



ORIGINAL ARTICLE

Artificial intelligence (AI) in Medicine: A cross-sectional study of undergraduate medical students' knowledge, attitudes, and perceived importance of Artificial Intelligence.

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ABSTRACT... Objective: To assess the knowledge and perceptions of AI among medical students in a public sector medical college of Punjab, Pakistan. **Study Design:** Cross-sectional study. **Period:** January 2024 to March 2024. **Methods:** With sample size of 137 convenient sampling technique was used, questionnaire was generated and data was collected from 1st year to final year via online Google forms. Then, data analysis was done using IBM SPSS software version 26. **Results:** 137 students participated in the study. Majority of the students 123(89.8%) were aware of Artificial Intelligence and its fascinating tools; some out of them 57(41.6%) also knew about Machine Learning & Deep learning and their applications in medical field 87(63.5%). Some of them 44(33.6%) believed that AI will be a burden on medical practitioners but majority 107(78.1%) of the students are willing to work on AI. **Conclusion:** Many students knew much about AI and they had good perception regarding AI functioning in the medical field. They are keen to master the skills of AI and they are looking forward to utilize these tools in their medical studies as well as during healthcare practice.

Key words: Artificial Intelligence (AI), Medical Field, Undergraduate Medical Students.

INTRODUCTION

The urge to provide the whole world with the ever-increasing needs of technology has been a cat and mouse race for centuries. The world has seen many advancements in this department with the passage of time. Owing to demarcating the current needs of the latest century, the Artificial Intelligence (AI) has revolutionized the whole world with its incredulous and remarkable implications.^{1,2} The Artificial Intelligence (AI) has brought magnanimous and revolutionary changes in every field up to date. The urge to get used to the increasing demands of time needs to be sorted out. AI has brought many complex tasks under the belt through its intriguing and magnificent tools. The knowledge to master the best possible use of Artificial Intelligence is a crucial demand of this century. Artificial intelligence has brought remarkable innovations in almost every field of science. Furthermore, AI has also found

its applications in the field of literature. Therefore, the knowledge to pursue its better and maximum use, needs to be delivered at every aspect so that one may not feel like living in a primitive world.^{2,3} Although little bit somehow, Artificial Intelligence has also got its ability acknowledged in the field of medicine.^{5,6} Through the skill of AI, the doctors can handle various medical procedures with much ease. They can make the best possible early diagnosis by mastering the skill of using Artificial Intelligence. The treatment of different diseases of unknown cause needs to be addressed and AI can be the perfect tool to perform this task.⁷ Although the world has become a global village, the activities of AI in this Global Village are highly appreciated. Since excess of everything is bad, there can be a possibility that side effects of AI can be harmful but a proper control over it will make it the best tool ever to happen to humanity.

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The profound interest of medical students in artificial intelligence is going to be the biggest revolutionary thing going to happen in their careers. In order to up bring the overall quality of life, Artificial Intelligence can facilitate the health care professionals and many other future doctors to make more informed decisions and improve the patient outcomes. AI tools can provide better understanding to diagnose a disease; AI-powered Algorithms can easily provide analysis to medical images such as X-rays and Magnetic resonance imaging (MRIs) to diagnose the disease earlier, easily and accurately.^{8,9} Ultimately, improved health outcomes are the hallmark of magnanimous features of Artificial Intelligence. The collaboration of Artificial Intelligence with medical field can bring out the best potential for innovation, discovery and healing. The health care professionals can easily forecast the future illness of patients through the direct and pin-point accuracy of the diagnosis made by AI-powered Algorithms.

Machine learning and deep learning are the most significant subsets of Artificial Intelligence that can play an amazing role in education of medical undergraduates. Similarly, they are also significant in training of post-graduate trainees. Machine learning can improve the accuracy and efficiency of various medical processes by gathering a big data and allowing the computers to learn from their data and perform their tasks efficiently. Through the machine learning algorithms, one can easily identify complex medical images such as X-rays and MRI scans that are going to make an early diagnosis of illness potentially leading to the cause of death.⁸

Similarly, deep learning is also a revolutionary technology that mimics the neural networks of brain to analyze and interpret data. In a medical field, deep learning can have a significant impact in diagnosing diseases from X-rays and MRI. They can identify outcomes of the patient and potential drug targets with more accuracy. So, both Machine learning and deep learning tools of Artificial Intelligence can find applications in various fields of medicine such as dermatology, oncology, neurosciences, pathology, cardiology,

ophthalmology, radiology, pulmonology.^{9,10}

There are still a lot of innovations ahead. These AI tools are going to be upgraded with the passage of time. So, the potential of Artificial Intelligence to enhance patients' care, providing a streamline clinical workflow and the improvement of healthcare outcomes is vast and continually expanding and the technology of Artificial Intelligence is determined to fulfil these objectives at much better pace with the advancements in its procedures that are going to happen with the passage of time. There are high chances that the treatment of rare diseases which is nothing less than a hard nut to crack, become accessible with the quick diagnosis and the corresponding medical procedures through the skillful use of AI tools.^{11,12} There are also chances that the effectiveness of telemedicine therapy can be done better with the help of Artificial Intelligence. In order to treat the patients who have no access to the hospitals and there is dire need of corresponding first aid; the drones based on AI powered algorithms can provide that necessary therapy and first aid with much efficacy. Similarly, AI powered visual assistants can help us with management tasks such as scheduling appointments and management of medication. AI driven analytics can help identify high-risk patients and predict the progression of disease thereby enabling proactive interventions.

