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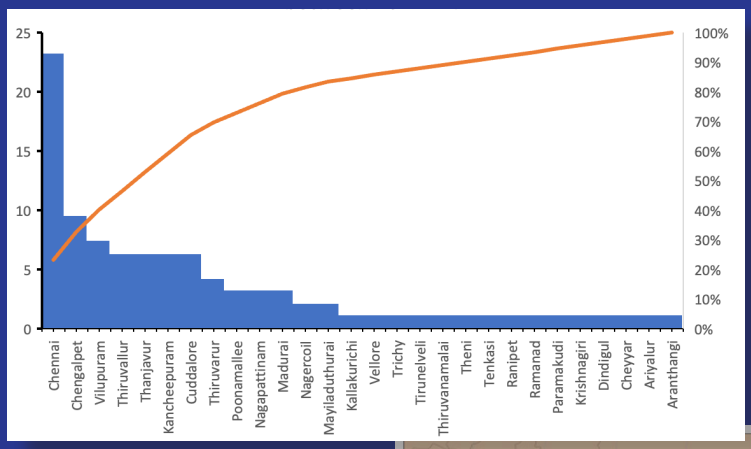

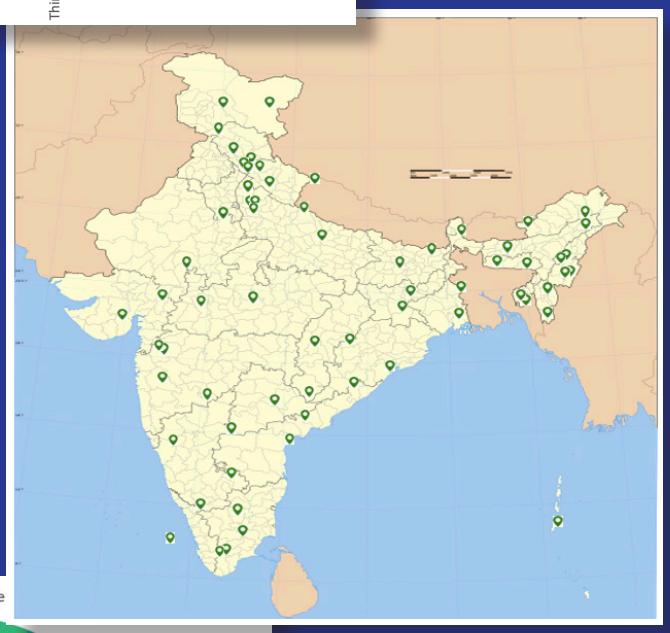

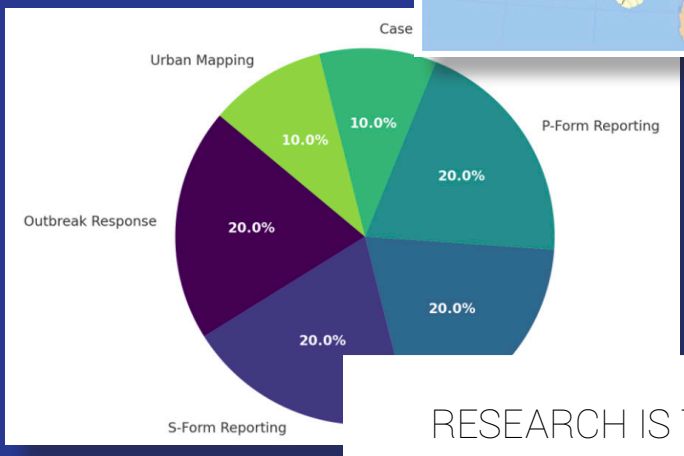

RESEARCH IS TO SEE WHAT EVERYBODY ELSE HAS SEEN, AND TO THINK WHAT NOBODY ELSE HAS

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ORIGINAL ARTICLE

A DESCRIPTIVE ANALYSIS OF NATIONAL QUALITY ASSESSMENT STANDARDS CERTIFICATION STATUS OF PRIMARY HEALTH CARE CENTRES IN TAMIL NADU, MAY 2024.

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ABSTRACT

INTRODUCTION : Ensuring high-quality healthcare delivery is a fundamental goal of health systems worldwide. In India, the National Quality Assurance Standards (NQAS) were introduced to evaluate and enhance healthcare services, including those provided at Primary Health Centers (PHCs). This study examines the NQAS certification status of PHCs, Urban PHCs (UPHCs), and Community Health Centres (CHCs) in Tamil Nadu to identify factors affecting compliance and propose improvement strategies.

METHODS : A cross-sectional study was conducted from April to June 2024, encompassing all PHCs, UPHCs, and CHCs in Tamil Nadu. Secondary data on certification status from May 2023 to May 2024 were collected from state-level quality officers, while district-level officers provided insights into reasons for non-certification. Data were analyzed using descriptive statistics to identify trends and common deficiencies in achieving NQAS certification.

RESULTS: Among 2,127 Primary Health Centers (PHC) facilities, 469 received full certification, 83 were certified with conditions, and 17 were deferred. Key deficiencies were identified in quality management, patient rights, and service outcomes. Deferred CHCs often failed to meet criteria related to blood storage management and outsourced service monitoring, while PHCs and UPHCs struggled with inpatient care, national health programs, and infection control measures.

DISCUSSION: The study highlights gaps in infrastructure, workforce capacity, and adherence to standardized protocols. Addressing these deficiencies requires regular internal assessments, targeted training, and policy reforms. Digital tools like GUNAK and patient feedback applications can support quality monitoring and engagement.

CONCLUSION: Strengthening PHC services in Tamil Nadu necessitates an integrated approach involving capacity building, infrastructure development, and evidence-based quality improvement models. The study's findings provide insights for program implementers to enhance primary healthcare delivery and achieve sustained NQAS compliance.

KEYWORDS : Quality care, NQAS, PHC, Kayakalp, Accreditation

INTRODUCTION

Providing the finest available care at the appropriate time for the appropriate person while achieving the best outcomes is the cornerstone of high-quality healthcare. Quality improvement methods in healthcare have their roots in the 19th century. Two notable examples are the handwashing advocacy of obstetrician Ignaz Semmelweis and nurse Florence Nightingale's efforts to improve living conditions and reduce soldier mortality in army hospitals.[1] Quality health services according to WHO, should be: effective; safe; people-centered; timely; equitable; integrated; and efficient also to attain Universal Health Coverage, and attention to quality of care in all settings including those experiencing fragility, conflict, and vulnerability is mandatory.[2]

Primary Health Centers (PHCs) are the cornerstone of India's healthcare system, especially in rural regions, providing essential medical services to a vast population. To ensure the delivery of high-quality care, the Ministry of Health and Family Welfare (MoHFW) introduced the National Quality Assurance Standards (NQAS), in 2013 a comprehensive framework designed to assess and enhance the quality of services in public health facilities at Sub-districts, District-level hospitals, including PHCs.

NQAS aims to assess and certify healthcare facilities on eight quality parameters, including service provision, patient rights, inputs, support services, clinical care, infection control, quality management, and outcome. These standards

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are ISQua (International Society for Quality in Health Care) accredited and meet global benchmarks in terms of comprehensiveness, objectivity, evidence, and firmness of development. Once a health facility gets certified for NQAS, it is felicitated and recognized for its achievement with financial incentives. Further surveillance will be done every year and recertification will take place after three years.

