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Vaccine Distribution System-An Alternative Approach

Akanksha Tomar[1], Sugandha Sharma[2], Kunal Gupta[3], Naveen Chauhan[4]
[1, 2, 3, 4]*Department of Computer Science & Engineering, KIET Group of Institutions, Ghaziabad, Uttar Pradesh*

Abstract: Coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2. SARS-CoV-2 is a newly emerging coronavirus. It was first found in Wuhan, China, in December 2019.Globally, as of 18 February 2022 , there are 416,614,051 confirmed cases of COVID-19 reported to WHO. The epidemiological situation is changing continuously. Since the beginning of the COVID-19 outbreak, WHO has worked with countries on public health measures to slow or stop the spread of the virus. Safe and effective vaccines were identified as a critical tool, along with other measures, to protect people against COVID-19, save lives, and reduce wide-scale social disruption. With the assembly of vaccines came the necessity of distribution of those vaccines and equitable access at the same time. WHO recommended that initial vaccination prioritize groups at the highest risk of infection in each country, including medical experts, older people, and people with disabilities. Once COVID-19 vaccines reach priority groups, countries should vaccinate other priority groups and also the general population. This website was made to solve this problem.

I. INTRODUCTION

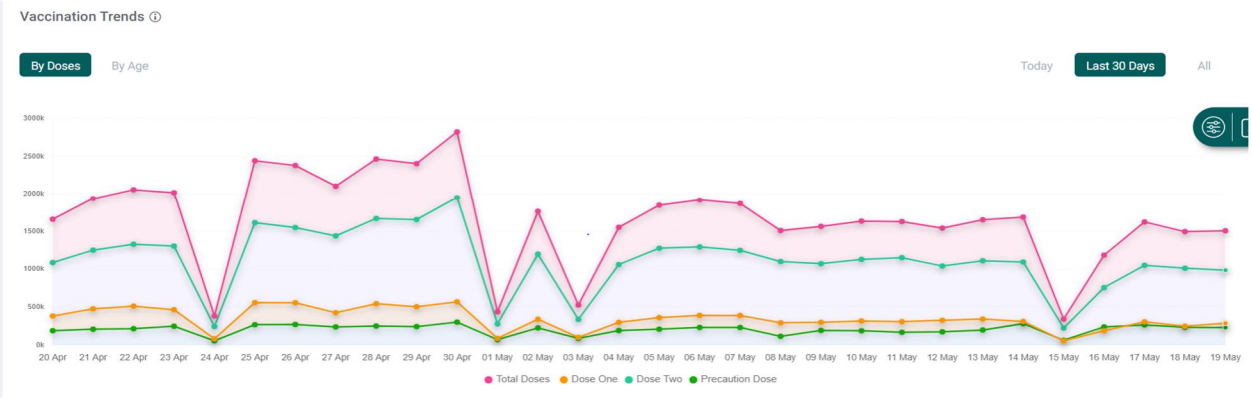
The past year has seen the rapid global spread of SARS-CoV-2, the virus responsible for the continuing COVID-19 pandemic. While non-pharmaceutical interventions are the mainstay of epidemic control to this point, vaccination constitutes the definitive, long-term defense strategy against SARS-CoV-2's morbidity, mortality, and transmission, offering the most effective hope of a return to normal life. Vaccination in India was administered from January 16, 2021, with the administration of vaccines to all or any health care workers within the first phase. In February, the vaccination programme was expanded to include front-line workers as well. The second phase of the programme began in March and includes citizens over the age of 60 and, subsequently, people over the age of 45 with comorbidities. The vaccine supply has three scenarios. These three scenarios of constrained vaccine supply are considered within the Roadmap for every epidemiologic setting scenario: a Stage I scenario of very limited vaccine availability (ranging from 1–10% of every country's total population) for initial distribution; a Stage II scenario as vaccine supply increases, but availability remains limited (ranging from 11–20% of every country's total population); and a Stage III scenario as vaccine supply reaches moderate availability (ranging from 21–50% of every country's total population).

