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Exploring the perspectives of healthcare professionals regarding artificial intelligence; acceptance and challenges

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Abstract

Objectives The main objective of the study was to explore the perspectives of healthcare professionals (HCPs) regarding artificial intelligence (AI) and to identify challenges in its incorporation in the healthcare sector of Pakistan.

Methods A qualitative exploratory study design was adopted. The study was conducted from January 15th to February 29th, 2024, and HCPs (doctors, pharmacists and nurses) from two tertiary care teaching hospitals in southern Punjab, Pakistan were taken as the study population. The interviews were conducted with the help of a semi structured interview schema. A thematic approach was adopted to analyse the data.

Results Out of 40 HCPs approached, 25 participated in the study with a response rate of 62%. The participants included in the study were doctors (14), pharmacists (6) and nurses (5). The participants had limited knowledge regarding AI and its basics. However, they showed positive perceptions about its incorporation. They believed that many of the problems faced by the healthcare sector of Pakistan can be minimized by AI incorporation. They believed that AI can boost up the efficiency of healthcare providers, reduce their workload, save time and minimize medical errors. Four main themes with multiple subthemes were identified: (1) Cognizance of AI, (2) Acceptability of AI among HCPs and training requirements for effective incorporation, (3) Merits and Demerits of AI, and (4) Challenges in incorporation of AI with proposed solutions.

Conclusion HCPs showed a willingness to embrace AI incorporation and believed that it may bring numerous benefits to the health system. Policymakers should take necessary steps to ensure AI incorporation in our healthcare sector.

Keywords Artificial intelligence, Healthcare professionals, Healthcare system, Qualitative study, Pakistan

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Introduction

The digital revolution has transformed almost everything with no exception to the healthcare sector [1]. Many novel techniques have emerged to diagnose, treat and monitor the patients [2]. This revolution is likely to shift healthcare from traditional to advanced systems, promising improvements in health outcomes, smoothing healthcare managerial tasks and increasing accessibility to medical services [3]. In the context of the digital revolution, artificial intelligence (AI) is a crucial advancement that impacts all spheres of life [4]. AI is simply defined as a computing system equipped with the capability to execute tasks and thinking processes that usually require human intelligence [5]. In the healthcare sector, AI plays a pivotal role in optimizing tasks such as data management, pattern recognition and overall operational efficiency [6]. Its important utilization in medical imaging has been greatly facilitated by innovations in super-computing technology and enhanced access to data [7]. Healthcare sector in many countries, often encounters challenges due to financial crises that further lead to struggles such as budget cuts, a shortage of trained staff and unexpected crises such as the COVID-19 pandemic [8]. The incorporation of AI in healthcare has the potential to address these problems [9]. It can lessen workloads, reduce human workforce in specific tasks and improve the efficiency of healthcare professionals (HCPs) in their daily practices [10]. By utilizing the advanced algorithms and deep learning capabilities of AI, improvements can be made in health information systems, mapping of health data, epidemic monitoring and diagnosis [11, 12]. AI systems remain resistant to fatigue and are endowed with substantial memory capacity [3].

Pakistan is a developing country, although the infrastructure of its healthcare system is spread all over the country, it still has limited resources including modern equipment and advanced technologies [13]. The government hospitals lack a health management information system (HMIS), advanced diagnostic techniques, well-trained staff, essential medicines and remote services [14]. However, armed forces and some private institutions are endowed with specialized equipment and the latest technological facilities [14]. AI has the potential to upgrade the healthcare system as it can lessen the problems associated with it. Inadequate health budget, high patients load, lack of trained personals, burnout of HCPs and high treatment costs are some problems faced by healthcare system of Pakistan that may be solved by AI integration [15]. However, it is necessary to take viewpoints of HCPs on integrating AI into their daily practices because they are the primary users and key influencers driving advancements in the healthcare system. Failure to address their viewpoints, behaviour and ethical concerns may prevent these advancements from theory to

practical application. Despite the growing incorporation of AI in healthcare globally, there is a noticeable absence of qualitative research within our country's context. This gap urges us to understand the unique concerns, expectations and experiences of local HCPs regarding AI adoption. The present study aims to investigate healthcare professionals' perspectives on AI and to identify challenges regarding its use. To the best of our knowledge, this is the first qualitative study in Pakistan to explore the perspectives of HCPs regarding reasons for acceptance or reluctance and potential barriers to AI incorporation. The study will contribute to inform policymakers, educators, and healthcare institutions, helping to tailor AI-related training, policies, and implementation strategies to better align with the needs and perspectives of the medical community.

