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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].

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).

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)

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	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).

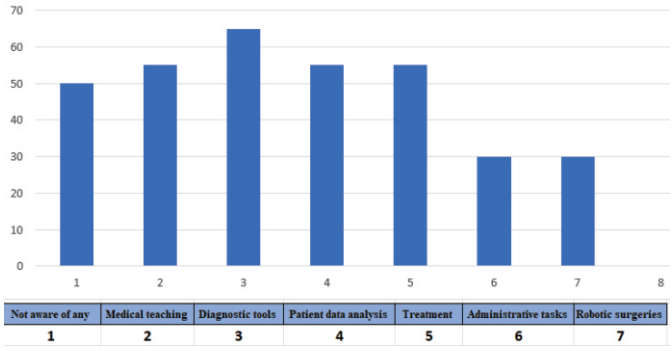

Figure 1: Awareness of AI Applications Among Healthcare Professionals

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).

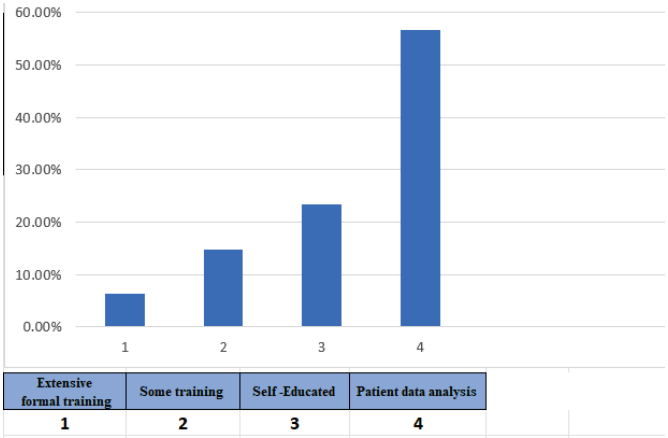

Figure 2: AI Training Status Among Health Professionals

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 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: Health Professionals perceptions of AI applications in Medical Practice

AI Application	Percentage of Respondents
AI considered of no value in profession	7.60%
AI effectiveness in medical teaching	12.20%
AI assists in patient diagnosis	17%
AI in managing patient records	15%
AI's role in treatment planning	15.20%
AI considerably increases diagnostic accuracy	24.50%
AI improves diagnostic accuracy slightly	38.70%
AI aids in the development of concepts and learning skills	16.90%

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

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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].

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 review and editing: ZUK, RS, TH, US

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

The authors declare no conflict of interest.

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