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EXPLORING THE FEASIBILITY AND IMPLICATIONS OF TEACHING ARTIFICIAL INTELLEGENCE APPLICATIONS IN DIAGNOSTICS AND TREATMENT PLANNING IN MEDICAL SCHOOLS

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ABSTRACT

Background: The rise of digital health technologies and artificial intelligence [AI] has transformed medical practice and education, highlighting the need for healthcare professionals to understand and integrate AI in diagnostics and treatment.

Objective: To investigate that how the training regarding feasibility and implications of teaching AI in diagnostics and treatment planning impacts the knowledge of the healthcare professional through pre-and-post-training session.

Methods**:** Pre-and-Post training Research Design was chosen. This study was conducted in Khyber Medical College, Peshawar from 1st September 2024 till 20 November 2024. A pre-post training research design was adopted. The population of the study were students of MBBS programs studying in different years from 1st to 5th. A sample of 50 students was chosen among the student's population through convenient sampling technique. The 4 training modules, i.e., AI in Diagnostics, AI in Treatment Planning, General Knowledge of AI and Perceived Feasibility and Challenges of AI were including in the training provided to the students, based on which the knowledge of the students was examined. Cronbach alpha for all the scales was higher than standard value of 0.6, showing that the scales were reliable. A paired t-test was conducted to determine if the differences in pre- and post-test scores were statistically significant, while the significance level was set at $p < 0.05$. All the analysis were conducted through SPSS.

Results: The post-test results showed significant improvements in students' knowledge of AI applications, with mean scores of 4.72 [AI in Diagnostics], 4.60 [AI in Treatment Planning], 4.80 [General Knowledge of AI], and 4.55 [Perceived Feasibility]. One-sample t-tests confirmed significant differences [$p < 0.001$] for all categories, indicating the effectiveness of the training.
Conclusion: The study concluded that AI applications can be effectively incorporated into the process of medical education.

Keywords: AI, Medical Education, AI in Diagnostics, AI in Treatment Planning, General Knowledge of AI

Introduction

The ability to access, comprehend, evaluate, and make appropriate use of health-related information and services is known as health literacy [1]. A person's ability to obtain resources and navigate the demands and complexity of their information-seeking environment are major mediators of these abilities. We can take steps to improve people's ability to find and use trustworthy health information and to simplify and ease the strain on the health care system by gaining a better understanding of these two aspects of health literacy [2].

The use of digital media for health communication has increased significantly over the last 20 years due to the evolution of digital technology. We can now reach out to huge audiences for little to no outlay of resources because to these technological advancements [3]. In addition to facilitating interactive contact, they provide hitherto unseen possibilities for targeting and personalising information. The ability to access and make informed decisions about one's health via the use of digital resources has been defined as "eHealth literacy" or "digital health literacy," terms that have developed with the proliferation of digital media [4].

Given the growing role of AI in healthcare, integrating its training into medical education is crucial for preparing future professionals. The integration of AI in medical education is essential to equip healthcare professionals with the skills needed for modern diagnostic and treatment practices [5].

Public health and healthcare are just two of many fields that stand to benefit from the increasing visibility of artificial intelligence [AI] because to the release of publicly accessible platforms like OpenAI's ChatGPT and Google's Bard. The term "artificial intelligence" is overused and misunderstood [5]. While the term "artificial intelligence" [AI] might mean different things to different people, at its core it refers to the subfield of computer science concerned with creating systems that can mimic human intellect without requiring direct human intervention at every stage. Machine learning models are able to interpret and respond to data by sifting through massive databases in search of patterns and trends. Many of these models may be "trained" to learn and become better over time, so they can generate new material automatically [6].

The fact that there is an increasing trend as to the use of AI in the diagnosis of diseases reinforce the need to train doctors who are capable of analyzing and integrating the use of such systems in practice. Given the volume and format of data, it is especially useful in cancer, diabetes, cardiovascular diseases diagnoses, medical images and electronic health records[7, 8]. However, the knowledge of AI’s ethical, legal, and clinical aspect is equally crucial for positive integrative. Integration of AI applications into the medical education also has some challenges such as lack of faculty knowledge, curriculum time, and institutional support to address the learning needs of students[9]. Previous studies point out the requirement of systematic courses and exercises that between academic theory and practice allow students to inquire about the applications of ai this study aimed to investigate that how the training regarding feasibility and implications of teaching AI in diagnostics and treatment planning impacts the knowledge of the healthcare professional through pre-and-post-training session[10, 11].

