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Artificial Intelligence for Global Health: Difficulties and Challenges: A Narrative Review

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Abstract

Global health (GH) aims to improve healthcare for all people on the planet and eradicate all avoidable diseases and deaths. The inception of Artificial Intelligence (AI) is innovating healthcare practices and improving patient outcomes by shuffling enormous volumes of health data—from health records and clinical studies to genetic information analyzing it much faster than humans. AI also helps in the improvement of medical imaging and medical diagnosis. There is an increased optimism regarding the use of applications of AI locally but can these facets be translated globally in the advancement and delivery of healthcare with the help of AI. At present majority of AI developments and applications in health care provide to the needs of developed countries and there is little effort to develop programs which could help to improve healthcare delivery globally. We performed this narrative review to assess the difficulties and discrepancies in implementing AI in global health delivery and find ways to improve.

Keywords

Artificial Intelligence, Global Health, Implementation, Pitfalls

1. Introduction

The inception of AI has changed the way that health services are being offered to patients in developed countries particularly imaging modalities, diagnosis of cancer and robotic surgeries [1] [2] [3] [4]. This was possible due to advanced technology, hardware and softwares, infrastructure and large medical databases provided by the healthcare providers [5] [6]. The use of AI has enabled people to tackle big, societal challenges, from advancing medical research to improving the accuracy and efficiency of diagnostic processes and health information quality, but the same to be applied for improving GH is a serious challenge.

It was suggested that enhanced AI can predict the spread of diseases rapidly so that early decisions can be made to save lives. Bio-surveillance still remains flat-footed and does not have the data, proper analysis and clear cut prediction [7] [8]. Collins and Tabak (2014) [9] drew the interference that synchronization and integration of the data are most important in prediction of the pandemics. But in GH how we can predict a disease in an African country if the data from that region is not available and integrated. Prediction analysis mainly depends on how good the data is, which could be verified and the data was not inserted in the AI systems [10].

Globalization has transformed the way that governments and nongovernmental organizations are taking global health into serious consideration to control the spread of infectious diseases, prevention of acquired diseases, malnutrition and any future epidemics like COVID-19. For such an endeavor to be successful the verified and correct data need to be incorporated into the AI systems as the disease pattern, presentation and outcome are quite different in various parts of the world. The objective of this review is to assess the current status of AI and healthcare and how it can be implemented taking into consideration the Global Health Disparity in the world.

In this review, we aim to highlight additional research requirements, inform national and global policy discussions, and support efforts to develop a research and implementation agenda for AI in global low-income and middle-income countries.

2. AI in Healthcare at Present in the Developed World

AI is the result of a combination of science and engineering to create intelligent machines by using a set of algorithms, and rules which the machine follows to mimic human logical functions, such as learning, implementing knowledge, and problem solving [11]. In a nutshell, AI is a machine which has the ability to grasp, synthesize, information and then perform cognitive functions that often humans do. In addition, AI programming has the ability to learn and identify the images and compare what is fed into their systems databases. AI is a machine's ability to perceive, synthesize, and infer information and then make decisions similar to the human mind.

Machine Learning (ML): One of the most common techniques which AI uses to process big data is machine learning, a self-adaptive algorithm that gets increasingly better and analysis, patterns and improves further with newly added data. The different components of AI are Learning as AI systems learn from the large dataset fed into their systems. One such example is Siri and Alexa, which are digital voice assistants. Alexa and Siri rely on natural language generation and processing and machine learning, forms of artificial intelligence, ML offers algorithms that allow computer programs to automatically improve through experience. [12]. ML itself may be classified as supervised, unsupervised, and reinforcement learning (RL), and at present, there is ongoing research in various sub-fields, including semi-supervised, self-supervised, and multi-instance ML [13]. Deep learning (DL) is a subset of ML and is an important function of AI that emulates the understanding of the human brain in extracting and comparing stored data and creating patterns for use in making a final decision. DL networks have the capability of learning unsupervised from data that is already available for analysis. This is also known as deep neural learning or deep neural network. DL learns from vast amounts of unstructured data that could normally take humans decades to understand and process [14] [15].

Reasoning and Decision Making: The second component of AI is reasoning and decision-making. AI systems can use logical rules, contingency models, and algorithms to extract conclusions and make proper decisions. When the system faces a problem, the AI will be able to make proper reasoning to bring out the same results. When faced with any issue, AI models can use reasoning to generate congruous results. Problem-solving in AI is similar to reasoning and decision-making. AI systems have the ability to analyze the data, manipulate it, and apply it to create a solution that solves a specific problem.

Perception: The final component of AI is perception. Perception, often the ability in speech recognition, presupposes image identification, object recognition, image septation, and analysis of the videos uploaded.

