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ORIGINAL ARTICLE

EFFECT OF THE COVID-19 PANDEMIC ON ROUTINE IMMUNIZATION SERVICES: A COMPARISON OF IMMUNIZATION SERVICES DURING PRE-PANDEMIC, PANDEMIC, AND POST-PANDEMIC PHASES IN TAMIL NADU.

Farida Fahhima A [(1)], Kanagabala Balasubramanian [(2)], Vidhya Viswanathan [(1)], Vinay Kumar K [(2)]

(1) Saveetha Medical College and Research Institute

(2) Directorate of Public Health & Preventive Medicine

ABSTRACT

INTRODUCTION : Immunization is one of the most cost-effective public health investments. Before the pandemic, immunization services operated under established routines, with fixed and outreach sessions ensuring access even in remote areas. The COVID-19 pandemic disrupted this system through lockdowns, redeployment of healthcare workers, supply chain interruptions, and increased vaccine hesitancy.

METHODS : Retrospective observational study was conducted using Immunization secondary data from the Tamil Nadu Health Management Information System [TN-HMIS]. The number of immunization sessions planned and held and the immunization target and coverage during Pre-Pandemic [2018-19 to 2019-20], Pandemic [2020-21 to 2021-22], and Post-Pandemic [2022-23 to 2023-24] were collected from TN-HMIS portal. Immunisation coverage represented as Full Immunisation Coverage (FIC).

RESULTS: Immunisation sessions held has decreased during early phase of pandemic and post pandemic. Gap between sessions planned is consistent during the entire period with maximum gap during early pandemic. Near approximation of sessions planned and conducted is observed during 2023-24 (during post pandemic phase). Fully immunized coverage decreased from 99% during Pre pandemic to 97% during pandemic and increased to 102% in early Post pandemic and returned to 99% during late Post pandemic 19.

CONCLUSION: There is an increase in the number of immunization sessions planned and held during pandemic and Post Pandemic. Coverage of FIC is in declining trend during pandemic phase followed by increasing trend during early part of post pandemic, followed by return to normalcy during later part of post pandemic phase.

KEYWORDS : Immunisation, Sessions, Coverage, COVID 19.

INTRODUCTION

Immunization is one of the most cost-effective public health investments and a success story in the history of global health and development. Vaccines being an effective intervention have significantly reduced morbidity and mortality due to a wide range of infectious diseases, cancers, and other chronic illnesses.

The history of vaccination dates back to as early as 496 B.C., when Thucydides observed that those who survived smallpox did not get re-infected. The breakthrough in modern immunization came in 1798, when Edward Jenner introduced the world's first vaccine—against smallpox—using material from cowpox lesions. This pioneering effort laid the foundation for the development of the term "vaccine," derived from Variolae vaccinae (smallpox of cow).

The eradication of smallpox in 1980 by the World Health Organization (WHO) stands as one of the greatest triumphs in public health. The 27th World Health Assembly held in 1974 recommended the use of vaccines to protect against six diseases namely, tuberculosis, diphtheria, tetanus, pertussis, measles and poliomyelitis under the Expanded Programme on Immunization (EPI).[2]

Following this, all countries have launched national immunization programs and introduced additional vaccines like Hepatitis B, Inactivated Polio virus vaccine (IPV), Haemophilus influenza type b (Hib), Rota Virus, Pneumococcal, Japanese encephalitis (JE), Typhoid, Human Papilloma virus (HPV) and other vaccines.

In 2003, it was estimated that vaccines prevent almost six million deaths/year and save 386 million life years and avert 96 million disability-adjusted life years (DALYs) globally.[3] WHO in 2019 stated that vaccines have prevented more than 4-5 million deaths each year.[4]

The impact of vaccination on reducing childhood

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Corresponding Author: Farida Fahhima A
e-mail : farida.7fahhima@gmail.com

