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Preliminary Investigation of AI Adoption among Healthcare Practitioners in Pakistan

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ABSTRACT

Artificial intelligence (AI) is progressively revolutionizing healthcare systems globally, delivering innovative solutions for diagnosis, treatment, and operational efficiency. However, its acceptance among healthcare providers in Pakistan remains unexplored. **Objectives:** To determine the awareness of AI adoption among healthcare practitioners in Pakistan. **Methods:** A cross-sectional survey was conducted from May to July 2024, using Google Surveys to collect data from 321 healthcare professionals across various medical specialties in Pakistan. Structured questionnaires were distributed electronically, and the responses were analyzed using Chi-Square tests to determine associations between AI knowledge, attitudes, and professional characteristics. **Results:** The majority of respondents (61.1%) were female, with 53.6% aged 20-29. Most had 1-5 years of experience (48.3%) and worked in tertiary healthcare institutions, with 52.3% in the public sector and 47.7% in the private sector. Only 7.6% considered AI of no value, while 24.5% saw it greatly improving diagnostic accuracy, 17% aiding patient diagnosis, and 15.2% in treatment planning. **Conclusions:** This study concludes that there is a crucial knowledge gap and poor AI adoption among Pakistan's healthcare practitioners, which is compounded by insufficient training and technological constraints. Addressing these challenges is critical for attaining AI's potential in improving healthcare outcomes.

INTRODUCTION

Applications of Artificial intelligence (AI) in medical field globally have shown diverse horizons for rapid and accurate diagnosis, overall patient management and improved medical teaching [1]. The potential of AI to analyze variety of diverse data pertaining to clinical and medical education, permits rapid evaluation and early diagnosis of underlying disorders [2]. This potential has revolutionized the domain of prompt patient management, prevention protocols in medicine and updated health care provision [3]. AI has readily demonstrated healthy and accurate progress encompassing virtually all domains of health-care provision by introducing innovative technologies, including Internet of Things (IoT), Cloud technologies, and Wearable devices, to fulfil the critical demands in the healthcare field [4]. AI is rapidly being utilized worldwide to enhance medical applications and improve overall patient outcomes especially in developed countries. [5, 6]. On the other hand, in developing countries, the adoption and subsequent implementation of AI in health-care practices is subject to a variety of technical and administrative challenges [7]. In Pakistan, the employment of AI in the healthcare sector appears to be in its embryonic stage,

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with existing applications being generally targeted for diagnostics and the management of extensive patient data. Although the potential of AI in service delivery is well appreciated by most healthcare workers and physicians, it still faces hindrances, such as infrastructural limitations and a lack of specific AI training among health professionals [8]. The applications of AI in medical education and faculty engagement are equally pivotal [9]. This study also encompasses the adoption of AI among medical faculty in medical colleges in Pakistan, as it explores how AI technologies are integrated into the curriculum and advanced teaching methodologies. Further knowledge of how faculty members adopt and perceive AI can provide insights into the preparedness of future medical practitioners and the potential progress in educational methodologies [10]. Despite its significant potential, the comprehensive integration of AI in healthcare services appears to be an upheaval task. Similar studies have effectively highlighted the new challenges faced by the medical practitioners and faculties in adopting and utilizing AI technologies [11]. Along the same lines, few studies have emphasized the necessity to create developed frameworks to improve the implementation of AI in providing up to mark healthcare services and medical education [12].

Artificial intelligence is rapidly transforming global healthcare delivery through innovations in diagnostics, treatment planning, patient data management, and medical education, yet its meaningful integration into Pakistan's healthcare system remains critically underdeveloped due to infrastructural deficiencies, inadequate AI-specific training, and limited institutional support. While international literature increasingly documents varying levels of AI adoption across healthcare settings, comprehensive local data examining the knowledge, attitudes, and practices of Pakistani healthcare professionals toward AI across diverse medical specialties, experience levels, and work environments are virtually absent, representing a significant evidence gap that hinders evidence-based policy formulation. The disparity between AI's transformative potential and its actual uptake in Pakistan's public and private healthcare sectors, compounded by generational differences in technology acceptance and the absence of structured AI curricula in medical education, underscores the urgent need for a systematic baseline assessment. This study aims to focus on how healthcare professionals in different hospital settings in Pakistan understand and utilize AI. The study assesses their baseline knowledge of AI, examines current AI applications in patient care, hospital settings, and educational environments, and simultaneously explores their attitudes towards adopting and integrating AI in patient care and medical teaching.