Many studies have been done to assess the knowledge and implications of AI. Our study objective is to provide an insight into the knowledge and perception of Artificial Intelligence and its remarkable tools among the medical students of Sahiwal Medical College, Sahiwal which is a public sector medical college of Punjab, Pakistan. It's an opportunity that will open the doors to many opportunities to make it common in our country. All we need is the progress of the country and being medical students, we want to try every possible means to alleviate the plight of our people. We are sure this study will bring out purposeful results and it will allow students of different medical colleges to adopt this methodology and try out every necessary means to nurture the AI knowledge and its belligerent

tools. Although there is little work to prevalence of AI in our country, our main objective is to insist others to have a look at our study and design their studies with much better practice. Alleviating the ailing humanity in much better ways is going to be our primary choice.

METHODS

A cross-sectional study was conducted from January 2024-march 2024 in a Public Sector Medical College of Punjab, Pakistan, after having ethical approval from institutional review board (111/IRB/SLMC/SWL-22/1/24). Convenient sampling technique was used and students from 1st year to final year were included in this research study. We calculated sample size by using the following formula:

$$\text{Sample size } n = \frac{[DEFF * Np(1-p)]}{[(d2/Z21 - \alpha/2 * (N-1) + p * (1-p))]}$$

$$n = 137$$

Our sample size was found to be 137. After calculating the sample size, we generated an online survey form containing a validated questionnaire¹ with the help of Google forms, we circulated it on electronic media and asked the students to fill it. After collecting our required responses, we analyzed the data via IBM SPSS software version 26.

RESULTS

Students from 1st year to Final year took part in this study. We calculated a sample size of 137. Out of these respondents 77(56.6%) were females and 59(43.4%) were males. There were 56(40.9%) responses from 1st year, 49(35.8%) students from 2nd year, 11(8%) students from 3rd year, 14(10.2%) students from 4th year and 7(5.1%) students from final year. The perception of undergraduate medical students regarding Artificial Intelligence is shown in Table-I.

DISCUSSION

Artificial Intelligence has assumed to be the one of the greatest wonders ever happened to mankind in the field of technology.^{2,3} It has been highly

reputed in different fields of science but we are concerned with its implications in medical field.^{4,5} It can bring out positive outcomes in various fields of medicine such as oncology, ophthalmology, pathology, cardiology, dermatology.^{11,12} But the major problem is that most people of our country are unaware of its applications and such problems are needed to be addressed through every possible medium.^{13,14} There has been little interest of AI in the field of medicine.^{15,16} A similar study was conducted at one of the public medical universities of Pakistan.¹ To follow their footsteps, we also decided to embark upon their route and I hope the ignition we started will prevail in every institute of Pakistan. There has been a study that took place among medical students in district Peshawar and those students also didn't have significant information about AI.¹⁴ There has been a study that took place in UK and that study suggested that people there had much information about AI and they are going to implement it in their medical field to strengthen various medical procedures.⁶

Out of our total study participants, 77(56.6%) were females and 59(43.4%) were males. As compared to a previous study, held in Rawalpindi Medical University, there were 71.6% females and their sample size was 211. The reason for major involvement of females is that there is more ratio of girls than boys in medical colleges.¹ There were 56(40.9%) responses from 1st year, 49(35.8%) students from 2nd year, 11(8%) students from 3rd year, 14(10.2%) students from 4th year and 7(5.1%) students from final year. We got the 76.7% responses collectively from 1st year and 2nd year and the major reason is that they are being taught modular integrated curriculum in which there is significant weightage of research. In a previous study, there were 86.7% responses from 1st year and 2nd year. There were 89.8% students who knew about AI which is a good sign for any institute. In previous study, there are 71.5% students who have information about what AI means.¹ It also means they are nurturing themselves with time.