PHC/ Upgraded PHC with beds that receive full Certification and Certification with conditionality will get an incentive of Rs.3.0 Lakh and Rs.2.0 Lakh respectively (Table 1). U-PHC/ PHC without beds will receive an incentive of Rs.2.0 Lakh for Full Certification and Rs.1.5 lakh for certification with conditionality.

CHCs with full certification will receive an incentive of Rs. 10,000 x No. of functional bed x No. of applicable checklist/ total number of checklists in the standards. CHCs with certification with conditionality will receive an incentive of Rs. 7,000 x No. of functional bed x No. of applicable checklist/ total number of checklists in the standards.

Certification with conditionality (Table 1) is given only when the facility meets the first criteria of aggregate score ≥ 70% including four out of five remaining criteria for the Community Health Centre (CHC) and three out of four remaining criteria for the Primary Health Centre and U-PHC.[3] Certification will be deferred if the facility does not meet four out of five remaining criteria for the Community Health Centre (CHC) and three out of four remaining criteria for the Primary Health Centre and U-PHC.[3]

[*Standard A2 – The facility provides RMNCHA services; Standard B4 – The facility has defined and established procedures for informing patients about the medical condition, and involving them in treatment planning, and facilitates informed decision making; Standard B5 – The facility ensures that there are no financial barriers to access, and that there is financial protection given from the cost of hospital services; Standard D8 – The facility has defined and established procedures for promoting public participation in management of hospital transparency and accountability; Standard F6 - The facility has defined and established procedures for segregation, collection, treatment and disposal of Bio Medical and hazardous Waste. Abbreviations – SDH – Sub-district hospital; CHC – Community health centre; PHC – Primary health centre; U-PHC – Upgraded primary health centre]

Despite the implementation of NQAS, achieving certification remains a significant challenge for many PHCs. As of October 31, 2024, a total of 16,586 health facilities across India have received NQAS certification.[4] However, numerous PHCs still struggle to meet the required standards. Identifying and understanding the barriers to certification are crucial steps toward improving healthcare quality.

Several studies have highlighted common obstacles faced by PHCs in attaining NQAS certification. A report on the enablers and barriers of NQAS accreditation in Kerala identified factors such as inadequate infrastructure, insufficient staffing, and limited training opportunities as significant hurdles.[5]

Table 1: NQAS assessment criteria for SDH/CHC and PHC/U-PHC facilities

		Aggregate Score (%)		Quality Certified		Quality Certified with Conditionality		Deferred	
S. no	Criteria	SDH/ CHC	PHC/U-PHC	SDH/ CHC	PHC/U-PHC	SDH/ CHC	PHC/U-PHC	SDH/ CHC	PHC/U-PHC
1	Aggregate score of the health facility	≥ 70%	≥ 70%	√	√	√	√	√	√
2	Score of each department of the health facility	≥ 70%	NA	√	NA	At least three criteria out of remaining five (√)	NA	Does not meet at least three criteria out of remaining five	NA
3	Segregated score in each Area of Concern	≥ 70%	≥ 60%	√	√		At least three criteria out of remaining four (√)		Does not meet at least three criteria out of remaining four
4	Score of Standard	Standard A2, Standard B5 and Standard D8 is >60%	Standard A2, Standard B4 and Standard F6 (PHC)/F4 (U-PHC) is ≥ 60%	√	√				
5	Individual Standard wise score	≥ 50%	≥ 50%	√	√				
6	Patient Satisfaction Score	65% or Score of 3.2 on Likert Scale	60% or Score of 3.0 on Likert Scale	√	√				

Understanding these centres' current NQAS certification status and exploring the reasons behind their success or failure in obtaining certification can provide valuable insights. Such an analysis can inform targeted interventions to bridge existing gaps, thereby enhancing the quality of primary healthcare services in the state.

This study aims to conduct a descriptive analysis of the NQAS certification status of CHCs, U-PHCs, and PHCs in Tamil Nadu. By examining the certification status of 2,127 healthcare facilities and exploring the reasons for non-certification, this study seeks to identify prevalent challenges

and propose actionable solutions. The findings are expected to contribute to policy formulation and the implementation of strategies aimed at strengthening primary healthcare services, ultimately leading to improved health outcomes for the population.

METHODS

A cross-sectional study conducted over a period of three months, from April 2024 to June 2024. All Primary Health Centers (PHCs), Urban Primary Health Centers (UPHCs), and Community Health Centers (CHCs) in Tamil Nadu are included to assess their National Quality Assurance Standards (NQAS) certification status. Facilities deferred or received conditional certification are further examined to identify the reasons for non-certification.

Secondary data on the certification status of health facilities from May 2023 to May 2024 were obtained from state-level quality officers.

Additionally, data on the reasons for non-certification were collected from district-level quality officers. The collected data were entered into Microsoft Excel. Descriptive statistical analysis was performed to identify trends and factors associated with certification outcomes.

RESULTS

Totally 2127 primary healthcare facilities are actively operating in Tamil Nadu, out of these 2127 facilities, 570 (26.7%) appeared for NQAS assessment for the year 2023-2024. At the end of the assessment, 469 (82%) centres got full certification, 83 (14.5%) got conditionality and 17 (3.6%) got deferred. District wise list is represented in Figures 1,2 and 3.

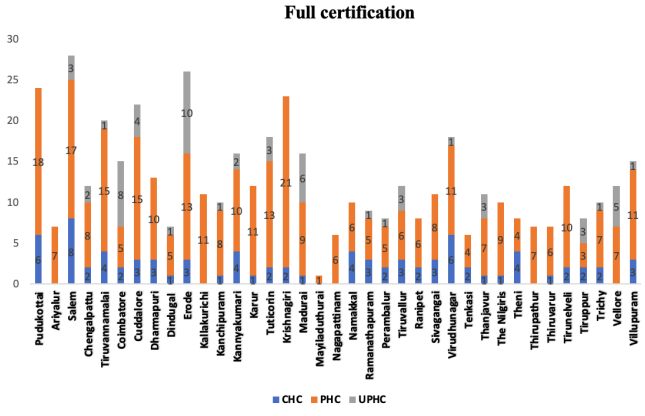

Figure 1: Distribution of facilities received full certification in NQAS assessment by District, Tamil Nadu, May 2023 – May 2024

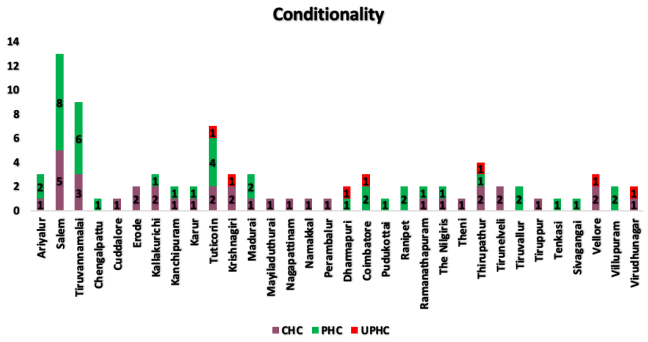

Figure 2: Distribution of facilities received certification based on conditionality in NQAS assessment by District, Tamil Nadu, May 2023 – May 2024

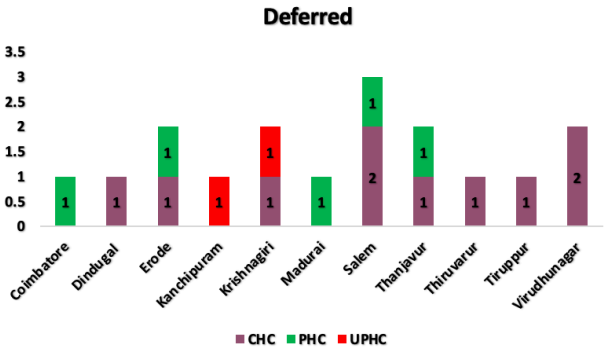

Figure 3: Distribution of facilities deferred for certification in NQAS assessment by District, Tamil Nadu, May 2023 – May 2024

17 deferred facilities include 10 CHCs, 5 PHCs, and 2 UPHCs. A detailed analysis of the deferred facilities is given below.

