding AI			
• I view artificial intelligence in medicine as a collaborator rather than a rival.	0.051	**0.002***	0.076
• Artificial intelligence is poised to transform the fields of medicine and dentistry fundamentally.	**0.008***	0.145	**0.016***
• Shortly, non-interventional physicians may be superseded.	0.393	**<0.0001***	**0.002***
• Soon, it's conceivable that all doctors could be replaced.	0.071	0.084	**0.002***
• I find these advancements alarming.	**<0.0001***	0.141	**<0.0001***
• These advancements make the field of medicine more stimulating me overall.	**<0.0001***	0.800	0.156
• Artificial intelligence will never render the human physician unnecessary.	0.953	0.220	0.522
• Artificial intelligence will enhance the field of medicine overall.	**<0.0001***	0.058	**0.014***
• Incorporating artificial intelligence into medical/dental training is essential.	**0.036***	0.746	0.083

Discussion

Artificial intelligence (AI) is rapidly advancing in the field of medicine and dentistry with dentists and doctors playing a pivotal role in assuring the ethical and successful use of AI technology. To effectively use AI tools in medicine and dentistry, dental and medical practitioners must have both foundational knowledge and perceptive evaluative skills. This study primarily examines the impact of artificial intelligence on dentistry and medicine in Pakistan.

AI is a popular topic among medical and dental doctors. Currently, most doctors and dentists do not perceive AI as a danger or fear of job replacement. Despite this, they are eager to learn about cutting-edge AI and stay up-to-date with current advances. This could be due to the assumption that doctors and dentists with knowledge of AI will outperform those who do not use it in the competitive field (13). The study findings indicated that around 64% of respondents had serious concerns regarding the potential decline of human interaction with patients due to the growing utilization of AI in medicine and dentistry. Throughout history, effective communication, empathy, and nurturing patient relationships have been fundamental in both fields. As AI integration increases, preserving the human touch in healthcare necessitates upholding these core principles which is consistent with Kenny D (14).

While students' viewpoints hold significance, they may not solely dictate the formation and arrangement of the medical curriculum. Although many universities seek student feedback on courses, the degree to which this feedback influences decisions remains uncertain. Furthermore, the key factors impacting medical education are suggested to be social, technological, economic, and political (15, 16). The results also suggested that the medical community holds varied opinions regarding the subject of AI in Medicine. Nevertheless, there is a shared agreement that the incorporation of AI into clinical practice will substantially transform the course of the medical profession which is similar to a study conducted by Coiera E., in 2018 (17). Ethical concerns emerge regarding privacy and data control, with notable variability in AI protocols among different centers. Furthermore, the absence of standards for quality and malpractice liability in AI is evident (18,19,20,21). The research should investigate the practicality of potential changes. Additionally, exploring the attitudes of academic staff, university management, and accreditation bodies towards integrating AI into medical curricula would offer valuable insights.

The main limitation of the study was that this study was a single-center study due to which a restricted number of questions were opted to enhance participant turnout. Participants are selected based on their availability or accessibility, potentially leading to results that are not representative of the entire population. Certain survey questions in the study may be susceptible to self-assessment bias. Due to the convenience sampling method and the specific location (Karachi-based private medical institution), the findings may not apply to broader populations or other geographical regions.

Conclusion

Recent research has indicated that artificial intelligence may find use in the fields of medicine and dentistry. Artificial intelligence will be crucial to the development of medicine and dentistry since it is a technology that promotes growth and progress, especially in the field of personalized healthcare, which will lead to significantly better treatment outcomes.

References

1 Ahmed Z, Bhinder KK, Tariq A, Tahir MJ, Mehmood Q, Tabassum MS, Malik M, Aslam S, Asghar MS, Yousaf Z. Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Pakistan: A cross-sectional online survey. Annals of Medicine and Surgery. 2022 Apr 1;76:103493. http://doi:10.1016/j.amsu.2022.103493. PMID: 35308436; PMCID: PMC8928127.

2 Schwendicke FA, Samek W, Krois J. Artificial intelligence in dentistry: chances and challenges. Journal of dental research. 2020 Jul;99(7):769-74. http://doi:10.1177/0022034520915714. Epub 2020 Apr 21. PMID: 32315260; PMCID: PMC7309354.

3 Silver D, Hubert T, Schrittwieser J, Antonoglou I, Lai M, Guez A, Lanctot M, Sifre L, Kumaran D, Graepel T, Lillicrap T. Mastering chess and shogi by self-play with a general reinforcement learning algorithm. arXiv preprint arXiv:1712.01815. 2017 Dec 5.

