

Guest Editorial

Combatting Dengue Epidemics: Bridging Gaps with Vaccine Innovation

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How to cite: Afzal S, Nasir M. Combatting Dengue Epidemics: Bridging Gaps with Vaccine Innovation. Ann King Edw Med Univ.2025;31(3): 247-248

Dengue is an arthropod viral disease which poses a public health concern globally as well in Pakistan. Its virus called as dengue virus spreads through Aedes mosquito. The clinical spectrum varies from asymptomatic infections to life threatening complications like dengue hemorrhagic fever and dengue shock syndrome. Classic dengue fever, the symptomatic form, is characterized by high-grade fever, severe headache, retro-orbital pain, myalgia, arthralgia and rash. Only symptomatic treatment is required in these cases. Dengue Hemorrhagic fever is accompanied by decline in platelets and hemorrhagic tendencies. If untreated it can lead to dengue shock syndrome which causes circulatory collapse and organ dysfunction. Factors influencing the severity of disease include secondary infection with a different serotype, younger age, pregnancy, diabetes and hypertension. Since there is only symptomatic treatment available, it makes prevention and vaccines to control epidemics critical.¹⁻³ In Pakistan, dengue is a public health concern with outbreaks affecting major urban cities. Dengue epidemics started in 2011 in Pakistan; to address this threat Dengue Expert Advisory group was formed.^{4,5} The National Institute of Health in

Pakistan has reported 20,057 confirmed dengue fever cases in 2024.⁶

There are a number of licensed vaccines and vaccines under development for dengue prevention including Dengvaxia, QDenga, InViragen's TDV and GlaxoSmithKline's tetravalent dengue vaccine and Takeda's V180. Sanofi Pasteur, Dengvaxia was the first licensed dengue vaccine. It is approved for individuals aged 9-45 with prior dengue exposure and has demonstrated efficacy in preventing severe dengue and hospitalization. Administering it to seronegative individuals has been associated with an increased risk of severe dengue upon subsequent infection. This is particularly concerning in resource limited settings like Pakistan where testing prior to vaccination becomes challenging. The Drug Regulatory Authority of Pakistan has approved Dengvaxia, but not for routine mass immunization. Moreover, its use is recommended under strict guidelines by the World Health Organization.⁷ The second licensed vaccine in several countries is QDenga, a tetravalent live attenuated vaccine developed by Takeda. However as per now this has not been approved for use in Pakistan. QDenga offers broader protection across all four dengue serotypes and is suitable for a more extensive population, including seronegative individuals. Mass administration makes it more suitable for developing countries.^{8,9}

Vaccines under development include InViragen's



Production and Hosting by KEMU

<https://doi.org/10.21649/akemu.v31i3.6272>
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TDV and GlaxoSmithKline's tetravalent dengue vaccine represent the next wave of vaccine development, with both showing promising early results. These vaccines aim to provide high efficacy and safety across diverse populations and regions.¹⁰ Another vaccine still in trial phase Takeda's V180, developed by Merck and Hawaiian researchers have used a novel recombinant subunit approach.¹¹

Dengue vaccines have shown efficacy in preventing severe dengue and reducing hospitalizations. The challenges are vaccine related and health system related. Dengvaxia can only be used in individuals with prior dengue. Moreover, high costs may their accessibility low in developing countries. Antibody-dependent enhancement risk makes concerns regarding safety. Dengue outbreaks can be reduced in number and severity by using these vaccines as part of immunization program. Partnerships can be done with World Health Organization, Global Alliance for Vaccines and Immunization and other organizations to improve the access of vaccines in low and middle income countries. Vaccinations should be combined with the traditional mosquito control measures to control dengue outbreaks.¹¹

To combat dengue outbreaks in Pakistan; a multifaceted approach is required. Vaccination along with vector control measures must be integrated as broader public health strategy. Community awareness campaigns should focus on educating the public about the benefits and potential risks of vaccination while dispelling myths and misinformation. Dengue vaccines, while not a panacea, represent a significant leap forward in reducing the global and regional burden of this disease.^{12,13} Collaborative efforts among governments, healthcare providers, and pharmaceutical companies, alongside active participation from the public, will pave the way for a dengue-free future in Pakistan and beyond.

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