Methodology

Study design and setting

A qualitative exploratory study design was adopted to explore the perspectives of healthcare professionals [16]. The purpose was to get a fair understanding of facilitators and barriers to AI use and to find out possible solutions to counter the challenges in AI adoption. The study was conducted in southern Punjab, Pakistan. The HCPs from two tertiary care teaching hospitals were approached for data collection including Nishtar Hospital, Multan and Bahawal Victoria Hospital, Bahawalpur. Both the hospitals are the largest hospitals in southern Punjab which cater to a population of nearly 40 million people constituting about 17% of total population of Pakistan [17].

Nishtar Hospital Multan is one of the largest hospitals in Pakistan. It is a public sector hospital equipped with 1850 beds, 24 departments, 15 operation theatres, 31 wards, a burn unit and A & E services [18]. Bahawal Victoria Hospital comprises of 1600 beds, offering all necessary medical and surgical facilities. It is equipped with 34 indoor specialties, 25 outdoor specialties, and A & E services [19].

Participants

The HCPs included in this study were doctors, pharmacists and nurses. Only those HCPs were selected who had a minimum experience of 2 years because they have enough exposure to medical equipment used in their daily practices. To obtain maximum variations, HCPs from different specialties were selected including orthopaedic, paediatrician, gynaecologist, cardiologist, gastroenterologist, neurologist, oncologist, urologist, pulmonologist, ophthalmologist, pathologist, general surgeon, general physician and radiologist.

Data collection tool and data collection procedure

The participants were recruited using convenient sampling method. They were contacted by phone call for appointment schedule. Then they were interviewed face-to-face with the help of a semi structured interview schema from January 15th to February 29th, 2024. The interview schema was developed by the authors by keeping in mind the purpose of the study (Interview Schema) and after a thorough review of existing literature [20, 21]. The interviews were conducted by three researchers (AA, MRA and MY). Prior to data collection, a pilot study was conducted on three respondents to check the reliability and validity of the interview schema. The pilot interviews were not included in the final results. All interviews were conducted in Urdu, the national language of Pakistan, at a place and time convenient to the participants [22]. Consent was obtained through a duly signed form by the respondents before starting the interviews. Saturation point criterion was adopted to determine the sample size of the target population [23].

Data analysis

An inductive thematic approach was adopted to analyse the data using Braun & Clarke methodology [16]. All the interviews were transcribed verbatim. To acquire familiarity with the data, the transcripts were read several times by the researchers (MY, ZI and JN) and initial codes were created. The coding phase led to the repetitive identification of subcategories and categories, and early themes which after analysis repetitively, contributed to create main themes [22]. To confirm thematic saturation, the data were transcribed on the same day or very next day of data collection. Regular evaluation was performed upon receiving each new transcript to identify additional themes by comparing with existing ones. All the authors continued to discuss the analysis till its completion.

Table 1 Demographic features of the participants (n = 25)

Characteristics	Variables	Frequency (n)	Percentage (%)
Gender	Male	14	56
	Female	11	44
Profession	Doctors	14	56
	Pharmacists	6	24
	Nurses	5	20
Age (years)	≤ 30	4	16
	31–40	12	48
	41–50	7	28
	> 50	2	8
Experience (years)	2–5	3	12
	6–10	12	48
	11–15	6	24
	16–20	4	16

Ethical considerations

The study was approved by the Pharmacy Human Ethics Committee (PHEC) of the Faculty of

Pharmacy, the Islamia University of Bahawalpur (Reference no. 205-2024-/PHEC). Consent was also taken from the respondents through duly signed form before starting interviews.

Results

In total, 40 HCPs were approached, among whom 25 participated in the study with a response rate of 62%. Of these 25 respondents, 12 (48%) were from Bahawal Victoria Hospital, Bahawalpur, and 13 (52%) were from Nishtar Hospital, Multan. The participants included were doctors (14), pharmacists (6) and nurses (5). The male-to-female ratio of the participants was 14:11 (Table 1). The average duration of the interviews was 22 min. With the help of thematic analysis, 4 main themes with multiple subthemes were identified (Table 2). These included (1) Cognizance of AI, (2) Acceptability of AI among HCPs and training requirements for effective incorporation, (3) Merits and Demerits of AI, and (4) Challenges in incorporation of AI with proposed solutions.