METHODS

A cross-sectional, questionnaire-based survey was conducted to determine the level of AI adoption among healthcare professionals and medical faculty, in Pakistan's private and tertiary care facilities. The study was carried out from May to July 2024. Pertinent data regarding Knowledge, Attitudes, and Practices (KAP) was summated through the survey, disseminated via Google survey forms to gather baseline information from medical specialists, clinical practitioners, and medical faculty regarding knowledge, impact, and practice of AI. The survey questionnaire was distributed through professional networks and social media channels dedicated to a spectrum of medical professionals in Pakistan. All the respondents were preliminarily informed about the anonymity and confidentiality of survey participation. Principles of research ethics and relevant legal requirements were fully complied with, and duly considered during the entire survey, and focused on the baseline knowledge and applications of AI among the given population. The calculated sample size at 50% probability, with 6% margin of error and 95% confidence interval, and 20% non-response rate the sample size was 321. All the results obtained were evaluated using SPSS version 26.0, a bivariate analysis was conducted. Chi-square test was employed for this analysis, including all the completed survey responses. This study adhered to all relevant ethical requirements and approved by the Institutional Review Board (IRB) of RLKU medical and dental college (Ref no: RLKUMC/IRB/0023/24). Prior to their participation in the trial, all subjects provided their informed consents, while the participants were assured about the privacy and confidentiality of their responses, and special information.

RESULTS

Data were obtained from 321 healthcare experts in Pakistan. The majority of responders (61.1%) were female, with 53.6 percent being between the ages of 20 and 29. Almost half of them possessed one to five years of professional experience (48.3%). Most respondents worked in tertiary healthcare institutions, with 22.4% in affiliated teaching hospitals and 17.4% in public healthcare facilities, such as DHQ (District Headquarters Hospital) and THQ (Tehsil Headquarters Hospital). Hospitals in the private sector, which are comprised of clinics and general practitioners, comprise 16.2% of respondents, while an equal number (16.5%) work in rural health centers (RHC) and basic health units (BHU). Medical faculty accounted for 14% of responders while teaching hospitals affiliated with medical colleges contributed about 11.9%. In terms of overall sector distribution, about half of the respondents (52.3%) worked in the public sector, whereas 47.7% worked in the private sector (Table 1).

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Table 1: Socio-Demographic Characteristics of Study Participants (n=321)

Variable	Category	Frequency (%)
Gender	Male	122 (38)
	Female	196 (61.1)
	Preferred Not to Say	03 (0.9)
Age	20-29 Years	172 (53.6)
	30-39 Years	104 (32.4)
	40-49 Years	23 (7.2)
	50-59 Years	12 (3.7)
	60-69 Years	10 (3.1)
Medical Specialty	Medicine and Allied	131 (40.8)
	GP and Family Medicine	83 (25.9)
	Surgery and Allied	47 (14.6)
	Medical Faculty	45 (14)
	Public Health and Administration	15 (4.7)
Professional Experience	Less than 1 Year	60 (18.7)
	1-5 Years	155 (48.3)
	6-10 Years	53 (16.5)
	11-20 Years	38 (11.8)
	More than 20 Years	15 (4.7)
Professional Experience	Private Sector	153 (47.7)
	Government Sector	168 (52.3)
Professional Setting	Private Care Health Facility (Teaching Hospital)	38 (11.9)
	Private Care Health Facility (Clinic/GP)	52 (16.2)
	University /Medical College	43 (13.4)
	Rural Health Care (RHC)/Basic Health Unit (BHU)	53 (16.5)
	Tertiary Healthcare Facility (DHQ/THQ)	56 (17.4)
	Tertiary Healthcare facility (teaching hospital)	79 (24.6)