Table 2: Criteria met and not met at CHC level (n=10), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

CHCs Criteria	Met	Not met
criteria 1	10	0
criteria 2	2	8
criteria 3	1	9
criteria 4	4	6
criteria 5	0	10
criteria 6	10	0

Table 2 shows that at the CHC level, criteria 5, 3, and 2 are not met in most of the CHCs that got deferred. The auxiliary department, operation theatre, and general/ administration department are the departments that are commonly not met (Table 3). Quality management is the area of concern not met by 8 of the 10 CHCs that got deferred (Table 4). The most common standards that are not met include Standard E12 (6 CHCs) and Standards G6 and D10 (4 CHCs).

Table 3: Departmental criteria met and not met at CHC level (n=10), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

Department	Met	Not met
Emergency	8	2
NBSU	10	0
Operation theatre	7	3
Laboratory	8	2
OPD	10	0
Labor room	10	0
IPD	8	2
Auxiliary	5	5
General/admin	7	3
Radiology	9	1
Pharmacy and store	9	1
Blood storage unit	9	1

Table 4: Area of concern met and not met at CHC level (n=10), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

Area of concern	Met	Not met
Service provision	8	2
Patient rights	10	0
Inputs	9	1
Support services	9	1
Clinical services	9	1
Infection control	10	0
Quality management	2	8
Outcome	10	0

At the PHC level, criteria 5 and 3 are not met by the deferred PHCs (Table 5). In-patient department was not met by 3 out of 5 PHCs, followed by NHP and OPD which are not met by 2 PHCs respectively (Table 6). Quality management and outcome are the areas of concern not met by 4 and 3 of the deferred PHCs respectively (Table 7).

Table 5: Criteria met and not met at PHC level (n=5), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

PHCs Criteria	Met	Not met
criteria 1	4	1
criteria 2 (NA)	-	-
criteria 3	1	4
criteria 4	4	1
criteria 5	0	5
criteria 6	5	0

Table 6: Departmental criteria met and not met at PHC level (n=5), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

PHCs Department	Met	Not met
OPD	3	2
Labor room	5	0
IPD	2	3
National Health program	3	2
General	5	0
Laboratory	4	1

Table 7: Area of concern met and not met at PHC level (n=5), Deferred facilities for NQAS assessment, Tamil Nadu, May 2023 – May 2024

PHCs Area of concern	Met	Not met
Service provision	5	0
Patient rights	5	0
Inputs	5	0
Support services	5	0
Clinical services	5	0
Infection control	5	0
Quality management	1	4
Outcome	2	3

DISCUSSION

The analysis of National Quality Assurance Standards (NQAS) certification status among 2,127 health facilities in Tamil Nadu reveals critical gaps in achieving quality standards. While 469 facilities obtained certification, 83 were certified with conditions, and 17 were deferred. Among the eight key quality areas (Service Provision, Patient Rights, Inputs, Support Services, Clinical Services, Infection Control, Quality Management, and Outcome), Quality Management was the most commonly unmet criterion, followed by Outcome-based assessments across the majority of the deferred centers (CHCs/PHCs/UPHCs). A thorough assessment of the unmet standards among the failed centers is essential to drive future improvements.

Non-Compliance with Certification Criteria: The primary reason for deferment was the failure to meet Criteria 3 and 5, which require a minimum score of ≥60% (PHC/UPHC) or ≥70% (CHC) in each area of concern and an individual standard score of ≥50% across all facility types. Additional gaps were noted in Criteria 1, 2, and 4, which emphasize overall scores (≥70%), service package scores (≥7), and standard scores (≥60%).

Departmental Deficiencies: CHCs: Key challenges were observed in the Auxiliary and General Administration departments. Six CHCs lacked defined procedures for blood storage and transfusion management (Standard E12). Four CHCs failed to establish protocols for monitoring outsourced services, adherence to contractual obligations, and defining quality objectives (Standards D10 and G6). PHCs: Major gaps were in the Inpatient Department (IPD), National Health Program (NHP), and Outpatient Department (OPD). The deficiencies were observed in the public participation mechanisms in the management of hospitals, a structured quality assurance system for clinical and support services, and defined service quality benchmarks were major barriers (Standards D4, G3, and H4) for the deferred PHCs. UPHCs:

Non-compliance was noted in Newborn and Child Health, Communicable Diseases, Family Planning, and Non-Communicable Diseases (NCDs).

Across India, NQAS assessment has shown a positive impact on improving the quality of healthcare facilities. An assessment by Javeed et al., showed that staffs in NQAS-certified facilities are more satisfied, work efficiently, and feel a sense of pride compared to the non-certified centres.[6]

A study by Sujata Gupta et al has shown that the involvement of medical college faculties in managing the PHCs has improved the overall Kayakalp scores from 56% to 84% in 2 years of undertaking by the community medicine department.[7] Under the direction of public health experts, resource management and capacity building can lead to a notable improvement in cleanliness, hygiene, and infection control. This study concluded that an integrated approach involving public health specialists and other medical professionals such as medical officers, field workers, and sanitary inspectors was useful in improving the primary care services.[7] In George et al study, a stronger evidence base linking improved quality of care with health financing, private sector partnerships, and community participation and engagement strategies. The evidence related to leadership, system design, information and monitoring, and accountability and transparency is limited.[8]

Many quality improvement methods can be applied to healthcare, 3 of which include Plan-Do-Study-Act (PDSA), Lean, and Six Sigma.[9] Each method has a unique goal-oriented outcome that has been applied to healthcare to streamline and optimize processes. PDSA is a cyclical quality improvement method often compared to the application of the scientific method, differing from Lean philosophy due to its iterative format. PDSA was adapted to healthcare in 1996 by statistician Gerald J. Langley and built upon its manufacturing origin in 1986 by statistician Edwards Deming. PDSA focuses on 4 stages: plan, do, study, and act.[10]

"GUNAK" is an application that abbreviates Guidelines for NQAS and Kayakalp. The app displays the availability of state-specific customized checklists. Real-time reporting of scores to respective State/ district Quality Assurance units.[3] Mera Asptaal or My Hospital is a simple, and multi lingual application launched in 2016, that captures patient feedback in a very short time on the services received from public hospitals. The goals of Mera Asptaal or My Hospital application are to improve quality of care at healthcare facilities, to establish a patient-driven, responsive and accountable healthcare system, to establish an environment of healthy competition among providers to provide better quality services, and to recognize top-performing facilities, which will boost the morale of staff.[3]

To enhance the quality of Primary Health Centers (PHCs) in Tamil Nadu, a multifaceted approach is essential. Implementing regular self-assessments and internal audits can help identify gaps in service delivery, enabling targeted improvements. The Tamil Nadu Health System Reform Program (TNHSRP) emphasizes a multipronged approach to quality improvement, recognizing that there is no single solution to achieving high-quality care. Community engagement is another critical factor in improving PHC quality. Strengthening community linkages and promoting multisectoral collaboration can lead to more responsive and accountable healthcare services.

