Role Of Artificial Intelligence In Extending Life Expectancy: Precision Medicine In The Indian Healthcare Perspective

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Abstract:

Artificial intelligence (AI) is a transformative technology that is being used in almost every sector, including the healthcare. In the recent years, it has brought remarkable advancements in the field of medical science. From Virtual Health Assistants to life-threatening surgeries, we can notice the unseen hand of AI at work. AI algorithms have the potential to analyse and interpret vast amounts of complex genetic data of patients and help the medical practitioners to treat diseases more accurately and quickly. Developed countries are already leveraging artificial intelligence in critical surgeries and customized medicine development. In India, especially in the last decade, many start-up MedTech companies sprout up to deploy AI in Personalized medicine. Personalized medicine (PM) is also called as customized medicine, precision medicine or tailored medicine. The main objective of PM is to provide the fitting medicine to the right patient with the appropriate dose. In this paper, we describe the benefits of personalized medicine alongside with the growing role of AI in tailored drug development in Indian healthcare system.

Keywords:

Artificial intelligence, precision medicine, Indian healthcare, tailored medicine, customized medicine

Introduction:

AI is a branch of computer science that focuses on making machines to think like human beings. This groundbreaking technology can aid in early disease detection and treatment of deadly diseases.In the initial days of the introduction of AI, there were many speculations on the practicality of implementation of AI algorithms in the field of medicine, but, machine learning and deep learning algorithms alleviated the doubts and made it possible to implement AI in medicine.Scientists could develop predictive models which can help in not only detecting the diseases in advance but also help in providing preventing measures. AI algorithms can accelerate the diagnostic process and spot early indicators of a disease by generating automated medical reports.

In cardiology, AI based software can be used to interpret even the slightest abnormality in ECG and predict the risk of heart diseases. In pulmonology, AI algorithms can accurately interpret pulmonary functional test results and predict pulmonary diseases in advance.In Endocrinology AI-based machines are used to continuously monitor blood glucose levels of patients[1]. In nephrology, AI algorithms can help in the diagnosis and treatment of diseases like kidney injuries and kidney failures[2].In Gastroenterology, AI-enabled machines can intensely interpret endoscopy and ultrasound images and aid in the detection and diagnosis of abdominal problems of all levels.In Neurology, AI algorithms can be trained in the processing and interpretation of images and scans to assist in the earlier detection and treatment of neurological disorders and severe brain diseases.AI's rapid computation speed and capacity to detect hidden patterns in massive, complicated datasets can enable medical professionals to make better, individualized decisions according to the health condition of the patient[3].According to the Valuates Reports, Medical Virtual Assistant Market Size to Grow USD 2668.4 Million by 2029 [4].

Advantages of Personalized medicine:

Customizing medical treatment according to the unique needs of every patient is called as personalized medicine or precision medicine.We know that the genetic makeup, food habits, and other factors of all the patients are not the same. So, using the same medicine to all patients for a particular decease may not alwaysgive good results. This is what happens with traditional medicine.In personalized medicine, the unique genetic profile of a patient is analysed and a treatment is prescribed according to the profile. The first human genome took about 10 years to complete but in now-a-days it is taking a couple of days. The cost of genome sequencing is reduced from billion dollars to few hundreds of dollars. The Government of India hasannounced in February 2024 that it has completed sequencing 10,000 healthy genomes [5].It is really a big leap in understanding genetic variations in the vast Indian population. This endeavour helps in the process of customized patient treatments.In a way, the traditional approach of medication is like a trial-and-error method. If a particular drug is not effectively working on a patient, the physician may refer another drug and observe its effects. Sometimes some drugs may result in severe side-effects. These side-effects caused by the traditional medicine can be avoided by the tailored medicine.AI algorithms can analyse large amounts of patients' data and based on the family history of diseases, life style, and genetic sequencing they can suggest personalized medication [6]. The difference between traditional medicine and precision medicine is show in Fig1.
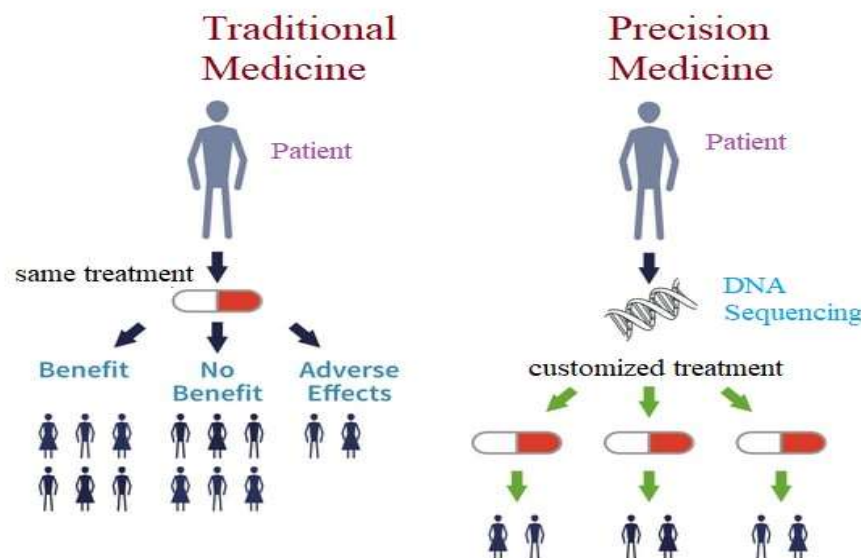
(Fig 1: Traditional Medicine vs Precision Medicine)

