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BLOCKCHAIN IN INDIAN HEALTHCARE DATA SECURITY: A BRIEF REVIEW

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***Abstract*:** As India experiences rapid advancements in healthcare digitization, the need for secure and efficient medical data management solutions becomes paramount. This research article presents a comprehensive review of the applications, challenges, and future prospects of blockchain technology in the context of medical data management in India. Examining the unique challenges and opportunities within the Indian healthcare landscape, this article explores the potential of blockchain to revolutionize data security, interoperability, and patient-centric healthcare delivery.

Keywords: Electronic Health Records, Blockchain, IOMT,Challenges,Remote Monitoring Devices

1.Introduction:

The Internet of Medical Things (IoMT) has the important role improve healthcare in India by increasing access to medical information and services, reducing costs, and improving the quality of care. Examples of IoMT applications in healthcare include remote patient monitoring, telemedicine, and electronic medical records.The adoption of Electronic Health Records (EHRs) in India marks a significant leap towards modernizing healthcare practices, streamlining patient care, and improving overall healthcare outcomes. The Indian healthcare sector is witnessing a transformative shift towards digitalization, with electronic health records (EHRs) and telemedicine gaining prominence[1]. However, the centralized nature of existing data management systems poses challenges related to security, privacy, and data integrity. Block chain technology emerges as a promising solution to address these concerns and elevate the standard of medical data management in India.

2.IoMT rapidly changing India's healthcare sector:

The Internet of Medical Things (IoMT) is a symbol of the steady progress made in the global medical field. It has enabled healthcare providers to deliver more efficient, the ability to remotely monitor their own health. After COVID-19, this has proven to be the most potent way to make healthcare accessible to patients while also ensuring the safety of healthcare providers. IoMT platform is enabled by using various types of sensors devices that are used in the medical field that are connected to the server using different technologies like WIFI, Bluetooth etc. [2].One of the most important advantage of IoMT is utilization of resources and infrastructure is optimal. Capsule Endoscopy, Continuous Glucose Monitoring ,Diagnosis of sleep Apnoea, Smart contact Lenses and Ingestible Pills are the best examples for the IoMT.

The use of remote monitoring devices, wearables and even telemedicine kiosks hold much potential in expanding care access to low-resource settings in India.

Fig 1. **Remote monitoring devices**

3.Healthcare Landscape in India:

Briefly outlining the current state of healthcare in India, including the diversity of healthcare providers, the prevalence of electronic health records, and the challenges associated with data sharing and interoperability.

Healthcare providers face challenges in terms of maintaining data immutability and privacy, with respect to data sharing with relevant stakeholders. Different healthcare institutions use different models and their own set of codes, which also makes it hard to achieve interoperability. This issue is further escalated when patients change their service providers due to unforeseen reasons. Patients are forced to redo their medical tests and treatment processes, which adds to the overhead costs and also to their frustration. This can be addressed to a major extent through the use of Blockchain technology. Israa Abu-Elezz et al. explored Blockchain emerges as a promising technology to enhance the healthcare data sharing and storage system, leveraging its decentralization, immutability, transparency, and traceability attributes. Despite these advantages, numerous healthcare organizations hesitate to embrace blockchain due to concerns like security and authorization issues, interoperability challenges, and a shortage of technical expertise in blockchain technology[3].

4.Blockchain Technology Overview:

A Blockchain is a distributed and immutable ledger. **There are 4 types of blockchain:** Public Blockchain , Private Blockchain, Hybrid Blockchain and Consortium Blockchain. Blockchain technology has emerged as a promising solution for secure and decentralized data transfer in the healthcare industry [4][5].. The use of blockchain in medical data transfer addresses the security and privacy concerns associated with centralized storage and sharing of electronic health records (EHRs) [4]. By design, blockchain ensures the integrity and immutability of data, making it practically impossible to tamper with [4]. Additionally, blockchain supports pseudonymity, which enhances patient privacy by allowing them to control access to their data [4].

Blockchain-based approaches for medical data transfer leverage the decentralized nature of blockchain to enable secure and reliable exchange of data fig 2 [4][5].