Cognizance of AI

Knowledge and understanding

The HCPs showed varying degrees of awareness with some having satisfactory knowledge regarding the role of AI in healthcare, while others had limited knowledge. The respondents got awareness from multiple sources including social media, movies and research papers. Although most of the participants were familiar with AI, they had a poor understanding of its use in their settings.

“I think artificial intelligence is a system that first learns from stored memory or speech and then applies that knowledge back to us.” (Doctor-08).

The knowledge of physicians and pharmacists was satisfactory, whereas nurses exhibited a lack of basic understanding.

“I think artificial intelligence is an ability that humans develop in computers. I don't know much about it, but I recently watched a video on YouTube.” (Nurse-02).

Use of AI tools

The HCPs included in the study did not utilize AI tools much due to unavailability in their healthcare settings. Surprisingly, only two participants used the ChatGPT, employing it for synopsis writing and obtaining information on the signs and symptoms of some diseases.

Table 2 Thematic framework

Main Theme	Sub Themes	Categories
Cognizance of AI	Knowledge and understanding	Physicians and pharmacists were familiar with AI but lacked a thorough understanding of it. Nurses were not much familiar with AI.
	Source of information	Social media, movies and research papers were main sources of information about AI.
	Use of AI tools	Majority of the participants did not use any AI tool during their practices. ChatGPT was the only AI tool used by a couple of the participants.
Acceptability of AI among HCPs and training requirements for effective incorporation	Dual sentiments of AI	Majority of the participants were willing to embrace incorporation of AI in their fields. According to some respondents, AI adoption will take time in Pakistan.
	Need of training	According to the respondents, training of AI is important. Without adequate training, HCPs may not fully get AI's intended benefits.
	Type of training	Workshops, online lectures or self-taught courses would be enough. Some respondents stated that only basic understanding of computer is enough to use AI tools.
Merits and Demerits of AI	Possible advantages	AI can be helpful in boosting efficiency of HCPs. AI can reduce workload. AI can save time of HCPs. It can minimize medical errors and enhance diagnostic accuracy.
	Limitations	AI can never understand the emotions, feelings and personal needs of the patients.
	Concerns of HCPs	The fear being replaced by AI was one of the concerns stated by some respondents. Critical thinking of young HCPs may be affected if they start to over-rely on AI. Government has no interest in up-gradation and advancement of healthcare sector.
Challenges in incorporation of AI with proposed solutions	Government related challenges	Government has no interest in up-gradation and advancement of healthcare sector.
	Financial challenges	Respondents considered the financial resources as one of the main challenges in implementation of AI.
	Resistance by HCPs	Few participants concerned that AI may replace them in future. Preferring traditional way of diagnosis and treatment by HCPs also offer a barrier.
	Lack of training	Lack of training of HCPs about the use of advanced technology was also reported as a challenge in AI implementation.
	Technical problems	Access to internet was stated as an obstacle. The outdated equipment in public sector hospitals was considered as one of the challenges. The shortage of electricity was also a major barrier to AI's incorporation.
	Proposed solutions	Proper training of HCPs, awareness to public and professionals can be helpful. An adequate funding and involvement of policymakers can facilitate AI incorporation. Promoting research on AI can be helpful to counter the challenges faced in integration of AI.

“Some healthcare providers are using ChatGPT personally. I've also used it a few times to find answers to questions not covered by our web searches and to clarify concepts. It offers instant information.” (Doctor-03).

Acceptability of AI among hcps and training requirements for effective incorporation

Dual sentiments of AI

A broad consideration was that AI can benefit Pakistan's healthcare sector as it would enhance the capabilities of healthcare providers. In the main, they indicated willingness to accept AI, expecting a similar response from their colleagues.

“Acceptance often follows the creation of a model. Previously, it was said that ‘necessity is the mother of invention,’ meaning invention arises from need. Today, it's the opposite: ‘invention creates need.’ We didn't initially need touch phones, but once invented, they became essential.” (Doctor-04).

Few interviewees speculated that senior medical providers might be hesitant to adopt AI because it urges a shift from conventional practices to modern and technical approaches. They predicted a slow embracing process in Pakistan. However, they anticipated that young healthcare professionals would be more receptive due to their familiarity with cutting-edge technology.

“See, things develop slowly and slowly, and they get their acceptability slowly. In the beginning, it will be a great fear that AI will replace us” (Doctor-05).

Need for training

Multiple respondents emphasized the importance of HCPs' training for effective use of AI. Without proper training, users may not get its intended benefits. Therefore, HCPs should be provided with opportunities to acquire adequate training from AI experts to enhance their medical practice techniques.