This research contributes to the existing literature in the period of AI in medical education by coming with some evidence of the benefits of teaching AI. Thus, by analyzing systematic applicability of training, the work provides recommendations on design and implementation of the

AI modules for the wider application in different educational environments. By means of this approach, medical colleges can attend to existing deficits of knowledge about AI and prepare students to the skill that they need to successfully operate in the healthcare industry that is rapidly becoming increasingly technologically advanced.

Methods

In this cross-sectional study, a pre-post training research design was adopted to investigate the implications and feasibility of teaching AI application to medical students for treatment planning and diagnostics. The Pretest-Posttest is that quasi-experimental type of research in which the individuals are investigated before and then after the experimental manipulation.The current study was conducted in Khyber Medical college, Peshawar. The population of the current study were the students of MBBS programs studying in different years from 1st to 5th year .A sample of 50 students was chosen among the student's population for the current study through convenient sampling technique. Based on justification and resource availability, the sample size was chosen to detect statistically significant pre- and post-training score changes.

A questionnaire was developed based on the training provided to the students. The 4 training modules were including in the training provided to the students, based on which the knowledge of the students was examined. The questionnaire included the below sections.

Table1: Questionnaire

S.no	Section	Description	No of items	Cronbach Alpa
1	Section 1	Demographic information [age, gender, year of study, prior exposure to AI].	4 items	
2	Section 2	Likert-scale questions		
	Training Modules	AI in Diagnostics	3 items	0.67
		AI in Treatment Planning	3 items	0.71
		General Knowledge of AI	3 items	0.62
		Perceived Feasibility and Challenges of AI	6 items	0.69

A panel of the medical experts reviews the items of the questionnaire to ensure the validity of the scales. While Cronbach Alpha was used to examine the scales' reliability. All of the scales had Cronbach alpha values more than the industry norm of 0.6, as shown in the table above, indicating that they were dependable.

The data was collected using pre-and-post training technique. The pre-training questionnaire was distributed among the study participants. After the training was provided to the students based on the 4 modules, the same questionnaire was again distributed among the participants for getting post-training opinions.Mean scores of participants' responses were calculated for pre-test and post-test data. A paired t-test was conducted to determine if the differences in pre- and post-test scores were statistically significant, while the significance level was set at $p < 0.05$. All the analysis were conducted through SPSS.

Results

Table 2 shows that the participants were evenly distributed across the age categories, with the majority of participants falling within the age range of 20-22 years [36.0%] and 23-24 years [32.0%]. There were more male participants [52.0%] compared to female participants [48.0%],

The study had a broad representation across various years of study in the MBBS program. The 2nd Year MBBS [24.0%] and 1st Year MBBS [20.0%] students made up the highest proportion. A majority of participants [60.0%] had no previous exposure to AI concepts, indicating that the training program was targeting students without prior knowledge of AI.

Below is the demographic analysis based on the responses of 50 student participants.

Table2: Demographic analysis

Demographics	Category	[n]	[%]
Age	20-22 years	18	36.0%
	23-24 years	16	32.0%
	25-26 years	16	32.0%
Gender	Male	26	52.0%
	Female	24	48.0%
Year of Study	1st Year MBBS	10	20.0%
	2nd Year MBBS	12	24.0%
	3rd Year MBBS	8	16.0%
	4th Year MBBS	10	20.0%
	5th Year MBBS	10	20.0%
Previous Exposure to AI	Yes	20	40.0%
	No	30	60.0%

Table 3 shows that the mean scores for each category show a moderate understanding of AI concepts among the students prior to the training, with scores ranging from 3.32 to 3.68.While for AI in Treatment Planning, the p-value of 0.056 is indicating a moderate but not statistically significant difference.