Stage I: very limited (For 1-10% national population)	Stage II: limited (For 11-20% national population)	Stage III: moderate (For 21-50% national population)
la: health workers at high to very high risk of acquiring and transmitting infection lb: older adults defined by country/region specific age-based risk	-Older adults (not covered in Stage lb) -Individuals with co-morbidities or health status determined to be at significantly higher risk of severe disease or death -Socio-demographic groups at significantly higher risk of severe disease or death -Health workers engaged in immunization delivery -High priority teachers and school staff	-Remaining teachers and school staff -Other essential workers outside health and education -Pregnant women -Health workers at low to moderate risk of acquiring and transmitting infection -Personnel needed for vaccine production and other high-risk laboratory staff -Social/employment groups at elevated risk of acquiring and transmitting infection (unable to effectively physically distance)

Vaccine availability stages

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The vaccine distribution was supported by many factors, like age, priority, and most significantly, the number of active cases present within the state. Accordingly, the website divided the cases into mild and severe cases and distributed the vaccines accordingly. The work of the vaccine distribution is set by the central government, and similarly, on the website, there is a central authority that divides the vaccines. The vaccines are then distributed among hospitals where they're administered to the people.
Multiple Indian regions might be seeing the impact of vaccination against COVID-19 on the likelihood of getting severe disease within the ongoing third wave, some data released by local governments shows. The proportion of Covid deaths in active cases during the current surge is visibly lower, because of the large-scale vaccination coverage, than in the previous wave, the Center said, underlining the role of vaccines in protecting against severe illness and deaths because of Covid-19. Shown below is the current percentage of individuals at different stages of vaccination. The administration of all doses, including booster doses, necessitates elaborate and effective distribution and transparency, which the website provides.



Number of people receiving vaccines on a particular day

This is a population vs date graph which depicts the number of people who received Covid vaccine on a particular day. This is important information as it helped us know about the efficiency of our current system of distribution. Knowing that, we could make a model for our website and thus, ensure a uniform distribution of vaccines.

II. TECHNOLOGIES USED

This project is based on Web Development using both FrontEnd and BackEnd Technologies.
For making Frontend of the project following technologies have been used:

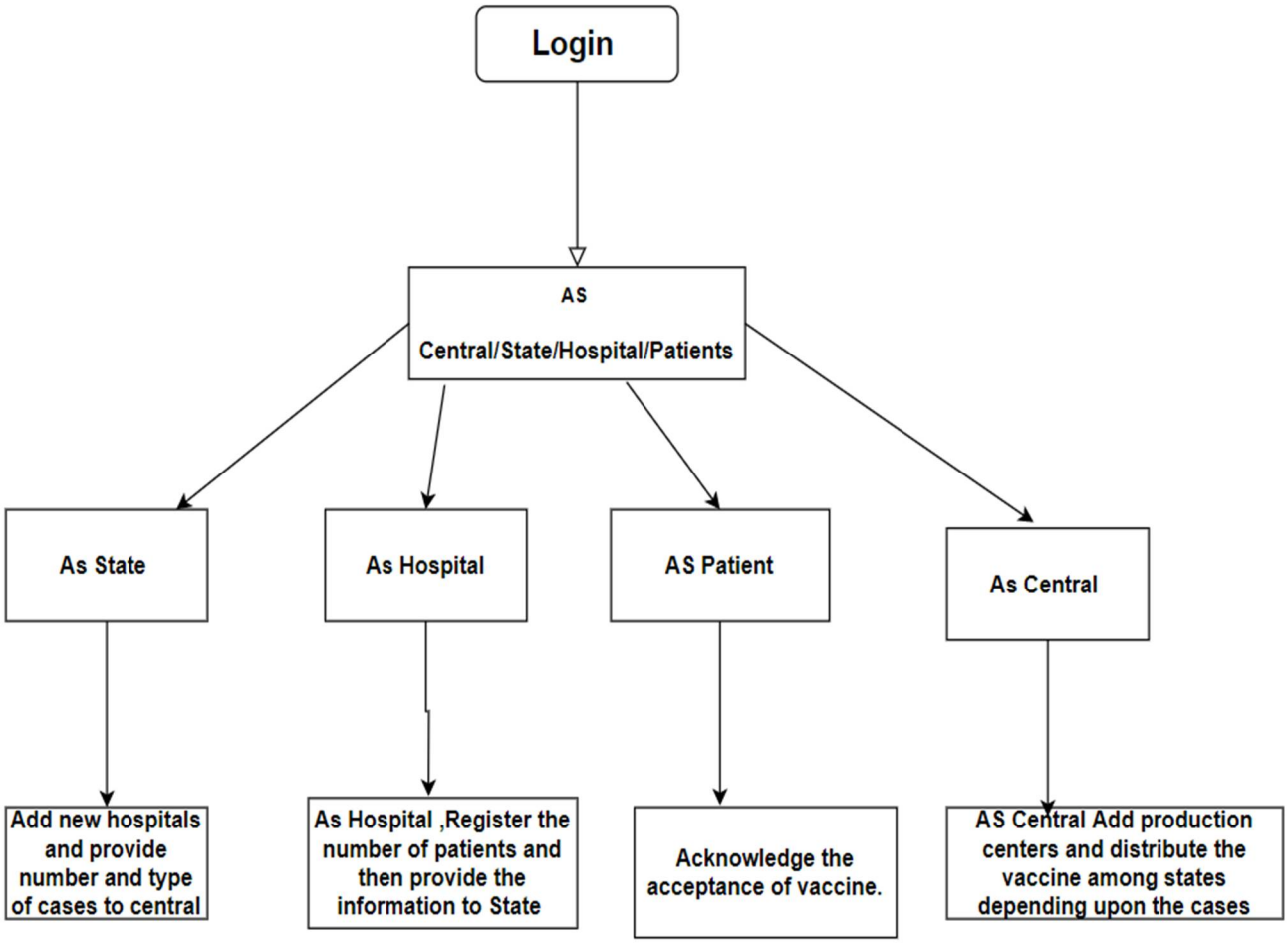
1) *HTML:* HTML is one of the easiest to use search engines available in the market. It is much easier to build SEO-friendly websites using HTML than other programming languages available. HTML websites are easy to read and accessible by web crawlers which helps in reducing the analysis time and page loading time and thus improves its performance.
2) *CSS:* CSS is very easy to maintain which helps in making consistent designs. It helps in making sure that the designs are compatible with flexible positioning of design elements of the webpage. It is platform independent and can support the latest browsers.
3) *Bootstrap:* The greatest benefit of bootstrap is that it helps in increasing the development speed and completing the work quicker. By using bootstrap one can easily develop responsive designs for the website. If our website is responsive then it adjusts itself according to the screen size in any device such as desktop, mobile phones, tablets etc. Not only on devices but web pages will look alike in almost all modern browsers like Firefox, Chrome etc.
4) *JavaScript:* JavaScript works fine with other programming languages so many developers choose javascript in developing many applications. We can insert it on any web page or within the script of another programming language also.

