Research Article

Smart Healthcare: The Genesis of a New Era in Post-Pandemic Scenario

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Abstract— The expeditious development of high-end technologies including big data as well as machine learning works as a bridge among healthcare providers, patients, insurance agencies whereas the application will help Indian citizens in various aspects of healthcare segment by serving as a solution to all the problems associated with disease or disorder which will provide a good service to all the patients in every segment starting from diagnosis till post-treatment, insurance facilities and this application will educate the common people regarding upcoming diseases and make them aware of various health hazards by improving their quality of life. The ultra-modern technologies will provide better medical facilities to the required people whereas the application comprises remote patient monitoring, electronic health records, telemedicine, telehealth services, etc. The focus of the research serves to establish co-ordination, cooperation among the various healthcare providers to provide the best medical treatment to every user; application of artificial intelligence is required to carry healthcare personnel with several functions from administrative workflow to clinical documentation, patient outreach, specialized support in image analysis, medical device automation as well as patient monitoring. The methodology followed in the present research by developing an algorithm using patient's proximity to establishment, availability of medical practitioner and doctor, suitability and specific requirement of patient. Data from healthcare databases are taken using systematically sampling method and this data are recorded, analyzed and collaborated using Internet of Things & software such as Microsoft Azure, Cloud, RevX, Google machine learning, etc. The present research has concluded that an application must be developed with the integration of high-end technologies to connect several types of healthcare providers and establishments to facilitate every user irrespective of their caste, creed, financial background, etc. Thus, the research has also concluded that smart healthcare technologies possess the potential to transform healthcare industry by ameliorating patient care, efficiency and cost-effectiveness; through the integration of internet of things, wearable devices, AI, telemedicine healthcare can become more personalized, proactive, and accessible.

Keywords— Artificial Intelligence, Data analytics, Integrated Healthcare System, Healthcare Applications, Machine Learning, Medical Device Automation, Image Analysis, Remote Patient Monitoring, Mobile Health

1. Introduction

Smart healthcare is the integration of ultra-modern technologies (IoT, data analytics, artificial intelligence, etc) into healthcare sectors to ameliorate quality of patient care, enhance patient engagement, optimize operations, diminish medical errors, reduce the expenses of treatment, increase efficiency & effectiveness of the service (Sundaravadivel et al. 2017). Smart healthcare is a multi-level change (Tian, 2019) which will transform disease-centred care to a more patient-centered approach which will also be a metamorphosis from a focus on treatment to a focus on preventative care. Smart healthcare implies s human as well as non-human participants which comprises the following new technologies together with modern Biotechnology.

The foremost objective of Smart healthcare is to allow a seamless experience to the patients so that they do not suffer more from any kind of disease. Smart healthcare includes various innovations like Remote Patient Monitoring (RPM), Electronic Health Records (EHR), Mobile Health (mHealth) applications, Health Information Exchange (HIE), Telemedicine as well as Telehealth Services (TTS), etc. The unification of smart healthcare offers innumerable benefits for the patients and the healthcare sectors (Saifuzzaman and Ananna, 2023). An application must be developed to build coordination and cooperation among various healthcare providers for wrapping up on seamless treatment facilities available as per requirements. In this generation, 8 out of 10 people are suffering from some sort of illness. Out of these 8 people, 5 of them are suffering from critical illness, and out of these 5 people, 4 of them don't have access to the required facilities at the needed time, out of these 4 people 2 of them can't afford the treatment/diagnosis. Smart healthcare offers real-time monitoring and analysis to enhance patient care

because there be less chance of medical errors (Zeadally et al. 2020). This application will not only serve for the treatment purpose but also it will help in prophylaxis, diagnosis, mitigation, and post-treatment facilities. Currently, the total population of India is approximately 1.44 billion. Many people in India die due to some gap between the patients and healthcare sector professionals. The gap arises due to several reasons such as some people are dying due to misinterpretation of a laboratory report, negligence in treatment, misuse of time, blood loss, lack of knowledge regarding the disease and vaccination, unavailability of healthcare service at a particular healthcare centre charitable trust, etc. centre (hospital, nursing home, charitable trust etc).