The Tamil Nadu Health Policy - Vision 2030 underscores the importance of community participation and intersectoral coordination in achieving health objectives. Furthermore, adopting advanced technologies for screening, diagnostics, and treatment can enhance service delivery. By implementing evidence-based strategies, Tamil Nadu can strengthen its primary healthcare system and ensure high-quality, patient-centered care.

CONCLUSION

Ensuring the quality of primary healthcare services requires a comprehensive approach that integrates structured quality assessments, workforce capacity building, process optimization, and community engagement. While achieving NQAS certification is a milestone, the ultimate goal should be to provide high-quality, patient-centred care rather than merely fulfilling certification requirements.

CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

ASSESSMENT OF INTEGRATED HEALTH INFORMATION PLATFORM - INTEGRATED DISEASE SURVEILLANCE PROGRAMME IN TAMIL NADU, 2022-2024

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ABSTRACT

INTRODUCTION : The effective control of communicable diseases relies on robust surveillance systems that facilitate timely identification and prompt response to public health threats. The Integrated Health Information Platform (IHIP-IDSP) was introduced in 2021 as an extension of the Integrated Disease Surveillance Programme (IDSP), which was started in 2004 by the Ministry of Health and Family Welfare, Government of India. In order to improve disease monitoring and outbreak preparedness, this digital platform prioritizes real-time data reporting and geotagging with an emphasis on improved analytics. The aim of this study is to evaluate the performance trends of IHIP-IDSP surveillance units across the districts of Tamil Nadu from January 2022 to December 2024.

METHODS : A retrospective cross-sectional analysis was conducted using district-wise secondary data extracted from the IHIP-IDSP portal, with official permission from the Directorate of Public Health and Preventive Medicine, Tamil Nadu. Timely reporting of syndromic, presumed, and laboratory-confirmed cases; outbreak response; urban mapping; and coverage of health facilities were among the key performance indicators. Using IBM SPSS Version 21, data were analyzed, and descriptive statistics and graphical representations were used to present the results.

RESULTS: Most districts showed an overall upward trend in performance, with the biggest improvements occurring in Tiruppur (35.92), Sivagangai (25.95), and Madurai (25.38). The performance of Tuticorin (-7.15), Kallakurichi (-5.15), and Cuddalore (-3.67) decreased, on the other hand. In performance dashboards, Ariyalur and Kalakurichi showed remarkable total scores, while Dharmapuri reported the highest cumulative performance score (74.22). The timely reporting and outbreak response categories showed the most improvement, indicating improved operational effectiveness and training efficacy in a number of districts.

CONCLUSION: The results highlight how the incorporation of digital platforms and improved data reporting mechanisms has led to the public health surveillance system in Tamil Nadu developing its capacity. To maintain and increase the gains made, district-by-district performance variances underscore the necessity of specialised interventions, regular training, recurring assessments, and localized policy support. In addition to adding to the larger conversation on digital health governance in India, the study offers state and national stakeholders in public health planning a useful resource.

KEYWORDS : Surveillance, health information platform, integrated disease surveillance Programme.

INTRODUCTION

Programmes for disease prevention and control can also be monitored, assessed, and improved with the use of a surveillance system. As it offers vital information for the best possible health care delivery and a financially sensible health plan, disease surveillance is therefore an important part of the health system.[1]

In order to improve the surveillance of communicable diseases in India, the Ministry of Health and Family Welfare (MoHFW) started the Integrated Disease Surveillance Programme (IDSP) in November 2004 with World Bank support. The next generation, highly improved IDSP, was introduced in April 2021 as IHIP-IDSP, an overarching platform from the Integrated Health Information Platform (IHIP) with multiple updates. The National Digital Health Mission (NDHM) is aligned with it. Major diseases that are prone to epidemics are the focus of this decentralized state-based surveillance system.[2]

HIP is intended to collect disaggregated data at different levels of healthcare and, in contrast to IDSP, helps prevent resource waste, pool resources, and provide prompt information and response with higher quality and efficiency. The platform's creativity is found in the incorporation of Geographic Information System (GIS) enhanced data

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representation and geo-tagging of symptomatic cases and medical facilities, which greatly simplifies surveillance and follow-up. Raising event and outbreak alerts is made simple with near real-time/daily data reporting, which aids in prompt intervention and disaster prevention. Additionally, all patient information and health-related data are centralized for the convenience of patients, data users, and health planners.[4]

According to the IDSP-IHIP nationwide performance report for January through October 2023, Tamil Nadu scored 80.25, higher than India's mean performance score of 70.24.[3] Despite this overall progress, limited evidence exists regarding district-level disparities and longitudinal trends in the performance of surveillance units across the state. This study aims to fill that gap by assessing the performance and progress of district-level surveillance units under the IHIP-IDSP framework in Tamil Nadu over a three-year period (January 2022 to December 2024). The findings are expected to inform policy decisions, resource allocation, and targeted interventions aimed at strengthening disease surveillance systems at the subnational level.

METHODS

Using a cross-sectional design, this study evaluated the performance and advancement of surveillance units in Tamil Nadu, India, at the district level over a two-year period from January 2022 to December 2024. The Integrated Disease Surveillance Programme (IDSP) and the Integrated Health Information Platform (IHIP) online platform provided the data was used in this analysis. Encompassing all 38 district surveillance units in Tamil Nadu, the IHIP-IDSP system serves as a powerful surveillance tool. Approval was obtained from the Directorate of Public Health and Preventive Medicine (DPH & PM), which is overseen by the Joint Director of Communicable Disease/State Surveillance Officer.

An extensive dashboard for tracking and assessing each district's performance is offered by the IHIP-IDSP platform. For monitoring numerous metrics pertaining to disease surveillance, case reporting, and outbreak responses across districts, this dashboard is an essential tool. A performance ranking system, which is based on multiple weighted indicators, is used to enable a nuanced understanding of district-level progress. Figure 1 illustrates the distribution of weights assigned to each performance metric. The scoring methodology is intended to record the timeliness and accuracy of surveillance operations. The following are the primary metrics used to evaluate the districts' performance:

Outbreak Response (20%): Outbreak responses are graded using a variety of performance indicators that assess the district's capacity to detect, investigate, and manage disease outbreaks. Each of these indicators is given a maximum score of 10 points. The total score for outbreak response is then scaled to account for 20% of the overall performance ranking.

Syndromic Form (S) Reporting (20%): The percentage of reporting units (RUs) that submit Syndromic (S) forms on a daily basis is calculated. The score for this category is based on the total percentage of RUs reporting syndromic cases, including nil reporting. A maximum of 20 points is allocated for this category.

Laboratory Form (L) Reporting (20%): Similar to the syndromic reporting, the percentage of RUs that submit laboratory (L) forms daily is measured. The performance is evaluated based on the completeness and accuracy of laboratory-based case reporting. A maximum of 20 points is assigned to this category.

Presumptive Form (P) Reporting (20%): The percentage of RUs reporting daily Presumptive (P) forms is evaluated. The reporting rate for presumptive cases is considered in this metric, contributing to a score of up to 20 points.