Artificial intelligence in Healthcare in India:

The usage of AI in Indian hospitals is gradually growing.In addition to global healthcare giants like Google, IBM, GE Healthcare, Siemens, and Philips, many Indian MedTech companies are using AI in medicine.According to the Economictimes, in our country, 55 out of 94 established companies received funding in the field of Oncology [7]. The Ministry of Health, Government of India has recognized AIIMS Delhi, PGIMER Chandigarh and AIIMS Rishikesh as Centre of Excellence for Artificial Intelligence to develop AI based healthcare solutions [8]. The following Indian companies are using AI in medicine. Sigtuple is a Bangalore based company that is developing AI-powered devices that can digitize both blood and urine. NIRAMAI Health Analytix is a Bangalore-based company that is doing extensive research on breast cancer. It has developed an AI-powered gadget to detect breast cancer much earlier.Tricog Health is a Bangalore based healthcare company, using AI in prediction, monitoring and treatment of cardiovascular diseases(CVD). Qure.ai is another AI based healthcare organization working on Chest X-ray interpretation tools for lung cancer patients. Aindra is a Bangalore based MedTech company that is using AI to build affordable healthcare solutions for early detection of Cervical Cancer. Perfint Healthcare, a TamilNadu based AI health care company developed AI-based machines for healthcare and working on non-invasive methods to detect cancer.UE Lifesciences, a Mumbai based company, provides AI-based, radiation-free devices for early cancer screening.HealthifyMe, an Indian HealthTech startup,has developed an AI (AI)-enabled nutritionist which can offer a personalized nutrition advice to the seekers.

Using AI in predictive analytics to prevent diseases:

Rapid development of genetic and molecular analysis techniques can push forward the progress of precision medicine. In developed countries, medical practitioners with technical knowledge are using DNA sequencing to identify the genetic mutations that are responsible for a given cancer. Biomarkers can forecast the patient's risk of disease or individuals' tendency to respond to the medicine.For example, in breast cancer treatment, the medication of Herceptine is widely used. But, those who have mutations in HER2 gene are naturally resistant to the medicine[9]. But molecular stratification of patients can help in effective

treatment.In cancer treatment, through research, it is proved that AI algorithms have the potential to detect breast cancer in mammogram images. Scientists developed a new model to predict 5-year breast cancer risk [10].In lung cancer detection, AI-powered algorithms help the physicians in early detection and staging of the cancer.In prostate cancer, AI algorithms assist in the risk assessment and predict if it is Benign or malignant [11]. AI algorithms can rapidly analyse the biopsy reports and scanned images and help in the early detection of head and neck cancers as well as throat and mouth cancers.

Obstacles in Using AI in Indian Healthcare:

Lack of awareness of AI in the undergraduate level of medical education is the major barrier to use AI in medicine [12]. In Korea, few universities are offering AI courses to medical students [13]. There are a number of major obstacles that need to be overcome for AI to integrate effectively into Indian healthcare systems [14].Getting organized and standard health care data that can be interpreted by machines is very difficult. So, there should be some standardized protocols to store, collect and organize datasets. Privacy and protection of data, integrity of data are other concerns of implementation. The data to be used to train the algorithms must represent the entire population, otherwise bias issues may arise. In our country, there is no centralized database to store digitized medical data.When using AI in Indian clinics, issues with algorithmic bias, data privacy, and the need of human judgment in clinical decision-making must be tackled [15].It is sometimes very difficult to the medical researchers to understand the molecular mechanisms of certain diseases [16].

Conclusion:

Personalized medicine has the potential to completely change the future of medical practice and research.Though AI algorithms may not diagnose all the patient diseases, they have the potential to analyse the CT, MRI and other inputs to offer valuable insights for diagnosis, more precisely than medical professionals.AI can also help to mitigate the lack of skilled medical professionals. In the near future, the awareness of PM will increase, as people are becoming more educated about this new revolution in the healthcare system, and ultimately the length of life will increase.

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