Awareness of Opportunities and Challenges Related to Artificial Intelligence in Health Sector of Developing Economies: Systematic Review Analysis

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Abstract
Purpose: Given the proper implementation of Artificial Intelligence (AI) technology, administrative and medical processes in the health sector of countries with low incomes can change quickly. This modification highlights the crucial influence of AI on a variety of health sector processes. Previous research indicates that AI may improve the standard of medical treatments. According to reports, AI technologies make life better for people by making it simpler, safer, and more productive. This study sought to identify the most significant potential and difficulties related to the application of AI in the health sector of emerging economies. **Method:** A thorough systematic literature review analysis was conducted using a total of 6 databases (Web of Science, ACM Digital, Science Direct, Emerald, IEEE, and Scopus). The selection was narrowed down to 49 articles after careful consideration in order to complete the review on potential AI possibilities and challenges that the health sector of developing economies need to be aware of.**Results:** The study found five major obstacles connected with AI adoption that requires attention in developing nations' health sectors: a lack of infrastructure, a lack of AI capabilities and skills, data integration, security, privacy, and legal concerns, as well as patient safety. The research also revealed six AI potentials that can aid the developing economy's health sector, including data exchange and availability, workflow management, cost reduction, resource management, professional training, and autonomous decision-making. It was discovered that AI has the ability to significantly outperform humans in terms of accuracy, efficiency, and timeliness of medical and associated administrative activities.
Keywords: Artificial Intelligence, Opportunities, Challenges, Health Sector, Developing Economies, PRISMA
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INTRODUCTION
Technology has been given a high priority in production and expansion ever since the advent of Industrial 4.0 (Li et al., 2017; Ali et al., 2022). Machine technology improvements have replaced laborious and manual activities, advancing human growth (Kaplan and Haenlein, 2020). Beyond the assistance that robots provide with physical labor, AI is a significant technical development that has allowed people to replace manual labor with jobs requiring higher levels of intelligence and mental acuity in a range of industries (Kumar, Sharma, and Dutot, 2023).

AI has the ability to significantly enhance the health industry and its stakeholders in emerging nations. The need for health care should be boosted by the growing populations in emerging nations. Innovative approaches are required in the health services industry if it is to become more productive and economical (Pee, Pan, and Cui, 2019). Rapid technological advancements, particularly in the realms of AI and robotics, can help emerging nations' health sectors complement one another. It transforms the manual health sector business processes into ones that are automated, allowing people to handle regular duties in healthcare administration and resource management as well. When programmers design AI platforms to do activities, the technological difficulties of digitizing health sector services present additional issues (Tobore et al., 2019).

As a result, one of the main draws of AI is that it can carry out a wide range of human-like tasks, gain expertise through use, and adjust to new inputs and settings. AI uses pertinent knowledge sources, such as big data, block chain technology, to achieve higher performance for certain jobs (Kaplan and Haenlein, 2020). The critical health sector in emerging nations can potentially benefit greatly from AI's rapid advancement which has been applied to a variety of businesses and economies (Strachna and Asan, 2020; Mahajan et al., 2019). In many areas of the health sector in developed economies, AI has already digitally changed the manual health system into an automated version, with humans now only needed to carry out the most basic duties in healthcare settings such as handling patients and medical resources, leaving complex processes to be dealt with by or reliant on AI elements (Lee and Yoon, 2021; Bernardini et al., 2021).