Case Reporting (10%): The percentage of reporting units that report at least one case on a given day, excluding nil reporting, is assessed for all three types of forms (S, P, L). This category accounts for 10% of the total performance score.

Urban Mapping (10%): Urban mapping evaluates the percentage of urban wards that are mapped with a subcenter. This category aims to measure the extent to which urban areas are included in the surveillance framework. As of 2024, this metric is merged with the case reporting category, but it still retains its separate weight of 10% in the overall scoring system.

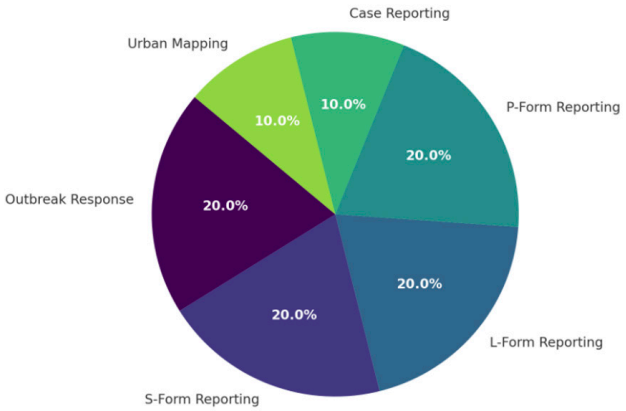

Figure 1. Proportional Weightage of Surveillance Indicators in District-Level Performance Assessment under IHIP-IDSP (2022–2024)

RESULT

A comparative analysis of district-level performance scores under the Integrated Health Information Platform–Integrated Disease Surveillance Programme (IHIP-IDSP) for the periods 2022–2023 and 2023–2024 is done in districts of Tamil Nadu. Table 1. summarizes the degree of improvement by ranking districts in descending order of performance enhancement from January 2022 to December 2024.

The improvement performance score of Tiruppur district is **+35.92 points accounting to +81.69%** improvement, followed by Sivagangai (+25.95; +45.99%) and Madurai (+25.38; +47.49%) improvements in performance score respectively. The improvement of performance score for one-year period is observed in Chennai (20.70; +131.60%), Thanjavur (0.72; +30.16%), and Tenkasi (+24.39; +36.85%).

Numerous other districts, such as Thiruvallur, Vellore, and Ramanathapuram, demonstrated improvements in performance score of 15–20 points. A few districts, however, showed decrease in performance scores, including Tuticorin (-7.15), Kallakurichi (-5.15), and Cuddalore (-3.67).

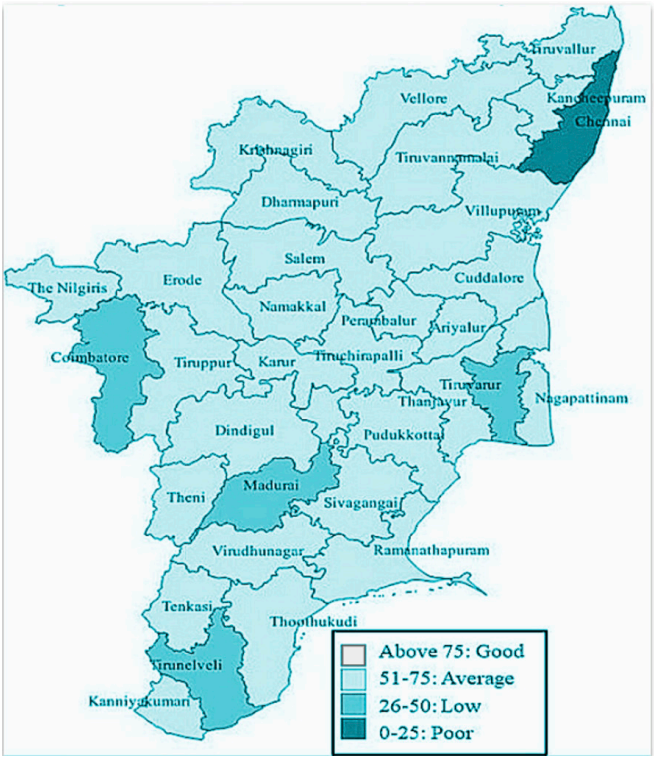

Figure 2: District-level Mean Performance Scores in Tamil Nadu (2022–2024)

The Comparison of S Form scores of the districts between 2022 and 2023 and 2023 and 2024 is listed in Table 2. The S form performance score of Madurai showed improvement of 6.72 points, followed by Tiruppur 6.10 points and Theni 4.99 points. The S form performance scores of Tenkasi, Tirupathur, Tirunelveli, Thiruvallur, and Ranipet, showed improvements exceeding 4 points.

These districts show improved adherence to reporting syndromic surveillance during the monitored time frame. On the other hand, the S form performance score of districts like Coimbatore (-1.73) and Chengalpattu (-3.38) showed a decline, while Tiruvannamalai showed the least improvement at +0.05 points. Chennai did not exhibit any change over the period.

Table 1: Comparative Analysis of the district's overall performance scores under IHIP-IDSP, 2022–2023 vs 2023–2024, in Tamil Nadu.

District	2022-2023	2023-2024	Absolute change in Overall Performance (2023–2024 vs 2022–2023)	Percentage of progress in Overall Performance (2023–2024 vs 2022–2023)
Tiruppur	43.97	79.89	35.92	81.69
Sivaganga	56.43	82.38	25.95	45.99
Madurai	53.44	78.82	25.38	47.49
Tenkasi	66.18	90.57	24.39	36.85
Thanjavur	68.71	89.43	20.72	30.16
Chennai	15.73	36.43	20.7	131.6
Thiruvallur	49.18	69.14	19.96	40.59
Vellore	58.2	77.24	19.04	32.71
Ramanathapuram	54.51	72.64	18.13	33.26
Kanniyakumari	60.98	78.96	17.98	29.49
Namakkal	65.15	82.37	17.22	26.43
Chengalpattu	41.89	58.67	16.78	40.06
Tirupathur	59.11	74.62	15.51	26.24
Erode	62.3	77.64	15.34	24.62
Tirunelveli	59.57	74.33	14.76	24.78
Salem	72.66	86.98	14.32	19.71
Dindigul	55.38	69.51	14.13	25.51
Tiruchirappalli	56.89	69.81	12.92	22.71
Thiruvarur	48.9	61.41	12.51	25.58
Virudhunagar	63.61	75.91	12.3	19.34
The Nilgiris	53.09	64.02	10.93	20.59
Mayiladuthurai	66.65	77.16	10.51	15.77
Coimbatore	56.07	65.75	9.68	17.26
Nagapattinam	66.25	75.69	9.44	14.25
Villupuram	62.91	72.08	9.17	14.58
Ranipet	60.29	68.89	8.6	14.26
Krishnagiri	70.95	79.04	8.09	11.4
Theni	55.59	63.57	7.98	14.36
Tiruvannamalai	69.89	75.59	5.7	8.16
Dharmapuri	81.41	86.66	5.25	6.45
Perambalur	65.54	70.48	4.94	7.54
Karur	71.55	76.18	4.63	6.47
Ariyalur	83.82	87.89	4.07	4.86
Pudukkottai	82.6	84.01	1.41	1.71
Kanchipuram	66.85	67.57	0.72	1.08
Cuddalore	70.99	67.32	-3.67	-5.17
Kallakurichi	84.05	78.9	-5.15	-6.13
Tuticorin	66.97	59.82	-7.15	-10.68