mortality is profound. The global estimates for 1990 to 2019 showed that four childhood vaccines namely DTP, measles, rotavirus and Hib vaccines were significantly associated with a reduction of 86.9 million deaths globally in 204 countries and territories and a global decline of 21.2 deaths per 1000 live births. Countries with large populations such as India, China, Ethiopia, Pakistan and Bangladesh had the largest absolute reductions in deaths among children younger than 5 years associated with vaccines.[5] Universal Immunization Programme (UIP) of India is one of the largest public health programs in the world. It has a target of nearly 2.6 crore newborns and 3.0 crore pregnant women per year. UIP offers vaccines against twelve Vaccine Preventable Diseases (VPDs) of which eleven are nationwide and one (Japanese Encephalitis (JE) in endemic districts) sub-nationally. About 1.3 crore routine immunization (RI) sessions are planned annually. Despite steady progress, full immunization coverage in India increased slowly—from 35% in 1992-93 to 62% in 2015-16 (NFHS-4). To accelerate this, the Government of India launched Mission Indradhanush (MI) in 2014, targeting underserved populations. The program was further intensified with Intensified Mission Indradhanush (IMI) in 2017. These initiatives led to a notable increase in immunization coverage: IMI contributed to a 6.7% rise in coverage during its first two phases (2015–16), and a 2018 evaluation reported an 18.5% improvement compared to NFHS-4. By NFHS-5 (2019–21), India achieved a full immunization coverage of 76.4%, up from 62% in 2015-16. DPT3 (Penta3) coverage surpassed 90% nationally in 2019. However, the onset of the COVID-19 pandemic in 2020–21 significantly disrupted immunization services worldwide, including in India, causing a 6% decline in DPT3 coverage (down to 85%).

Before the pandemic, immunization services operated under established routines, with fixed and outreach sessions ensuring access even in remote areas. The COVID-19 pandemic disrupted this system through lockdowns, redeployment of healthcare workers, supply chain interruptions, and increased vaccine hesitancy. These disruptions created immunity gaps, placing vulnerable populations—especially children—at heightened risk for VPDs.

In response, the Government of India initiated several recovery strategies, including IMI 3.0 (Jan–Feb 2021), IMI 4.0 (Feb–Apr 2022), and IMI 5.0—The Big Catch-Up in 2023. IMI 3.0 and 4.0 targeted high-priority districts, covering nearly 10 lakh and 56 lakh children respectively. IMI 5.0, with the theme "A Big Leap towards Measles-Rubella Elimination", was implemented nationwide, aiming to bridge immunity gaps, particularly in children under five.

In Tamil Nadu, routine immunization services faced multiple operational challenges during the pandemic—lockdowns, diversion of resources to COVID care, reduced footfall at health facilities, and community-level hesitancy. These challenges not only interrupted ongoing immunization efforts but also emphasized the critical role of vaccines in responding to public health emergencies.

OBJECTIVES

1. To assess the effect of the COVID-19 pandemic on immunisation sessions across Tamil Nadu during Pre-Pandemic [2018-19 to 2019-20], Pandemic [2020-21 to 2021-22], and Post-Pandemic [2022-23 to 2023-24] Phases.

2. To assess the effect of the COVID-19 pandemic on immunisation coverage across Tamil Nadu during Pre-Pandemic [2018-19 to 2019-20], Pandemic [2020-21 to 2021-22], and Post-Pandemic [2022-23 to 2023-24] Phases.

METHODS

A retrospective observational study was conducted using Immunization secondary data from the Tamil Nadu Health Management Information System [TN-HMIS]. The number of immunization sessions planned and held and the immunization target and coverage during Pre-Pandemic [2018-19 to 2019-20], Pandemic [2020-21 to 2021-22], and Post-Pandemic [2022-23 to 2023-24] were collected from TN-HMIS portal.

The planned sessions represented the intended immunization sessions in each year, while the held sessions accounted for the actual conducted sessions. Immunisation coverage was represented as Full Immunisation Coverage (FIC). The data was extracted and analysed in Microsoft Excel. Immunisation sessions planned and conducted and Immunisation target and coverage were expressed as percentages. Line graphs were used to visualize differences between planned and held sessions over the years.

RESULTS

The number of Immunization sessions planned and held in Tamil Nadu from the year 2018-19 till 2023-24 were represented in Table 1 and Figure 1. There is an increase in the number of immunization sessions planned and held during pandemic and Post Pandemic compared to Pre pandemic. However, when sessions held is compared with sessions planned, sessions held has decreased during early phase of pandemic and post pandemic.

Table 1: Number of planned and held Immunization sessions in Tamil Nadu (2018-19 to 2023-24)

	Year	Immunization sessions planned	Immunization sessions held (%)
Pre pandemic	2018-19	573053	567612 (99.05)
	2019-20	577033	571435 (99.03)
Pandemic	2020-21	604483	594725 (98.39)
	2021-22	644130	638093 (99.06)
Post pandemic	2022-23	634305	626668 (98.80)
	2023-24	637665	634592 (99.52)

There is an increasing trend of immunization sessions planned and conducted during pre pandemic and pandemic, with maximum peak of sessions planned and conducted during 2021-22, followed by declining trend during the early post pandemic period. Gap between sessions planned is consisted during the entire period with maximum gap during early pandemic. Near approximation of sessions planned and conducted is observed during 2023-24, that is during post pandemic phase.

