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BLOCKCHAIN BASED DATA ANALYSIS OF COVID-19 VARIANTS AND VACCINES

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Abstract: The spread of the ‘COVID-19’ (coronavirus) pandemic has caused a host of problems around the world, and it continues to pose a global threat. The world is currently experiencing a coronavirus epidemic that has spread to practically every country on the planet. In such situations, it is critical to disseminate information faster than the diseases themselves spread. This research focuses on data analysis of several Covid19 variations and the efficacy of various vaccinations. In the realm of epidemic intelligence, the advent of the information age has shown to be effective. The use of block chain technology (BT) in data analysis is critical for effectively managing the COVID-19 epidemic. To tackle the epidemic, we suggest a block chain-based data analysis. Decentralization, transparency, and immutability are just a few of the qualities of block chain technology that can help contain the pandemic by recognizing breakouts and symptoms early on. Following immunization against the initial strain of COVID-19, the body's ability to harness numerous components of the immune system continues to provide effective resistance against multiple variations.

Index Terms - Block chain, COVID-19, Variants, Vaccines.

I. INTRODUCTION

In 1991 the term “block chain” was used for the first time. The technology was adopted and recreated by Satoshi Nakamoto. Nakamoto developed the first crypto-currency in 2008 based on the Bitcoin “block chain”.

1.1 Block chain Technology

A “block chain” is a block network, in which unique information is safely and authentically grouped into a network. This is, “block chain” is a mix of interconnected computers rather than a central server, meaning the entire network is decentralized. Block chain is a connected list of records. Data, previous data block, and root block are the three primary components of every “block chain”. Transaction is communicating with these 3 blocks.

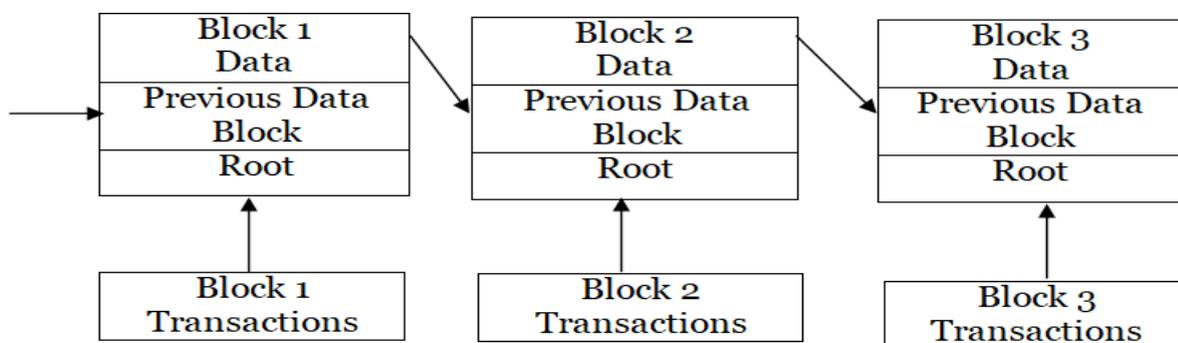


Figure 1: A Block Diagram

Decentralization is the main concept of “blockchain” and a well-known technological platform behind Bitcoin. Its database is not centrally located and it’s distributed across the network. This decentralized definition gives high strength and safety to the database stored in the “blockchain” and ensures immutability, privateness, protection, and transparency. No central authority to verify and confirm transactions, all “Blockchain” transactions is fully secure, checked and accessible to all network users. This enables a set of orders, called consensus, to ensure agreement between all members about status of “blockchain” ledger.

Blockchain have 3 types as public, private and federated whereas this research will be based on federated approach

- Public “blockchain” - permissionless. As a new user, anyone can sign up. This is where Bitcoin and Ethereum fit in. Every node has the ability to send and read transactions without requiring any permission. The public is welcome to attend Consensus.
- Private “Blockchain” - permissioned. The transaction can only be viewed or written by the entity that owns the blockchain network.
- Federated / Consortium “blockchain” – partial permission. A hybrid integration of public and private blockchains. Permission to read or send may be made public or restricted to a small number of authorized nodes.

1.2 Consensus Algorithm

Consensus algorithms are a method in which a group takes decisions. A public “Blockchain” technology can be used to make this study effective and accessible to everyone and anyone can join in the world. It changes transactions and partners in the consensus system. Public “blockchain” applications include Bitcoin. A member must be permission using a validation mechanism.

A ‘consensus’ algorithm is a method for all peers in a "Blockchain" network to agree on the state of the distributed ledger at any given time. In a distributed computing environment, 'consensus' methods provide durability to "blockchain" networks and create confidence among unknown peers. In other words, the consensus method ensures that each new block added to the "Blockchain" is the only version of the truth agreed upon by all "Blockchain" nodes.

The blockchain's 'consensus' protocol serves a number of purposes, including 'consensus,' collaboration, and cooperation, as well as equal rights for all nodes and each node's mandatory participation in the 'consensus' process. As a result, a 'consensus' algorithm looks for a point of agreement that is good for the whole network. We can write anything in data node that satisfies some rules. Once the data is accepted then we can access these data. If we delete any data on hash then we can't add that data again.

The main two consensus algorithms which are used to study about COVID-19 blockade and to find an effective vaccine are, Proof of Work (PoW) and Proof of Stake (PoS)

Users produce transactions, which PoW records and maintains, guaranteeing that the mining process is conducted in a uniform manner. Nodes with a strong computing competence can join the mining process. The process of transacting a block down the chain should not be controlled by a single organization, and each block should be managed equally by all members to avoid the possibility of security concerns with "consensus" algorithms. The PoW algorithm is Bitcoin's primary consensus mechanism for transaction management. Nodes with powerful processing capabilities can take part in the mining process and compete to be the first to verify a block. The winner may receive a certain quantity of currency as a prize for its mining efforts.