1.1 Artificial Intelligence (AI): Application of AI and related technologies resurge in healthcare sector.

1.2 Machine learning: Neural networks as well as deep learning, imitation of intelligent human behaviour; computer algorithms ameliorate through experience. This key variety of AI typically be required for precision medicine. A neural network is a complex form of machine learning used to decipher whether a patient will evolve a particular disease based on weighing inputs, outputs and various features.

1.3 Physical robots: They execute tasks such as lifting, welding and deliver supplies in healthcare setting. Surgical robots can create incisions and stitch wounds and perform surgical procedures in gynaecologic, prostate, head as well as neck surgery.

1.4 Natural language processing (NLP): It concerns creating sense of human language and comprises usage such as speech recognition, text analysis as well as goals. Statistical and Semantic approaches are contemplated as two main approaches to NLP. Statistical NLP is based on machine learning and deep learning techniques have raised accuracy of recognition. In healthcare setting, NLP can be applied in concoction of classification and documentation of clinical information which can examine clinical notes and provide transcription.

1.5 Internet of Things (IoT): The IoT is considered as a complex system of wireless, connected digital devices that can collect, send, store data through a network in absence of manual or human-to-computer synergy (Kelly, 2020). IoT can assemble health-related data from individuals such as computing devices, mobile phones, smart bands and wearables, digital medications, implantable surgical devices etc. that can measure health care data and is connectable to the internet. It is anticipated that IoT will streamline healthcare delivery from diagnosis through treatment of monitoring of patients within and beyond healthcare setting.

1.6 Smart healthcare in the future: Technology will arrive to reinforce many facets of hospital care though there will still be a vital need for hands-on human care as well as empathy. Healthcare providers and patients can take benefit of many wearable devices in order to improve overall healthcare, including biosensors, smart thermometers, connected inhalers, smart watches, fitness trackers (FitBits), ECG monitors, blood pressure monitors etc. Wearable biosensors will be used to monitor patients and administer proactive care. These sensors are worn on the body and monitor vital health signs like temperature and heart rate to provide healthcare providers more insights on the progression of diseases, illnesses and overall health. These biosensors will help the world to track regarding the spread of COVID-19 by monitoring patients to detect symptoms and other signs of the virus. Medical staff could monitor patient data thanks to the devices and avoid unnecessary exposure.

1.7 Telehealth and Remote Care
People are now familiar with telehealth which becomes popular in post pandemic era. With the help of conferencing technology, providers could virtually treat patients over video call, provide prescriptions, and perform follow-up visits. Part of this virtual care was the use of medical portal technology to build secure online healthcare portals to help providers and patients to track treatment, store health records, collect and access data from wearable devices or clinic visits. While the use of telehealth and remote care became prevalent after the onset of the Covid pandemic, it is clear that both patients and practitioners have found benefits in the use of this technology and hospitals will continue to use it.

1.8 Connected Emergency Response Solutions
Connectivity can significantly improve efficiency and response times of emergency care in post pandemic scenario. With modern healthcare smart technology, it becomes feasible to share data between ambulances, physicians, first responders, emergency departments in less time that facilitates real-time responses. This technology enables faster communication, video calls with doctors from inside ambulances, quicker patient histories, easier hospital admittance with history and conditions already established. On arrival, doctors can already get patient data on-hand including vital signs.

1.9 Smart Hospital Management
Smart hospitals are going to play an incredibly relevant role in future of healthcare using sophisticated technologies such as AI, Internet of Things (IoT), telehealth. Smart hospital management can assist to enhance efficiency and effectiveness, improve patients' experience and assist doctors by linking digital systems to access details like bed occupancy, device usage, equipment status, materials, supply counts and other operational data. Tracking this information and making it use in decision-making can upgrade e resource management, reduce waste, assist hospital staff due to incorrect data collection.

2. Related Work

Khatib et al. (2023) stated that e-healthcare systems with the use of upgraded smart contracts and blockchain technology had brought continuous health monitoring, time-effective operations and cost-effectiveness in healthcare sector. Aziz (2021) stated that smart healthcare used internet of things, big data, cloud computing, artificial intelligence to transform

traditional medical system in an all-round way creating healthcare more efficient.

Tian et al. (2019) stated that smart healthcare used internet of things (IoTs), big data, artificial intelligence, cloud computing creating healthcare more convenient. Gazal et al. (2021) stated that how AI-powered IoT and WSNs were applied in healthcare sector.