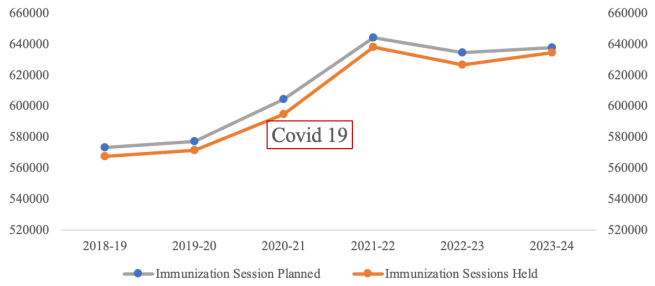

Figure 1: Trend of Planned vs. Held Immunization Sessions in Tamil Nadu (2018-19 to 2023-24)

Immunisation coverage in terms of number of children with FIC in comparison to immunization target is depicted in Table 2. Fully immunized coverage decreased from 99% during Pre pandemic to 97% during pandemic and increased to 102% in early Post pandemic and returned to 99% during late Post pandemic. Coverage of FIC is in declining trend during pandemic phase followed by increasing trend during early part of post pandemic, followed by declining trend in later part of post pandemic phase, depicted in Fig.2.

Table 2: Immunization target and coverage of fully immunised children in Tamil Nadu (2018-19 to 2023-24)

	Year	Infant target	Fully immunized
Pre pandemic	2018-19	943938	934592 (99%)
	2019-20	953533	944470 (99%)
Pandemic	2020-21	931511	902796 (97%)
	2021-22	920871	889885 (97%)
Post pandemic	2022-23	915228	933498 (102%)
	2023-24	916269	905877 (99%)

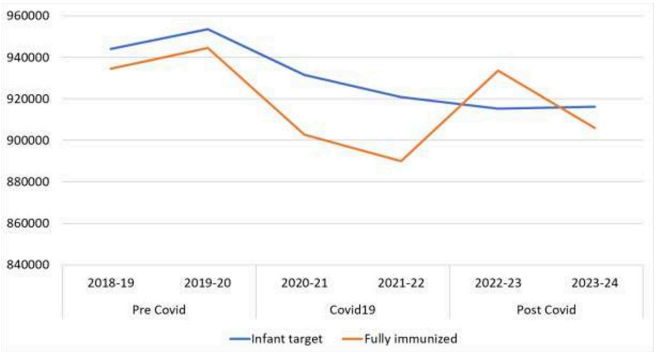

Figure 2: Trend of Infant target vs fully immunized infants in Tamil Nadu (2018-19 to 2023-24) and Impact of COVID-19

DISCUSSION

The findings of this study highlight the impact of the COVID-19 pandemic on routine immunization sessions and immunization coverage over a six-years period. Immunisation sessions are planned as per microplanning which is based on Head Count Survey. HCS is conducted twice a year, in February and September, to identify Pregnant women, Children aged 0–2 years, and Children aged 2–5 years who have missed MR, OPV, and DPT vaccines under UIP. The surveys is conducted in Tamil Nadu by Village Health Nurses, Urban Health Nurses with support from Anganwadi Workers (AWW).

The area-wise, actual number of pregnant women and children (infants, 1-2 years and children 2-5 years missed the RI dose) are obtained from Head count survey. From this, the annual and monthly target beneficiaries of pregnant women and infants (0-1 years) are utilized for planning RI sessions, estimation of vaccine and logistics. Based on the monthly injection load, the number of RI sessions to be conducted for each village/area is calculated. Community needs and demands are also considered for planning sessions.

Routine Immunization (RI) microplanning is the basis for ensured delivery of RI services to a community. RI microplans are prepared annually based on actual Head Count Surveys (HCS) and reviewed quarterly. Microplanning begins at the Subcentre (SC) or Urban ANM area level with HCS at primary level and is compiled upward to PHC/UPHC, Block/Taluk/Zone, District, and finally the State level.

Immunization sessions are being conducted both as Institutional in all days a week and on every Wednesday as Outreach sessions. Institutional Immunization sessions will be conducted in all Primary Health Centres, Pediatric Units of Government Medical College Hospitals, District Head Quarters Hospitals, Government Taluk & Non-Taluk Hospitals. Outreach Immunization services are being

conducted in all villages and towns.