Table 2. Year wise variation in S Form Performance Scores by District, Tamil Nadu, 2022–2024

Rank	District	2022-2023	2023-2024	Percentage of progress in Overall Performance (2023–2024 vs 2022–2023)
1	Madurai	4.59	11.31	146.41
2	Tiruppur	6.79	12.89	89.84
3	Theni	8.05	13.04	61.99
4	Tenkasi	10.01	14.77	47.55
5	Tirupathur	9.12	13.84	51.75
6	Tirunelveli	6.7	11.4	70.15
7	Thiruvallur	7.03	11.64	65.58
8	Ranipet	7.48	11.85	58.42
9	Dindigul	8.99	13.35	48.50
10	Thiruvarur	6.92	11.18	61.56

Table 3. Year wise Variation in L Form Performance Scores by District, Tamil Nadu, 2022–2024

Rank	District	2022-2023	2023-2024	Percentage of progress in Overall Performance (2023–2024 vs 2022–2023)
1	Chennai	5.29	12.9	143.86
2	Tiruppur	12.73	19.45	52.79
3	Madurai	14.56	18.4	26.37
4	Kanniyakumari	15.57	19.21	23.38
5	Chengalpattu	11.68	15.14	29.62
6	The Nilgiris	15.43	18.39	19.18
7	Vellore	13.81	16.64	20.49
8	Tirunelveli	14.05	16.86	20
9	Dindigul	15.23	17.84	143.86
10	Thiruvarur	13.95	16.41	52.79

An analysis of L Form scores across districts between 2022–2023 and 2023–2024 is done and listed below in Table 3. The improvement of L form performance score of Chennai is +7.61 points, followed by Tiruppur (+6.72) and Madurai (+3.84). The improvement of L form performance score of Kanniyakumari, Chengalpattu, and The Nilgiris, each exceeds a 2.5-point increase. In contrast, some districts exhibited little to no change. The improvement of L form performance scores by Tiruvannamalai is +0.54 and Tuticorin is +0.16.

Table 4. Year wise Variation in P Form Performance Scores by District, Tamil Nadu (2022–2024)

Rank	District	2022-2023	2023-2024	Percentage of progress in Overall Performance (2023–2024 vs 2022–2023)
1	Tiruppur	10.8	14.9	72.18
2	Chennai	5.5	9.47	20.88
3	Kanniyakumari	12.98	15.69	14.31
4	Madurai	14.4	16.46	15.41
5	Tenkasi	13.17	15.2	10.92
6	Thiruvallur	14.65	16.25	13.08
7	Chengalpattu	12.23	13.83	10.28
8	Tirunelveli	14.11	15.56	9.50
9	The Nilgiris	15.05	16.48	7.89
10	Ramanathapuram	15.96	17.22	72.18

The descriptive analysis revealed an overall improvement in P Form scores across most districts. The improvement in P- performance score of Tiruppur is +4.10 points, followed by Chennai (+3.97) and Kanniyakumari (+2.71). Additionally, improvement in P- performance score of Madurai, Tenkasi, and Thiruvallur is at 1.5 points, indicating consistent advancements in the reporting of presumptive cases.

DISCUSSION

This study uses secondary data to assess the implementation of the Integrated Health Information Platform–Integrated Disease Surveillance Programme (IHIP-IDSP) in Tamil Nadu during the January 2022–January 2024 period.

The analysis covers all districts' form-based data submissions (S, P, and L Forms), case reporting, outbreak response, and other surveillance components. According to the data, performance scores show an overall upward trend, suggesting that reporting procedures are being followed more closely and that system engagement has increased throughout the state.

A small percentage of districts showed either marginal improvement or decline in their surveillance metrics, whereas the majority showed notable gains.

Several studies have emphasised the role that digital health interventions can play in bolstering surveillance systems. For example, a study conducted in 2023 by Kumar et al. highlighted how IHIP's automated outbreak alerts, geospatial mapping, and real-time reporting greatly increase the effectiveness of disease detection and response in India.[6]

The implementation of IHIP-IDSP in Tamil Nadu also led to a higher state performance score (80.25), as compared to the national average (70.24), according to research by Sampath et al. (2023).[7]

In our study the performance at the district level, in addition to assessments based on individual indicators, identified a number of significant trends. Notably, some districts showed steady progress in all three of the primary surveillance metrics: reporting on the S Form, P Form, and L Form.

In all three domains, Tiruppur, Madurai, and Chennai were among the districts with the best performance. Although more qualitative research would be necessary to support such hypotheses, this raises the prospect of comprehensive system strengthening in these areas, possibly through better data practices, increased workforce engagement, or local leadership.

Notable advancements were also made in districts like Ramanathapuram, Tirunelveli, and the Nilgiris, which helped to improve reporting procedures generally.

Despite overall progress, notable intra-district discrepancies were observed. Some districts displayed strong gains in specific form types (e.g., L Form reporting) but showed stagnation or decline in others. Such discrepancies highlight the uneven development of surveillance capabilities within districts, possibly due to differences in infrastructure or operational priorities between primary reporting levels (S/P Forms) and confirmatory laboratory systems (L Form). The mean absolute change across S, P, and L form scores for each district was used to create a composite improvement score, which better reflects integrated performance progress. Districts like Tiruppur, Chennai, and Madurai consistently rank in the top tier of performance across S, P, and L forms, which highlights the possibility of systemic improvements in surveillance operations. On the other extreme, districts like Tuticorin (+0.01) and Tiruvannamalai (+0.11) demonstrated the least amount of progress, indicating that performance stagnated over the period under observation. Even though the quantitative data supports different degrees of progress, more contextual research is necessary to comprehend the district-specific elements affecting reporting patterns.

A comprehensive evaluation of district-level surveillance system improvement is made possible by this metric. High composite score districts might be used as models for integrated surveillance advancement, whereas districts with low composite scores might need targeted capacity-building initiatives.

A few districts, like Tiruvannamalai and Tuticorin, which continuously showed little to no improvement in all metrics, became possible causes for concern. These outliers might profit from focused audits, capacity evaluations, or policy reviews to find and fix obstacles to improving performance.

Although spatial and geopolitical analysis was not within the scope of this study, future evaluations could incorporate regional mapping of performance data to examine potential alignment with zonal administrative divisions, health infrastructure clusters, or ecological characteristics (e.g., deltaic districts, hilly regions). Such spatial analysis, combined with qualitative insights, may help elucidate systemic trends affecting program efficiency. Previous work has highlighted the potential of real-time digital surveillance systems like IHIP in enhancing disease detection and reporting[4,7] further underscoring the value of continuous, data-informed evaluation frameworks.

CONCLUSION

This study provides a descriptive analysis of district-level performance under the Integrated Health Information Platform–Integrated Disease Surveillance Programme (IHIP-IDSP) in Tamil Nadu between January 2022 and December 2024. The analysis uses secondary data from the IHIP-IDSP portal to show changes and improvements in surveillance scores across laboratory-confirmed, syndromic, and presumptive case reporting indicators. Most districts showed improvements in their performance scores from year to year, but some showed no change at all.