Zedalli et al. (2019) stated that how IoT as well as big data technologies can be integrated with smart health to address few of the challenges to improve health-care availability.

Kshirsagar et al. (2020) explained several methods to assemble reliable patient checking framework so that social insurance experts could observe their patients which consisted of temperature sensor, accelerometer, gyrator, area locker (GPS), microcontroller (Raspberry Pi), programming (Raspbian, Disk imager). The patient's temperature, no of steps he/she strolls, area information, android application would show timing and sum for drinking water and alarm about the same.

Agrawal et al., (2024) explored the relevance of robotics in medical science; the integration of AI with robotics had led to the development of intelligent systems capable of analysing medical data and assisting in decision-making including surgery, rehabilitation, diagnosis, imaging and prosthetics.

Research Gap and Rationale for the Study
Currently, the total population of India is approximately 1.44 billion. Many people in India and overseas die due to the gap between the patients and the healthcare establishments & professionals. People are dying due to inadequate healthcare infrastructure mostly in urban areas, unconsolidated information about the healthcare industry, negligence in treatment, misuse of time, blood loss, misinterpretation in laboratory reports, lack of knowledge and awareness about medical attention & prevention, unavailability of healthcare service & facilities, insurance facilities, vaccinations, and lack of coordination between healthcare providers.

Objectives of the research
To conduct seamless operations in prophylaxis, diagnosis, treatment, and patient care, the following objectives are considered:
a) To maximize insured benefits and claim settlement ratio
b) To avail of cost-efficient operation with the best treatment facilities for every class of people
c) To minimize the time spent on an arrangement which reduces the risk of health obligations
d) Vigilance by feedback in a broader spectrum by regulatory authorities and government bodies to increase productivity and efficiency
e) To increase awareness on health, environment, pandemic, consumption & interaction of drugs, availability of healthcare facilities in local areas, and many more medical affairs.

Requirements of preparing an Application/ Website to create link between the healthcare sectors and citizens of India

Table 1: Requirements of preparing an application/ website

Primary Information
Patient's Name, Age, Location [Permanent + Current (GPS, NAVIC)], Aadhar number, contact number, Emergency contact number, Blood group, Existing insurance (if any), Existing government insurance scheme (if any), Employment insurance (if any), Current employment, Annual family income, Image of face, Biometrics, Birthmark, Height & Weight to understand patient and keep in databases of nearby healthcare providers.
Secondary Information
Current location (GPS, NAVIC), Current medication, Physical symptoms, Temperature, Previous medical prescriptions & reports(upload), Unusual observation, Image & Video to analyze the disease or disorder by AI Diagnosis.
Technical team, Equipment, Database & Servers
To create coordination between various healthcare providers and maintain harmony for seamless operation in patient diagnosis, treatment, and post-treatment care databases from various healthcare providers should be connected and analyzed to provide the best treatment facility with cost efficiency (Mansour et al. 2021). In fact, from prophylaxis and diagnosis to post-treatment care as well as maximizing insured benefit by health insurance, medical agencies, the banking sector, and government authorities, certain equipment, technology, and personnel with skillset are required to perform it seamlessly in a time & cost-efficient manner. To launch such applications based on healthcare services, several interfaces should be prepared for seamless operation as per their requirement of the situation, so that patients from various financial backgrounds must have options in a cost-efficient manner with the best treatment facility as per availability and specialty.

3. Methodology

The methodology followed in the present research is to develop an algorithm using patient's proximity to establishment, availability of medical practitioner and doctor, suitability and specific requirement of patient. Data from healthcare databases should be gathered using systematically sampling method and this data should be recorded, analyzed and collaborate using software, IoT and dedicated technical team in resemblance of healthcare industries to strengthen the current infrastructure.