3. Current Status of AI in Underdeveloped Countries

With breakthroughs in cheap computing power, cloud services, big data, and advancements in ML, AI has the ability to make constructive changes and improve the way governments, organizations, and individuals deliver services, access information, and plan and operate.

Recent studies in Sub-Saharan Africa, North Africa, and South and Southeast Asia have found several barriers and challenges to implementing AI in low-income countries. India, Nigeria, South Africa, Egypt, Indonesia, Pakistan, Malaysia, Tunisia, Ghana, and Vietnam are involved.

Lack of availability, accessibility, and quality of data and to develop new effective algorithms, AI and ML applications require an abundance of quality data. This data is lacking in less digitized countries and less effective data. Even in some countries, remote hospitals do not have regular computers to enter data. On the other hand, if the data is available from private healthcare providers, the data could be inaccessible. The success of the AI providing help in healthcare globally adequate data should be available which is lacking now.

Availability and Accessibility of Cheap Internet Services: A report from the World Bank indicates that about 35 percent of the population in developing countries has access to the Internet [16]. In addition to these, in developing countries, there is a lack of sufficient computing power, which is a significant hindrance due to lack of funds. Added to the availability of hardware, internet connectivity is not the same in all parts of the country, and this could ward off the continuous use of applications that can assess AI-based services. The cost of mobile internet data connection also limits the size of the market and the number of people who can use it. While cloud computing is a significant step toward overcoming this barrier, the cloud's impact is limited in many areas due to the unreliable availability of internet services.

Capricious power infrastructure: There needs to be more power supply in developing countries. There is a power generation shortage, and distribution and fluctuations are frequent. Under these situations, the high-technology computers cannot properly function, and there will be a failure to enter data which is the foundation for the AI to work.

Human Resources Development: Given all other factors are taken care of, the important aspect in the development and implementation of AI requires robust upskilling and training. Many countries need to develop human resources and train them first before they can put AI to use.

Lack of Infrastructure investment: All AI-based solutions require a notable investment. Despite the willingness and investment, many governments, are finding it difficult to establish an efficient and programmatic way to incorporate machine learning and big data into their execution strategies. AI applications can be computationally expensive to run. Countries need to invest in the necessary infrastructure, such as cloud computing resources, to support their AI applications. The total cost of AI implementation varies widely based on the specific needs of the healthcare delivery and the complexity of the AI application.

4. Current Status of AI and Global Health

At present, AI is attempting to develop interventions so that low-income countries can implement their algorithms to improve global health outcomes. The first such endeavor was to provide access to vaccines to the needed areas, countering, controlling, and detecting emerging resistant pathogens and tracking their spread. Currently, diseases like tuberculosis and pneumonia are being targeted mostly using radiological data [17] [18]. Malaria, which is quite common in poor countries, and WHO reported that globally in 2022, there were 249 million cases with 608,000 malaria deaths in 85 countries. AI has been employed for early diagnosis of malaria using microscopy data for malaria, cervical cancer [19] [20].

AI-driven interventions also focused on the diagnosis of non-communicable diseases and early detection of cervical cancer utilizing images of the cervix with precancerous stages [21] [22] [23].

As of 2022, 23% of the global population (1.8 billion people) were living on less than the threshold of poverty, which kills Noncommunicable diseases (NCDs), which kill 41 million people each year, equivalent to 74% of all deaths globally [24]. There are more than 100 diseases that AI can target with diagnosis and drug development, and at present, only a few diseases are being worked on

AI platforms in poor and low-income nations.

5. WHO Intervention in Global Health Delivery

Building of Infrastructure:

One of the fundamental activities of the World Health Organization (WHO) is to work and promote health in all quarters of the world and keep the world safe in this process WHO provides the required resources to countries to keep their citizens healthy. Some of these resources are in guiding the countries on clinical care, and establishing standards for medical products, vaccines and other essential supplies. In this century the landscape has changed in the face of globalization of trade, the movement of people, and spread the disease like COVID-19. The ideal implementation of providing the uniform global health delivery requires multiple agencies with more close coordination of investments and budget reallocations.

With the recent advancement of AI in healthcare and the efficiency rising to 83% in the prediction in the diagnoses of various diseases, the use of AI will become more common in the coming years [25]. If global health should be successful adoption, acceleration and use of technologies should strengthen local health systems first. However, WHO's new report cautions against overestimating the benefits of AI for health, especially when this occurs at the expense of core investments and strategies required to achieve universal health coverage. WHO should appropriately plan to build the infrastructure so that AI can be used properly. Without proper infrastructure, AI implementation will fail, and the WHO's dream of providing Universal Global Health will falter.

