**Covid-19 Vaccination in Pakistan: Impact and Perspective for the Future**

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June 15, 2022

The covid-19 pandemic has presented a number of challenges to mankind and will not end with the virus disappearing from the face of the earth. It is now widely believed that worldwide, enough people will gain immune protection from vaccination and from natural infection leading to less transmission and much fewer Covid-19-related hospitalisations and death, even as the virus continues to circulate, as endemic. According to Tedros Adhanom Ghebreyesus of the World Health Organisation, the acute phase of the pandemic may end by mid-2022, if about 70 per cent of the world gets vaccinated; highlighting the importance of vaccine-induced immunity as the single most important factor in ending the pandemic.

However, with varying levels of interventions and unpredictable emergence of Variants of Concern (VOC) in addition to population and environment-related factors, periodic increases in cases of outbreak or epidemic, well beyond the endemic levels, are likely to occur.

Vaccines are among the most effective interventions in modern medicine and save millions of lives each year. Ever since Edward Jenner’s first use of a vaccine against smallpox in 1796, the use of vaccines has become indispensable to the eradication of infectious diseases.

Vaccines work by training and preparing the body’s natural defences and the immune system to recognise and fight off the viruses and bacteria they target. After vaccination, if the body is later exposed to those disease-causing germs, the body is immediately ready to destroy them, thus preventing illness. Vaccines represent the least expensive and most simple way to protect against devastating epidemics and have played a pivotal role in combating the Covid-19 pandemic.

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Currently, re-exposure and evolution of new variants are driving the pandemic. Covid-19 vaccines may not prevent infection after exposure to SARS CoV-2. The main benefits of these vaccines include the prevention of symptomatic infection and the development of serious diseases requiring hospitalisation and death from Covid-19. Prevention of severe symptomatic disease indirectly leads to economic benefits as well, by preventing hospitalisations, decreasing the burden on health systems, avoiding long-term disability, and reducing absence from work.

Pakistan’s Covid-19 control strategy has been lauded by international organisations including the WHO. The effective vaccination plan, tailored to local needs (like other non-pharmacological interventions) was successful in the containment of the disease. Seven different types of vaccines were rolled out in phases for healthcare workers, the elderly, immunosuppressed (high-risk groups) and the general population. All vaccines were found to be effective with negligible adverse events.  Vaccinated individuals were noted to be 7 times less likely to develop severe symptomatic disease requiring hospitalisation.

Immunity to SARS CoV-2 wanes over time and breakthrough infections have been reported in persons who have completed a primary vaccination series. A subsequent additional dose of the vaccine (i.e. a booster dose) has been shown to restore vaccine effectiveness against infection and severe/critical disease. The first booster dose is now recommended five months after the primary series and the second booster dose may be administered 4 months after the first booster dose.

As countries transition over time to managing Covid -19 as an endemic disease, the world may reach a long-term state of disease prevention similar to that seen with the flu, with annual or twice yearly booster doses. In the short term, an accelerated rollout of booster doses of Covid -19 vaccines is likely to be one of the best protection against the new VOC-fueled wave of the disease.

The pandemic to endemic transition would be complete when the overall Covid-19 disease rates become static – neither rising nor falling. However, endemicity should not be considered a benign phenomenon.  A disease can be endemic and yet be widespread and deadly. Endemicity does not imply that evolution has somehow tamed a pathogen so that life simply returns to ‘normal’. There can still be disruptive waves arising from endemic infections, as seen with other infectious diseases like measles.

Persistence of SARS-CoV-2 as an endemic virus, perhaps with seasonal epidemic peaks, may be fueled by pockets of susceptible individuals and waning immunity after infection or vaccination; the emergence of VOCs that escape vaccine-induced immunity and re-entries from zoonotic reservoirs are factors which will impact long term behaviour of the virus and its ongoing transmission in different populations.

In light of the extensive infection rate and the enormity of cases, hospitalisation and severe illness, the fourth dose of vaccination is being recommended for those aged 18 and older, those with pre-existing conditions and risk factors for severe Covid-19 illness, for their caregivers and for anyone else at high risk for exposure to a confirmed Covid-19 patient in their line of work.  Studies show that those vaccinated with the fourth vaccine are twice as protected against infection than those vaccinated with three doses, and three to five times better protected from a severe illness compared to those vaccinated with three doses. Pakistan is currently offering first and second booster doses to eligible groups. Guidelines, policies and plans are being regularly reviewed and updated based on available international data to protect the health of our people.

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