

# Transforming Healthcare With Artificial Intelligence In Pakistan

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## Abstract

**Introduction:** In recent years, the healthcare industry has witnessed a revolutionary shift driven by advances in artificial intelligence (AI) and machine learning (ML) technologies. These ground-breaking tools are transforming the way we deliver care, enhance patient outcomes, and optimize healthcare systems.

**Objective:** The main objective of the study is to find the transformation in healthcare with artificial intelligence in Pakistan

**Methodology:** This cross-sectional study was conducted at Punjab and Karachi regions from June 2023 to December 2023. Data were collected through a systematically designed questionnaire. There were 550 respondents who participate in the study. It contains questions regarding use of AI in <sup>1</sup>healthcare system. It includes the current use of AI technologies in healthcare facilities, the impact of AI on clinical practices and patient outcomes, challenges and barriers to AI implementation, and attitudes towards AI adoption.

**Results:** Data were collected from 550 respondents according to inclusion and exclusion criteria. 21.8% of the participants were aged 30 or below, 54.5% were between 31 and 50 years old, and 23.6% were over 50. Among healthcare professionals, Physicians constituted the largest group (32.7%), followed by Administrators (27.3%), Nurses (21.8%), and Technicians (18.2%), with others accounting for 9.1% of the sample. 60.0% of the participants are both aware of artificial intelligence (AI) and utilize it in some capacity. Additionally, 40.0% are aware of AI but do not utilize it. Notably, 30.0% of the participants are not aware of AI at all. In terms of perceived impact, the majority (80.0%) believe AI has a positive impact, while a smaller percentage (20.0%) perceive it negatively.

**Conclusion:** It is concluded that AI technologies have the potential to transform healthcare delivery in Pakistan by improving efficiency, accessibility, and quality of care. Our study highlights the need for targeted interventions to connect knowledge gaps, improve access to AI technologies, and address concerns regarding data privacy and security.

**Key words:** AI, Healthcare, Patients, Radiology, Facilities, Impact.

## Introduction

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The integration of artificial intelligence (AI) into healthcare systems worldwide has ushered in a new era of innovation and transformation, and Pakistan is no exception to this trend. With advancements in AI technology and the increasing digitization of healthcare data, Pakistan is witnessing a significant shift towards utilizing AI-driven solutions to address various challenges within its healthcare sector [1]. From improving diagnostic accuracy and treatment efficacy to streamlining administrative processes and optimizing resource allocation, AI has the potential to revolutionize healthcare delivery in Pakistan [2].

In recent years, several initiatives and collaborations have emerged in Pakistan aimed at harnessing the power of AI to enhance healthcare outcomes [3]. These initiatives span a wide range of applications, including disease diagnosis, drug discovery, personalized medicine, remote patient monitoring, and predictive analytics [4]. Furthermore, the proliferation of telemedicine platforms and mobile health applications has further accelerated the adoption of AI-enabled technologies, particularly in underserved rural areas where access to healthcare services is limited [5].

Artificial Intelligence (AI) represents a revolutionary force across various sectors, particularly in healthcare. It entails the emulation of human intelligence in machines, empowering them to analyze data, make decisions, and execute tasks autonomously [6]. In healthcare, AI holds immense potential to transform disease prevention, diagnosis, and treatment methodologies. This transformation is fueled by the availability of vast healthcare datasets, advancements in computational capabilities, and breakthroughs in machine learning algorithms [7]. AI techniques like machine learning, natural language processing, and computer vision facilitate the extraction of valuable insights from extensive data sources, including electronic health records, medical imaging, genomics, and biomedical literature [8].

The integration of technology and artificial intelligence (AI) in healthcare holds promise for addressing supply-and-demand challenges in the industry. With the availability of diverse datasets and advancements in technologies like mobile, internet of things (IoT), and cloud computing, there's an opportunity to revolutionize healthcare delivery through AI-enhanced systems [9]. Cloud computing, in particular, facilitates the analysis of large datasets at faster speeds and lower costs compared to traditional infrastructure. This convergence of healthcare and technology is driving partnerships between technology providers and healthcare organizations, leading to innovative AI-driven solutions for medical care enabled by cloud computing and other transformative technologies [10]. The integration of AI into healthcare holds immense promise for improving patient outcomes, enhancing clinical decision-making, and optimizing healthcare delivery [11]. AI can assist healthcare professionals in diagnosing diseases at an early stage, predicting treatment responses, and personalizing patient care plans. By analyzing complex data patterns, AI algorithms can identify subtle signs and patterns that may not be evident to human observers, thereby enabling early detection of diseases and improving prognostic accuracy [12].

