Editorial

Vaccination, the only weapon against COVID-19, for the nonce

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Epidemics of infectious diseases have always been well documented throughout human history, particularly in ancient Egypt and Greece, and for diseases like smallpox, leprosy, tuberculosis, meningococcal infections, and diphtheria. Since ancient times, the morbidity and mortality of these infectious diseases have profoundly shaped the politics, commerce, culture, and social structure of different eras in epidemics.[1] With the beginning of 2020, the world has encountered a new challenge, with the name of Covid-19. Commencing from Wuhan city of China, this disease spread like wildfire within a matter of next few months, with a rising death toll and serious consequences on the entire globe. The impact of COVID-19 on the population was no less than terror and shock. Since COVID-19 disease kept on spreading via aerosol and droplet infections, World Health Organization (WHO) declared an emergency and along with other health agencies emphasized respiratory hygiene i.e. covering the nose and mouth with a mask and using cough etiquettes in addition to standard precautionary measures. Social distancing was emphasized. Different rapid treatment guidelines were developed and practiced across the globe, with no definitive management guaranteeing the recovery cent percent. Where a number of interventions were being tried and tested, attention was diverted towards vaccination since it had always been contemplated to be the integral in control of many infectious diseases.[2]
Vaccination is envisaged as one of the most effective public health interventions for preventing and saving lives from different infectious diseases and promoting good health. Hence scientists from all over the world got involved in the rapid and expeditious development of vaccines against this novel disease
According to WHO, different immunization programs prevent between 2 to 3 million deaths every year across all age groups. Since the advent of vaccination, as a preventive measure for communicable disease, its use has eradicated some of the most dreadful diseases from the world, the eminent example being smallpox. The main purpose of mass vaccination against any disease is to eradicate, eliminate or control it. Eradication of a disease means that disease and its causal agent are removed worldwide for example eradication of smallpox. Elimination of disease refers that the disease has disappeared from one WHO region but remains elsewhere like Polio Myelitis. The target was the eradication of Polio and we are almost there, whereby Polio almost nearly has been eradicated from the world, but its prevalence still affecting two countries is not attributed to the failure of the vaccine itself, but various geopolitical and social factors are responsible for thwarting our success. Containment or control of disease means that a point has been achieved that a particular disease no longer constitutes a significant public health problem.[3] If we look into disease pattern so far, eradication or elimination of the COVID-19 disease from the globe appear to be elusive at present but containment of the disease should be our primary and foremost aim; whether we will be able to achieve herd immunity against COVID-19 or not? This question is yet to be answered.
We can define a successful vaccination program like the one which achieves its aims in terms of disease control. Attainment of this goal and the impact of any vaccination program depends on a number of factors like vaccine coverage, vaccine efficacy, effectiveness, and herd immunity. Vaccine coverage is defined as a percentage of the target population who has been fully vaccinated against a disease. Vaccine efficacy gives an estimate of how much a vaccine reduces the risk of development of a disease in persons vaccinated versus

those who received a placebo, established from the evidence acquired from clinical trials. Vaccine effectiveness is an estimate of the direct protection of a vaccine under ordinary conditions of a public health program. And lastly, herd immunity also known as population immunity is an indirect effect of vaccination in a group of communities due to reduced disease transmission.[4] This is particularly important to protect people at increased risk for severe illness from COVID-19, such as healthcare providers, older or elderly adults, and people with other medical conditions.

Nevertheless, we should also be mindful of 'vaccine failure' defined as the development of disease despite being vaccinated against it. It may be primary vaccine failure where an individual fails to produce an adequate immune response to initial vaccination or secondary vaccine failure where a person accomplishes adequate initial response but then the immunity wanes over time.

The world had been witnessing for over a century now, the lengthy procedures and time invested in the development of a successful vaccine featured by various phases; Phase 1 trials for safety in adult volunteers, following Phase 2 trials for immunogenicity and reactogenicity in the target population and ultimately proceeding for Phase 3 trials intended to evaluate and establish protective efficacy and safety of any vaccine. All the above-mentioned protocols and procedures have been taken into account for COVID-19 vaccines too but very hastily, giving precedence to urgent and swift production, basically owing to the lethal and dreadful nature of COVID-19 claiming human lives brutally involving many frontline health workers across the globe. Till now results are encouraging, however long-term safety of these vaccinations is still awaited.

Many existent, as well as new techniques, have been used in the development of different vaccines with the availability of one group of vaccines in a certain part of the world and another group of vaccines in another part of the world, with no clear-cut guidelines by health professionals. So far many types of vaccines have been developed by different techniques in different countries and a worldwide campaign of vaccination has been initiated. Moreover, preferences and regulations by different countries regarding the use of a particular vaccine also make people confused regarding its administration. The general population was initially reluctant for vaccination even in the developed countries, but with the passage of time people of all classes of society are showing their willingness and acceptance.