3.1 Probable resources could be used to develop such algorithms are mentioned below:

Table 2: Probable Resources used to make such algorithm

Patients	Hospitals	Doctors	Laboratories & Path Labs	Local laboratories	Organ Bank	Pharmacies	Paramedical Personnel	Transportations	Insurance	National Insurance Company	Govt Bodies
	AIIMS	Specialized doctors (Domestic & Foreign)	Private laboratory Agencies (Apollo, Practo, etc.)	Private laboratory Agencies (Apollo, Practo, etc.)	Blood bank	Online pharmaceutical companies (Netmeds, Tata 1 mg, etc.) Hospital Pharmacies (Government & Private)	Nurses	Sample collectors	Government Insurances (ABHA, Swastha Sathi, etc.)	Life Insurance Corporation of India (LIC)	Ministry of Health & Family Welfare
	Army hospitals	Hospital doctors (Government & Private)	Hospital laboratories	Hospital laboratories	Stem cell bank	Community Pharmacies (incl. Jan Aushadi stores)	Paramedics	Ambulance (Government & Private)	Insurances provided by banks	Other insurance providers	Government of India (MoHFW GOI)
	Government hospitals (Central & State28)	Online doctors (Practo, etc.)	Online doctors (Practo, etc.)		Organ or tissue donors	Vaccine stores	Medical Equipment technicians	Organ transport	Health Insurance & Mediclaim Companies		Public Works Department, Government of STATE(s)
	Multispecialty hospitals										
	Nursing Homes										
	Healthcare Providers										
	Government Healthcare (Urban/Primary/Rural)										
	Foreign Hospitals (Specialized)										
	Ventures Hospitals (Semi Government)										

3.2 **Stages of Operation**

After Basic Diagnosis through the application, previous medical prescriptions, laboratory reports, and criticality of the patient, the application will be categorized into four stages.

Table 3: Stages of Operation

Mild	Moderate	Severe	Emergency
Prophylaxis and vaccination, Pyrexia, Skin disease, 1st-degree burn, infertility, private consultations & other diseases.	COPD, IVF, Transplants, Cancer, Diabetes, Animal bite, childbirth, unknown and other long-term diseases & disorders	Heart Attack, Appendix, Testicular Torsion, Minor accident cases, Gun-shot wound, Minor surgical procedures etc.	Mazor accident cases, Life-threatening serious injuries, battlefield severe injuries, Mass accident cases, natural calamity & disasters.

Table 4: Probable resources could be used to develop such algorithms

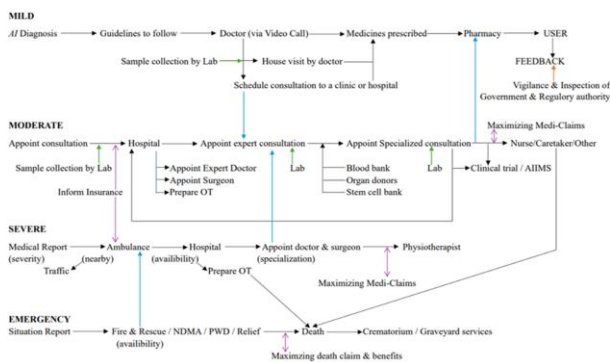| Software	OS	Server	Web server	Interface	Caching & Queuing	Protocol	Tools	Logging	Compliance
Microsoft Azure, Cloud, Infobip, RevX, Vecos, H2O AI, Google machine learning	Ubuntu	PHP	Nginx	Angular.js	Memcache	Thrift	Gits	Greylog 2	ABDM
Cloud		Python		Backbone.js	Elasticsearch	HTTP	Puppet	Sentry	
Infobip		Node			Amazon SQS				
RevX									
Vecos									
H2O AI									
Google machine learning									

Proposed Model

Figure 1: Operation of proposed model

4. Data Analysis and Interpretation

4.1 Implementation of Smart Healthcare in India

Implementing smart healthcare in India involves integrating innovative technologies and digital solutions to enhance healthcare delivery and accessibility across the country. India can transform its healthcare system into a smarter, more efficient, and patient-centered ecosystem that delivers quality care to all segments of the population.

