

Challenges of COVID-19 Vaccine Delivery Management in India

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Abstract: Corona Virus or SARS-CoV-2 or Covid-19 virus has disrupted the world like nothing else humanity has seen. It has brought about an unprecedented health crises that we only heard about in books. Every country was found wanting in preparation to fight the attack. With no treatment in sight, the only solution scientists started working on was to make a vaccine to prevent infection. Vaccine development history shows at best 10 years in the making. In a rare worldwide cooperation of best minds of the world, this feat was achieved in 10 months. Humanity will never forget the year 2020 which brought a crises and the human spirit to find solution to it.

The main objective of this study is to look at the scenario post vaccine discovery and approval. The disease being so contagious, has to be curbed by vaccinating the entire population. This is not an easy task as it involves mind boggling efforts on part of government authorities who are directly concerned with public health. For a vast and highly populated country, it is even more complicated. The study examines the major challenges in vaccinating the billion plus Indian population. Availability of skilled manpower, a weak healthcare infrastructure, delivery logistics, cost of the vaccine, and spread of misinformation are some of the most important challenges that have emerged out of this study.

Keywords: COVID-19, Delivery, Management, Vaccine

1. INTRODUCTION:

The last time a Pandemic hit humanity was in 1919 and the disease was called the Spanish Flu. It spread to all parts of the world killing 1.7 million people around the globe as of 25th December 2020. Hundred years later, Covid-19 has had a much more devastating effect across the world. SARS-CoV-2 virus or Covid-19 has spared no one - from the rich to the poor, from heads of states to migrant workers, from developed nations to under-developed. In fact, the virus that originated in the Wuhan markets in China has put every human being on earth at risk. The Covid-19 virus works just like flu, only much more contagious. One could catch it just by breathing the air around the infected person. Early symptoms include dry cough, fever and breathlessness. The spread of the disease was so fast that the healthcare systems across were overwhelmed. Once infected, the virus causes havoc in the respiratory system creating a series of reactions in the body that can potentially be life threatening, particularly for those with existing co-morbidities. So, socialising between humans became

the first casualty. The more one came in physical contact with others, the more likelihood of being infected. No physical interaction meant a complete shutdown of the economy resulting in loss in businesses and unemployment. The year 2020 saw the world come to a near standstill, perpetuated by an unprecedented health crises like never before. There is no known 'cure' for the disease and the health care could only treat the symptoms or the damage to the biological systems caused by the disease.

Discovery of vaccine is the first step towards the fight against the disease. The study was conducted to bring to light the challenges in delivering the vaccine to one and all. The results of the study will help Indian authorities to plan their vaccine strategy for the benefit of the nation and its citizens.

2. MATERIALS AND METHODS

The study was conducted using secondary sources from various credible sources like World Health Organization, Ministry of Health and Family Welfare, Government of India, Newspaper Articles etc. An online Focus Group interview was taken with 9 leading light s from the field and their expert opinions were incorporated in the Results and Discussion part of the study.

3. RESEARCH ELABORATIONS

A. The Deadly Disease

According to the World Health Organization (WHO), globally, as of 27th Dec 2020, there have been more than 79 million confirmed cases of Covid-19 including 17.5 million deaths due to it. "The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes" (1). According to WHO "The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe heavily. These liquid particles are different sizes, ranging from larger 'respiratory droplets' to smaller 'aerosols'." Those infected by the virus feel mild to extreme respiratory problems. These can get grave in case of senior citizens or persons suffering from pre-existing diseases like diabetes, chronic respiratory illness, cardiovascular diseases and cancer. Though any infected person irrespective of age can become critically unwell or die. According to the WHO, "Among those who develop symptoms, most (about 80%) recover from the disease without needing hospital treatment. About 15% become seriously ill and require oxygen and 5% become critically ill and need intensive care. Complications leading to death may include respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, thromboembolism, and/or multi-organ failure, including injury of the heart, liver or kidneys." (2). The highly contagious nature of the disease makes it very difficult to handle and respond to. Frontline healthcare workers are at the highest risk since they are the first ones to come in contact with the infected person. The patient comes to them with some symptoms without even aware of the fact that he or she may be infected.