The use of AI in the health sector is quickly developing (Merhi, 2023; Goralski and Tan, 2020). These advancements allow AI to execute activities that humans occasionally are unable to do with the speed, ease, dependability, and thoroughness that AI can provide at a cheaper cost (Zhou et al., 2020). The technical

breakthrough from the health sector digitalization can also overcome additional hurdles when information systems and technology developers successfully create AI systems to carry out particular activities (Tobore et al., 2019). AI, for instance, has the potential to significantly improve patient care while also reducing healthcare costs (Kaur, Garg, and Gupta, 2021; Dhieb et al., 2020). Therefore, creative algorithms are required in the health industry to enhance effectiveness and efficiency without increasing costs (Pee, Pan, and Cui, 2019). The requirement for health services to be given at a quick pace is projected to increase as humanity grows. This is one area where artificial intelligence continues to set the bar high by offering ground-breaking solutions. Rapid technological development, notably in the area of artificial intelligence, has already helped to control the expansion of the health sector (Maduri et al., 2020; Ardan, Rahma and Geroda, 2020).

The health sector in poor nations may be significantly impacted by AI deployment efforts as AI technology can enhance human life quality by making life simpler, safer, and more productive (Malik et al., 2021; Hradecky et al., 2022). AI has several uses that simplify our lives, including facial recognition for security, automation for business, NLP for translation, robots for homes, machine learning, and vision for the medical field (Herath and Mittal, 2022). Due to the Internet of Things (IoT), Cloud Computing (CC), robotics, cyber-physical systems, and machine-to-machine communication, AI has changed our civilization and propelled us into the Age of 4.0 (Votto et al., 2021). In emerging countries as well as the rest of the globe, efficient use of automation and connection may help individuals manage their time, flexibility, and partnerships (Kar et al., 2021; Ahsan and Siddique, 2022).

This innovative technology makes medical facility administration more efficient. Because there are advantages in the process, the future of AI in health care is not entirely hopeful due to the fact that numerous skeptics have arisen over whether AI may exercise doctors' rights and responsibilities to preserve privacy concerns, and the applicable law is not entirely equipped for this advancement. The usage of AI in the global health sector suggests that present policies encourage it. It has been demonstrated that the rules for developing technology and health technology goods may be produced and used for healthcare services. Hence, the purpose of this study was to discover the prominent opportunities and constraints of AI implementation that health sectors of developing economies need to pay much attention to if they are to implement AI projects as well as a future agenda related to AI implementation for the health sector in emerging nations such as Sub-Saharan Africa. The study's methodology is presented in the next part, which is followed by the study's findings. The existing literature is then discussed in terms of the potential and problems that AI presents for the health sector in emerging nations. The research on the future agenda is emphasized last.

METHODOLOGY

This study used the PRISMA process, which is a systematic review and analysis of reviews. The flowchart illustrates the process (Figure 1). When putting together and producing academic work, writers, reviewers, and editors frequently employ the PRISMA statement as a critical guide (Selçuk, 2019). A fundamental set of components for evidence-based reporting in systematic reviews and meta-analyses is PRISMA, as well. The accepted method for disclosing data in systematic reviews and meta-analyses is called PRISMA. It demonstrates the review's caliber, allows readers to assess its virtues and shortcomings, permits the reproduction of the review's technique and structure, and formats the review using PRISMA headings (Selçuk, 2019). It serves as the basis for creating literature search plans and applying quantitative research techniques.

The following search method was used: Using a combination of word searches on the topics of potential possibilities and problems related to AI adoption in the health sector of developing economies, data were gathered from 6 databases (Table 2). Only original articles were chosen for analysis from the publications from 2017 to 2023 in English (Table 1 shows inclusion and exclusion criteria). The articles chosen were those whose titles are most closely related to the purpose of this literature study. There were 49 publications total that were selected for content analysis. In addition, the writers studied the articles and reviewed the abstracts and conclusions of the chosen publications.
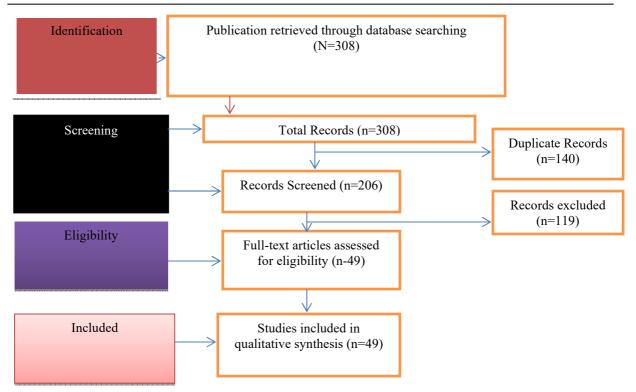
Figure 1: The Flowchart of the Methodology Following PRISMA Guidance