4.2 **Key Strategies for smart healthcare implementation in India**

Telemedicine and Telehealth Services
Expand telemedicine services to reach remote and underserved areas, enabling people to consult healthcare professionals remotely using digital platforms
Electronic Health Records (EHR)
Implement EHR systems to maintain comprehensive and secure digital records of patient's medical history, diagnoses, medications, and treatment plans, facilitating better coordination of care among healthcare providers.
Integrated Healthcare System (IHS)
Well-established tie-ups and coordination between various healthcare providers make it easy for patients for hassle-free and seamless treatment procedures. It will also help in decision-making as per availability and requirements.
Mobile Health (mHealth) Applications
Develop and promote mobile health applications for preventive care, health monitoring, medication reminders, and access to health information, catering to the diverse healthcare needs of the population.
Wearable Devices
Wearable devices play a crucial role in smart healthcare, as they provide individuals with the ability to monitor their health and well-being in real time. These devices include smartwatches, fitness trackers, and smart clothing embedded with sensors. Wearables can track various health parameters, such as heart rate, sleep patterns, physical activity, and even stress levels (Ghazal et al. 2021). The collected data can be utilized to create personalized healthcare plans, prevent diseases, and improve overall wellness.
Health Information Exchange (HIE):
Establish interoperable systems for sharing health information among healthcare providers, ensuring seamless continuity of care and reducing duplication of tests and procedures.
Remote Patient Monitoring (RPM)
Deploy RPM technologies for monitoring patients' vital signs and health parameters remotely, particularly for chronic disease management and post-discharge care.
Artificial Intelligence (AI) and Data Analytics:
Leverage AI and data analytics to analyze healthcare data, identify patterns, predict disease outbreaks, optimize resource allocation, and personalize treatment plans, thereby improving clinical outcomes and efficiency.
Internet of Medical Things (IoMT)
Integrate IoMT devices such as wearable sensors and medical devices with healthcare systems to enable real-time monitoring, early detection of health issues, and proactive interventions.
Healthcare Infrastructure

Figure 1: Access to Healthcare Facilities in India

4.3 *Aspects of a Smart Hospital*
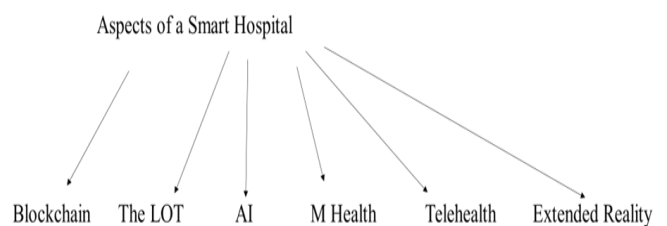
4.3.1 Blockchain

Blockchain technology introduces a layer of security and transparency to healthcare data management in smart hospitals which ensures the integrity of patient records through its decentralized and tamper-resistant nature, safeguarding against unauthorized access and data manipulation. Interoperability is enhanced as blockchain facilitates secure sharing of health information across disparate systems, promoting seamless collaboration. In supply chain management, blockchain is employed to trace the authenticity and distribution of pharmaceuticals and medical devices, ensuring transparency. Smart contracts, automated and secure agreements facilitated by blockchain, streamline processes like insurance claims and billing, reducing administrative complexities. Blockchain reinforces data security, interoperability, and efficiency, contributing to the trustworthy and streamlined operation of smart hospitals. Although, it's worth noting that HIPAA regulations also play a major role in data security among healthcare organizations (Abraham et al, 2017).

4.3.2 The IoT (The Internet of Things)

In the realm of smart hospitals and digital transformation in healthcare, the Internet of Things serves as a driving force and IoT streamlines hospital operations by optimizing asset tracking – ensuring medical equipment availability and functionality. Energy management is also improved, with IoT systems self-regulating energy consumption for cost-efficiency. Lastly, patient flow within the hospital is also enhanced as IoT-enabled systems track movements, minimizing wait times and improving overall operational efficiency. IoT forms the foundation for smart hospitals, fostering connectivity and data exchange for better patient care and operational excellence.

4.3.3 Artificial Intelligence (AI)

Artificial Intelligence stands at the forefront of innovation, and AI's capacity to analyse vast datasets expedites diagnostic processes aiding healthcare professionals in making accurate and timely decisions. This technology also powers predictive analytics that enable the identification of potential health risks, giving patients more preventative care options. On the patient-experience side of things, AI-driven chatbots and virtual assistants to enhance patient engagement, providing instant responses to queries, appointment scheduling, and very basic advisory ability. On the administrative front, AI automates tasks like billing, data entry, streamlining operations. This frees up precious time for the sake of healthcare providers and contributes to a more patient-centric healthcare premises. AI plays the role of the cognitive powerhouse here, augmenting healthcare capabilities and improving outcomes across the board. AI will be a major player in smart hospitals, but this technology can also help providers make more informed decisions and greatly improve patient care with proactive care predictions, quicker data analysis, and accelerated diagnosis. Using AI to diagnose certain diseases with test results can minimize the patients' waiting time.