This technique, however, has significant drawbacks, including inefficiency, latency, and vulnerability to security attacks. To address these issues, a new consensus technique known as proof of stake has been devised, this allows for consensus to be reached by proving stake ownership. Having these two algorithms together will achieve the goal of having a blockchain platform for vaccine development.

Leaders in PoS are chosen based on the amount of stakes they have. With the stake-based leader selection process, the probability of it is no longer possible for a node to be chosen as a leader. Dependent by its processing power, resulting in a significant reduction in PoS process energy consumption. Because each cycle of PoS approaches only creates one block, block creation and transaction confirmation times are usually much faster. To authorize the addition of the addition of a new block to the “blockchain”, the Proof of Stake (PoS) technique is utilized.

In healthcare, In terms of data security, safe data management, and transparent medical data storage, blockchain has showed promise. Many healthcare systems have implemented blockchain technologies to increase patient data privacy, device interoperability, and preserve an immutable decentralized database of medical records. Therefore, it is possible to provide a platform to discover a vaccine or medicine for corona virus like pandemic as early as possible.

1.3 Healthcare System

A healthcare system is a method of financing, organising, and delivering healthcare to a community. It covers concerns like as who has access to what services and when, as well as healthcare staff and facility expenditures and resources. Given a society's resources and competing needs, the purpose of the healthcare system is to improve people's health as efficiently as feasible. By the turn of the 21st century, most countries and the United Nations had come to regard healthcare as a distinct benefit that is required either as a matter of or by basic human rights. As a result, a comparison of healthcare systems must consider how each system satisfies shared values.

The extent and application environment are influenced by a variety of factors, including a populations or nation's unique culture and history. The level of development, culture and societal values of a country can all influence what is deemed healthcare. Some populations place a greater emphasis on disease prevention, while others place a greater emphasis on the treatment or cure of certain disorders. The accepted health professional, as well as the definitions of health and disease, are culturally different.

The second important impact says that "until a court of values is willing to share its expertise, there is no way to discover inequalities among the Holy Trinity of cost, quality, and access." Respect for both patients' and providers' autonomy, benefit maximisation, and the promotion of justice or fairness, as defined by equality or liberty, are among these values.

The number of financial resources available is a third factor that determines the form of a healthcare system. Economic resources measured by per capita GDP and healthcare expenditures measured by the percentage of a country's GDP spent on healthcare have a strong positive relationship. While healthcare is important in general, countries and people may place a higher priority on food, shelter, and, in some situations, military spending. Although a country's economic resources have a significant impact on its overall healthcare spending, in economically destitute countries, there is nearly as much variation in healthcare systems as there is in prosperous countries.

According to the 'World Health Organization,' a health system is comprised of all organisations, individuals, and actions whose primary objective is to promote, restore, or maintain health. Programs aimed at altering health factors as well as more direct measures aimed at enhancing health are included.

Figure 2 depicts the many organizations with which you will be collaborating. You'll need to know about hospital systems, forms of care, and the functions of each member of the healthcare team as you work with them. You'll need to know about different types of insurance, how to support uninsured patients, and how to preserve patient rights and privacy when working with patients. You should also be aware of community resources and how patients could make use of them.

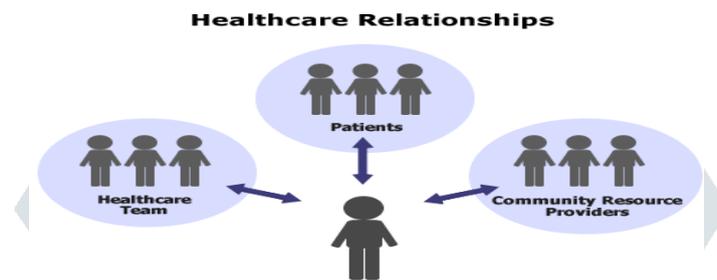


Figure 2: Healthcare Relationships

1.4 COVID -19

Corona virus is an infectious ailment this is due to a newly located corona virus. The "COVID-19" virus is transmitted via way of means of coughing or wheezing through spit beads or nasal discharges, in widespread from an inflamed individual. Many human beings with contamination with the "COVID-19" virus have slight respiration infection and get better without unique treatment.

'COVID-19' is a scary terrible catastrophe that haunts mankind. No one has been able to trace the origin or spread of this virus. It is very clear that this virus is spreading rapidly without any segregation in caste, creed, color, race and gender. Coronavirus illness is an infectious disease caused by the 'SARs-Cov-2' virus, which was recently found. The 'World Health Organization' declared 'COVID-19' a pandemic on March 11, 2020.

COVID 19 symptoms differ from one person to the next, however the following are the most common: A fever is characterized by a high temperature, a dry cough, and tiredness. Aches and pains, diarrhoea, conjunctivitis, headache, loss of taste or smell, skin rash, and discoloration of fingers or toes are some of the less common symptoms. Breathing difficulties, chest pain or pressure, and speech or mobility difficulties are all common signs and symptoms.

Elderly human beings and people with scientific troubles like coronary heart ailment, diabetes, continual lung ailment and most cancers are at extra chance for severe infection. One of the best ways to avoid and delay the spread is to become conscious of the "COVID-19" virus. Nobody knows its cause and how it spreads and from where it comes. No one has traced the origins of Covid-19. Washing your hands or using a sanitizer frequently and not touching your face will keep you and others away from infection and useful for protect themselves. There are currently no clear "COVID-19" vaccines or therapies in operation. There are several clinical trials under way to test potential therapies.