The study investigated respondents' awareness and comprehension of AI technology in their respective fields, and it was observed that only 44% had a basic knowledge of AI. These results reveal that while a considerable majority of respondents have at least a basic comprehension of AI, a sizeable proportion of health professionals lack knowledge, with only a handful holding advanced competence in this technology. Respondents were familiar with a variety of AI applications, with diagnostic tools (32.1%), medical teaching (26.4%), patient data management (23.9%), treatment planning (21.8%), robotic procedures (19.1%), and administrative chores (15.5%) being the most well-known. However, 25.5% of respondents had no awareness of it (Figure 1).

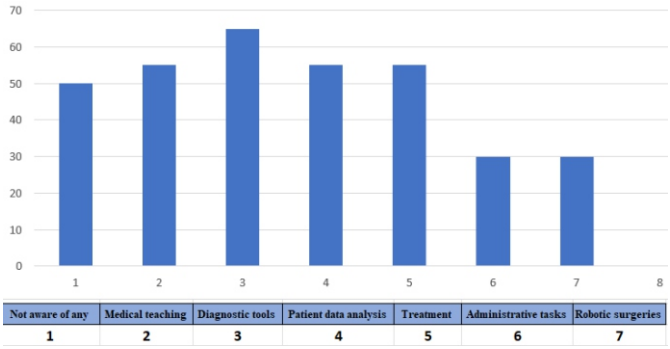


Figure 1: Awareness of AI Applications Among Healthcare Professionals

The study primarily focused on respondents' degree of AI training and found that just 6.3% got considerable formal training. Notably, the majority, 56.6%, had received no training in AI applications in the medical field. Nearly half of the respondents (48.6%) had never utilized any AI application in their medical practice. Among those who had utilized this technology, the most common users were medical teaching (14.5%) and diagnostic tools (14.5%). Other popular applications included AI imaging and patient data management (9.7%) and AI treatment planning (11.8%) (Figure 2).

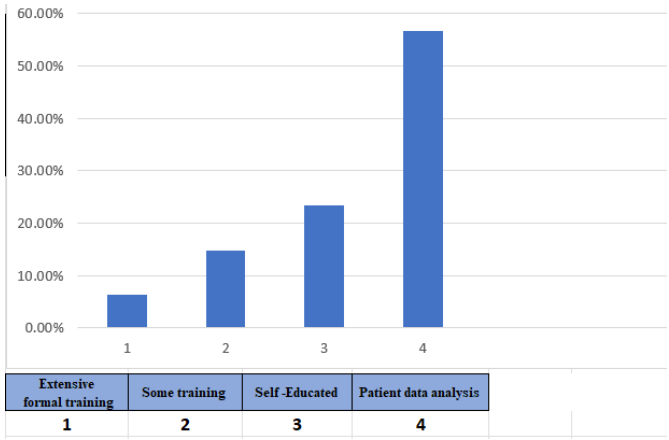


Figure 2: AI Training Status Among Health Professionals

Only 7.6% of respondents considered AI to be of no value in their profession. In contrast, 12.2% saw the effectiveness of AI in medical teaching as pivotal. A larger proportion, 17%, were of the view that AI considerably assists in patient diagnosis, whereas 15% of respondents saw managing patient records as a crucial benefit, while 15.2% viewed AI's role in treatment planning as considerably applicable. A substantial number of respondents (24.5%) stated that AI considerably increases diagnostic accuracy, whereas 38.7% thought it improved accuracy slightly. In addition, 16.9% of interviewees said AI may aid in the development of concepts and learning skills. Healthcare providers' opinions toward AI adoption may be influenced by their working environment. Furthermore, the analysis of AI applications in various professional fields indicating that

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medical professionals and faculty possessing larger working experience have adopted AI better compared with those having less professional experience in their fields (Table 2).