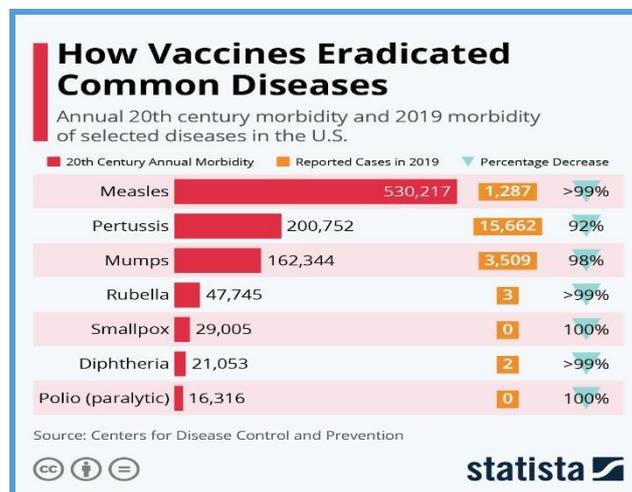
B. The Indian Scenario

India is one of the countries that has been hit very hard by the Covid-19 virus. As of Dec 27, 2020, India has witnessed more than 10 million cases and 147000 deaths. It stands at number 2 after USA in terms of number of cases and third in terms of mortality after USA and Brazil.

The public health care system in India was in any case inadequate and when Corona hit the population, the ugly reality was exposed. In February 2020, just before the virus struck India, The Global Health Security Index, 2019, published its report on countries' readiness to combat pandemics. India's rank stood at Number 57 with Index score of 46.5 whereas the United States stood at rank 1 with an Index score of 83.5. Initial response to the Coronavirus was to quarantine all symptomatic patients in isolation in health-care facilities (3). This put the public health-care facilities under tremendous pressure. "Using data from National Health Profile-2019, we observed that there are 713986 total government hospital beds available in India. This amounts to 0.55 beds per 1000 population" (4). "The number of intensive care beds per 100,000 population ranges from 2.3 in India and 34.7 in the USA, to 3.6 in China, 6.6 in the United Kingdom, 7.3 in Japan, 10.6 in South Korea, 12.5 in Italy and 29.2 in Germany" (5). "With nearly 1.2 million allopathic doctors in the country, the number of doctors per 1000 population in India is 0.75 which is also below the norm of 1 per 1000 population as prescribed by WHO" (6)

C. *Prevention is better than cure.*

The only way the disease could be fought was by preventing it from happening. This could only be done by creating a vaccine which would stop the spread of the disease in the human body. The way vaccines work is that they prepare body's natural defences to resist an attack by a particular infection. It teaches the body to produce antibodies when struck, by injecting a weak form of the same virus into the body. Vaccines have been very successful in preventing dangerous diseases and have contributed in saving millions of lives. Historically, vaccines have been used to fight many diseases like Tetanus, Polio, Typhoid, Rabies, Smallpox etc. See Chart below. Many vaccines are taken commonly by hundreds of thousands of people every day.



Every vaccine development process has to go through 5 stages in modern times, viz.

- 1) Discovery Research.
- 2) Pre-Clinical.
- 3) Clinical Development – 3 phases
 - a. Phase 1: Is it Safe?
 - b. Phase 2: Does it activate immune response?
 - c. Phase 3: Does it protect against the disease?
- 4) Regulatory Review and Approval

5) Manufacturing and Delivery

All the 5 stages take approximately 10 years to complete. Vaccines for many diseases that we see today typically took 15 to 20 years plus from discovery research to manufacture and delivery. But, what researchers and pharmaceutical companies are doing today for the Covid-19 vaccine is truly unprecedented. There is a race amongst them to bring out the vaccine as fast as possible. For this to happen, there has been a massive collaboration worldwide between governments, private and public sector companies, research organizations and pharma companies. Researchers are working with teams across the globe, collecting data, conducting parallel trials, using modern technologies thus speeding up the development. For COVID-19 virus, there are more than 50 vaccines in various stages of development. One vaccine by Pfizer BioNtech has been approved for use by the UK and the US and other countries are following suit. WHO has developed a framework for fair allocation of the vaccine once it gets the approval. The framework aims speedy access to those who need the vaccine at the earliest. It has identified groups of people within the population who would get the vaccine on priority like healthcare workers, senior citizens etc.

4. FINDINGS - CHALLENGES OF VACCINE DELIVERY MANAGEMENT

A. *Availability of skilled Healthcare workers*

“Skilled health workforce in India does not meet WHO recommended threshold of 22.8 skilled workers per 10,000 population recommended by the World Health Organisation”. (7). Moreover 80% of the Doctors and 70% of Nurses and midwives are engaged in private practice. Their cooperation in the vaccination drive would be purely on voluntary basis or incentive basis.

This is further complicated by the fact that the healthcare workers consist of “informal practitioners like child birth attendants, faith healers, snakebite curers, bonesetters” etc. The low availability of healthcare workers leads to delay in vaccinating the huge population. The delay may lead to new waves of the disease resulting in further loss of lives.

B. *Public Healthcare Penetration*

The Healthcare system in India consists of a sub-centre, a Primary Health Centre (PHC) and a Community Health Centre (CHC) each covering a different geographic size and providing different facilities.

