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VACCINE RACE TO BECOME A REALITY AGAINST THE HIGHLY INFECTIOUS CORONAVIRUS (COVID19)

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Abstract:

COVID-19, is a global pandemic started in November 2019, extending beyond its biological scale to infect lives globally by inserting their genomic material inside the host cells. This global threat has till now claimed numerous lives with no possible full proof cure till date. There is no unanimity amongst the countries in the design and development of specific vaccines to cure COVID-19 and its distribution among the global population. India Government acquired "cold chain management" for safe and even distribution of present vaccines (Covaxin, Covisheild). Here, authors intend to put some light on the brief introduction, stages and perspective of cold chain logistics of vaccine distribution in 150 crore populated country like India.

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COVID-19 is a global pandemic that infected lives globally claimed countless lives and is still hindering the social and personal lifestyle (Cui et al., 2019). The magnitude of CoV2 infection extending beyond its biological scale with no conceivable cure. There is no unanimity amongst the countries in the application of specific vaccines to cure COVID-19. However, the design, manufacture, and smooth distribution of vaccines is a challenging path that has to be overcome by strategic planning of logistics and management.

According to the Ministry of Health and Family Welfare (06 January 2021), the country's total coronavirus cases have mounted to 89,12,907 while the death toll touched to 1,30,993. The Government of India is planning to run a massive immunization program throughout the country, with nearly 27 million new-borns targeted for immunization annually from mid of January 2021 to irradiate the pandemic (Wells and Galvani, 2021). However, a country like

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India, having a population of more than 150 crores, must be prepared to face severe problems regarding the production as well as distribution of the vaccine ^a.

The first stage is about the vaccine designing process, which is intensive and very time taking (~10 years) normally. Starting with the target, which can be a disease or a protein or a gene, and ending with a cure is a long journey for designing a specific drug molecule. For any developmental process, there should be a starting material. Out of lakhs of compound one (lead compound) may show some promising characteristics towards the target, which is then modified and optimized. Then comes the clinical trials comprising of different phases of trials, and that lead compound succeeds in the process then only it is sent for the Government approval (FDA). After the approval, the lead compound can be told as a drug, and then it will be dispatched to the markets (Fig. 1).

The second stage is distribution. The Indian Government planned systematic and organized distribution starting with four categories of people for vaccination in the initial phase, around 1 crore healthcare professionals including doctors, MBBS students, nurses and ASHA workers, etc.; the second phase, ~ 2 crore frontline workers including municipal corporation workers, personnel of the police and armed forces; the third phase, ~26 crore people aged above 50; the fourth phase with a special group of those people below 50 years of age with co-morbidities and requiring specialized care.

To overcome the problem of distribution “cold chain” logistic approach is going to roll the dice for India. It is a kind of supply chain that specializes in the storage, transport, and preservation of cargo that needs to be maintained at a specific temperature range (Zhang et al., 2018). The cold chain has four main components (Fig 2), ensuring the safe transport and storage of cold chain products:

- Temperature-controlled storage (specialized refrigerated facilities)
- Temperature-controlled transport (customized insulated cold containers)
- Trained and diligent personnel (expertise people for handling sensitive cold chain cargo)
- Efficient operational and management procedures (to minimize day-to-day risk)^b.

In the current scenario, India has about 27,000 cold chain stores, 76,000 cold chain equipment, 700 reefer vans, 55,000 cold chain handlers, and 2.5 million health workers as part of its vaccine logistics network. With the offline mode, the digital platform (Electronic Vaccine Intelligence Network, eVIN) is designed to provide real-time information on vaccine stocks and storage temperatures across all cold chain points in the country.