Table 1: Review Selection Criteria

Inclusion	Exclusion
Scholarly Articles	Reports and any other sources
Peer-reviewed articles published from 2017-2023	Non peer-reviewed articles that published prior to 2017
Written in English language	Written in any language other than English

Table 2: Review Search Results

Database	Search results
Science Direct	52
Emerald	50
Scopus	49
IEEE	55
ACM digital	53
Web Science	48
Total	**308**

Distribution of articles by publication year: The articles were published between 2017 and 2023 (Figure 2). The year with the most articles published was 2020 with 12, and the year with the fewest articles published was 2017. The majority of the publications were released between 2020 and 2023, indicating the current interest in this field of study.
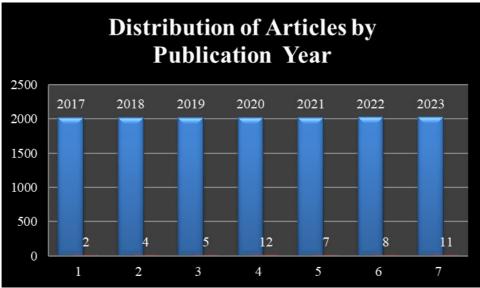
Figure 2: Distribution of articles by publication year

Distribution of articles by database: The distribution of the chosen articles per database source is shown in Figure 3. 12 papers were found in the IEEE database, followed by 10 documents from the same source and 10 documents from Emerald, 7 papers from Science Direct, and just 5 documents from Scopus and 5 documents from Web Science.
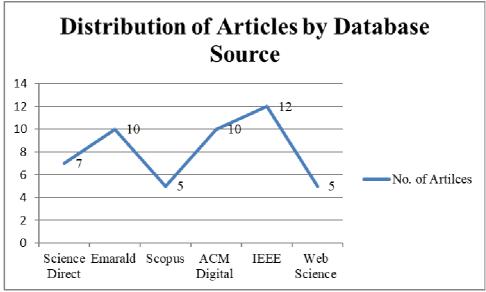

Figure 3: Distribution of articles by database source

RESULTS

With support from the rich economies, AI should be applied as soon as possible in the health sector of emerging nations. Technology today plays a significant role in the health sector of emerging nations. Technology has a function to play in easing human labor and increasing its effectiveness, especially in the health sectors of the suffering countries. Additionally, technology is crucial in these developing nations' health systems for reducing mistakes brought on by negligent behavior. For example, if technology plays no part in surgical procedures carried out by doctors along with other sector players' processes, the procedure may be risky and perhaps result in failure and death for the case patient and financial loss for the case administration. In other terms, AI refers to computer intelligence that has been artificially created and is designed to mimic human intellect. AI has the ability to significantly enhance the clinical decision-making process, patient diagnoses, prevention, and therapy in the health sector of underdeveloped countries (Triantafyllidis and Tsanas, 2019).

A- AI Opportunities that Health Sector of the Developing Economies Sector Need to Comprehend
The envisaged advantages of AI technology may be seen across the whole health sector in emerging nations, which includes a variety of stakeholders and player institutions including hospitals, insurance firms, and governmental organizations (Jaiman and Urovi, 2020). Building on this data AI can support professional training

in the health sector of developing economies that are resource-constrained (Deist et al., 2020; Paranjape et al., 2019; Torner et al., 2019), and such applications can save time and reduce the use of resources (Kaur et al., 2021; Sasubilli, Kumar, and Dutt).