Table 2: Correlation of Health Professionals Knowledge and Perception Regarding AI Use with Different Variables

Characteristics	Variable	Chi-Square Value	Degrees of Freedom (df)	p-value
AI Knowledge	Medical Specialty	22.896	20	0.294
	Professional Experience	14.481	16	0.563
	Professional Setting	38.300	24	0.032
Utilization of AI tools	Medical Specialty	33.057	20	0.033
	Professional Experience	29.706	16	0.020
	Professional Setting	40.630	24	0.018
Perceived Benefits of AI in Healthcare	Medical Specialty	50.969	35	0.040
	Professional Experience	32.369	28	0.260
	Professional Setting	89.634	42	<0.001
Impact of AI on Medical Accuracy	Medical Specialty	16.659	20	0.675
	Professional Experience	14.532	16	0.559
	Professional Setting	16.852	24	0.855
Impact of AI on Patient Care	Medical Specialty	16.659	20	0.675
	Professional Experience	14.532	16	0.559
	Professional Setting	25.399	20	0.187
Cultural and Ethical Sensitivity of AI	Medical Specialty	14.265	20	0.817
	Professional Experience	17.961	16	0.326
	Professional Setting	21.044	24	0.636
AI Adoption Barriers	Medical Specialty	32.336	25	0.149
	Professional Experience	16.859	20	0.662
	Professional Setting	19.447	30	0.930

DISCUSSION

Adoption and application of AI in improvising diagnostic and other healthcare benefits are rapidly progressing worldwide, thus positively contributing to effective treatment of the patients [13]. Our study focusses to evaluate the knowledge, attitudes and behaviors of diverse healthcare professionals and medical faculty toward AI in Pakistan. These variable findings are strongly influenced by professional experiences and medical specialties. On the contrary, medical specialists demonstrated better levels of adoption of AI, whereas, general medical practitioners showed broader utilization of AI expertise, which is probably owed to better focused training and exposure in their disciplines. Highly experienced medical professionals mostly remain cautious, probably owing to their established habits and routine, or enduring profound doubts about the efficacy of newer diagnostic and management technologies [14].This generational difference emphasizes the importance of ongoing professional and faculty development programs designed to meet more experienced practitioners' concerns while utilizing the passion and adaptability of younger professionals. Younger professionals' knowledge of developing technology and their more adaptable approach to breakthroughs are likely to contribute to their more positive views of AI. Specific 'mentorship' programs can potentially address the specific hindrances faced by highly experienced medical practitioners, thereby, motivating them to adopt and utilize AI in respective medical fields [15]. On the contrary, a study conducted in Hungary reveals that older individuals have higher digital health literacy than younger individuals [16]. Regarding the attitudes of healthcare professionals about use of AI, majority of healthcare professionals were considerably optimistic about the potential of AI to improve overall patient care, diagnostic accuracy, and better and effective administrative tactics. Similarly, a study conducted in Seoul, South Korea, shows that most medical professionals trust AI devices to aid the healthcare sector [17]. However, these optimistic views were encompassed by considerable concerns about data privacy, job displacement, and reliability of AI in diagnosis of complex clinical disorders [18]. The positive attitudes observed in tertiary care settings were probably influenced by increased exposure to advanced research, better access to AI resources, and frequent backing-up by organizational support for adopting the innovative technologies [19]. On the other hand, in primary care settings, due to lack of required resources and back-up support, there exists a skepticism about the utility and overall benefits of AI in respective domains [20]. Regarding practical applications, the study observed that AI technologies are currently being utilized in a very limited range within private clinical practice. Tertiary care facilities and academic institutions had much better and effective adoption rates compared with private clinics and rural health centers [21]. Routinely scheduled workshops, online training courses on AI, and practical hands-on sessions are effective options for assuring accessibility to healthcare professionals in private sectors or in less privileged areas [22].