1.5 COVID-19: Variants

Viruses, such as the 'SARS-CoV-2' strain, develop over time and will continue to do so as they propagate. Virus variants might appear at any time. A variant is a virus that differs in at least one manner from the original virus.

DELTA andOMICRON coronaviruses, for example, are more easily spread between people. When alterations in genetic mutations arise during the replication of the genome, viruses like 'SARS-CoV-2' evolve over time. A lineage is a genetically related group of virus variants that have a common ancestor. A 'SARS-CoV-2' virus variant is distinguished from other 'SARS-CoV-2' virus variants by one or more mutations. Several strains of 'SARS-CoV-2' have been detected in the United States and around the world throughout the epidemic, as expected. In order to inform local epidemic investigations and comprehend national patterns, scientists investigate biological variations across viruses to uncover variants and how they are connected to one another.

COVID-19 is caused by a virus that is constantly developing, with additional variants expected to arise in the future. On a regular basis, new kinds emerge and then go away. At other times, new varieties emerge. Multiple strains of the virus that causes 'COVID-19' are being tracked in the United States and around the world during this epidemic. Alpha, Beta, Gamma, Epsilon, Eta, Iota, Kappa, Mu, Zeta, Delta, and Omicron are some of the variations.

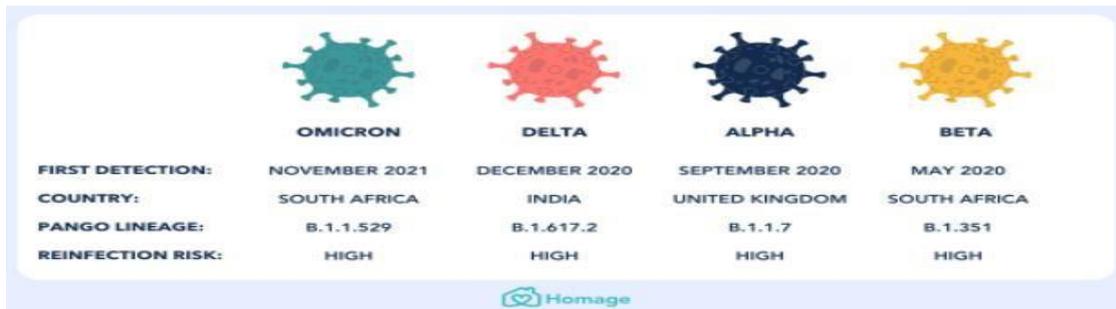


Figure 3: COVID-19 Variants

How Variants Work

Like a tree, a virus grows and branches out, each branch being somewhat different from the others. By examining the differences between the branches, scientists can categorise them. These tiny alterations, or variations, have been examined and recognised since the beginning of the epidemic. Some alterations let the virus propagate more easily or make it resistant to treatments and vaccines. Those distinctions must be kept in mind.

How Variants Change

The virus will have more chances to develop as it spreads, making it more difficult to eradicate. To track these changes, physical characteristics such as treatment resistance or genetic code changes (mutations) from one version to the next might be used.

By evaluating each variety and knowing these features, Scientists can track and forecast which variants are more dangerous than others. This information can be used by scientists to trace the distribution of a variant.

We know we can protect from the virus and its new variants by:

- Getting vaccinated when it's your turn to be vaccinated
- Keeping a safe distance
- Opening windows when possible
- Wearing a mask
- Covering coughs and sneezes
- Keeping hands clean

1.6 COVID-19 Vaccines

If the COVID-19 pandemic is to be halted, equal access to safe and effective vaccines is critical, therefore seeing so many vaccines being tested and manufactured is really encouraging. WHO and its partners are always working to find safe and effective vaccines to research, manufacture, and distribute.

Safe and effective vaccines are a game-changing tool, but for the time being, we must continue to wear masks, wash our hands, maintain proper indoor ventilation, and keep a safe distance from people.

Vaccination does not absolve us from exercising caution and putting ourselves and others at risk, especially since research into the extent to which vaccines protect against disease, infection, and transmission is still ongoing.

‘COVID-19’ vaccine candidates are updated twice a week with the most recent information on vaccines in clinical and pre-clinical research. The number of vaccination doses given around the world is also shown on the WHO’s ‘COVID-19’ dashboard, which is updated on a daily basis, with more information available on the dedicated ‘COVID-19’ vaccination dashboard.

Immunization, not vaccinations, will, however, put an end to the epidemic. We need to make sure that vaccines are delivered fairly and equally to all countries, and that each country receives and can use vaccines to protect its inhabitants, starting with the most vulnerable.

Table 1: COVID-19 Vaccine Comparison

	TYPE	PROTECTION	APPROVAL	AGE GROUPS	DOSAGE	BOOSTER
Pfizer / BioNTech	mRNA	95.6% (3 doses)	WHO, FDA, EMA	5 years and up	2 doses (21 days apart)	5-6 months, Pfizer
Moderna	mRNA	93%	WHO, FDA, EMA	Adults (FDA) 6 and up (EMA)	2 doses (28 days apart)	5-6 months, Moderna
Oxford / AstraZeneca	Vector	76%	WHO, EMA	Adults	2 doses (8-12 weeks apart)	4-6 months, Pfizer or Moderna
Sputnik V	Vector	92%	Other	Adults	2 doses (21 days apart)	TBD
Johnson & Johnson	Vector	66%	WHO, FDA, EMA	Adults	1 dose	2 months, Pfizer or Moderna
Sinopharm	Inactivated	79%	WHO	Adults (WHO) 3 and up (other)	2 doses (21 days apart)	Protein-based booster
Coronovac / Sinovac	Inactivated	51%	WHO	Adults (WHO) 3 and up (other)	2 doses (14 days apart)	Mix and Match
Covishield	Vector	62%	WHO	Adults	2 doses (8-12 weeks apart)	Covishield
Covaxin	Inactivated	77.8%	WHO	Adults	2 doses (28 days apart)	Covaxin
Novavax	Subunit	90.4%	WHO, EMA	Adults	2 doses (3-4 weeks apart)	Novavax