4 Naylor CD. On the prospects for a (deep) learning health care system. Jama. 2018 Sep 18;320(11):1099-100. http://doi:10.1001/jama.2018.11103. PMID: 30178068.

5 Israni ST, Verghese A. Humanizing artificial intelligence. Jama. 2019 Jan 1;321(1):29-30. http://doi:10.1001/jama.2018.19398. PMID: 30535297.

6 Topol E. Deep medicine: how artificial intelligence can make healthcare human again. Hachette UK; 2019 Mar 12.

7 Schwendicke F, Chaurasia A, Wiegand T, Uribe SE, Fontana M, Akota I, Tryfonos O, Krois J. Artificial intelligence for oral and dental healthcare: core education curriculum. Journal of Dentistry. 2023 Jan 1;128:104363. http://doi:10.1016/j.jdent.2022.104363. Epub 2022 Nov 21. PMID: 36410581.

8 Waymel Q, Badr S, Demondion X, Cotten A, Jacques T. Impact of the rise of artificial intelligence in radiology: what do radiologists think? Diagnostic and interventional imaging. 2019 Jun 1;100(6):327-36. http://doi:10.1016/j.diii.2019.03.015. Epub 2019 May 6. PMID: 31072803.

9 Sarwar S, Dent A, Faust K, Richer M, Djuric U, Van Ommeren R, Diamandis P. Physician perspectives on the integration of artificial intelligence into diagnostic pathology. NPJ digital medicine. 2019 Apr 26;2(1):28. http://doi:10.1038/s41746-019-0106-0. PMID: 31304375; PMCID: PMC6550202.

10 Hassabis D, Kumaran D, Summerfield C, Botvinick M. Neuroscience-inspired artificial intelligence. Neuron. 2017 Jul 19;95(2):245-58. http://doi:10.1016/j.neuron.2017.06.011. PMID: 28728020

11 Schmalz G, Jakubovics N, Schwendicke F. Normative approaches for oral health: standards, specifications, and guidelines. Journal of dental research. 2022 May;101(5):489-94. http://doi:10.1177/00220345211049695. Epub 2021 Oct 25. PMID: 34689656; PMCID: PMC9024015.

12 Schwendicke F, Krois J. Data dentistry: how data are changing clinical care and research. Journal of dental research. 2022 Jan;101(1):21-9. http://doi:10.1177/00220345211020265. Epub 2021 Jul 8. PMID: 34238040; PMCID: PMC8721539.

13 Brady AP, Neri E. Artificial intelligence in radiology—ethical considerations. Diagnostics. 2020 Apr 17;10(4):231. http://doi:10.3390/diagnostics10040231. PMID: 32316503; PMCID: PMC7235856.

14 Kenny D. Time for a Paradigm Shift: The Necessity for the Human Side of Patient Care. Journal of Health and Human Experience. 2022;8(1):23-40.

15 Healy C, Ryan Á, Moran CN, Harkin DW, Doyle F, Hickey A. Medical students, mental health and the role of resilience–A cross-sectional study. Medical Teacher. 2023 Jan 2;45(1):40-8. http://doi:10.1080/0142159X.2022.2128735. Epub 2022 Oct 10. PMID: 36214365.

16 Slavin SJ. Resilience and mental health: How we can help medical students flourish. Medical Teacher. 2023 Jan 2;45(1):3-5. http://doi:10.1080/0142159X.2022.2136930. Epub 2022 Oct 28. PMID: 36306378.

17 Coiera E. The fate of medicine in the time of AI. The Lancet. 2018 Dec 1;392(10162):2331-2. http://doi:10.1016/S0140-6736(18)31925-1. Epub 2018 Oct 11. PMID: 30318263.

18 Masters K. Artificial intelligence in medical education. Medical Teacher. 2019 Sep 2;41(9):976-80. http://doi:10.1080/0142159X.2019.1595557. Epub 2019 Apr 21. PMID: 31007106.

19 Imran N, Jawaid M. Artificial intelligence in medical education: Are we ready for it? Pakistan Journal of Medical Sciences. 2020 Jul;36(5):857. http://doi:10.12669/pjms.36.5.3042. PMID: 32704252; PMCID: PMC7372685.

20 Paranjape K, Schinkel M, Panday RN, Car J, Nanayakkara P. Introducing artificial intelligence training in medical education. JMIR medical education. 2019 Dec 3;5(2):e16048. http://doi:10.2196/16048. PMID: 31793895; PMCID: PMC6918207.

21 Miotto R, Li L, Kidd BA, Dudley JT. Deep patient: an unsupervised representation to predict the future of patients from the electronic health records. Scientific reports. 2016 May 17;6(1):1-0. http://doi:10.1038/srep26094. PMID: 27185194; PMCID: PMC4869115.