### **Objective**

The main objective of the study is to find the transformation in healthcare with artificial intelligence in Pakistan.

### **Methodology of the study**

This cross-sectional study was conducted at Punjab and Karachi regions from June 2023 to December 2023. Data were collected through a systematically designed questionnaire. There were 550 respondents who participate in the study.

### **Inclusion criteria**

- Age >18 years

- Participants must be healthcare professionals or a student and involved in patient care, including physicians, nurses, pharmacists, and allied health students.
- Participants currently practicing in healthcare facilities located in Pakistan.

#### Exclusion criteria

- Participants who are not currently practicing in healthcare settings in Pakistan.
- Participants who are unable or unwilling to provide informed consent.

#### Data collection

Data were collected through a designed questionnaire. We collected data from Karachi and Punjab through online survey method. There were 220 respondents from Karachi which include students of nursing, allied health sciences and professionals related to healthcare. 330 respondents from Punjab from different regions and different fields of healthcare including students and professionals. It contains questions regarding use of AI in healthcare system. It includes the current use of AI technologies in healthcare facilities, the impact of AI on clinical practices and patient outcomes, challenges and barriers to AI implementation, and attitudes towards AI adoption. Data collection was conducted through online surveys, depending on the preference and convenience of the participants. Participants were assured of confidentiality and anonymity, and informed consent was obtained before participation in the study. The questionnaire was developed by reviewing the previously published literature. The questionnaire was developed in English language, then was translated in to local language “Urdu” for the easy understanding of the respondents.

#### Statistical analysis

The collected data were analyzed using SPSS v26 and MS Excel 2023 to find the trends, and associations related to the use of AI in healthcare in Pakistan. Results are interpreted and explained through the Tables and graphs.

#### Results

Data were collected from 550 respondents according to inclusion and exclusion criteria. 21.8% of the participants were aged 30 or below, 54.5% were between 31 and 50 years old, and 23.6% were over 50. The majority held a Bachelor's degree (36.4%), followed by High School education (27.3%), Master's degree (27.3%), and Doctorate (9.1%). Among healthcare professionals, Physicians constituted the largest group (32.7%), followed by Administrators (27.3%), Nurses (21.8%), and Technicians (18.2%), with others accounting for 9.1% of the sample.

**Table 01: Demographic data of study participants (n=550)**

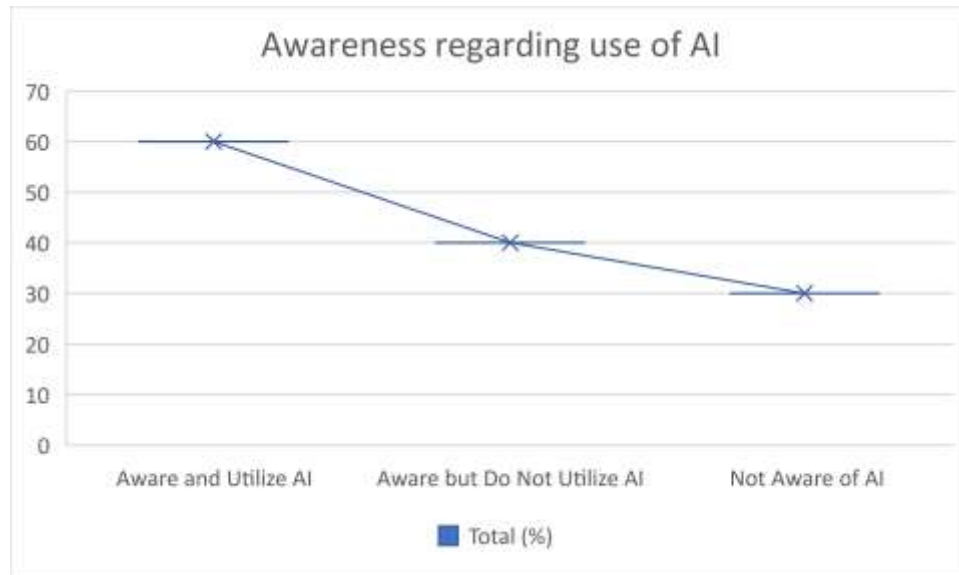
Variable	Category	Frequency	Percentage
Gender	Male	275	50%
	Female	275	50%
Age (years)	≤ 30	120	21.8%
	31 - 50	300	54.5%
	> 50	130	23.6%
Education Level	High School	150	27.3%
	Bachelor's Degree	200	36.4%
	Master's Degree	150	27.3%
	Doctorate	50	9.1%
Healthcare Profession	Physician	180	32.7%
	Nurse	120	21.8%
	Technician	100	18.2%
	Administrator	150	27.3%