“There’s a saying: ‘A fool with a tool is a dangerous fool.’ The key is who gets the tool. Providing it to an expert yields good results, while an untrained person might make mistakes.” (Doctor-13).

Type of training

A dominant viewpoint was that workshops, online lectures or self-taught courses would be quite useful for learning and acquiring expertise in AI.

“I think online lectures, workshops at regular intervals and other short courses will be sufficient for the training.” (Doctor-03).

“Self-taught videos have become incredibly helpful these days. For those who don’t have time for in-person courses, platforms like YouTube make learning more accessible and convenient.” (Nurse-05).

Merits and demerits of AI

Possible advantages

A myriad of the participants articulated that the integration of AI into the healthcare system will allow smoother operations and improved efficiency. This improvement can benefit the patients and healthcare providers through better diagnostic assistance, improved inventory management and increased accessibility to remote areas. Additionally, the burden on healthcare professionals is likely to decrease as AI speeds up their tasks.

“The speed of doctors making decisions will be 10-fold. I mean, a doctor who can see 100 patients will see virtually one thousand patients.” (Doctor 14).

“It’s useful; tasks that once took four hours can now be done in an hour, 30 minutes, or even less.” (Pharmacist-02).

According to a few respondents, AI is instrumental in reducing medical errors through its advanced algorithms and predictive analytics. It can enhance diagnostic accuracy and treatment precision, contributing to improved patient safety.

“Medical errors can definitely be reduced. If you do not forget anything, if you do not miss anything, then the chance of negligence will be minimized.” (Doctor-03).

Limitations

Limitations highlighted by interviewees included; AI’s inability to show empathy and understand human

emotions. The technology falls short of perceiving patients’ feelings and individual needs, leading to ineffective doctor–patient interactions due to communication gaps.

“The human touch can never be taken from artificial intelligence no matter how accurate it is. The computers can’t perceive our feelings and emotions as we humans do.” (Doctor-11).

“Recognizing that humans have emotions and spirituality is crucial. This explains why two patients with the same appendicitis may show different symptoms due to their unique personalities.” (Doctor-01).

Concerns of HCPs

A couple of the respondents raised concerns about AI potentially taking over tasks that involve reasoning and judgment. There was an apprehension that too much reliance on AI may impact the critical thinking abilities of HCPs, especially young ones.

“You can’t learn to swim just by watching YouTube videos; you need hands-on experience. Similarly, no matter how much information is available, a patient can’t be treated effectively without practical involvement.” (Doctor-13).

Certain participants expressed a contrasting viewpoint, predicting that healthcare professionals can enhance their critical thinking skills through the proper use of AI.

“If they are doing it intelligently, then their critical thinking can be enhanced. It can go to the next level.” (Doctor-04).

While talking about the possibility of AI replacing HCPs, most of the participants asserted that AI is incapable of replacing humans, especially in Pakistan, while it may do so in developed countries.

“It can’t do this in Pakistan yet. Outside, maybe—like with robotic surgeries and other advancements—but in Pakistan, it’ll take a lot of time.” (Doctor-08).

A few respondents speculated that AI might replace humans to some degree due to recent technological advancements. Others have argued that complete replacement is unlikely, but certain professions, such as radiology, may experience a decrease in the human workforce.

"I don't think it can ever replace a human being. Yes, in some specialties, AI can reduce the number of workers in a short time, especially in diagnostic services." (Doctor-05).

"This is a big problem in our country in which no one is trained. We have to accept this first. If I tell you the truth, no training schedule exists in our country." (Doctor-11).

Challenges in incorporation of AI with proposed solutions
Financial constraints, lack of training and resistance by healthcare providers were found to be the main barriers to implement AI in our healthcare sector.

Government-related challenges

Some participants felt that the government is not prioritizing the up-gradation of our healthcare system. They believe that current health policies are not sufficient. There were also concerns that individuals are assigned ministries without relevant expertise.

"First, we will have to educate policymakers. This is an issue." (Pharmacist 05).

Financial challenges

Plenty of the participants considered financial resources a primary challenge in incorporating AI as introducing advanced equipment powered with AI will put an extra burden on the economy, particularly in countries like Pakistan that may struggle to afford it.

"Financial problems are a major issue. In Pakistan, patients have to face persistent shortages of life-saving and basic medicines in public sector hospitals." (Doctor-06).