4.3.4 Mobile Health (MHealth)

Mobile Health (MHealth) is a pillar when it comes to patient-centric care in smart hospitals. With the widespread popularity of smartphones, MHealth applications empower patients to diligently gets involved in their well-being. Remote patient monitoring emerges seamless as people can track health metrics and share real-time data with healthcare providers. Telehealth services also walk hand-in-hand with MHealth as the two facilitate one another. Health and wellness apps on mobile devices offer personalized fitness tracking, nutritional guidance, mental health support, promoting preventive care. MHealth allows patients to more easily manage their medication and prescriptions. By making certain aspects of healthcare more readily accessible, MHealth transforms healthcare into a personalized and accessible experience, extending beyond the hospital walls.

4.3.5 Telehealth

Telehealth, a key component of smart hospitals, redefines communication in healthcare through digital transformation. The main advantage of telehealth is the potential to conquer geographical hindrance, securing healthcare access to a wide population. Through video consultations and remote monitoring, telehealth enhances patient-physician interactions, facilitating timely interventions and reducing requirement for physical hospital visits. The cost efficiency of telehealth is evidenced by reduced travel expenses and optimum resource use. Telehealth can also benefit patients managing chronic disease through regular virtual check-ins, personalized care plans, and daily reminders. Additionally, telehealth serves a critical role in emergency situations, providing quick access to medical advice. Ultimately, telehealth fosters healthcare accessibility, efficiency beyond traditional healthcare settings.

4.3.6 Extended Reality (AR and VR)

AR as well as VR technologies offer immersive and innovative mixture in smart hospitals and in training the future of healthcare professionals. In medical training, AR laminates digital information onto real world, creating realistic simulations for surgical procedures as well as strengthening learning exposure. VR technology also furnishes a completely immersive environment, favourable for pain management during medical procedures and rehabilitation exercises. The visual and interactive nature of AR and VR technologies also largely aid in surgical planning, offering surgeons a detailed three-dimensional view. These technologies enhance professional education and contribute to patient care experiences by minimizing pain and improving engagement in rehab processes. AR and VR bring immersive experiences which strengthen medical operations, healthcare education, training as well as patient experience.

4.3.7 Smart Technology and Digital Transformation in Healthcare

The healthcare industry is in the midst of a total metamorphosis driven by smart technology and digital transformation. Smart tech and digital transformation in healthcare are paving the way into the future and flipping the whole game on its head. With monitoring, elevated

accessibility and a wider variety of treatment options available, physicians can use AI-powered data analysis, smart monitors, and other innovative tools and technologies that promote a more proactive, data-driven approach to healthcare. Taking a more proactive, preventative, and data-driven approach to healthcare services will translate to real lives being extricated every single day.

4.3.8 Benefits of Smart Healthcare Technologies
The integration of smart healthcare technologies contributes significant advantages for patients, healthcare providers, and society as a whole which include improved patient outcomes, enhanced patient engagement and empowerment, streamlined healthcare processes, reduced medical errors, cost savings through preventive care, and better allocation of resources (Lee and Yoon, 2021; Kelly et al. 2020). Smart healthcare technologies also have the potential to convert healthcare delivery by shifting from reactive to proactive care models.