	Other	50	9.1%
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60.0% of the participants are both aware of artificial intelligence (AI) and utilize it in some capacity. Additionally, 40.0% are aware of AI but do not utilize it. Notably, 30.0% of the participants are not aware of AI at all. In terms of perceived impact, the majority (80.0%) believe AI has a positive impact, while a smaller percentage (20.0%) perceive it negatively.

**Table 02: Awareness and utilization of AI in healthcare**

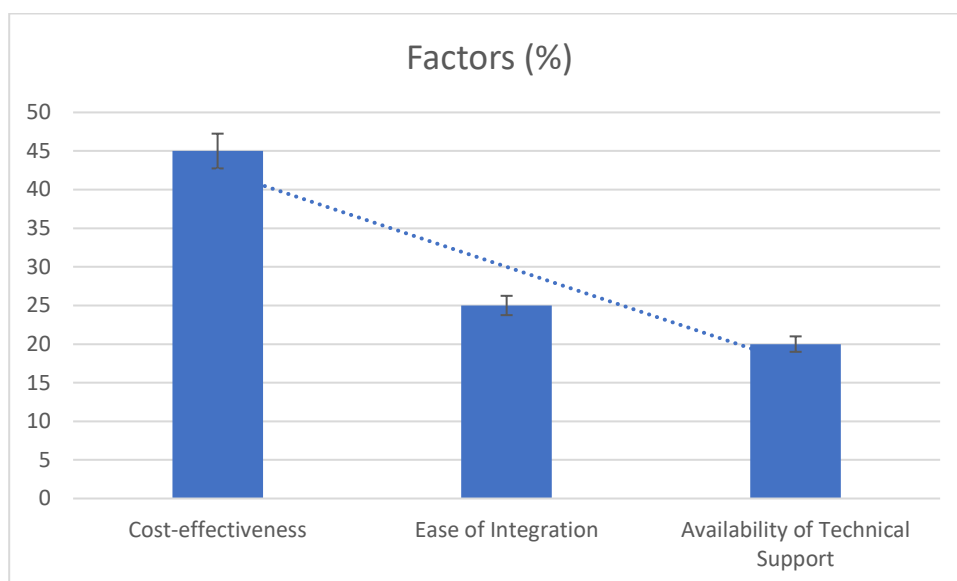
<b>Awareness and Utilization</b>	<b>Total (%)</b>
Aware and Utilize AI	60.0
Aware but Do Not Utilize AI	40.0
Not Aware of AI	30.0
<b>Perceived Impact</b>	
Positive	80.0
Negative	20.0



Cost-effectiveness emerges as the most significant factor, cited by 45.0% of the participants. Additionally, ease of integration (25.0%) and availability of technical support (20.0%) are also noted as influential factors. Conversely, barriers to implementation are highlighted, with data security and privacy concerns being the most prominent (40.0%). Other barriers include the lack of regulatory frameworks (30.0%) and resistance to change (20.0%).