*Data is based on information available in media
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II. Related Work

Pneumonia cases of unknown cause were reported in Wuhan, China, in December 2019. The causative factor was known as a novel corona virus that was originally referred to as '2019-nCoV' and was renamed 'SARS-CoV-2'. This lung-related disease, "COVID-19", is increasingly spreading from human to human causing large epidemics worldwide and causing substantial morbidity and mortality. When governments balance prevention, clinical treatment and socio-economic problems, it has stressed the health system and the global economy. The structure of the virus is shown in the provided figure. It mainly contains 3 words, which are Spike Glycoprotein, Envelope Protein & Glycoprotein Matrix [1].

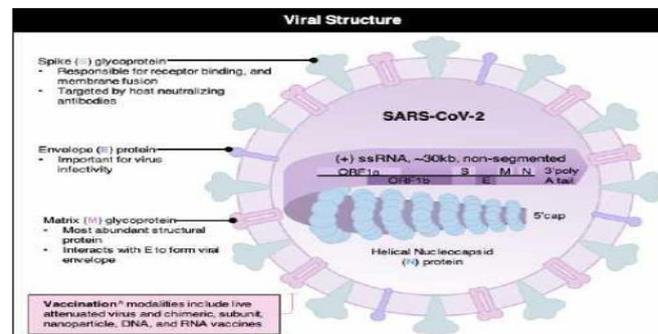


Figure 4: Viral Structure

A "blockchain"-based framework that explores P2P use of "blockchain", time stamping, and decentralized storage attributes to construct an established network for the diagnosis and identification of unknown "COVID-19" virus cases. In addition, the proposed framework would enable people through a new design of the P2P-mobile app to predict the risk of "COVID-19" virus infection in communities or general locations. The aim is to create an efficient system to help government, health authorities and people make important diagnostic, preventive, and avoidance decisions. The risk factors for infection with coronavirus work together to identify cases of unknown disease, and to predict and assess infection. The template is being constructed and executed as a real era consisting of 4 components: a subsystem for virus authentication, a "blockchain" framework, a mobile P2P device and a mass monitoring system [2].

The nCOVID-19 is quickly spreading in high-income countries where mortality and infection rates are lower than in low-income countries. With this "COVID-19" outbreak, overwhelming health care facilities and inadequate diagnostic services in resource-limited settings would struggle to survive, and call for a strategic response to those changes. Here, advise self-tracking and monitoring structures for low value "blockchain", artificial intelligence, "COVID-19", and different acting infectious diseases. Appropriate method and proper execution of the proposed system is capable of preventing "COVID-19" transmission and related deaths, especially in settings with restricted get admission to laboratory infrastructure [3].

On developing and applying a powerful diagnostic tool to be used in health care laboratory environments, without the need for viral content. Discussing the correct diagnostic workflow for 2019-nCoV using synthetic nucleic acid technology currently relies on 2019-nCoV's close genetic connection to the SARS corona virus [4].

Cyber security provides safety to the IoT devices, network and Data. Fraud detection and Identity theft need more network security, privacy. Qualitative analysis and using consensus algorithm mainly focused on IoT devices data security. "Blockchain" technology used to secure more legitimate authentication and data transfer on IoT computers [5].

The information security "blockchain" and focuses mainly on the use or implementation of "blockchain" technology in cyber security development of "blockchain" applications for computer protection and ongoing security enhancement efforts. Security-centric "blockchain" applications are data storage and sharing, IoT, network security, privacy and www. Qualitative and quantitative data processing is used in "blockchain" applications utilizing IoT protection. For support applications, these are more powerful and stable "blockchains". [6].

The outbreak of coronavirus (COVID-19) in late 2019 involves a serious threat worldwide. Earlier research discovered that a few SARSr-CoV bats have the capacity to infect people. Here's a report on locating and performing a brand new coronavirus that triggers acute human respiration syndrome. The sequences are nearly comparable and proportion a 79.6 in line with cent series identification with SARS-CoV. And noting the 2019-nCoV is 96 per cent similar to a bat corona virus' entire genetic data point. After thorough study, like pairwise protein sequence analyses- they can identify the including the virus spices of SARSr-CoV. Serum will inactivate the 2019-nCoV virus, that's remote from the bronchoalveolar lavage fluid with inside the vital patient. [7].

Some representative "Block chain" consensus systems, reviews their functionality and reviews compatibility between systems and applications. Here, discussed the PoW, PBFT, PoS, DPos, PoET & PoA consensus algorithms and compared these mechanisms shown in the below table [8].

Methods for handling the occurrence of a humanitarian catastrophe. Gradually, "Block chain" development was introduced as a means to aid different facets of the epidemic. In below chart briefly described how to use "block chain" to fight "COVID-19" pandemic. It can help break down pandemics through early warning, fast monitoring, drug trials, and recovery intervention support. It's time for the current epidemic to prioritize the delivery of "block chain" applications and allow it for future crises [9].

Image features and computing fashions implemented for "COVID-19" management. It applied diagnosis, treatment, and follow-up. Equally studied is the systematic study of imagery data using artificial intelligence (AI). Such results demonstrate that not uncommon location imaging capabilities and their modifications play a critical part in the research and exploration with

“COVID-19”. Moreover, AI or other methodologies for quantitative image evaluation will also optimize the benefit of imagery with “COVID-19” within the power [10].

