

## COVID-19 and the Hidden Damage to the Childhood Immunization Agenda in India

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**F**rom that first ever vaccine for smallpox developed by Edward Jenner in the 18th century to today's pediatric mRNA vaccines for COVID-19, childhood vaccines have proven to be one of the greatest miracles of modern medicine. Vaccines save an estimated 2-3 million lives globally every year, and in India, they have played an important role in reducing the annual number of deaths among children under the age of five years from 3.4 million in 1990 to 1.2 million in 2015 [1].

With an estimated 26 million children born every year in India, routine immunization at scale is a challenging task. Although the Universal Immunization Programme (UIP) was launched during the mid-1980s, coverage rates of diphtheria-pertussis-tetanus third dose (DPT3) among children under the age of two years – a commonly used measure of efficiency of national immunization programs – remained in the 60-70% range until almost the end of 2000s. It is only during the past decade that UIP has shown tremendous progress, reaching 91% DPT3 coverage in 2019 [2]. Not only were children vaccinated at higher rates than ever before, rates of receiving DPT3 on time (at recommended age) increased by 26% during the decade leading to 2016 [3]. Timely receipt of the BCG vaccine increased by an astounding 94% during this time [3].

Two special programs played a key role in intensifying childhood vaccination efforts under UIP. Following the footsteps of the Pulse Polio Campaign which freed India from the curse of poliomyelitis, the Government of India implemented Mission Indradhanush (MI) during 2015-2017, followed by Intensified Mission Indradhanush (IMI) during 2017-2020 (in two phases). Scientific evidence using large scale survey and administrative databases shows that both programs substantially increased routine vaccination coverage and timely receipt of doses. Full immunization rates among under-2 children who benefited from the first two phases of MI increased by 27%, while median rise in vaccine delivery due to IMI was 11% [4,5].

IMI 2.0 ended in March, 2020, and then the pandemic arrived. Every aspect of life in India was disrupted, including health systems, public service delivery, schooling and learning, livelihoods, and physical and mental well-being. The Indian government reports that around half a million Indians lost their lives to COVID-19 by the end of 2021; although, independent experts have estimated much higher death tolls. During April to June of 2020, India's gross domestic product (GDP) fell by 23.8%, and throughout 2020, it contracted by 6.6% [6]. The Reserve Bank of India estimates that it may take up to 15 years for the Indian economy to return to a path of robust economic growth [6].

An important but overlooked collateral damage from the pandemic was the global interruption in childhood vaccine delivery. Health systems were overburdened with COVID-related care, and childhood immunization rates reduced substantially. DPT3 coverage rates in India fell to 85% in both 2020 and 2021, while coverage rates of individual vaccines reduced by 2-10% and timely receipt rates decreased by 3-5% through April, 2021 [2,7].

In this issue of *Indian Pediatrics*, the study by Ahmed and colleagues [8] reaffirms the need for universal routine immunization coverage among Indian children. The authors examined clinico-epidemiological profiles of 318 children (median age of 5 years) admitted with diphtheria to a tertiary care hospital in Northern India during January, 2018 to December, 2020. Rates of complications and fatality among patients were 48.4% and 17.9%, respectively, and among children with immunization data (56% of the sample), only 4.5% were fully immunized. The data exhibited clear seasonality patterns with most cases occurring during the second half of the year. Although, the sample size was small, interestingly, the seasonal peak was the highest in 2020, among all the years. The study had some limitations. The authors only reported full and partial immunization status and not DPT vaccination status; although, one could assume that most patients likely missed doses of the pentavalent

vaccine, which contains the DPT vaccine. As with most hospital-based studies, data on background socioeconomic status of patients were not available.

Nevertheless, this study and other related research show that even with the rapid rise in childhood immunization rates in recent years, there is no room for complacency. Vaccine-preventable diseases (VPDs) continue to kill close to half a million Indian children every year, and the pandemic may have made the situation worse [9]. Between March, 2020 and April, 2021, more than 2.5 million scheduled doses of DPT3 vaccine were not delivered to Indian children [7]. The generation of children who were not vaccinated, partially vaccinated, or vaccinated with a delay due to the pandemic, may experience higher morbidity and mortality from VPDs than the previous cohorts of children. These children may also suffer from poorer non-health outcome over the life course, as childhood vaccinations in India have been linked with 0.2-0.3 gains in schooling years completed [10] and 14% higher wages in adulthood [11].

Intensified Mission Indradhanush 3.0 was launched by the Indian government in early 2021, across 250 districts, with a primary goal of vaccinating children and pregnant women who had missed their scheduled vaccines during the pandemic. IMI 3.0 was followed by IMI 4.0, which was launched in 2022 to cover 416 districts. While these efforts are laudable, regular vaccine delivery under UIP should also be strengthened. The current annual funding gap of UIP is estimated to be a staggering \$560 million (routine childhood vaccines only), which must be closed [12].

A robust UIP, together with periodic intensification of vaccine delivery through special programs when necessary, can help India achieve the Sustainable Development Goals target of reducing under-5 mortality to 25 per 1,000 live births by 2030 (from 31 in 2021).

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