Resistance by HCPs

The fear of HCPs being replaced by AI was also considered a barrier. Our HCPs have been following traditional systems of diagnosis and treatment, and the use of AI in the healthcare system can be a challenge for them, resulting in opposition to its incorporation.

"Yes, it is possible. Machines have already replaced humans in technology. Machines have replaced humans in the industry. It is possible that in the future, it may happen in our healthcare profession as well." (Pharmacist 06).

Lack of training

A significant barrier to incorporate AI in Pakistan's healthcare sector is the limited training available. The HCPs lack the basic knowledge and skills to operate advanced technological tools effectively.

Technical problems

In most areas of our country, there is no access to the internet. The equipment used in our hospitals is outdated and does not support the latest software. A shortage of electricity and unavailability of the internet are also barriers to integrate AI.

"Technical issues, like system crashes, can happen. Last time, a network problem caused patients to wait in line for 3–4 hours, during which the system froze, halting access to their data, reports, and medication." (Doctor-10).

Proposed solutions

The respondents were asked to present their opinions on what strategies or actions should be taken to counter the challenges in integrating AI in healthcare. This question led to a very narrow variety of responses; most of the respondents suggested that AI training and education should be provided to healthcare students and professionals. A few respondents also proposed that policymakers or higher authorities should be educated about this field, as they are the most important when integrating new technology into a system. Appropriate budgets and financing were also proposed. It was also suggested that promoting awareness among the general public and professionals and targeting their lack of acceptability will be helpful. They should be reassured of its credibility and validity.

"We should incorporate these trainings into our courses across all fields, not just healthcare. While these concepts are essential in healthcare, raising awareness about them is crucial in every sector." (Pharmacist-03). "An appropriate budget and financing are crucial for successfully integrating AI into the healthcare system. Adequate funding ensures the acquisition of advanced technologies and the development of necessary infrastructure." (Doctor-07).

Discussion

This study offers an in-depth discussion of healthcare professionals' views on the adoption and integration of artificial intelligence in healthcare systems. Through a qualitative analysis, this study sheds light on the landscape of artificial intelligence in healthcare, exploring its

potential benefits and hurdles as perceived by those at the forefront of patient care. Our findings provide valuable information that can be useful for developing future strategies for effectively incorporating AI in healthcare system.

The participants involved in the study were familiar with AI but did not possess a deep understanding. They had superficial knowledge about AI and its basics similar to a study conducted by Bo Zheng [24]. This is probably due to the absence of AI tools in our healthcare settings and limited time for HCPs to explore new things coming in the market. As AI tools are not accessible in our healthcare settings, most of the participants did not use them that's why there were only two participants who used ChatGPT, mainly for obtaining quick information regarding the signs and symptoms of diseases and for writing synopsis. Similar uses of ChatGPT by HCPs were reported by Priyanka B. Kharat [25].

Although the interviewees did not know much about AI, most of them were willing to embrace AI incorporation in the healthcare sector. They believed that it can assist them by making many helpful improvements. These findings are consistent with Orlova [26]. A few participants predicted that AI incorporation would be welcomed gradually, and it may take time. This slow adoption of AI by HCPs may be due to conventional cautiousness in this field, apprehension arising from uncertainty, and the fear of job displacement. Some participants pointed out that senior HCPs might be more sceptical about the technology, with some never fully accepting its incorporation into healthcare, as they possess less skills regarding advanced technological equipment. These findings are strengthened by a study conducted in Tunisia by Asma Chaibi [27]. Younger HCPs were predicted to be more inclined to embrace AI because they became familiar with advanced technological tools earlier in their lives. A study in the UK conducted by Fazakarley showed similar results [28]. For effective incorporation, AI training is essential. Therefore, there should be proper training sessions and workshops for HCPs regarding AI tools utilization. Basic education on AI should be included in the curriculum of health science subjects to familiarize students with it at early stages. These results are in agreement with a study conducted by Lena Petersson [29].

Numerous advantages were explained by the respondents which AI integration can bring to the healthcare system. It can reduce workload, save time and resources, and boost up efficiency of HCPs. It was also expected that AI can be helpful in reducing medical errors and improving diagnostic accuracy [30]. This positive perception is encouraging, as it may help to attenuate issues such as patient load and HCPs' burnout, which are prevalent in public hospitals [15]. Some drawbacks of AI were also stated by the participants. These were lack of empathy

and understanding of human emotions. This may affect physician-patient interactions. Similar limitations of AI were found in another study [31]. Some concerns were raised by the respondents. These included job replacements and deskilling of HCPs due to a high reliance on AI. Young HCPs might be more susceptible to deskilling. They may not have much practical experience, and their critical thinking may be affected too much [30]. Some participants had contrasting viewpoints, stating that AI may enhance their capabilities if they use AI in a proper way. The result is similar to a study conducted by Ana Rita Pedro in Portugal [32].