Extending the use of AI in the health sector in poor countries has several benefits for this important industry. In addition to lowering treatment costs and duration, it helps conserve resources (Bohr and Memarzadeh, 2020). Additionally, it expedites the diagnostic process and subsequently the decision-making process, which has a significant influence on treatment plans and results and may even save lives in emergency cases. When used by different physicians in various healthcare institutions, data sharing in the health sector of developing economies is crucial for a person's well-being as well as the advancement of science. In accordance with Deist et al. (2020), who suggest the Personal Health Train (PHT) system, accessing medical data is frequently challenging due to regulatory and privacy challenges. The PHT system offers a privacy-by-design infrastructure connecting data sources while encouraging the use of machine learning techniques on distributed data. The application of AI in education is encouraged, and Paranjape et al. (2019) present a paradigm that incorporates AI implementation into the medical school curriculum. AI can be advantageous holistically for the whole healthcare industry. Given that AI has been successfully implemented in the health sector of emerging nations, Table 3 summarizes the prospects connected with AI implementation that the health sector of developing economies needs to put into account based on a review of many pertinent international publications.

Table 3: Potential Opportunities Related to AI Implementation that Health Sectors of Developing Economies Need to put in Consideration

Author	Opportunity					
	Automatic decision making	Workflow management	Cost Reduction	Resource Management	Professional Training	Data sharing and availability
Sqalli and Al-Thani (2019)	√	√				
Strachna and Asan (2020)	√					
Bernardini et al. (2021)	√		√			
Dhieb et al. (2020)	√	√	√	√		√
McGregor et al. (2020)	√	√	√			√
Comito, Falcone and Forestiero, 2020	√	√	√			√
Sivarethinamohan et al. (2021)		√				√
Deebak and Al-Turjman (2021)		√				√
Deng et al. (2019)		√				√
Bernardini et al. (2021)		√	√			
Yu and Zhou (2021)		√	√			
Zhou et al. (2020)	√			√		
Kaur et al. (2021)	√			√		
Wahl et al. (2018)				√		
Torner et al. (2019)		√			√	√
Gupta et al. (2019)		√			√	√
Reddy and Chavan (2020)		√			√	√
Wiljer et al. (2019)		√			√	√
Deist et al. (2020)		√			√	
Jaiman and Urovi (2020)				√		√
Antoniou et al. (2018)					√	√
Lv, Guo and Lv (2023)	√	√		√		
Ranchal et al. (2020)	√	√		√		
Gonza´lez-García et al. (2019)	√	√		√		
Jahan and Tripathi (2021)	√	√		√		

B- AI Implementation Challenges that Health Sector of the Developing Economies Need to be in Account.

As shown in the table (Table 3), the assessment identified a number of possible obstacles to AI deployment that the health sector in developing nations needs to be aware of. Each challenge's details are provided in the discussion section that follows. On the other hand, the research evaluated a number of significant issues that, if not resolved, may prevent emerging nations' health sectors from deploying AI. Among these are issues with data availability and difficulty with data digitalization and consolidation (Dhieb, 2020; Khan et al., 2020; Murray, Macedo, and Glynn, 2019; Chen et al., 2018). They also involve difficulties with privacy and legal concerns, which include legal problems (legislation) and privacy problems (Shaban-Nejad, 2021; Shaban-Nejad et al., 2021; Zerka, 2020). Decision mistakes, treatment errors, data errors, and human interventions are the problems relating to patient safety (Madanan, Zulkefli, and Velayudhan, 2021; Tsang et al., 2020; Neuerburg, 2022; Sharma et al., 2022; Arakpogun et al. (2021; Secinaro et al., 2021; Strusani and Houngbonon, 2019) (Table 4). The remaining problems were centered on infrastructures and AI talents.