The results highlight the existence of district-level variation in trends in surveillance reporting. Throughout the observed period, districts like Tuticorin and Tiruvannamalai demonstrated little improvement, while districts like Tiruppur, Madurai, and Chennai continuously placed among the top improvers across a number of indicators. These distinctions do not represent causal inferences; rather, they are descriptive. Although performance trends over time and indicators are recorded in the study, the operational and qualitative factors that underlie these trends are not evaluated. The factors influencing inter-district differences may require more research that includes qualitative or contextual data. However, within the IHIP-IDSP framework, the analysis provides a baseline for surveillance performance monitoring and can help with future administrative review and policy planning.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

TOBACCO IN THE CLASSROOM: PREVALENCE AND PATTERNS OF TOBACCO USE AMONG SCHOOL STUDENTS IN NAMAKKAL DISTRICT, TAMIL NADU, INDIA,2023 – A CROSS-SECTIONAL STUDY.

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ABSTRACT

INTRODUCTION : Tobacco usage is a major global health issue, particularly in low- to middle-income countries like India. Early initiation, especially among school-aged children, increases the risk of tobacco-related morbidity and mortality. Understanding tobacco use prevalence and patterns among youth can help shape effective interventions. We aimed to assess the prevalence and patterns of tobacco use among 9th to 12th-grade school students in the Ernapuram Block of Namakkal, Tamil Nadu.

METHODS : This cross-sectional study surveyed 300 students in December of 2023, allowing them to disclose tobacco use through either a written questionnaire or a confidential in-person interview. Data were analysed using descriptive and statistical methods to determine prevalence and differences in disclosure rates.

RESULTS: Among the 300 students surveyed, 63 (21%) reported tobacco use, with 51 male and 12 female users. Confidential settings led to higher disclosure rates, particularly among female students (p-value < 0.05). Smokeless tobacco was the most common form, used by 76% of users, with an average initiation age of 13–15 years. A majority (56%) reported using tobacco more than five times weekly, with an average tobacco use duration of 3.37 years.

CONCLUSION: This study underscores a high prevalence of tobacco use among school students, particularly smokeless forms, with early initiation and frequent use patterns indicating dependency. Confidential interviews were more effective than questionnaires for disclosure, especially among girls. Targeted education on tobacco risks and long-term health impacts are essential to address this growing issue.

KEYWORDS : Tobacco, Smokeless tobacco, School children

INTRODUCTION

Tobacco is the most pressing health problem all around the world especially in Low to middle income countries such as India.[1] Tobacco usage causes mortality up to as high as half of its users who doesn't quit,[2-3] it already caused immense damage in terms of mortality of around 8 million people each year, including an estimated 1.3 million non-smokers through second-hand smoke.[4]

People with early age of tobacco initiation especially school going children, are highly likely to undergo tobacco related morbidity and mortality, as per the current trend it is estimated around 250 million adolescents, mostly from low to middle income countries, could face mortality in the future.[5] In India, nearly 1 in 10 School going children in the age group 13-15 years have ever smoked cigarettes.[6]

Action towards Preventing or quitting tobacco usage among Indian school going children is extremely important especially because India has various forms of tobacco, both in smoke and smokeless tobacco.[7] In this regard, only handful of studies that have reported on prevalence of tobacco usage in school going children.[8-11] Therefore, this study will further shed light on the prevalence of tobacco usage in a school in Namakkal among 9 to 12 grade students.

The primary objective of this study is to assess the prevalence, patterns, and influencing factors of tobacco use among 9th to 12th-grade school students in Ernapuram block, Namakkal, Tamil Nadu, 2023.

METHODS

A descriptive cross-sectional study was conducted in a school setting involving study population of 300 students from a single school in the Ernapuram block, Namakkal, Tamil Nadu with convenient sampling technique. This survey was conducted during December 2023.

The questionnaire used in this study was a pre-fixed, semi-structured questionnaire. It was not a completely

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standard template adopted verbatim from previous studies, but rather a customised questionnaire that drew upon established questions from prior research on adolescent tobacco use, adapted to the specific cultural and regional context of school-going children in Namakkal, Tamil Nadu.

The questionnaire contained the following sections such as demographic information, which included questions about the student's age, gender, class/grade, and their family's socioeconomic background.

Secondly it was about tobacco use wherein there were direct questions about current and past tobacco use. Later we also employed Confidential Disclosure Prompts, while not explicitly a separate section in the written questionnaire, the design anticipated the potential for underreporting.

Thus, the questionnaire served as an initial screening, with the understanding that more sensitive information would be sought during the confidential interviews. The closed-door environment interviews were conducted individually with all the students who either disclosed tobacco use in the initial questionnaire or were identified through other means.

We also chose convenient sampling primarily due to feasibility and resource constraints within the scope of this descriptive cross-sectional study. Conducting a census or a more complex probability-based sampling method (like stratified random sampling) across multiple schools in the block would have been significantly more time-consuming and resource-intensive, requiring a larger research team, more funding for travel and logistics, and potentially more time for obtaining permissions from multiple school administrations.

Following an awareness session by district tobacco consultant of Namakkal, school students were given the option of two different methods to disclose their tobacco usage which are Written Questionnaire based and In-person interview in confidential setting.

Written questionnaire used was based on World health organization designed global Youth Tobacco survey questionnaire including domains such as knowledge, attitude of school students towards tobacco and Prevalence of tobacco usage including frequency and pattern tobacco usage in school students.

The same questionnaire was used in in-person interview conducted in a confidential setting by District Tobacco consultant to facilitate increased compliance of school students to participate in this study

Paper-based questionnaires were used for the initial survey. The responses were then manually entered into a spreadsheet program (Microsoft Excel) for data cleaning, organization, and preliminary analysis. Statistical analysis to calculate frequencies & percentages, using statistical software SPSS.

Necessary approvals have been obtained before the start of the study from the Institutional ethical committee of Directorate of Public Health and Preventive Medicine. There were no deviations from the study proposal following approval.

RESULTS

A survey of 300 students revealed that 63 students (21%) disclosed using tobacco, among them 51 were boys and 12 were girls (Table 1). None of the girls and only nine boys admitted to tobacco use through the questionnaire, whereas 42 boys and 12 girls disclosed usage in a confidential in-person interview.

Regarding the types of tobacco products used, a striking majority of 48 students (76%) used smokeless tobacco with cigarette being second choice with 12 students (19%) and rest 3 were using beedis (5%). This usage of smokeless tobacco was reported to be as early as 4th grade (9 years), with the average initiation age between 13 and 15 years.

The duration of tobacco use varied, with 5% (n=3) of students reporting one-year use, 6% (n=4) reporting two years, 41% (n=26) with three years of usage, 43% (n=27) reporting four years of usage, and 5% (n=3) having a five-year history. The mean duration of use was approximately 3.37 years, with a standard deviation of ±0.87 years.

In terms of usage frequency, 16% (n=10) of the students reported using tobacco 2-3 times per week, 28% (n=18) used it 4-5 times per week, and the majority 56% (n=35) used it more than five times weekly and all the students were from low to middle income socioeconomic backgrounds.