5. Access to Healthcare Facilities in India
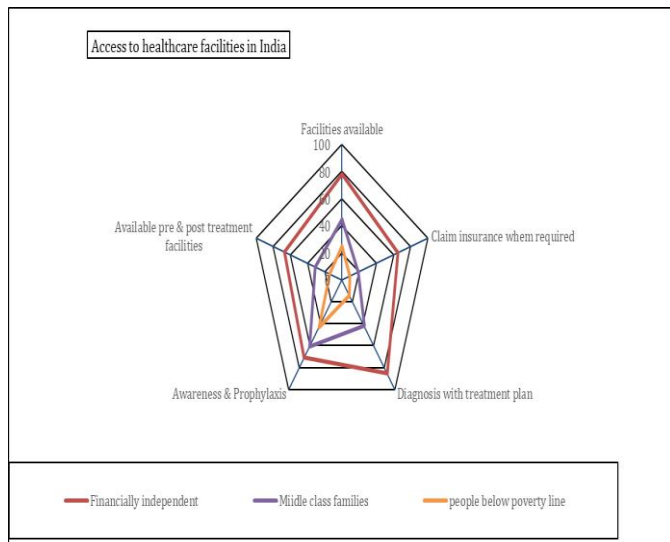
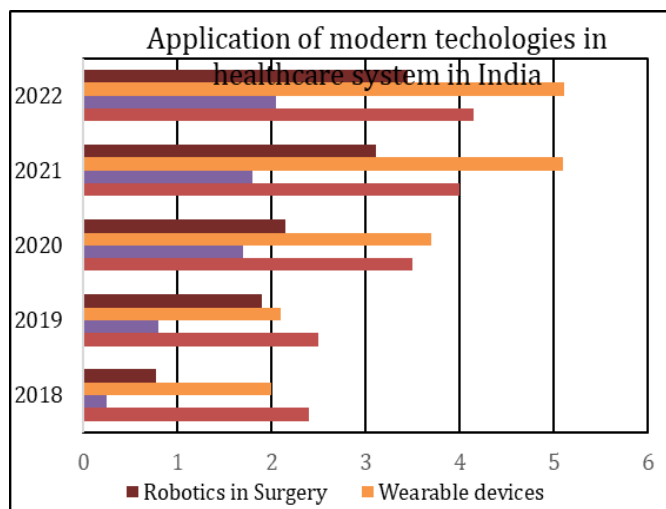Figure 2: Access to Healthcare Facilities in India

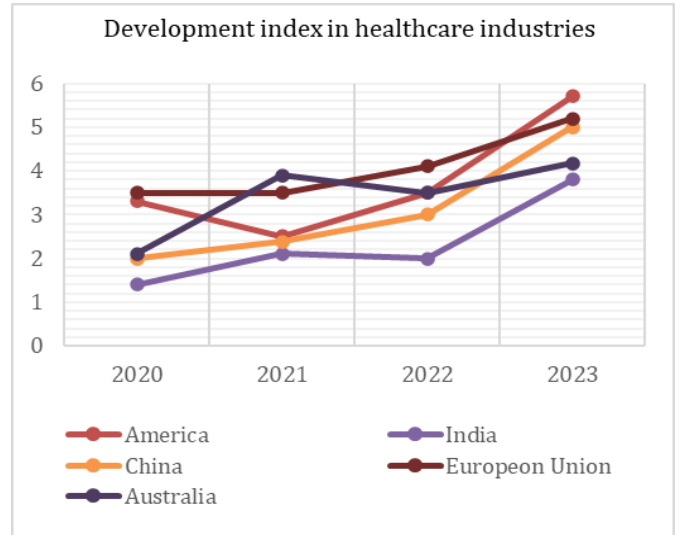Figure 3: Application of Modern Technologies in Healthcare System in India

Figure 4: Development Index in Healthcare Industries
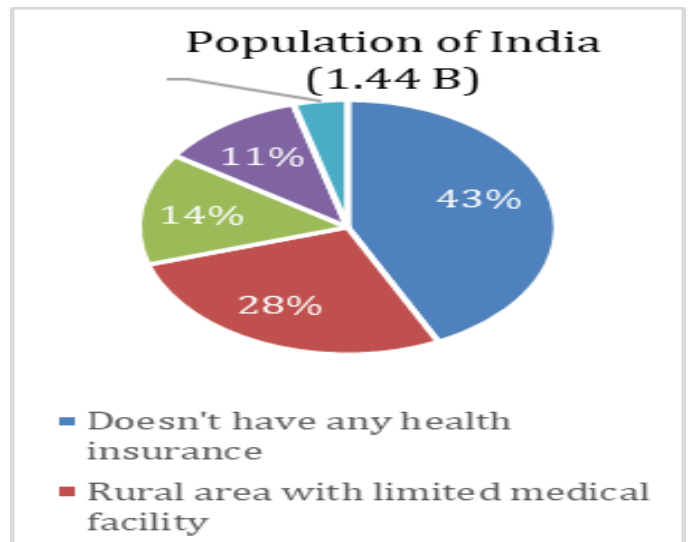
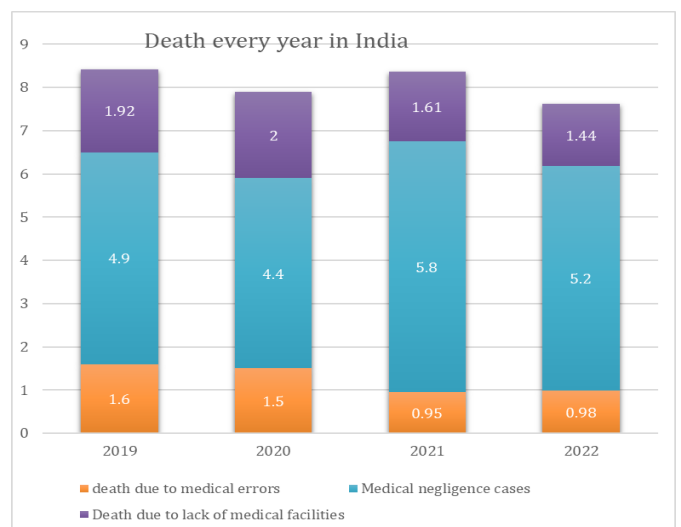5. Healthcare Facilities in India