Table 4: Potential Challenges to Hamper AI Implementation in Health Sector of Developing Economies

Theme: Challenge Potential Challenges that can Hamper AI In Health Sector Of Developing Economies					
Author	Challenge				
	Data Integration	Privacy/Legal Issues	Patient Safety	Infrastructure	AI skills
Chen et al. (2018)	√				
Murray et al. (2019)	√				
Peters et al. (2020)	√	√	√		
Dhieb et al. (2020)	√				
Khan et al. (2020)	√				
Shaban-Nejad et al. (2021)		√			
Kaur et al. (2021)		√			
Zhou et al. (2021)		√			
Liu et al. (2020)		√			
Esmaeilzadeh (2020)		√			
Nikolaev et al. (2021)			√		
Madanan et al. (2021)			√		
Kusano et al. (2017)	√				
Tsang et al. (2020)			√		
Sqalli and Al-Thani (2019)		√	√		
Srivastava and Rossi (2019)			√		
Strusani and Houngbonon (2019)				√	√
Sharma et al. (2022)				√	√
Arakpogun et al. (2021)	√	√		√	√
Secinaro et al. (2021)					
Neuerburg (2022)				√	√

DISCUSSION

As seen in Table 3, there seem to be a lot of AI-related potential prospects in the health sector of developing nations. However, there are problems connected with using AI in the health sector of poor nations. Opportunities for using AI in the health sector are evident, including bettering patient care decisions and results, lowering referral rates, cutting costs, saving time, and enhancing resource management, data sharing, and availability (Table 3). It may help rural health institutions, and it might encourage people to move to and stay in rural regions in developing nations. In the end, this may help create a more equal global health system (Tobore et al., 2019). Table 4 shows that the hurdles include combining data from diverse sources, security and privacy concerns, patent safety, technical skills, and infrastructure. Without the viewpoints and circumstances of patients and other sector consumers, technology cannot be employed efficiently in the sector. The orchestration of AI in these emerging nations' health sectors has the potential to provide a template for the flow of research focusing on various areas of AI deployment in developing economies.

The usefulness of AI in enhancing aspects of emerging economies' health sector administration may be represented in terms of workflow management advances. AI will most likely be integrated into the sector's

normal activities. However, questions have been raised about the ethical and legal consequences of using AI in underdeveloped nations' health sectors. These problems include the potential of bias, ambiguity in some AI algorithms, privacy concerns for data used for AI model training, security concerns, and AI implementation responsibilities. Some ethical issues that AI prospects confront include safety, efficacy, privacy, information and consent, the freedom to decide, and access, among others.

Accessing, altering, sharing, and exploiting data in the health sector raises obvious privacy concerns. Cloud computing and artificial intelligence (AI) are often employed in many sorts of applications in the health industry. Health data is collected, processed, stored, monitored, and shared by these systems (Sasubilli et al., 2020; Zerka et al., 2020; Peters et al., 2020). Despite the benefits of these systems, there are also drawbacks, such as security concerns, privacy concerns, cyber security, and ethical concerns. Hospitals and government institutions often have ethical data collection and sharing policies in place. To acquire and utilize data, even for research reasons, permission from a government-approved authority is necessary (Zhou et al., 2021). Inequity, joblessness, and humanity as whole, regulatory methods, prejudices based on behavior, demographic biases, and connecting biases are further moral difficulties related to AI in the health sector (Jameel et al., 2020). There is research on limiting adverse effects, rewarding security breaches, safe investigation, and robustness to lessen ethical difficulties in AI applications in the health field (Jameel et al., 2020; Zerka et al., 2020; Esmaeilzadeh et al., 2020; Bryson et al., 2018). Certain algorithms based on machine learning are utilized for illness forecasting, and they may make judgments or assist clinicians and other stakeholders in making judgments.