Table 2: Comparison of Consensus mechanisms

COMPARISON OF CONSENSUS MECHANISMS						
	PoW	PoS	DPoS	PBFT	PoET	PoA
Permission	×	both	×	○	both	○
Finality	probabilistic	probabilistic	probabilistic	immediate	probabilistic	immediate
Performance	low	high	high	high	medium	high
Token	○	○	○	×	×	○
Cost	○	○	×	×	×	×
Scalability	high	high	high	low	high	medium
Trust	×	×	×	△	×	○
Adversary Tolerance	≤25%	depends on algorithms	depends on algorithms	≤33%	unknown	≤33%

Table 3: Showing how to use block chain to fight COVID-19

Use case	Description	Example
Donation tracking	<ul style="list-style-type: none"> Secured donation to stakeholders without any third-party intervention Facilitate donations through cryptocurrencies (depending on situations) 	China's Red Cross wanted to increase the transparency of donations from members. In response, Hangzhou-based blockchain startup Hyperchain developed a donation-tracking platform that has already attracted \$2 million in donations.
Insurance claims	<ul style="list-style-type: none"> Connecting multiple stakeholders with a secured, single-insurance platform Automated triggering of claim processing through blockchain and smart contracts 	Ant Financial's online mutual aid platform Xiang Hu Bao is a blockchain-based collective claim-sharing platform with over 306 million users. The newest functions it added are for processing coronavirus claims, helping the firm reduce paperwork and the need for back-and-forth document delivery to clinics.
Medical materials supply chain tracking	<ul style="list-style-type: none"> Connecting stakeholders to track-and-trace of goods and materials in terms of ownership transfer, document management, and location change Demand planning among the stakeholders based on supply chain data 	Alipay, along with the Zhejiang Provincial Health Commission and the Economy and Information Technology Department, has launched a blockchain-based platform that enables users to trace the demand and the supply chains of medical supplies.
Outbreak data tracking	<ul style="list-style-type: none"> Patient monitoring and secured storage of health data Leverage the health data with the researchers Process automation to notify the right stakeholders for healthcare measures (area cordons, mass testing, etc.) 	Accor provides health care and life sciences institutes with blockchain solutions to easily track the virus and visualize how it is spreading around the world using an app called HashLog. The coronavirus HashLog dashboard allows researchers, scientists, and journalists to easily understand and follow the spread of the virus, as well as its trends over time.
Low-cost COVID-19 testing	<ul style="list-style-type: none"> Blockchain-enabled e-Procurement for sourcing of necessary healthcare items Data sharing with the authorities for disease control and prevention 	Genobank.io and the Telos Foundation have partnered to develop an open source app that will allow users to securely source low-cost COVID-19 testing. The results will be stored anonymously on the Telos blockchain, where each user will control their data and have the ability to share their results with researchers.
Mode of payment	<ul style="list-style-type: none"> Ease of payment through both fiat currencies and cryptocurrencies 	The Italian Red Cross society is ramping up its modes of accepting payment, with the latest development introducing support for the premier cryptocurrency Bitcoin, with the help of Helipret.

To the extraordinary dissatisfaction of all, the course of COVID-19 and its enduring financial ramifications are as eccentric as could be. As organizations hurry to help the COVID-19 reaction or battle to remain their entryways open, they require trust in providers and accomplices and straightforwardness into gracefully chains and legally binding commitments. Fortunately, “blockchain” exceeds expectations on the two fronts. There are now incalculable occasions of associations utilizing “blockchain” to counter the results of COVID-19. When the worldwide needs arrangements, “blockchain” prepares, including offering how to spare loads of the accessibility chain from COVID-19 [11].

Evaluate the various blockchain technologies and potential for combating the 'COVID-19' pandemic, and create a data monitoring mechanism for 'COVID-19' based on data acquired from a variety of external sources. The blockchain-based approach enhances network partner interaction and supports trust, responsibility, and experimentation [12].

To begin by highlighting the general challenges that emerged during the pandemic of ‘COVID-19’. To measure the applicability of blockchain as a key enabling technology, define potential use cases to fulfil current needs. Many sectors of life have been impacted by the ‘COVID-19’ pandemic, including “healthcare, banking, politics, economics, and education”. In the regulation of the post- 'COVID-19' world, Blockchain will play a significant role [13].

Some of the very strongest healthcare facilities around the world are also stressed by the pandemic. The capacity of “blockchain” in the fight against ‘COVID-19’ to make an instant difference. “Blockchain” will help make the sector safer and more competitive. Any moment a healthcare professional applies for a fresh role using ‘blockchain’ technology, such as forming a “blockchain”-enabled medical record verification network, the steady churn of verification requests could be removed [14].

Diagnostic testing has become a significant aspect of the COVID-19 response. An alternative COVID-19 antigen test, which is generally recognized by the healthcare community and the medical fraternity, has also been developed along with the generally used standard PCR tests. The ICMR has specifically defined the features of the antigen-based tests, reporting that COVID-19 antigen-based diagnostic kits should be used both in community settings and in clinics, as well as in the RT-PCR test technology [15].

It is important to have a framework on how this specific form of distributed ledger technology (DLT) functions and how it can be applied to the wider healthcare environment to understand blockchain in healthcare. The technology of Blockchain is focused on decentralized consensus and is currently being applied in public and private environments [16].

A look of blockchain health-care applications that are relevant to COVID-19 and those that aren't. Blockchain technology has a number of advantages. 'COVID-19'-related and 'COVID-19'-unrelated health-care usage [17].

To categories and evaluate a variety of healthcare solutions that leverage programmable Blockchain or a piece of it. Blockchain may be used in the healthcare industry to provide a variety of solutions depending on the use case and project challenges [18].