Figure 5: Population of India

Figure 6: Death every year in India

6. Conclusion and Future Scope

Smart healthcare technologies possess the potential to revolutionize healthcare industry, ameliorating patient care, efficiency, cost-effectiveness. Through the integration of IoT, wearable devices, AI, telemedicine, and big data analytics, healthcare can become more personalized, proactive, and accessible. Despite the challenges the future of smart healthcare focusses promising, as technology continues to transform the way healthcare is delivered. The present research has concluded that an application must be developed with the integration of high-end technologies to connect several types of healthcare providers and establishments to facilitate every user irrespective of their caste, creed, financial background, etc. Thus, the research has also concluded that smart healthcare technologies must possess the required potential to revolutionize healthcare industry by improving patient care, efficiency and cost-effectiveness through the integration of internet of things, wearable devices, artificial intelligence, telemedicine; With Big data analytics, healthcare can become more personalized, proactive, and accessible.

7. Limitations

While smart healthcare technologies offer great promise, challenges need to be addressed which incorporate data privacy and security concerns, interoperability issues between various devices and systems, regulatory compliance, the digital divide, which may limit access to technology for some populations. Healthcare organizations and policymakers need to address these challenges to ensure the successful implementation and adoption of smart healthcare technologies such as data privacy and security concerns, interoperability issues between various devices and systems, regulatory compliance, the digital divide which may limit access to technology for some populations, healthcare organizations and policymakers need to address challenges to ensure successful implementation and adoption of smart healthcare technologies.

Data Availability
The most indispensable aspect of life is health and in recent times, advanced healthcare systems have gained immense popularity by providing excellent services to both the patients and hospital staffs where as traditional healthcare systems become incompetent to accomplish the necessity of all humans as it is not always affordable and accessible to everyone.

Conflict of Interest
Three authors possess no conflicts of interest to declare and the contents of the manuscript is actually the outcome of original research work.

Funding Source
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Authors' Contributions
Author-1: Initiation of the concept, conceived the study, data analysis.

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AUTHORS PROFILE

Mr. Meghdip Haldar is a Category 'A' pharmacist registered with the West Bengal Pharmacy Council, possessing specialized expertise in drug design, QSAR modeling, and chromatographic techniques. His unique blend of technical and managerial skills enables him to navigate the critical intersection of NABH, IPSG and quality standards, with a focus on healthcare management, hospital administration, and operational excellence. As a seasoned professional, Mr. Haldar brings a distinctive combination of scientific acumen and administrative expertise to drive innovation as well as improvement in healthcare operations and management.

Mr. Sudip Bhowmick is a Category 'A' pharmacist registered with the West Bengal Pharmacy Council, with expertise in drug design and chromatographic techniques. Beyond his technical proficiency, Mr. Bhowmick's work delves into the dynamic convergence of marketing and sales within business administration, leveraging his scientific excellence to propel solutions in retail and daily commerce as well as aims to deliver value to customers and stakeholders alike.

Dr. Moumita Chatterjee is associated as faculty, Department of Management, Sister Nivedita University, Kolkata. She is MSc, MBA, UGC NET, PhD. She is the writer in Eastern herald.