For making Backend of the project following technologies have been used:

a) *NodeJS:* Based on MVP pattern, Nodejs is very easy to learn and is highly scalable. Node's scalability is reached by the load balancing and its ability to handle a large number of parallel connections. Moreover, Nodejs is asynchronous and event driven with amazing prototyping capabilities.
b) *Mongo Database:* MongoDb is a database that has flexible document schemas. MongoDB provides the feature of deep query because it supports a powerful dynamic query on documents. Moreover, it uses internal memory for storing working sets and this is the reason for its fast access.

III. PROPOSED WORK

Vaccine distribution system involves various bodies with different roles - Central body, states, hospitals, production centers and the covid-19 patients.
Central body will add production centers and states, then states will further add hospitals and hospitals will add covid-19 patients.
Hospitals can add a number of mild and serious cases which will be reflected on account of higher authorities.
Production centers can add the number of vaccines produced by them which will be reflected in account of central authority.
Central body can distribute the vaccines to states on the basis of mild and serious cases with the help of a very efficient algorithm which gives more weightage to serious cases and following the same procedure states will distribute vaccines to the hospitals.
Patients can upload their status if they got the vaccine and this data will be used to verify corruption free vaccine distribution by respective higher authorities thus ensuring a transparent supply chain.
With the help of our website we can also check number of mild and serious cases,total available vaccine, vaccine received, vaccine distribution status and its history, cases in lower authorities with their name and its history, verify vaccine distribution by authorities with actual vaccine received by patients with name of respective authority and time-stamp, track login information.

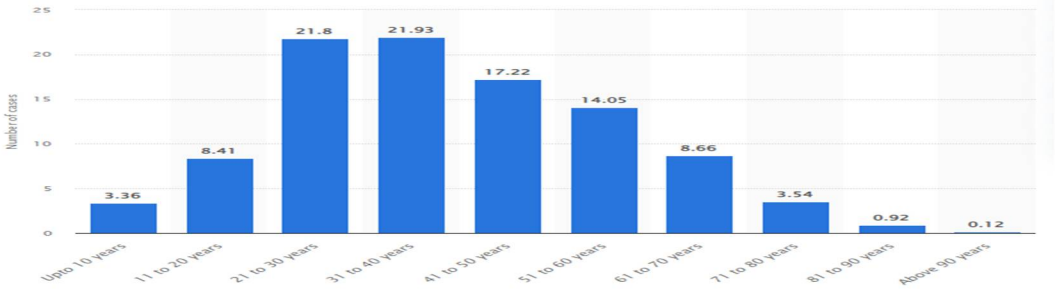


IV. RESULT AND DISCUSSION

Our website focuses on the distribution of vaccines on the basis of various factors such as the death rate of a particular region, the number of active cases, the number of serious cases, the number of adults above the age of 60 in the province etc. Considering these factors the vaccine will be distributed to different hospitals of a particular state. Central authority will be issuing vaccines to the state which will further issue them to hospitals. When the recipient will be administered with the vaccine it will also be reflected on the portal and hence this will create a transparent supply chain.