Table3: Mean scores

Category	Mean Score [Pre-Test]	p-value
AI in Diagnostics	3.45	0.043
AI in Treatment Planning	3.32	0.056
General Knowledge of AI	3.50	0.030
Perceived Feasibility and Challenges of AI	3.68	0.020

Table 4 presents the mean scores for the post-test show a marked improvement compared to the pre-test scores, with higher values ranging from 4.55 to 4.80.All p-values are highly significant [p-value < 0.05].

Table4: Mean scores for the post-test

Category	Mean Score [Post-Test]	p-value
AI in Diagnostics	4.72	0.000
AI in Treatment Planning	4.60	0.001
General Knowledge of AI	4.80	0.000
Perceived Feasibility and Challenges of AI	4.55	0.001

Table 5 shows t-value of -12.76 with a p-value < 0.001 indicates a statistically significant improvement in students' knowledge after the training, with a mean difference of -1.27
The t-value of -11.29 with a p-value < 0.001 similarly shows a significant increase in students' understanding of AI in treatment planning, with a mean difference of -1.28. The t-value of -14.16 with a p-value < 0.001 shows a significant improvement in students' general knowledge about AI, with a mean difference of -1.30.

The t-value of -10.84 with a p-value < 0.001 suggests a strong and statistically significant improvement in students' perceptions regarding the feasibility and challenges of teaching AI, with a mean difference of -0.87.

Table5: One-Sample t-Test for Pre-Test and Post-Test

Category	t-value	df	Sig. [2-tailed]	Mean Difference	95% Confidence Interval of the Difference
AI in Diagnostics	-12.76	49	0.000	-1.27	-1.48 -1.05
AI in Treatment Planning	-11.29	49	0.000	-1.28	-1.45 -1.10
General Knowledge of AI	-14.16	49	0.000	-1.30	-1.48 -1.13
Perceived Feasibility and Challenges of AI	-10.84	49	0.000	-0.87	-1.04 -0.71

Discussion

This study shows that the pre-post training analysis demonstrates a significant improvement in students' knowledge and perceptions of AI applications in diagnostics and treatment planning. The one-sample t-test confirms that the observed differences in scores are statistically significant, indicating that the training program was effective in enhancing participants' understanding of AI.

The adoption of AI in ME has been considered because of the opportunities to changing the practices in the healthcare industry[12]. This work adds to the existing knowledge base in conformance with various prior studies pointing to the role of AI instruments in diagnosis and management. Previous research has focused on identifying the ways in which AI is set to revolutionaries the medical decision-making process and increase productivity [13]. The case of radiology diagnosis using AI, the diagnostic accuracy and speed better than using imaging data alone [5]. However, there is limited application of AI education in the medical schools as seen in the results above much as the outcomes were encouraging[14]. According to studies only 15% of the surveyed medical schools offered topics related to AI in their curricula mainly due to inadequate teaching teams, and resources among others. But when structured training was incorporated into the training program students showed a lot of improvement in comprehending and applying AI as seen in the post training test results obtained in this study[15, 16]. These observations tally with an earlier studywhere the authors observed enhanced medical students' decision-making skills resulting from more clinical interoperation with AI devices[17, 18].

The current study's pre and post-training assessment also provides support to the effectiveness of the structured AI modules. The increase in test scores is consistent with the results obtained by other studies which showed a 25% increase in knowledge levels on participants who had undergone similar training. demonstrates the working of the technology, and its capabilities and constrains to the students[19, 20]. The hands-on workshops also provided enriched appreciation of the concept of AI in diagnostics. In conclusion, this research validates the idea that the inclusion of AI adds value to the knowledge and readiness of medical students as it also reveals some of the shortcomings outlined in prior research.

Conclusion

This study proves that AI applications can be effectively incorporated into the process of medical education. Structured training was properly effective in increasing students' knowledge, clinical decision making and their confidence to use AI tools. Additionally, fostering early exposure to AI tools in training can bridge the gap between theoretical understanding and real-world clinical application, ensuring a more adaptive and tech-savvy healthcare workforce. The integration of AI into medical curricula readies trainees for apt future health care systems enhanced by technology which result to higher patients standard care, enhanced diagnosis and treatment.The future study should be directed to the long-term assessment of knowledge retention and practical use of AI. The

expertise of a number of institutions takes the module farther and the interdisciplinary approach helps achieve a panoramic view of the problem.

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