Norms for healthcare workers and facilities available differ for Urban and Rural population. The Economic Survey 2018-19 shows that a lot needs to be done on the healthcare front in rural India. As per the report, 60% of PHC's have only one Doctor while 5% have none. (8). According to Rural Health Statistics, 2017, about 50% of them do not have male health worker and a shortage of 12% of Doctors in PHC's.

The situation in urban areas is no different. According to Rural Health Statistics 2018-19, Ministry of Health and Family Welfare, There is a vacancy of 19.1% of Doctors, 21.4% of Pharmacists, 29.8% of Lab Technicians and 21.7% of Staff nurses at the Urban Primary Health Centres. (U-PHCs). At U-PHC level shortfall has been observed in all the posts.

With this state of affairs, vaccinating the population across the length and breadth of the country is a huge task. At a time when the frontline health workers are themselves at huge risk, getting their services would be a challenge.

C. Training of Healthcare workers

WHO has indicated that Covid-19 vaccination can be administered safely by healthcare workers after going through a training courses. “All health workers involved in COVID-19 vaccination need to have adequate knowledge and skills in order to ensure safe and efficient COVID-19 vaccine administration”(WHO). A country where adequate human resources are not available, getting them trained through online courses would be another mind-boggling task. Training on specific Covid-19 vaccine could take up time leading to delay in implementation.

D. Supply Chain

It is anticipated that most COVID-19 vaccines will require at least two doses for optimal immunogenicity. Storage and distribution temperature will likely be +2 °C to +8 °C for most vaccines but may require an ultra-cold chain of -20 °C to -80 °C storage for certain products. The COVID-19 vaccine products are likely to have varying vaccine characteristics and presentations and will require different administration techniques. (9)

"Most if not all the current frontrunners require extremely stringent cold chains, making them immensely challenging for India to implement," said Satyajit Rath from New Delhi's National Institute of Immunology (NII). The immunologist noted that some Covid-19 vaccines will need storage temperatures that simply cannot be realistically managed in any large-scale Indian campaign. He said the real problems will arise once vaccines are ready to go into the market. (10)

Thus even after the vaccine is approved for administration, it would take massive logistics to store and transport from one point to another until the last mile connectivity. India does have a standardised protocol for Universal Immunization programs and has successfully managed the required cold chains, but this is an entirely different ball-game. “A challenge will be to reach taluka level in quickest time. Once the vaccine is out, everybody would like to be vaccinated at the earliest,” said Chander Agarwal, Managing Director, TCI Express that has contractual agreements with pharma companies that are engaged in producing vaccines. (11). The scale of logistics required if very high and the need is immediate.

E. Cost of fighting the Virus

“India will have to spend \$1.4 billion to \$1.8 billion in the first phase of a coronavirus vaccination programme, even after getting support under the COVAX global vaccine-sharing scheme, according to estimates by the GAVI vaccines alliance. By comparison, India's 2020/21 federal budget allocated just under \$10 billion to healthcare”. (12) As the demand to include more sections of the population increases, we will have to spend more and more leading to budgetary outflows. To what extent would the government support or subsidise the expenditure, particularly when the economy has nosedived during the pandemic and the subsequent lockdown. It would also mean diverting funds meant for other purposes to fight the virus.

F. Misinformation

Just as we have access to too much of information, so also, we are exposed to too much of misinformation. The pandemic is a classic example of how all kinds of unscientific content was peddled to us in the name of ‘prevention’ and ‘cure’ for the disease. Sometimes it is easier to fight the disease than the misinformation being spread about it. Misinformation spreads faster than information. One adverse reaction after vaccine administration (may or

may not be related) could cause people to shun it without understanding the scientific basis of such occurrences. Then there are conmen waiting to scam innocent people with fake treatments or vaccines.

5. CONCLUSION

We have come across one of the most adverse events in history but one must remember that ‘Adversity is the best teacher’. There are challenges, of course, but the indomitable human spirit comes out at its best during such times. We have managed to bring out the first miracle of vaccine in the shortest possible time. Now we have to strategize for the delivery in the most efficient way.

This will involve not just the government but a consistent effort from the private sector. A very good example is the cold supply chain. Private logistics companies, not just in pharma but those in food industry can be roped in for movement of the vaccine. Cost of the vaccine can be subsidized or made free for the poor while those who can afford it can be given the same at a fair price. It would be a massive task for only government employed healthcare workers to administer the vaccine to the huge population. Private healthcare workers will have to be used so as to complete the targets in time. Given the dangers that misinformation can cause in such a serious environment, it is important that ‘right’ information goes at the ‘right’ time by the ‘right’ people. There has to be a credible source of information from the authorities. Such information has to echo in all possible media to have maximum reach.

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