In Pakistan, the COVID-19 vaccination campaign started with the availability of the Sinopharm vaccine in February 2021. Health agencies of Pakistan had to put a lot of effort and different motivational drives were introduced and put into practice to get people vaccinated. Since the beginning of disease many clinical guidelines have been developed and exercised by different health authorities but since no definitive treatment is yet available, so old-time tested proverb, "prevention is better than cure" deems fits in the situation.[5]

We should be grateful to science and technology that we have so many choices available regarding the vaccines, even though there are still uncertainties and concerns regarding the side effects and unforeseen consequences. Several different types of potential vaccines for COVID-19 have been developed and marketed, (Table 1) and many more are in developmental phases, all are designed to teach the body's immune system to safely recognize and block the virus that causes COVID-19 including; Whole Virus vaccines, that use an inactivated or weakened form of the virus that doesn't cause disease, but still generates an immune response e.g. Sinopharm and Sinovac. Protein-based vaccines use harmless fragments of proteins or protein shells that mimic the COVID-19 virus to safely generate an immune response e.g. Novavax vaccine. Then there are Viral vector vaccines that use a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins to generate an immune response e.g. Oxford -Astra Zeneca vaccines. And finally, RNA or mRNA vaccines, a cutting-edge approach that uses genetically engineered RNA or DNA to generate a protein that itself safely prompts an immune response e.g. Pfizer, BioNTech, and Moderna vaccines.[6]

Whichever is the type of vaccine, we should not forget that mass vaccination of the population will result in achieving a high level of herd immunity to attain disease control. People of various communities behaved differently regarding the acceptance of this.

SARS-CoV-2 coronavirus is a rapidly mutating virus, with four variants of concern i.e., Alpha, Beta, Gamma, and Delta virus; the delta presently is believed to be most the transmissible and highly infectious strain of COVID-19. This means that achieving herd immunity is even becoming more difficult. An infection rate of the original strain of SARS-CoV-2 was estimated to be 3 and 67 percent of the population was needed to be immunized to attain

herd immunity, however, the estimated infection rate by delta variant of this virus is assumed to be 6, and vaccination of 83 percent if the community is required to achieve the population immunity.

As clinicians, we must be clear, no vaccination is considered entirely safe. Although a few common side effects are likely to occur and will be emerging during field trials and they may vary in frequency and severity because of changes in potential methods of manufacture storage or administration alteration in the target population.

The general population including health care professionals is yet confused about which vaccination is better than the other and so on. It is important that till now no large definitive head-to-head trials of these vaccinations are available regarding this, so the broad message is that so ever vaccination is available may be taken instead of waiting for the invention of a new ideal or perfect one. We must not forget that in present times when there is an inequitable distribution of vaccines and other health-related resources across the globe especially in lower and middle-income countries, we are fortunate to have various types available in our country. Whichever vaccines we have available, we must receive them because we are in a state of combat against the COVID-19 pandemic, and these vaccines are the only single weapons have, for the nonce….

Table 1: An overview of different COVID-19 vaccines being administrated in different parts of world

Name of Vaccine	*Type*	*Origin*	*Efficacy*	*Remarks*
Pfizer	mRNA	BionTech & Pfizer, Germany, United States	91.3%	SE: Mild to moderate pain, Fatigue, Headache, Rare allergic reactions Authorized for full and emergency use.
Moderna	mRNA	US NIAID & BARDA	94.1%	SE: Pain at sight of injection, Headache, Joint pain, Rare Allergic reaction Authorized for 12 years and older.
BBIBP/ Sinopharm	Conventional Inactivated (CIV)	Sinopharm Beijing Institute China	78.1% to 100%	SE: Pain at sight of injection, Headache, Mild symptoms WHO approved the use of this vaccine on May 7, 2021
IMBCAMS	Conventional Inactivated (CIV)	Institute of Medical Biology China	NA	Authorized on 9 June 2021 in China.
CoronaVac/SinoVac	CIV	Sinovac Biotech China	66% to 90%	June 1, 2021 for emergency use. Most widely used vaccine till July 2021, across World.
Covaxin	CIV	Bharat Biotech, India	64% to 93%	-
CoviVac	CIV	Chumakov Centre Russia	Not established as in phase II trials.	Approved on Feb 2021 in Russia
CovIran Barakat	CIV	Iran, Shifa Pharmed	93.8%	Approved in IRAN
Minhal-Kangtai	CIV	Shenzan Kangtai, China	NA	14 May, 2021 Authorized for emergency use.
QazVac	CIV	RIBS, Kazakhstan	NA	Not approved yet
WiBP-CorV	CIV	Developed by	72.8% to 100%	-

		Sinopharm, China		
Sputnik Light	Viral Vector Vaccine	Russia, Gamaleo RI	79%	-
Sputnik V	Viral Vector Vaccine	Russia, Gamaleo RI	90%	World's first combination vector vaccine Registered by 11th August, 2020 in Russia.
Astrazeneca	Viral Vector Vaccine	Oxford University, UK	61% to 76%	SE: Pain at the sight of injection, Headache, Nausea, Rare risk of blood clotting Should not be administered to patients with capillary leak syndrome
Convidecia/ Pak Vac	Viral Vector Vaccine	Cansino Biologics, China	65.7% to 91%	Approved for full and emergency use by WHO
Janessen/ Johnson's and Johnson's	Viral Vector Vaccine	Janessen Vaccine Leidan, Netherland	66% to 100%	SE: Headache, Nausea, Pain at the injection site Approved in UK and US
Abdala	Protein Subunit Vaccine	Cenetre for Genetiic Engineering, Cuba	92.28%	-
EpiVac Corona	Protein Subunit Vaccine	Russia	NA	Launched in November, 2020
MVC COV1901	Protein Subunit Vaccine	Medigen Vaccine Biologics, Taiwan	NA	Approved for Emergency used in Taiwan
Soberana	Protein Subunit Vaccine	Cuba	62%	-
Zf2001	Protein Subunit Vaccine	China and Uzbekistan	92-97%	-

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