Training of the Staff:

With the introduction of AI technologies, it is mandatory to invest in new and improved programs to empower staff with the adequate skills to work synergistically with AI technology. This includes identifying the specific AI-related skills and knowledge required for various job roles within the healthcare industry. Continuous training courses and workshops, can be used to provide employees with the competence required to leverage AI tools effectively. The focus should be on improving skills such as data analysis, Machine Learning, automation, and critical thinking, which will enable individuals to understand AI applications and make informed decisions. WHO should undertake the identification of learning goals on a correct training platform. It has to be understood that it is not a one-time episode, but the training needs continuous feedback and support to keep the innovations and developments in the field of AI up-to-date. Lastly, it has to be identified that different staff require AI-related skills and knowledge for different job roles. Moreover, AI systems should be tailored carefully to reflect the diversity of socioeconomic and healthcare settings.

Data Acquisition:

Data for many diseases are available in the AI programs, and more is being added every day so that there are no errors in the diagnosis and management.

More healthcare data and storage will help in creating more AI algorithms. Crimmins *et al.* (2010) [26] examined the cross-sectional data of 10 countries and reported differences in the disease patterns. Not only the presence of disease and severity of the diseases but also a large variation in the decision to treat a particular disease exists [27].

The key to the development of good AI algorithms is accurate data. Data sources can include imaging data, patient-generated data, and data on signs and symptoms. As AI-supported technologies learn and diagnose from a large volume of medical research and patients' treatment records, they play a significant role in augmenting doctors' decision-making process for diagnoses and treatment [28] [29] [30]. These processes are possible due to the enormous data available for comparison and diagnosis.

Due consideration need to be given as disease pattern itself differs in different parts of the world, their presentation and symptoms differ. The social environment has become an important determinant of health and disease patterns in any country. Added to this, socioeconomic disparity in countries also presents with a different disease pattern [31]. Numerous works have been conducted earlier to develop a system that senses the physiological variables and health indicators to assess severe cases and accidents. The health and disease data from individual countries need to be thoroughly investigated and added to the database so that it can be used correctly. Without proper data acquisition and incorporation into the AI, support technologies will fail to make an accurate diagnosis.

AI Deployment:

The most paramount challenge for WHO in properly improving global health is to design and implement AI appropriately in poor and low-income countries. Individual countries have common diseases which are different from other countries. Diseases like malaria and tuberculosis, cholera, HIV/AIDS, and diarrhoea [32] continue to account for a pronounced burden of disease, and in such countries, AI should target early diagnosis and proper treatment. Maternal death is quite common in third-world countries, and it was reported that over 99 percent of maternal deaths occur in developing countries. During the last decade, it was shown that AI coupled with electronic health records can be used to help prevent maternal morbidity and mortality [33]. The algorithm considers factors such as a woman's age, previous pregnancies, and medical records to identify women at high risk. This technology has the potential to enable early interventions and reduce preterm birth rates. Such a program should be instituted by WHO in countries where maternal health is common. If WHO is serious about uniform global health delivery, the research agenda and development of interventions should be driven by local needs, and AI interventions should be developed in a way that meets the needs of the local population. The new AI algorithms should be able to add additional benefits to the present way of diagnosis and care. If the locally acquired data is not properly incorporated into the machine and deep learning then there is always a threat that false symptoms could be identified and integrated into new AI-driven health interventions.

Hence, reliably collected data should only be consolidated. A functional startup of AI-driven healthcare interventions requires serious planning and investment to support the existing healthcare system. Another important facet that needs to be addressed is the regions in which WHO divided the world for the purpose of reporting, analysis, and administration. There are six regions Region of the African Region Americas, South-East Asian Region, European Region, Eastern Mediterranean Region, and Western Pacific Region. These regions need to be regrouped depending on the disease pattern and the financial ranking of the country. Like clubbing developed countries like Australia and New Zealand, Singapore in the same group as Cambodia, Papua New Guinea, Philippines, and Samoa in the same group with different disease patterns and severity will put the AI interventions into making incorrect diagnosis and improper treatment recommendations.

6. Conclusion

Artificial intelligence has the prospective to provide correct health information diagnosis, delivery, and better provision of the healthcare system. Many of the health issues can be solved by AI applications. Even though poor countries with low levels of healthcare will benefit from AI unfortunately the investment to implement AI in poor and developing countries will be enormous as most of the AI applications are being developed by private companies and will deficiently come with a price. Current research is progressing rapidly phase to provide standardized healthcare and diagnosis with excellent results on health issues and using various AI-driven health interventions. The depth and convincing results of AI interventions focus on the urgency for the WHO to make decisions to implement AI in the global community so that morbidity and mortality and the spread of diseases can come under check. One thing we need to understand the potential of AI interventions will always complement and remain adjunct to traditional approaches rather than replace them.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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