Regarding the protection of rights particularly of patients' rights, both governments of the rich and the poor have voiced their worries about these automated processes. A number of restrictions regarding data collection, processing, technology use, quality of such data, and analysis procedures have been created as a result of these worries. Additionally, before data can be used by AI applications, researchers working in the health sector should pay close attention to data quality, testing, and documentation. Some AI techniques need a lot of data to process. Because of the ethical ramifications of collecting data, especially patient data, it can be challenging at times. Some clustering and classification techniques may provide extremely excellent reliability when applied to a little quantity of data; however, this may not be realistic or useful. To be employed in AI approaches, the obtained data must be preprocessed. Text data, in particular, need extensive natural language processing before usage. Text, numeric, picture, and video data can sometimes be combined using an identical algorithm, which is one of the most difficult difficulties in medical data processing (Murray et al., 2019). Medical data can come from a variety of sources and formats, including medical pictures, 3D video sequences, photos, and numerical data. In health sector data analysis, collecting clean, robust, and efficient data is a difficulty.

Health sector data are processed, and models are created using machine learning, natural language processing, and expert systems as input to assist medical choices based on health systems. The majority of AI applications in healthcare systems are focused on evaluation. Automated evaluation errors might have highly negative effects. Sometimes the quality of the information gathered from hospitals is insufficient or it is just wrong. One of the biggest problems in using AI to process health data is data mistakes (Nikolaev et al., 2021). Decision mistakes generated by machine learning systems provide another difficulty. Data may not always be acceptable for the applicable method to utilize, or the data may not be trustworthy enough to be used with classification algorithms like decision trees. Possible health-related decision-making issues have been highlighted in several studies, along with potential remedies (Madanan et al., 2021; Srivastava and Rossi, 2019; Kusano et al., 2017). The healthcare industry now uses a sizable amount of AI and IoT hardware and software. Not all of them are automated, though; physicians still have the last say. The interaction between medical professionals and AI models might lead to inaccurate diagnosis and treatment outcomes (Sqalli and Al-Thani, 2019; Tsang et al., 2020).

CONCLUSIONS, LIMITATIONS AND FUTURE AGENDA

The potential of AI is needed in the health sector of developing nations like sub-Saharan Africa, particularly in the management of sector operations and services, to make well-informed decisions in both medicine and management, particularly in resource planning, finance management, process, and workflow management immediately to predictive analysis, in diagnosing and treating patients as the sector's clientele. The difficulties include a lack of sufficient infrastructure, data integration, security, and privacy, capabilities for the AI technology, as well as the safety of the primary clients (Patients), which must be taken into account by taking into account their perspective and circumstances. Due to the fact that most AI functionality are secret in nature, academic publications sometimes lack details about how AI performs. This was one of the research's main drawbacks. There was also a lack of particular AI operations, use cases, business processes, and rules that were unavailable in the industry. Second limitation: Despite the use of a rigorous search technique, certain research on AI in the healthcare industry was left out, including unpublished papers and gray literature. As the health sector heavily relies on medical data and analytics, AI technologies are seen to offer significant assistance in the operations of the clients (Patients), including monitoring, diagnosing, treating, and measuring clinical risks,

improving operations, and also enabling the management of the field of medicine. The potential and problems related to AI technology in the health sector of emerging nations are discussed in this systematic study. The results of this research demonstrate that, despite its difficulties, AI has the potential to improve the health system in developing nations. There are several difficulties, including infrastructural problems, privacy concerns, legal issues, patient safety, and a shortage of talent, which have all been taken into consideration. With the use of AI technology, the health sector in developing nations has to be aware of potential pros and concerns, which is why this review study provides an awareness of current Intelligence-related research. It is crucial to determine if the advantages AI may bring to the health sector of developing nations exceed the difficulties associated with its application in the area. The research included in this analysis provides enough support for the notion that AI can have a significant positive impact on the health industry. However, the difficulties associated with actual and perceived data integrity, as well as the resulting patient safety and privacy concerns, infrastructure, and AI skills, must be carefully assessed deeper.

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