This study was constrained by its cross-sectional, self-reported survey design distributed through professional networks and social media, which introduces response bias, limits representativeness of rural and less digitally connected healthcare practitioners, and precludes causal inference about the determinants of AI adoption. The achieved sample of 321 participants fell short of the calculated target of 385, and the predominance of younger, female respondents from tertiary care settings may not accurately reflect the broader Pakistani healthcare workforce. Additionally, the questionnaire did not capture qualitative nuances such as specific barriers to AI implementation, institutional policy environments, or the

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influence of cultural and religious factors on technology acceptance. Future research should employ mixed-methods, multicenter designs with stratified sampling to ensure adequate representation across all provinces, healthcare tiers, genders, and specialties, including greater outreach to rural primary care providers. Longitudinal studies tracking changes in AI adoption following targeted training interventions, combined with qualitative investigation of systemic and organizational barriers, would provide the comprehensive evidence base needed to design effective national AI integration frameworks for Pakistan's evolving healthcare system.

CONCLUSIONS

This study concludes that although the basic knowledge and awareness of AI is consistently present among medical professionals and faculty, but considerable lack of expertise exists, which exhibits a major gap in applications of AI in medical practice and teaching. Most of the practitioners are unaware of practical applications of AI in their respective domains, and they remain skeptic about effective applications of AI in diagnosis, patient management, medical teaching and administrative accuracy. To overcome the major knowledge gaps and limitations highlighted in this study, extensive AI training programs for Pakistan's healthcare providers must be implemented. These programs should concentrate on the practical uses of AI in medical practice, diagnosis, and education. Encouraging cooperation between healthcare practitioners and AI developers can help to create user-friendly, effective AI systems.

Authors' Contribution

Conceptualization: SH, AN
Methodology: SH, AN
Formal analysis: SH, RS, SS
Writing and Drafting: ZUK, RS, TH, US
Review and Editing: ZUK, RS, TH, US

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Karalis VD. The Integration of Artificial Intelligence into Clinical Practice. Applied Biosciences. 2024 Jan; 3(1): 14-44. doi: 10.3390/applbiosci3010002.

[2] Davenport T and Kalakota R. The Potential for Artificial Intelligence in Healthcare. Future healthcare Journal. 2019 Jun; 6(2): 94-8. doi: 10.7861/futurehosp.6-2-94.

[3] Qayyum MU, Sherani AM, Khan M, Hussain HK. Revolutionizing Healthcare: The Transformative Impact of Artificial Intelligence in Medicine. Bulletin of Informatics. 2023; 1(2): 71-83.

[4] Puri V, Kataria A, Sharma V. Artificial Intelligence-Powered Decentralized Framework for Internet of Things in Healthcare 4.0. Transactions on Emerging Telecommunications Technologies.2024 Apr; 35(4): e4245. doi: 10.1002/ett.4245.

[5] Batra P and Dave DM. Revolutionizing Healthcare Platforms: The Impact of AI on Patient Engagement and Treatment Efficacy. International Journal of Science and Research. 2024; 13(10.21275): 613-624.

[6] Johnson KB, Wei WQ, Weeraratne D, Frisse ME, Misulis K, Rhee K, *et al.* Precision Medicine, AI, and The Future of Personalized Health Care. Clinical and Translational Science. 2021 Jan; 14(1): 86-93. doi: 10.1111/cts.12884.

[7] Aldwean A and Tenney D. Artificial Intelligence in Healthcare Sector: A Literature Review of the Adoption Challenges. Open Journal of Business and Management.2024Jan;12(01):129-147.doi:10.4236/ojbm.2024.121009.

[8] 8Habib MM, Hoodbhoy Z, Siddiqui MR. Knowledge, Attitudes, and Perceptions of Healthcare Students and Professionals on the Use of Artificial Intelligence in Healthcare in Pakistan. PLOS Digital Health.2024 May; 3(5): e0000443. doi: 10.1371/ journal.pdig.0000443.

[9] Zhang W, Cai M, Lee HJ, Evans R, Zhu C, Ming C. AI in Medical Education: Global Situation, Effects and Challenges. Education and Information Technologies. 2024 Mar; 29(4): 4611-4633. doi: 10.1007/s10639-023-12009-8.

