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COVID-19 Vaccine Development to Vaccination

Ashok Pandey,[1] Pradeep Belbase,[1] Ayuska Parajuli[2]

[1]Nepal Health Research Council, Ramshah Path Kathmandu, Nepal, [2]HERD International, Thapathali, Kathmandu, Nepal.

ABSTRACT

In the race for a safe and effective vaccine against Coronavirus disease-19 manufacturer plays a critical role throughout the development, clinical trial, manufacturing, supply, and vaccination phases. For the efficacy of Coronavirus disease-19 vaccine, proper transport, storage, vaccine carrier, adjuvant, dosage form and route of vaccine administration plays a crucial role for immune response. In the context of no more people were willing to pay for a Coronavirus disease-19 vaccine the logistics of manufacturing, storing and distributing the vaccine, and mass vaccination are essential. It is urgent to improve health promotion and reduce the barriers to Coronavirus disease-19 vaccination.

Keywords: COVID-19; vaccine development; vaccination

INTRODUCTION

Vaccines keep communities healthy rather than individual. Vaccines save millions of lives. Vaccine prepares the body's natural defense which is known as an immune system to fight off the virus.[1] When people are vaccinated against Coronavirus disease-19 (COVID-19) disease, the virus can't transmit as easily from person to person, and the community is less likely to contract COVID-19 which is called "community immunity or "herd immunity".[2] It means, the additional people are vaccinated, the lesser the chance of COVID-19 spread. High vaccination rates protect us as well as vulnerable population such as infants, old age people, pregnant women, first-line health workers and people of all ages with compromised immune systems, who are not fully vaccinated yet.[3]

VACCINE DEVELOPMENT

As of early May, more than 120 vaccine manufacturer is reported to be in process of developing vaccines for COVID-19[4] But now, there are currently more than 50 COVID-19 vaccine candidates in trials in the WHO international clinical trials registry platform.[5] Vaccine should be helpful treatment to prevent the COVID-19 and must suppress the detrimental or deadly clinical manifestation.[6]which has been designated as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 Neutralizing the antibodies by the concerned vaccine has been considered effective prevention of the COVID-19 virus infection. In a non-professional term, first, an antigen is produced from mammalian cells. Those cells produce the protein and the antigen is scaled up for production. Before combined with adjuvant, purified antigen is required to be passed for the quality checks. After, passing the preclinical biological model, the vaccine is ready for a clinical trial in human beings. The candidate vaccine is taken to the three-stage of phase I, phase II, and phase III clinical trial testing in human volunteers. For the vaccine production in the current pandemic scenarios, emergency authorization was given via expedite approval.

The COVID-19 pandemic now exerts tremendous pressure to scientists to develop safe and effective vaccines. In this quick race to progress a vaccine, its pharmaceutical formulation serves as a link between stages of product development for the development process. The required vaccination rate for herd immunity is a bit higher than Osterholm's conservative 70% because no vaccine is 100% effective.[2] Table 1 shows that by Pfizer and Moderna vaccine indicate 94-95% effectiveness. Both require two doses and Pfizer's vaccine must be kept at a colder temperature than Moderna's. The third vaccine, made by AstraZeneca, is more stable, requires only one dose, and can be stored in normal refrigerators.[8] The Janssen (Infectious Disease & Vaccines) vaccine is also very promising, designed to be taken by adults in one dose, easy to store, and expected to be supported by efficacy data released in early March. The target of herd immunity must be achieved depending on the mix of the

Correspondence: Pradeep Belbase, Nepal Health Research Council, Ramshah Path Kathmandu, Nepal, Email: belbase.pradeep@gmail.com.

various types of vaccines distributed to the population. Pfizer's vaccine and Moderna's vaccine have initiated clinical trials for children. Normal vaccine-approval process rather than expedite may be appropriate for the trial of children vaccine.

Table 1. Status of COVID-19 Vaccines within WHO Emergency Use Listing Procedure prequalification process

SN	Manufacturer	Name of vaccine	Platform	Status of assessment	Anticipated decision	Efficacy
1	Pfizer (Biontech)	BNT162b2/ COMIRNATY (INN tozinameran)	Nucleoside modified mNRA	Finalized	Used	52% after first dose 95% after second dose[7]
2	AstraZeneca (University of Oxford)	AZD1222	recombinant replication defective chimpanzee adenovirus expressing the SARS-CoV2 S surface glycoprotein	In progress Core data Non-Covax. Covax data to be reviewed as EMA post approval change	Earliest by EMA End of Jan-Feb 2021 (nonCovax) Additional nodes in March/ April for Covax	more than 90%[8]
3	Serum Institute of India	Covishield (ChAdOx1_nCoV-19)	recombinant ChAdOx1 adenoviral vector encoding the Spike protein antigen of the SARS-CoV-2	In progress	Mid Feb 2021	62%[9]
4	Moderna	mRNA-1273	mNRA-based vaccine encapsulated in lipid nanoparticle (LNP)		Estimated end of Feb 2021	94.1%[10]
5	Sinopharm/ BIBP[2]	Ad26.COV2.S	Inactivated, produced in Vero cells	In progress	Earliest March	86%[11]
6	Sinovac	SARS-CoV-2 Vaccine (Vero Cell), Inactivated	Inactivated, produced in Vero cells	In progress	Earliest March	50.4%[12]
7	Janssen (Infectious Disease & Vaccines)	Ad26.COV2.S	recombinant, replicationincompetent adenovirus type 26 (Ad26) vectored vaccine encoding the (SARS-CoV-2) Spike (S) protein	Not yet started. Use abridged procedure relying on EMA	Earliest May – June 2021	More than 90%[13]

VACCINATION

The vaccination should focus on people age 65 and older, law enforcement and protective services workers (includes healthcare workers, police and government-employed personnel and FCHVs), childcare providers, teachers and staff and any vulnerable and 'hard to reach' population. The government should decide who gets the COVID-19 vaccine when it is in limited supply with many considerations to ensure equality and equity across diverse inhabitants. In a context where no more people were willing to pay for a COVID-19 vaccine, a policy of remunerating people for COVID-19 vaccination should be adopted. Priority should be given to voluntary vaccine to promote herd immunity within a time period. Central governmental funds should be spent better to increase the uptake of the voluntary vaccine.

CONCLUSIONS

The vaccination will definitely help to mobilize the COVID-19 specific adaptive immune responses. This will also provide increased protection against the development of the severe and often deadly forms of COVID-19. If vaccine efficacy is achieved in healthy human volunteers, the necessary logistic operations become the hurdles to ensure global distribution (manufacturing, maintaining the cold chain, storage, etc.). High priority should be given mostly to low-income countries. It will be necessary to subsidize the vaccine partially for those who are less wealthy. At the same time, designing the health promotion materials is also an important task to increase the perceived risk for COVID-19 in the country. Other steps, like following SMS measures (sanitizer, mask and social distancing) help to

reduce the chance of being exposed to the COVID-19 virus spreading. The combination of various therapies including mental support, social support, balanced immunomodulatory diet, establishing public trust and following the prevention guidelines of COVID-19 helps to global vaccine coverage.

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