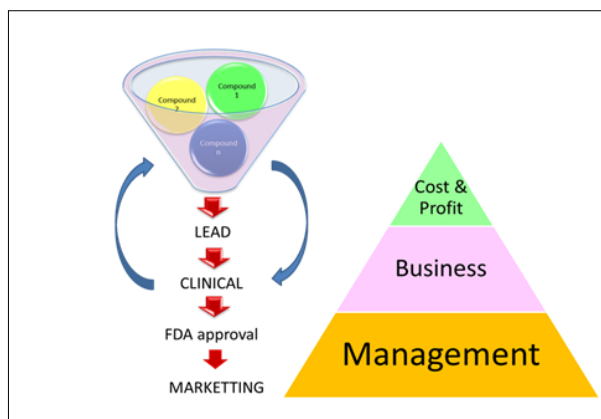
Indian Government's effort is to inoculate 300 million most susceptible people by August 2021, for which 600 million doses will be required. Presently, at least three vaccine candidates are under clinical trials in our country. The Serum Institute of India (SII) conducting the phase-3 trial of the Oxford vaccine, while that of the indigenously developed COVAXIN of Bharat Biotech. Dr. Reddy's Laboratories also doing the human clinical trials of the Russian Covid-19 vaccine, Sputnik V^c. SII alone is a producer of more than 1.5 billion vaccine doses every year

^aSee details at <https://dx.doi.org/10.2991/icedem-18.2018.117>

^bSee details at <https://dx.doi.org/10.2991/icedem-18.2018.117>

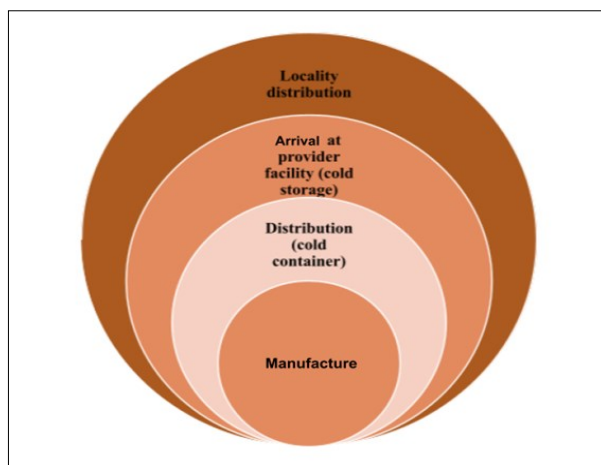
^cSee details at <https://health.economictimes.indiatimes.com/news/industry/covid-19-vaccine-distribution-faces-logistics-supply-chain-challenges-says-expert/79350936>

Fig. 1: Relation between drug discovery stages and commercial management



(Source: Author's perception)

Fig. 2: Cold chain management and its distribution



(Source: Author's perception)

The country may need repeated waves of vaccination based on priority groups, and it will take at least two years for all Indians to receive doses. The cold chain infrastructure in the country is twisted towards more affluent and urbanized areas. Statistics say that roughly 4 cold chain points serve 100,000 population in Gujarat, whereas there is just one cold chain point for the same number of people in Jharkhand. Overcoming the shortage of cold storage, the Government have to ensure that vaccine reaches every nook and corner of the country. Besides the Government solve the problem of procurement and distribution of the vaccine, the attention should be on keeping the spread under check and studying the virus for having more effective antiviral drugs.

References:

- Cui J, Li F, Shi Z L. (2019). Origin and evolution of pathogenic coronaviruses. *Nat. Rev. Microbiol.* 17:181–192. DOI: 10.1038/s41579-018-0118-9
- Deore A B, Dhumane J R, Wagh H V, Sonawane R B. (2019). The Stages of Drug Discovery and Development Process. *Asian Journal of Pharmaceutical Research and Development.* 7(6): 62-67
- Wells C, Galvani A. (2021). The interplay between COVID-19 restrictions and vaccination. *The LANCET Infectious Diseases.* [https://doi.org/10.1016/S1473-3099\(21\)00074-8](https://doi.org/10.1016/S1473-3099(21)00074-8)
- Zhang Y, Ma T, Abdul R & Arshian S. (2018). The Study on Efficient Cold Chain Logistics. Atlantis Press. <https://dx.doi.org/10.2991/icedem-18.2018.117>