Sr. No.			Frequency	Percentage
1.	Do you know about AI	Yes	123	89.8
		No	14	10.2
2.	Do you have idea about Machine Learning (ML) & Deep Learning (DL)?	Yes	57	41.6
		No	80	58.4
3.	Do you know about any AI application in medicine?	Yes	87	63.5
		No	50	36.5
4.	DO you think AI is essential in medicine?	strongly agree	27	19.7
		agree	93	67.9
		disagree	14	10.2
		strongly disagree	3	2.2
5.	Have you ever used AI for medicinal purpose?	yes	58	42.3
		no	79	57.7
6.	Have you ever been regarding taught AI use in college?	yes	12	8.8
		no	125	91.2
7.	Do you think AI education should be included in the curriculum?	strongly agree	35	25.5
		agree	70	51.1
		disagree	28	20.4
		strongly disagree	4	2.9
8.	Do you think AI aids in early diagnosis and severity assessment?	strongly agree	29	21.2
		agree	85	62.0
		disagree	20	14.6
		strongly disagree	3	2.2
9.	Do you think AI will replace physicians?	strongly agree	17	12.4
		agree	31	22.6
		disagree	65	47.4
		strongly disagree	24	17.5
10.	Do you think AI will be a burden on practitioners?	strongly agree	8	5.8
		agree	38	27.7
		disagree	81	59.1
		strongly disagree	10	7.3
11.	AI will increase errors in diagnosis?	strongly agree	14	10.2
		agree	58	42.3
		disagree	58	42.3
		strongly disagree	7	5.1
12.	Do you think physician role is important in AI?	strongly agree	50	36.5
		agree	79	57.7
		disagree	6	4.4
		strongly disagree	2	1.5
13.	Would you like to work utilizing AI in your clinical practice?	strongly agree	29	21.2
		agree	78	56.9
		disagree	27	19.7
		strongly disagree	3	2.2

Table-I

The table shows medical students' knowledge and perception regarding importance of Artificial Intelligence in medical field.

When we asked them about its fascinating tools like machine learning and deep learning, we got to know that only 41.6% students have such information which is not going to be a major issue as with the passage of time, they will start getting aware of their needs and this thing will prompt them to learn more about AI but in previous study, there are 76.4% students who have information about machine learning and deep learning. There were 63.5% who knew about the application of AI in medicine. When we asked about whether AI is essential in medicine or not, we found out that 87.6% students showed their confidence in it. Similar enthusiastic responses have also been shown in the previous study. When we asked about whether they have used AI for medicinal purposes or not, there were 42.3% students who favored it. When we asked about whether they were taught about AI or not, only 8.8% of students favored in it.

Although there is a tough schedule for MBBS, but if we manage to cut short some time, we can adjust this course and if taught wholeheartedly, this will bring the greatest impact in our healthcare system. When we asked about whether AI curriculum should be included or not, 76.6% students favored it. Although it is not 100%, I believe many of us are enthusiastic about learning AI and practicing its skills. When we asked about whether AI will be helpful in early diagnosis and assessment of severity of disease, 83.2% students showed confidence in it. When we asked about whether AI will replace practitioners or not, 64.9% students disagreed upon it. It suggests that humans can take much better history than a machine but still there is a need for a machine to improve our diagnosis. When we asked about whether AI will be a burden on practitioners or not, 66.4% students disagreed upon it. When we asked about whether AI will increase errors in diagnosis or not, 52.6% students agreed upon it. When we asked about whether the physician role is important in AI or not, 94.2% students agreed upon it. When we asked about whether they will work on AI or not, 78.1% of students favored it.

To cut the long story short, the majority of the students have knowledge about Artificial

Intelligence but as compared to previous study, the students had less but effective information about AI. There is still a requirement that this knowledge needs to be strengthened among them. It also shows that people are optimistic about its use and they want to acquire its basic skills. There is a perception that AI will replace jobs in future but this is still a mystery and the majority of students believe that nothing such a thing is going to happen. Many students are eager to work on it.¹⁷ This technology is growing day by day and we should also adjust ourselves to the ever-growing needs of time to be resolved in the best possible manner.^{18,19}

CONCLUSION

Most of the students are of opinion that Artificial Intelligence and its fascinating tools can revolutionize the medical field in the best manner. These AI powered tools and algorithms can play a significant role in early diagnosis and treatment of a disease. Some students also believed that Artificial Intelligence can be the nightmare as it can be the burden on medical practitioners but most of them are keen to work on learning much more about AI and implementing its tools for the betterment of their performances in the medical practice.

LIMITATIONS

This study was only limited to the students of Sahiwal Medical College, which is a public sector medical college of Punjab, Pakistan. The study should be done in other medical colleges and other cities also. Moreover, our study was limited to medical students only, but house officers and senior doctors should also be included in future studies to check their perception regarding AI use in this field.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	Hamza Khaliq	Results compiling and write up of the article.	
3	Yasir Yaqoob	Conception and design of work, supervision and revising it critically for important intellectual content.	
4	Menahal	Data analysis & Final approval of the version to be published.	Menahal
5	Sameen Rafique	Data collection and analysis.	
6	Pakeeza Naeem	Data analysis and write-up of the article.	