[10] Xie Y, Seth I, Hunter-Smith DJ, Rozen WM, Seifman MA. Investigating the Impact of Innovative AI Chatbot on Post-Pandemic Medical Education and Clinical Assistance: A Comprehensive Analysis. ANZ Journal of Surgery.2024 Feb; 94(1-2): 68-77. doi: 10.1111/ans.18666.

[11] Mennella C, Maniscalco U, De Pietro G, Esposito M. Ethical and Regulatory Challenges of AI Technologies in Healthcare: A Narrative Review. Heliyon.2024 Feb. doi: 10.1016/j.heliyon.2024.e26297.

[12] Akram M, ul Wahab N, Naz M, Din AL, Javed I, Manzoor A, *et al.* Transforming Healthcare with Artificial Intelligence in Pakistan. Migration Letters.2024; 21(S9): 752-758.

[13] Ötleş E, James CA, Lomis KD, Woolliscroft JO. Teaching Artificial Intelligence as a Fundamental Toolset of Medicine. Cell Reports Medicine.2022 Dec; 3(12). doi: 10.1016/j.xcrm.2022.100824.

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DOI: https://doi.org/10.54393/pjhs.v6i1.2487

[14] Weber S, Wyszynski M, Godefroid M, Plattfaut R, Niehaves B. How Do Medical Professionals Make Sense (Or not) of AI? A Social-Media-Based Computational Grounded Theory Study and An Online Survey. Computational and Structural Biotechnology Journal. 2024 Dec; 24: 146-159. doi: 10.1016/j.csbj.2024.02.009.

[15] Kamath D, Teferi B, Charow R, Mattson J, Jardine J, Jeyakumar T, *et al*. Accelerating AI Innovation in Healthcare Through Mentorship. In The Role of Digital Health Policy and Leadership.2024; 87-91. doi: 10.3233/SHTI231318.

[16] Papp-Zipernovszky O, Horváth MD, Schulz PJ, Csabai M. Generation Gaps in Digital Health Literacy and Their Impact on Health Information Seeking Behavior and Health Empowerment in Hungary. Front Public Health. 2021 May 13;9.

[17] Kim YJ, Choi JH, Fotso GMN. Medical professionals' adoption of AI-based medical devices: UTAUT model with trust mediation. Journal of Open Innovation: Technology, Market, and Complexity. 2024 Mar 1;10(1).

[18] Gerke S, Minssen T, Cohen G. Ethical and Legal Challenges of Artificial Intelligence-Driven Healthcare. Artificial Intelligence in Healthcare. 2020 Jan; 295-336. doi: 10.1016/B978-0-12-818438-7.00012-5.

[19] Khanijahani A, Iezadi S, Dudley S, Goettler M, Kroetsch P, Wise J. Organizational, Professional, and Patient Characteristics Associated with Artificial Intelligence Adoption in Healthcare: A Systematic Review. Health Policy and Technology.2022 Mar; 11(1): 100602. doi: 10.1016/j.hlpt.2022.100602.

[20] Gillner S. We're Implementing AI Now, So Why Not Ask Us What to Do? How AI Providers Perceive and Navigate the Spread of Diagnostic AI in Complex Healthcare Systems. Social Science & Medicine. 2024 Jan;340:116442.doi:10.1016/j.socscimed.2023.116442.

[21] Bekbolatova M, Mayer J, Ong CW, Toma M. Transformative Potential of AI in Healthcare: Definitions, Applications, and Navigating the Ethical Landscape and Public Perspectives.Healthcare.2024 Jan; 12(2): 125. doi: 10.3390/healthcare12020125.

[22] Naseem R, Wahab T. Exploring the Future Prospects of the Healthcare Sector of Pakistan Considering the Implementation of Artificial Intelligence in Operations–Extent of Challenges and Opportunities. Education Management Review. 2023 Jun; 2(1): 51-62.

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