Many challenges were identified in the study that may have to be faced while incorporating AI in the healthcare system of Pakistan. These were a wide range of hurdles, some linked to the government, others to healthcare providers, and some to technical issues [33]. According to some respondents, stakeholders are not prioritizing the up-gradation of the healthcare system. Financial constraints were also among the main barriers to the implementation of AI. Dubious government policies and financial constraints are major barriers to AI integration in the developing countries [34]. A lack of awareness, training and resistance by the HCPs are also obstacles. Our HCPs prefer old traditional methods of diagnosis and treatment, so introducing new technology might disrupt traditions, hierarchies, and traditional professional roles and job divisions [29]. The evolving roles and responsibilities of HCPs may create a mismatch with traditional working methods, presenting challenges for their acceptance of AI in healthcare settings. Therefore, to promote the incorporation of AI in the healthcare sector, we suggest educating frontline healthcare providers about the functionality of AI tools before their implementation [35]. The possibility of machine errors, the unavailability of an easy access to the internet, a shortage of electricity and the presence of outdated equipment in health settings all present barriers to the implementation of AI. Since research on AI in our country is almost absent, healthcare providers may lack confidence in its accuracy. They may be hesitant to accept it due to concerns about potential errors in diagnosis and other tasks, which may hinder its integration [36]. AI tools require internet access and electricity to function. However, the country's shortage in both of these areas can limit practical incorporation, rendering its incorporation more theoretical than practical. Some solutions were also proposed by the respondents to address these challenges. These proposed solutions are expected to contribute significantly to the successful integration of AI into Pakistan's healthcare sector. Awareness to the general public and HCPs, proper training, new strategies by stakeholders, specifying extra health budgets and empowering hospitals with advanced technological equipment may counter the challenges of

incorporating AI in the healthcare sector of Pakistan. Similar solutions have been summarized by Aravind Sasidharan Pillai in a review article [37]. The Ministry of National Health Services should prioritize enhancing the healthcare sector by introducing new technologies such as AI. This initiative would not only benefit healthcare professionals and patients but also contribute to the country's economic growth.

Strengths and limitations

The strength of our study is that we interviewed a wide variety of HCPs from two largest hospitals in southern Punjab, Pakistan. This provided us with an opportunity to look closely at the information we gathered and understand how AI can be used in our local healthcare settings. This also helped us to identify challenges in its incorporation that can be solved. One limitation of our study is that we interviewed participants in a specific region of Pakistan. Therefore, these findings cannot be applied to the whole country. Another limitation of the study may be the potential for interview biases, as convenience sampling may not capture a diverse range of perspectives which can lead to overrepresentation of certain viewpoints. Since the data were collected from public sector hospitals, which often lack the advanced medical services found in private institutions, the perceptions of HCPs in private institutions may differ.

Conclusion

This is the first study providing an extensive description about viewpoints of HCPs regarding AI. The study found that HCPs of Pakistan have positive perception regarding AI. They showed willingness to embrace it as they believe that it may solve many of the problems faced by our healthcare system. The challenges hindering incorporation of AI can be solved by awareness, proper training sessions, specifying extra budget for healthcare sector and promoting research on AI. It highly recommended that policymakers, in collaboration with private health institutes and technological companies, should take important steps to ensure the incorporation of AI in healthcare system of Pakistan. The government should start pilot projects of AI incorporation in health institutes of mega cities and then all over the country.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-024-11667-9>.

Supplementary Material 1.

Supplementary Material 2.

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Authors' contributions

MY, SA, JA and IM designed the study. MRA, MY and ZI designed the interview schema. MRA, AA, and MY carried out the interviews. IM, JA and SA oversaw the study and data collection. SA, JA, ZI, AA and MY analysed the data. MY, MRA, AA, ZI and JN wrote the article. All the authors critically revised the paper and approved the final manuscript. The author(s) read and approved the final manuscript.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to confidentiality agreements with the participants but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Pharmacy Human Ethics Committee (PHEC) of the Faculty of Pharmacy, Islamia University of Bahawalpur (Reference no. 205-2024-/PHEC). An informed consent was also obtained from the respondents through a duly signed form before the interviews began.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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