To overcome the "COVID-19" crisis, IoMT will use "blockchain"-enabled edge intelligence. 'Blockchain'-enabled edge intelligence is bringing answers to the "COVID-19" pandemic, from monitoring and tracing the roots of the pandemic to traceable supply chains of injectable medications and "COVID-19" vaccines, as well as telemedicine and remote healthcare services. IoMT systems can benefit from 'blockchain' technology to improve security and privacy [19].

It uses IoT-based devices to deliver secure "COVID-19" vaccine distribution. While distributing vaccines, the level-wise 'blockchain' network is employed to provide security among IoT devices. This is tested against existing methods for accurate report production and data change criteria. This is studied and validated using synthesized data from several distributors who supply vaccination units [20].

The role of AI technology includes ML, D), and CV techniques in monitoring and controlling the spread of "COVID-19". ML technique is widely being explored for predicting the spread of this virus and also provides useful information to control its spread. CV techniques are useful to diagnose infected patients through CT and MRI. The pharmaceutical sector is also looking into using AI to speed up the design and development of the "COVID-19" vaccine. In hospitals, AI-enabled robots are employed to reduce the labour of doctors and medical staff. This technology will show to be an effective weapon in the fight against other types of human life disruptions [21].

To establish the potential of private blockchain technologies in healthcare applications, look into their use. To construct testing scenarios for healthcare apps using Hyper ledger Fabric in order to evaluate various criteria and use-cases. In order to evaluate the blockchain-enabled security requirements, look into frequent test case scenarios in terms of data security, privacy, and access management. The experimental study demonstrates the potential benefits of private blockchain technologies in terms of security, regulation compliance, interoperability, adaptability, and scalability. [22].

III. Problem Statement

People's lives have already been engulfed by the pandemic. Since the beginning of the epidemic, certain countries have been dealing with an ever-increasing number of cases. Data analysis of instances can be used to assess how India is faring in terms of pandemic control. Analyzing data allows for the adaptation of a country's preventative model that is performing well in terms of lowering the graph. This project focuses on blockchain data analysis of Covid-19 variations and the efficacy of various vaccinations. Analysis are made with the dataset available to the individual/country/organizations, that helping them to decide to how they are able to affect the pandemic. Through this project, a step towards helping people to understand the spread and vaccinations in their country is done.

IV. Results and Discussion

The study among the people recovered from this prophylactic disease. Consulting with the health care personals about the medicines and precautionary measures given to the COVID 19 affected people. The first step in gaining insight into a large data set is data visualization. After the data has been obtained and preprocessed, the visualization of the data is the next phase in the Data Analysis process. The goal is to get usable data out of the data.

4.1 Hypothesis

Hypothesis is a model that is used to approximate the target function and performs mapping of input with output.

4.2 Dataset

This section include the parsing of date in a proper readable format, renaming some columns into short, adding new column 'active cases', 'death cases' with the help of other cases available in the dataset, creating a data frame that includes the latest cases up to date , grouping the data in terms of variants and vaccines.

4.3 Building a Blockchain

Create a blockchain class with two constructors: one for storing our blockchain and another for storing transactions. An index, a Unix timestamp, a transaction list, a proof, and the hash of the previous Block are all included in each Block. Each new block contains the previous block's hash. This is significant because it is the immutability of blockchains: if an attacker corrupts a prior all subsequent blocks in the chain will have erroneous hashes.

4.4 Incorporating Transactions into a Block

It yields the next block's index after new transaction () adds a transaction to the list of transactions that will be mined. This will come in handy later for the user who is submitting the transaction.

4.5 New Blocks Creating

While creating our Blockchain, we'll need to start with a genesis block, which is a block that has no predecessors. In our genesis block, we must also put a "proof," which is a product of mining or proof of labour.

First step in gaining insight into a large data set is data visualization. After the data has been obtained and preprocessed, the visualization of the data is the next phase in the Data Analysis process. The goal is to get usable information out of the data. Loading and processing the data using dataset collected from WHO, and Kaggle.

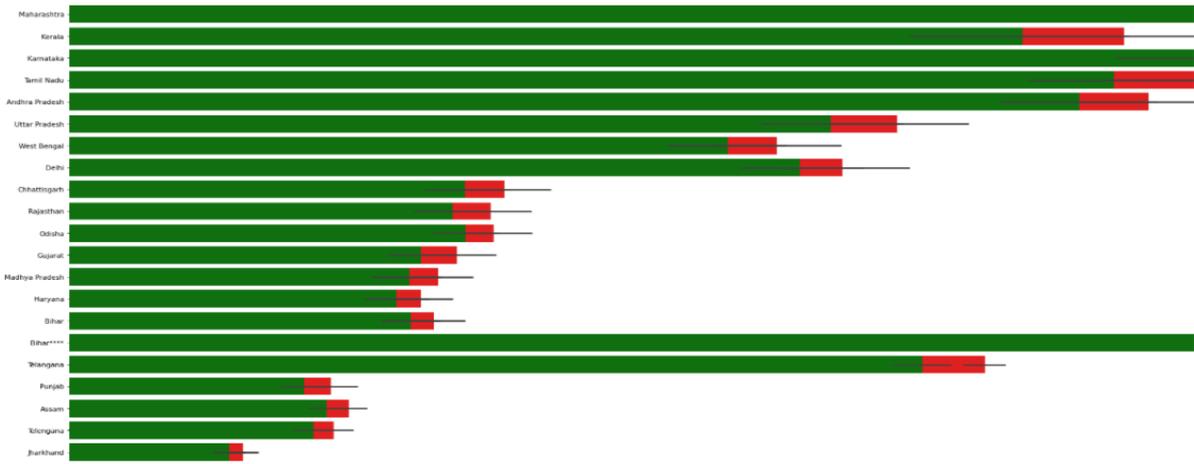


Figure 5: Race between recovered and deaths

Corona surveys uses a variety of methods based on aggregated, anonymous data to estimate the number of “COVID-19” cases in India for where sufficient data is available and then compares these estimates to Government estimates.