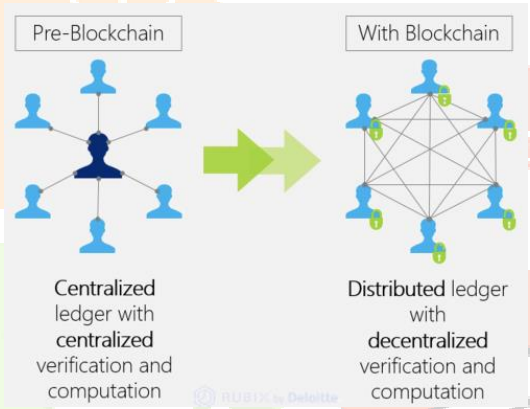

Fig2.Blockchain structure

5.Applications of Block chain in Indian Medical Data Management:

5.1. Patient Empowerment :

Due to low digital literacy and nearly 60% of Indians living in rural areas still do not regularly use the internet. the majore problem of accessing digital health services is Lack of proper digital literacy is thus a major hindrance for such people, prohibiting them from that usage. Individuals should contribute by supporting healthcare NGOs, advocating for improved healthcare policies and raising awareness about the importance of the use of cutting edge technology like artificial Intelligence, Machine Learning and Block chain in rural areas.

Blockchain can empower Indian patients by giving them control over their health data, ensuring privacy, and enabling seamless sharing of information with healthcare providers.

5.2. Government Healthcare Initiatives:

The Ministry of Health and Family Welfare constituted a committee headed by Shri J. Satyanarayana to develop an implementation framework for the National Health Stack. The National Digital Health Blueprint (NDHB) introduced by the ministry of health and family welfare committee it describes the building blocks and an action plan to comprehensively and holistically implement digital health. The NDHB establish strengthen the accessibility and equity of health services, including continuum of care with citizen as the owner of data, in a holistic healthcare programme approach leveraging IT & associated technologies and support the existing health systems in a 'citizen-centric' approach.[1]

There is lot of transformation in India's healthcare sector through Technology . Ayushman Bharat, digitization of health records and Mission Indradhanush are the wonderful schemes developed by the government's renewed focus to achieve universal healthcare through the healthcare system in the country will be largely defined by technological advancements and digitally enabled care.

Analyzing the potential for integrating blockchain into government healthcare initiatives in India, such as Ayushman Bharat, to enhance data security, reduce fraud, and streamline the delivery of healthcare services.

5.2.1.Ayushman Bharat Digital Mission:

National Health Authority (NHA) Is The Apex Body Responsible For Implementing India's Flagship Public Health Insurance/Assurance Scheme Called "Ayushman Bharat Digital Mission (ABDM).

The Ayushman Bharat Digital Mission (ABDM) aims to develop the necessary to support the integrated digital health infrastructure of the country. It is working like a bridge among different stakeholders of Healthcare ecosystem through digital highways.

5.3. Pharmaceutical Supply Chain:

Blockchain can improve the transparency and traceability of the pharmaceutical supply chain in India, addressing issues related to counterfeit drugs and ensuring the authenticity of medications. Amit Kumar Yadav et al. proposed Low- and Middle-Income countries (LMIC) like India have several issues with their regular immunization programs, i.e., frequent stock-outs, vaccine spoilage due to temperature variation and mishandling, huge workers need for continuous surveillance, etc.; it becomes worse when mass vaccination for pandemics as well as regular immunization programs run simultaneously. IoT and blockchain's advancement to make vaccine supply chains (VSC) more transparent and efficient by addressing the challenges of VSC in the Indian context.[6]

Fig3.Pharmaceutical Supply Chain

6.Benefits and Challenges in the Indian Context:

6.1. Benefits:

Highlighting the specific benefits that blockchain can bring to the Indian healthcare system, including improved data security, enhanced interoperability, and increased efficiency in healthcare delivery.Blockchain in India's healthcare enhances data security, transparency, and patient control. It streamlines processes, improves supply chain management, and prevents fraud. Regulatory and technical challenges need addressing for widespread adoption. Blockchain is an trending technology useful to provide innovative solutions in various sectors, including healthcare. In healthcare, a block chain network is useful to patient data store securly and exchange patient data securly. Blockchain application used to accurately identify serious mistakes and even dangerous ones in the medical field. Blockchain plays a decisive part in handling deception in clinical trials for better healthcare outcomes.[7]

6.2. Challenges:

Identifying challenges unique to the Indian context, such as the need for tailored regulatory frameworks, infrastructure limitations, and the necessity for widespread awareness and education about block chain technology.[3]. S. Dhingra et al proposed The Indian Government shall provide suitable standards and regulations for the use of Blockchain Technology. The ambiguities in the rules and regulations makes Blockchain Technology use in healthcare waste management a difficult task[8]

According to Best worst method (BWM), Sarthak Dhingra et al. classified the challenges of BlockchainTechnology in india.fig 4.[8].