**Table 03: Factors effecting in adoption of AI**

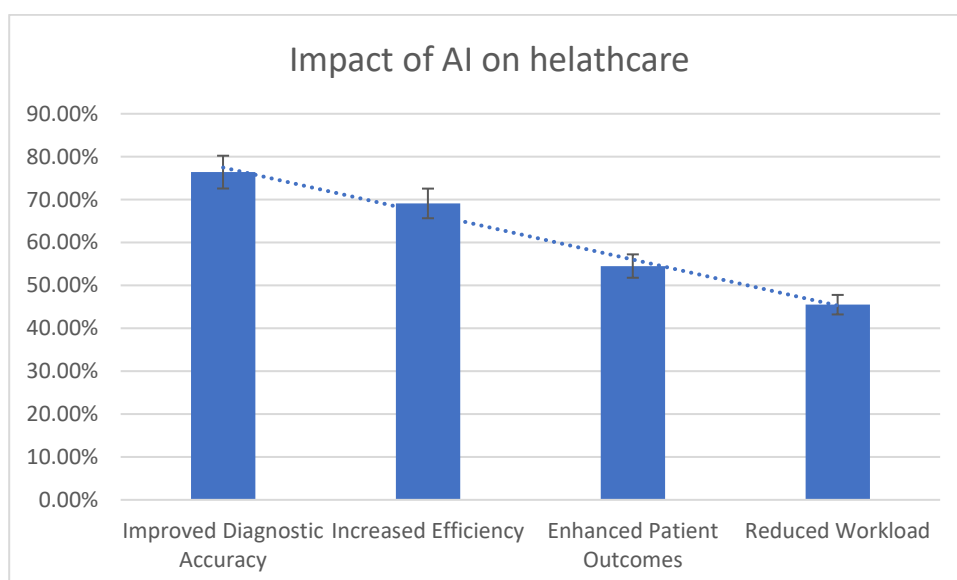
<b>Factors Influencing Adoption</b>	<b>Total (%)</b>
Cost-effectiveness	45.0
Ease of Integration	25.0
Availability of Technical Support	20.0
<b>Barriers to Implementation</b>	
Data Security and Privacy Concerns	40.0
Lack of Regulatory Frameworks	30.0
Resistance to Change	20.0



A significant majority of participants (76.4%) acknowledged the improved diagnostic accuracy associated with AI utilization. Moreover, a considerable proportion (69.1%) cited increased efficiency as a key advantage. Additionally, 54.5% of respondents recognized enhanced patient outcomes as a benefit, while 45.5% highlighted the reduced workload facilitated by AI technology.

**Table 04: Impact of AI on healthcare professionals**

Variable	Frequency	Percentage
Improved Diagnostic Accuracy	420	76.4%
Increased Efficiency	380	69.1%
Enhanced Patient Outcomes	300	54.5%
Reduced Workload	250	45.5%



**Table 05: Challenges in implication of AI**

Challenge	Frequency	Percentage
Data Privacy and Security Concerns	320	58.2%
Integration with Existing Systems	280	50.9%

Lack of Trust in AI Technology	220	40.0%
Cost of Implementation	180	32.7%

## Discussion

The findings revealed a high level of knowledge among participants regarding AI applications in healthcare, with a majority expressing positive attitudes toward its integration into clinical practice. However, despite this positive perception, there were notable gaps in understanding specific AI technologies and their potential benefits [13]. The integration of Artificial Intelligence (AI) into healthcare has rapidly advanced across various domains globally. AI applications span medical imaging, clinical decision support, drug discovery, genomics, and remote patient monitoring, offering potential to enhance diagnostic accuracy, treatment planning, and healthcare delivery processes [14]. Specifically, AI-driven medical imaging technologies, like computer-aided diagnosis systems, aid radiologists in interpreting images, detecting subtle abnormalities, and facilitating early cancer detection [15]. Moreover, AI algorithms analyze electronic health records (EHRs), extracting valuable clinical insights to support decision-making and patient management. The integration of Artificial Intelligence (AI) in healthcare brings forth several ethical challenges that need to be addressed [16]. One of the key concerns is the potential bias in AI algorithms, which can lead to discriminatory outcomes in healthcare. Biased algorithms may disproportionately impact certain patient populations, exacerbating existing health disparities [17]. It is crucial to ensure that AI algorithms are trained on diverse and representative datasets to mitigate bias and promote fairness in healthcare. Another ethical challenge is the issue of privacy and data security. AI algorithms require access to vast amounts of patient data, including sensitive health information [18,19]. Protecting patient privacy and ensuring the secure storage and transmission of data are essential to maintain patient trust and comply with regulatory requirements. Furthermore, the study highlighted variations in the adoption of AI across different healthcare settings, with tertiary care hospitals exhibiting higher levels of AI utilization compared to primary care facilities [20]. These disparities underscore the need for targeted interventions to promote equitable access to AI technologies and ensure that all healthcare providers can harness their full potential. Additionally, the study identified barriers to AI adoption, including concerns about data privacy and security, as well as limited access to training and technical support.

## Conclusion

It is concluded that there is a significant relation for the integration of artificial intelligence in Pakistani healthcare, but there are several challenges that need to be addressed. Our study highlights the need for targeted interventions to connect knowledge gaps, improve access to AI technologies, and address concerns regarding data privacy and security. By overcoming these challenges and fostering a supportive environment for AI adoption, Pakistan can connect the transformative potential of artificial intelligence to enhance healthcare delivery and improve patient outcomes.

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