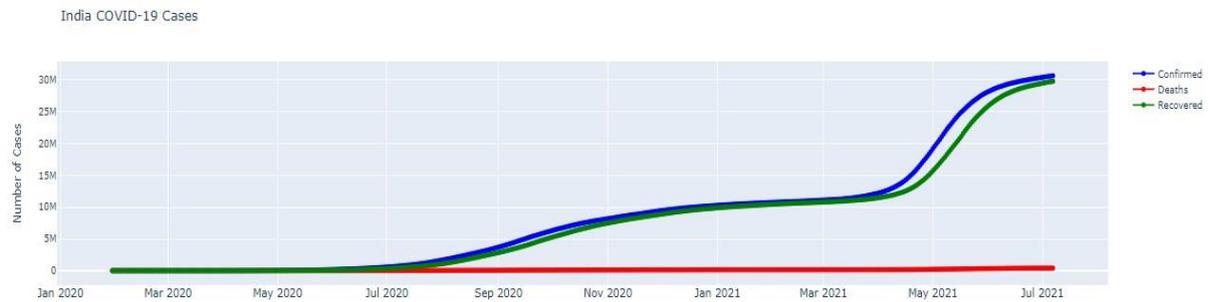


Figure 6: One graph to see the day-Wise Confirmed, Deaths and Cured cases

State/Union Territory	Confirmed	Deaths	Cured	Active	Death Rate (per 100)	Cure Rate (per 100)
24 Maharashtra	6113334	123531	5872268	117536	2.020000	96.060000
20 Kerala	2998004	13960	2877557	104577	0.470000	96.040000
19 Karnataka	2859595	35526	2784030	40039	1.240000	97.360000
34 Tamil Nadu	2503481	33132	2435872	34477	1.320000	97.300000
1 Andhra Pradesh	1908065	12898	1861937	33230	0.680000	97.580000
39 Uttar Pradesh	1706818	22656	1682130	2032	1.330000	98.550000
41 West Bengal	1507241	17834	1472132	17275	1.180000	97.670000
12 Delhi	1434657	25001	1408853	333	1.740000	98.280000
8 Chhattisgarh	996359	13462	977893	5004	1.350000	98.150000
32 Rajasthan	952836	8942	942882	1012	0.940000	98.960000
29 Odisha	927186	4299	897362	25525	0.460000	98.780000
14 Gujarat	823964	10072	811699	2193	1.230000	98.510000
23 Madhya Pradesh	790042	9017	780578	447	1.140000	98.800000
15 Haryana	769030	9506	758442	1082	1.240000	98.620000
4 Bihar	722746	9612	718913	1221	1.330000	98.500000
5 Bihar***	715730	9452	701234	5044	1.320000	97.970000
35 Telangana	628282	3703	613124	11455	0.590000	97.590000
31 Punjab	596736	16131	578590	2015	2.700000	98.980000
3 Assam	522267	4717	493306	24244	0.900000	94.450000
36 Telengana	443360	2312	362160	28888	0.520000	91.690000
18 Jharkhand	346038	6118	340365	555	1.480000	98.350000
40 Uttarakhand	340852	7338	332006	1538	2.150000	97.400000
17 Jammu and Kashmir	317481	4345	309554	3582	1.370000	97.500000
16 Himachal Pradesh	202945	3485	198134	1326	1.720000	97.630000
13 Goa	167823	3079	162787	1957	1.830000	97.000000
30 Puducherry	118227	1763	114673	1791	1.490000	98.990000
25 Manipur	73581	1218	66132	6231	1.650000	99.880000
37 Tripura	68612	701	63964	3947	1.020000	93.230000
7 Chandigarh	61752	808	60837	106	1.310000	98.520000
26 Meghalaya	52358	880	47173	4305	1.680000	99.180000
2 Arunachal Pradesh	37879	181	34525	3173	0.480000	91.150000
28 Nagaland	25619	503	23962	1134	1.960000	93.610000
27 Mizoram	22155	98	18383	3674	0.440000	92.970000
33 Sikkim	21403	309	19200	1894	1.440000	99.710000