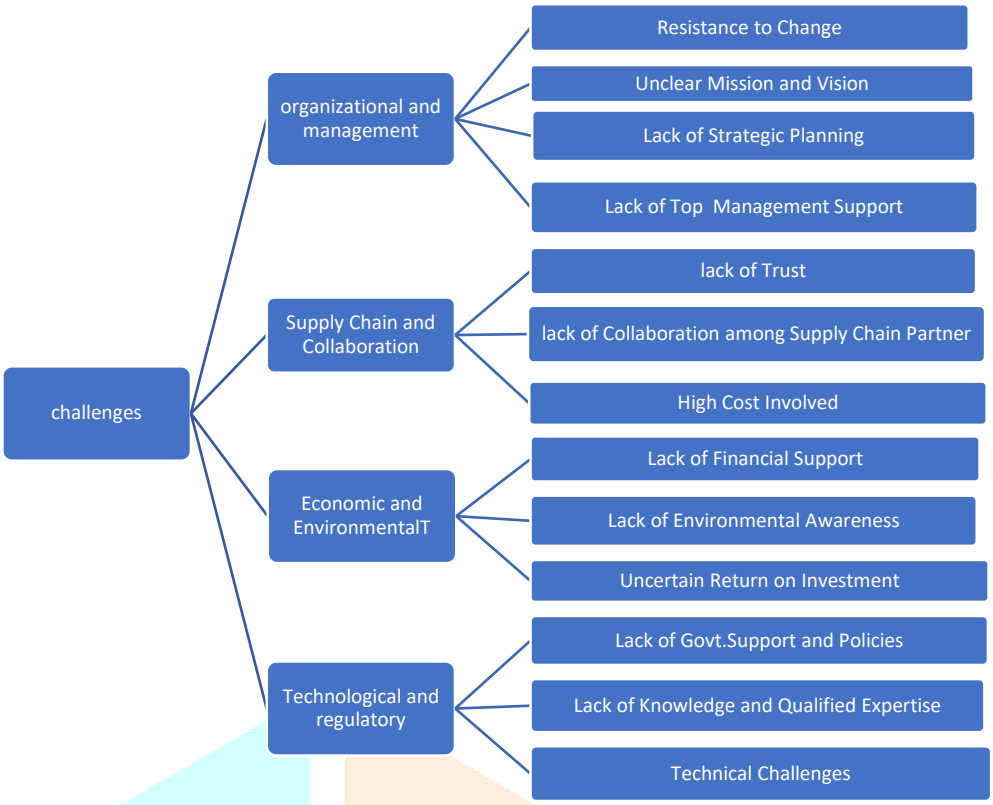

fig 4.Challenges and Sub Challenges

7.Regulatory Landscape:

Reviewing the current regulatory landscape in India concerning the implementation of block chain in healthcare and discussing potential regulatory frameworks that may facilitate its adoption. The healthcare industry plays an important role in the growth of our nation's economy and progress. Regulatory challenges is the top-ranked compare to all challenges. The Indian Government shall provide suitable standards and regulations for the use of Blockchain Technology[8].Sarthak Dhingra et al.supported The results indicated that the Indian healthcare waste management system is not yet prepared to implement Blockchain Technology widely.

8. Future Prospects and Recommendations:

Discussing the future prospects of block chain technology in Indian medical data management and providing recommendations for overcoming challenges and fostering collaboration between the healthcare and technology sectors. Rosanna Spanò et al. proposed the Prioritizing businesses backed by seasoned investors helps mitigate disruptions stemming from short-term investments and occasional frauds associated with blockchain endeavors,to identifies four distinct strategies for value generation: intrinsic hedonistic value, public-private conflict resolution, utilitarian/instrumental value, and social value[11]. In future healthcare there is a massive opportunity for the blockchain revolution so our Government should support blockchain platforms and projects that are active in the Indian market to get insights into the smart contracts being developed and deployed.Government should be increase the funds to improve and strengthen healthcare.Educate the uses of healthcare smart contracts.Public and Private partnerships can help to achieve goal of implement Blockchain Technology. Future work can include Blockchain Technology's potential to meet sustainability requirements in hospital management.

9.Conclusion:

Concluding the comprehensive review by emphasizing the transformative potential of block chain technology in Indian healthcare. Emphasizing the need for continued research, collaboration, and regulatory support to fully realize the benefits of block chain in improving medical data management in India. This paper utilizes the advantages of blockchain technolgy. There is lot of transformation in India's healthcare sector through Technology .still some of the area technically it has to be addressed and for that more research have to comeup the areas are open for the research also and need support from the government in implementing the block chain system drastically in maximum area. some vulnerability is also there when installing the system it has to be addressed proper security measures. This study used to analyse the challenges of block chain implementation in india.

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