In the current study, the number of immunization sessions planned and held during Pre-pandemic [2018-19 to 2019-20], Pandemic [2020-21 to 2021-22], and Post-Pandemic [2022-23 to 2023-24] was assessed. There is an increase in the number of immunization sessions planned and held during pandemic and Post Pandemic compared to Pre pandemic. However, when sessions held is compared with sessions planned, sessions held has decreased during early phase of COVID and post COVID, which has increased during later part of pandemic and post pandemic. This highlights the effect of COVID 19 on preparation of routine immunization services.

Regarding the trend of sessions planned and conducted, there is an increasing trend of immunization sessions planned from 2018-19, with maximum peak of sessions planned during 2021-22, indicating that catch-up efforts were made to compensate for missed doses during the pandemic. However, the By 2023-24, the near approximation of planned and held sessions by during 2023-24 indicates a return to normalcy, which signify the effectiveness of recovery measures.

Similar study done in Karachi, Pakistan to assess the impact of COVID-19 lockdown on routine immunization, has documented a declining trend in routine immunization, and added that outreach sessions were affected more than fixed immunization sessions, with worst hit for slums and scattered settlements.[13] The reasons attributed in the study were restriction of movement, disruption in supply, fear of infection contributed to a decrease in the mean proportion of vaccinators who attended work during the lockdown compared with baseline.[13] Full Immunization coverage (FIC) denotes children who have received BCG, 3 doses of OPV, 3 doses of pentavalent and 1 dose of MR by first year of age. Fully immunized coverage decreased from 99% during Pre COVID to 97% during COVID 19 and increased to 102% in early Post COVID and returned to 99% during late Post COVID 19. This highlights the effectiveness of health systems' recovery measures.

Pinto AM in a systematic review has documented that reasons for decreased coverage during COVID could be fear of COVID-19, including fear of contracting COVID-19 and fear of children contracting COVID-19, particularly in healthcare settings, Unavailability of transport services, which limited the ability of both service-users and Health Care Professionals to reach immunisation services14. Also, the lockdowns imposed, healthcare resource diversion, and logistical challenges during the pandemic could also have bearing effect on immunization coverage.

Coverage of FIC is in declining trend during pandemic phase followed by increasing trend during early part of post pandemic, followed by declining trend in early part of post pandemic phase. However, the decline during late post pandemic phase is indicating a return of normalcy.

The study has utilized data from HMIS which captures only numbers of session planned and held and immunization coverage, not the actual line list, which could potentially affect the inference. During the period from mid-March to June 2020, immunization sessions were not fully operational due to the pandemic. It was logically expected that there would be a shortfall of at least 12 sessions per rural and urban HSC, amounting to nearly 1,20,000 sessions across approximately 10,000 HSCs. However, contrary to expectations, HMIS data indicated that the number of sessions planned and held was not significantly affected. This discrepancy raises a cautionary note and underscores the need to consider transitioning to platforms like UWIN, which capture line-listed data rather than aggregate abstracts.

When UWIN is fully utilized throughout the process from HCS till immunization coverage, this disadvantage from HMIS could be eliminated. However, UWIN was launched post COVID, following the success of COWIN, and was functional in the state from August 2023. Further studies are recommended that involves triangulation of data from extracted from double check register which documents lifting of vaccines, number of beneficiaries vaccinated in each session, comparing fixed and outreach sessions, rural and urban comparison.

CONCLUSION

There is an increase in the number of immunization sessions planned and held during pandemic and Post Pandemic. However, when sessions held is compared with sessions planned, sessions held has decreased during early phase of COVID and post COVID. There is an increasing trend of immunization sessions planned and conducted during pre- pandemic and pandemic, with maximum peak of sessions planned and conducted during 2021-22, followed by declining trend during the early post pandemic period. Gap between sessions planned is consistent during the entire period with maximum gap during early pandemic. Near approximation of sessions planned and conducted is observed during 2023-24, that is during post pandemic phase.

Fully immunized coverage decreased from 99% during Pre COVID to 97% during COVID 19 and increased to 102% in early Post COVID and returned to 99% during

late Post COVID 19. Coverage of FIC is in declining trend during pandemic phase followed by increasing trend during early part of post pandemic, followed by return to normalcy during later part of post pandemic phase. The study extracted data from HMIS, which captures only aggregated information on sessions and coverage, without line-listed records. Consequently, the data did not reflect the expected shortfall in immunization sessions during the pandemic. This limitation underscores the need to transition to platforms like UWIN, which capture line-listed data and have built-in mechanisms to ensure the authenticity of reported information.

CONFLICT OF INTEREST

None

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