Figure 7: Analyze the Confirmed, Recovered and Deaths on Each State

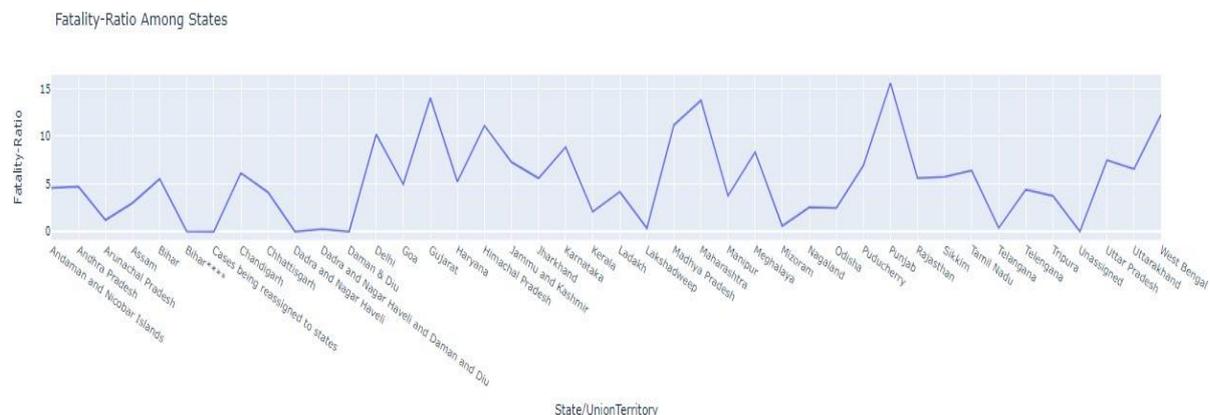
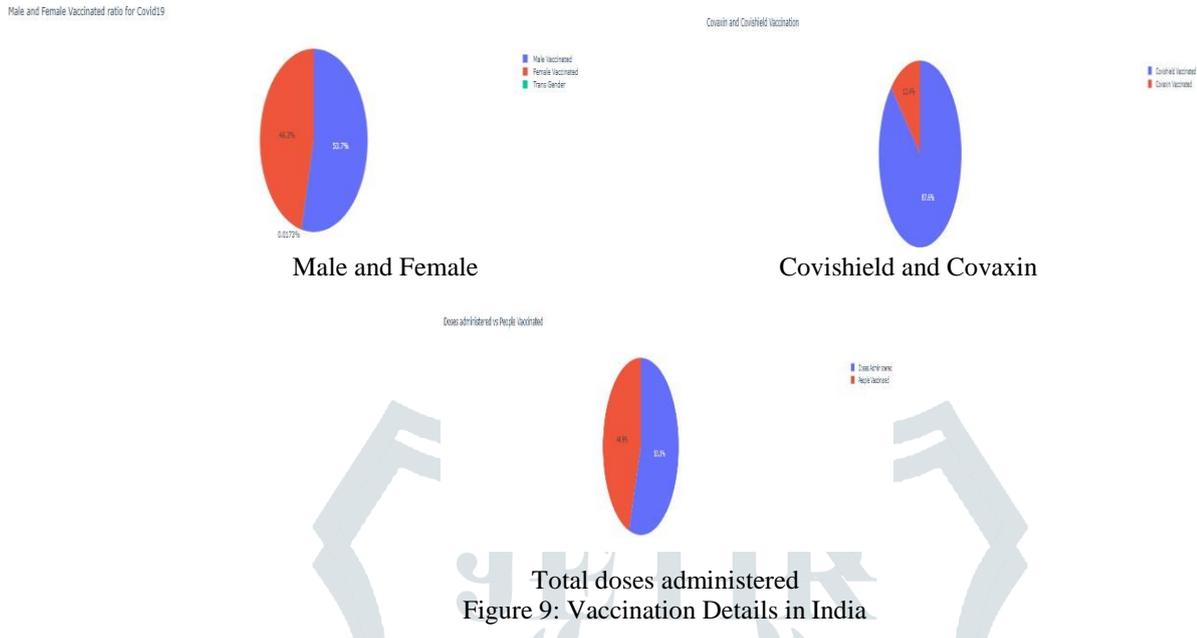


Figure 8: Fatality Ratio among States

V. Vaccination in India

Estimates of the number of COVID-19 vaccines taken in India for which sufficient data is available are derived using the aggregated Vaccine Surveys, and these estimates are compared to official authority figures.



Total doses administered
Figure 9: Vaccination Details in India

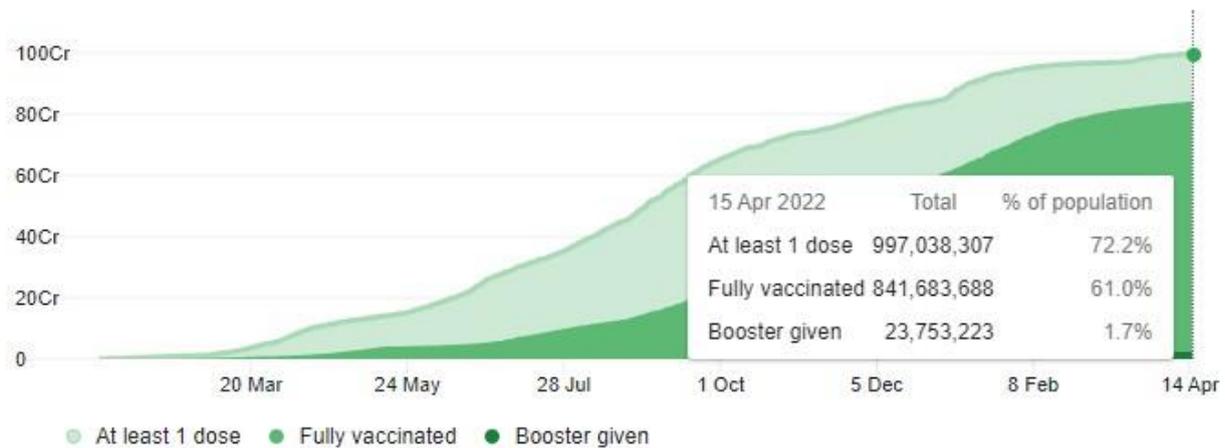


Figure 10: Current vaccination status in India

VI. Conclusion

Through this research, the analysis on COVID-19 data has been performed successfully. To tackle the epidemic, a block chain-based data analysis. Decentralization, transparency, and immutability are just a few of the qualities of block chain technology that can help contain the pandemic by recognizing breakouts and symptoms early on. The analysis on this pandemic spread has been done. The analysis of confirmed cases, active cases, recovered cases and deaths are done separately to give a clear look on how the virus is spreading, which vaccine are mostly vaccinated and how different vaccines are using. A separate analysis on cases of states in INDIA has been done.

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