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Analysis has been done to determine which factor should hold how much priority. For instance number of coronavirus cases in October 2021 were as follows:

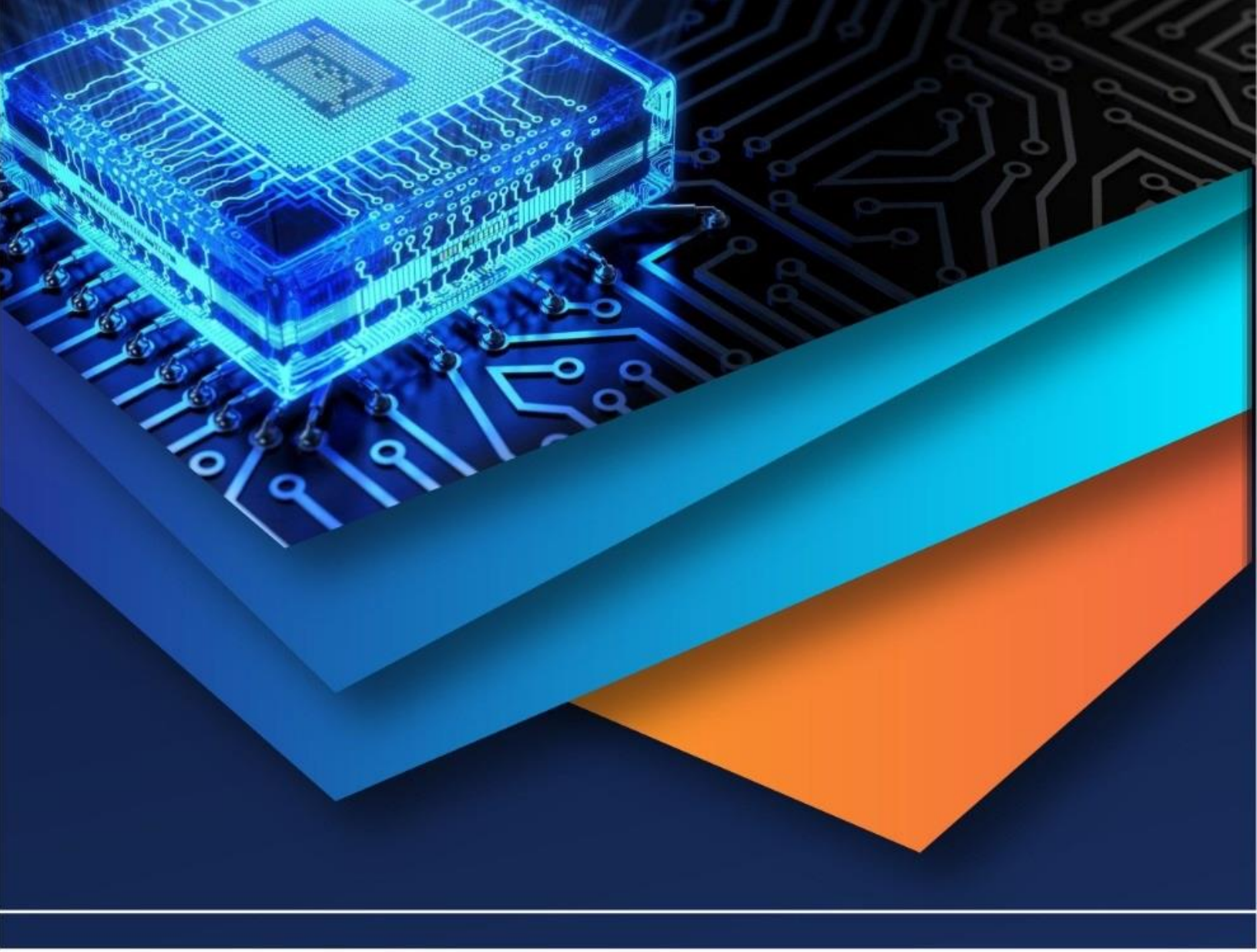


V. CONCLUSION

COVID-19 has taught us that we must always be ready to face new obstacles to life. During the pandemic it has been a major challenge for the government to roll out vaccines. Although non-pharmacological interventions have been the mainstay of epidemic control so far, vaccination is a sure, long-term strategy to protect against covid disease, death, and infection, which offers the best hope of returning to normal life. At the moment, in the absence of a vaccine distribution system, our website can effectively help spread the vaccine by solving the problem of inequitable distribution of vaccines. We have considered the features associated with coronavirus but in the future this website may help to address the distribution of vaccines by slightly modifying the algorithm.

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