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Typhoid Conjugate Vaccine Introduction in Bangladesh: Implementation, and Health System Strengthening Strategies

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Introduction:

Enteric fever, primarily caused by Salmonella Typhi and Paratyphi A, remains a significant public health threat in low- and middle-income countries, especially in regions with inadequate sanitation and unsafe water[1]. It is endemic across parts of Asia and Africa and is exacerbated by urbanization, climate change, and rising antibiotic resistance[2].

Typhoid fever remains a significant public health concern in many developing areas of the WHO African, Eastern Mediterranean, South-East Asia, and Western Pacific regions[3]. Salmonella Typhi causes about 30% of community-acquired bloodstream infections in Asia and 10% in Africa. Salmonella Paratyphi A is emerging in Asia, responsible for up to 35% of enteric fever cases in India and Nepal, and over 60% in China[4]. Globally, typhoid fever causes a substantial burden, with an estimated 14.3 million cases and 135,000 deaths annually as of 2019[1,3]. In 2021, there were over 2 million cases and over 14,000 deaths in South and Southeast Asia solely[5]. Bangladesh is one among the top five nations with the highest per capita incidence, typhoid-related mortality, and DALYs, according to the Global Burden of Disease (GBD) 2019 analysis[1]. Typhoid fever remains a significant public health challenge, with the rise of antimicrobial-resistant strains complicating treatment and heightening the risk of future outbreaks.

The typhoid conjugate vaccine (TCV) should be included to routine childhood vaccinations in typhoid-endemic countries, according to a 2017 recommendation by the World Health Organization's (WHO) Strategic Advisory Group of Experts on Immunization (SAGE), with a focus on those with high disease burden or antibiotic resistance[2]. The WHO presently recommends three vaccines to control endemic and epidemic typhoid fever: Injectable TCV, comprising Vi polysaccharide coupled to a carrier protein, licensed for children as young as 6 months and adults up to 45-65 years, depending on the vaccine. Injectable unconjugated Vi polysaccharide vaccine (Vi-PS) for people aged two years and up; Ty21a vaccine, live attenuated, in capsule form, for children over the age of 6. TCV is preferable for routine usage at all ages because it has a greater immune response, is suitable for young children, and provides longer-term protection. WHO also recommends that immunization campaigns be linked with health education, water and sanitation improvements, and diagnostic and treatment training for healthcare professionals[6]. In 2018, as part of a program scrutiny the TCV was first used in India for public health purposes. In countries like Pakistan (2019-2022), Liberia (2021), Zimbabwe (2021), Nepal (2022), and Samoa (2021-2022), TCV has now been included in national routine immunization regimens for children, typically at 9 months or between 15 and 18 months. With coverage estimates ranging from 63-95%, catch-up initiatives have administered TCV to approximately 75 million children. For instance, TCV was part of integrated campaigns in Nepal, Pakistan, and Zimbabwe that targeted children who were either unvaccinated or undervaccinated and paired it with other standard vaccines[7,8]. Since 2019, the Global Alliance for Vaccines and Immunization (GAVI) has supported vaccine use in eligible countries, and by March 2023, the WHO prequalified two conjugate vaccines offering long-lasting protection with a single dose for children over six months old[3]. In March 2024, the SAGE on Immunization convened to discuss vaccination tactics and provide evidence-based guidelines by highlighting its accomplishments and future objectives[9].

The WHO recommends TCVs in countries with high typhoid burden or drug resistance. While Bangladesh plans to include TCV in its EPI schedule, identifying the most cost-effective strategy remains crucial. To support this, researchers developed a cost-effectiveness model using clinical, economic, and serosurvey data to better estimate typhoid incidence and guide vaccine rollout[10]. The WHO recommends TCVs in countries with high typhoid burden or drug resistance. While Bangladesh plans to include TCV in its routine immunization program, identifying the most cost-effective strategy remains crucial. To support this, it is needed to develop a cost-effectiveness model using clinical, economic, and serosurvey data to better estimate typhoid incidence and guide vaccine rollout. The incorporation of TCVs into EPI programs forms a key part of a multi-sectoral strategy to prevent typhoid fever, alongside strengthened national surveillance systems. This approach supports countries in reducing the burden of typhoid-related illness and death. Experiences from countries that have successfully introduced TCVs and conducted catch-up campaigns with integrated health interventions can serve as valuable models for others

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planning implementation. Continued financial and technical support at both national and international levels is essential to enhance program delivery, gather accurate national data on typhoid prevalence, and expand TCV coverage. Strengthened surveillance and sustained financial and technical support are also essential to reduce typhoid burden effectively.

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