Table 1: Tobacco usage behaviour among school students at Ernapuram block, Namakkal, Tamil Nadu, India, 2023. (N=300)

Tobacco usage behaviour	n (%)
Number of tobacco users	63 (21%)
Smokeless tobacco usage	48 (76%)
Cigarettes	12 (19%)
Beedis	3 (05%)
Duration of usage - 5 years	3 (05%)
Duration of usage - 4 years	27 (43%)
Duration of usage - 3 years	26 (41%)
Duration of usage < 3 years	7 (11%)
Frequency of usage > 5 times a week	35 (56%)
Frequency of usage 4-5 times a week	18 (28%)
Frequency of usage < 4 times a week	10 (16%)

DISCUSSION

Prevalence of tobacco usage among school students in India has range from 1.9% to 75.3%.[12,13] and therefore prevalence of 21% from a single school in Namakkal, Tamil Nadu is higher. Prevalence is higher among boys than girls as seen in several Indian studies.[8,14,15]

The findings from this survey underscore a notable disparity in the willingness to disclose tobacco use through a written questionnaire versus in person confidential setting as 82% of male tobacco users and 100% of female tobacco users chose confidential interview setting to disclose their usage over written questionnaire which also highlights a statistically significant difference (p-value < 0.05) in disclosure rates suggests between female and male students This underscores the societal or peer-related stigma or fear of judgment when it comes to admitting tobacco use in a written questionnaire especially among female students.[12] The high prevalence of smokeless tobacco usage among school students, with 76% opting for products like "cool lip," is particularly concerning. This form is preferred mainly because it can be easily concealed in a school setting and suggests that it is easily accessible and cost friendly to these school children. Cigarettes and beedis are least favoured when compared to Smokeless tobacco. Smokeless is notorious in causing a premalignant condition called oral submucosal fibrosis in young individuals.[16,17]

According to the GAT survey India 2016-2017, 28.6% of all adults in the population use tobacco in some form. Among them, 21.4% use smokeless tobacco, while 10.7% are tobacco smokers. Additionally, 3.2 crore adults engage in dual use, meaning they consume both smoked and smokeless forms of tobacco. The prevalence of tobacco use varies significantly by gender: 19.0% of men and 2.0% of women are smokers, whereas 29.6% of men and 12.8% of women use smokeless tobacco.

In comparison to the GAT survey, which reported that 28.6% of all adults use tobacco, our study found a slightly lower prevalence of 21% (63 individuals). However, smokeless tobacco usage in our study was significantly higher, with 76% (48 out of 63 users) reporting its use, compared to 21.4% in the GAT survey. In terms of tobacco smoking, our findings showed that 19% used cigarettes and 5% used beedis, while the GAT survey reported a combined smoking prevalence of 10.7%. These differences may reflect variations in geographic, cultural, or demographic factors within the study population compared to the national average.

The early age of initiation, with some students starting as early as 4th grade and an average initiation age of 13 to 15 years, underscores a critical period during adolescence where tobacco prevention efforts are essential.

The duration data, with most students reporting three to four years of usage, indicates that initiation of tobacco usage by most of the students correlates with the lockdown period of India during pandemic and Sustained use over time, further highlights the potential for long-term health impacts.

The frequency of tobacco use among students reveals a concerning trend, with a majority 56% reporting use more than five times per week. This high rate of frequent usage suggests not only a habitual pattern but potentially a dependency on tobacco products among these students. Furthermore, 28% reported using tobacco 4-5 times weekly, and an additional 16% used it 2-3 times per week. The overall distribution indicates that a substantial portion of these students engage in regular, repeated use, which may quickly elevate their risk of developing health complications associated with tobacco consumption. These usage patterns underscore the urgency for intervention, as early and frequent use during adolescence can lead to stronger addiction and make cessation efforts more challenging in adulthood. Targeted interventions that not only address the risks associated with smokeless tobacco but also focus on early education to curb initial experimentation among young students. Additionally, public health efforts could emphasize the long-term health consequences of all forms of tobacco, especially as prolonged use patterns are already emerging within this age group.

LIMITATIONS

Smoking behaviour reported in the questionnaire may not accurately reflect students' actual smoking habits and may not be representative of the population because of the choice of sampling technique.

CONCLUSION

Overall, this study highlights critical insights into tobacco use among low to middle socioeconomic school students, with 21% reporting usage, predominantly of smokeless tobacco, and many starting as early as age 13. Confidential in-person settings are better than written questionnaire setting in disclosing tobacco usage especially with female students. The high frequency and extended duration of use indicate habitual patterns that could lead to dependency. Additionally, 80% of students lacked awareness of second-hand smoke dangers, and 64% had family members who smoked. Targeted educational initiatives addressing tobacco risks, second-hand smoke, and early intervention are essential to curb this growing issue among youth.

CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

"REDUCING ZERO-DOSE CHILDREN": TAMIL NADU'S STRATEGIC EFFORTS IN STRENGTHENING IMMUNIZATION COVERAGE – A PROCESS DOCUMENTATION

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Immunization: A Key to Global Health and Development

Immunization is a well-established success story in global health, saving millions of lives each year. Vaccines play a crucial role in preventing and controlling numerous communicable diseases, leading to a significant reduction in mortality from infectious diseases. Beyond saving lives, vaccines prevent disabilities that can impair children's growth and cognitive development, ensuring that children not only survive but also thrive.

India's National Immunization Program (NIP) was first launched in 1978 as the Expanded Programme on Immunization (EPI), which initially introduced vaccines such as BCG, OPV, DPT, and typhoid-paratyphoid. In 1985, the EPI was renamed the Universal Immunization Programme (UIP). Initially, the program provided vaccines for six diseases (BCG, OPV, DPT, and measles). Over the years, new vaccines and antigens have been introduced. Currently, the UIP offers free immunization against 12 vaccine-preventable diseases.[1]

Introduction of New Vaccines and Strengthened Initiatives

India has made impressive strides in vaccine introduction, particularly since 2015. Six new vaccines have been added to the UIP in a remarkably short span of time: Inactivated Polio Vaccine (IPV), Rotavirus Vaccine (RVV), Measles Rubella (MR) Vaccine, Pneumococcal Conjugate Vaccine (PCV), Tetanus & Diphtheria (Td) Vaccine, and Japanese Encephalitis (JE) Vaccine. These additions have enhanced the country's capacity to prevent a broader range of diseases.[2]

Through focused initiatives, India has strengthened its immunization efforts, with two key milestones being the country's declaration as "Polio-Free" in 2014 and the achievement of Maternal and Neonatal Tetanus Elimination in 2015. In December 2014, the Government of India launched "Mission Indradhanush," a vital initiative designed to intensify immunization activities and achieve full immunization coverage (FIC) of 90%. The mission aimed to reach unvaccinated and partially vaccinated children, as well as pregnant women, in regions with low immunization coverage, including high-risk areas.[3]

Till date, 12 phases of Mission Indradhanush and Intensified Mission Indradhanush have been successfully completed. These efforts have reached over 54.6 million children and 13.2 million pregnant women with vaccinations. As per the latest National Family Health Survey (NFHS) reports, full immunization coverage in India has increased from 62% in 2015-16 to 76.4% in 2019-21.[4] This improvement in immunization coverage has directly contributed to a significant decline in mortality and morbidity due to vaccine-preventable diseases (VPDs). The Under-5 mortality rate in India decreased from 45 per 1000 live births in 2014 to 32 per 1000 live births in 2020.[5]

Zero-Dose Children: A Critical Focus

"Zero-dose children" refer to children who have not received any basic vaccine. For operational purposes, zero-dose children are defined as those who have not received their first dose of Pentavalent vaccine by their first year of age. The number of zero-dose children is calculated as the difference between the estimated number of surviving infants and the reported number of infants vaccinated with the Pentavalent 1st dose vaccine.[1]

Addressing the issue of zero-dose children is crucial because these children are highly vulnerable. Communities with high numbers of zero-dose children often also have

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significant numbers of under-vaccinated children. Zero-dose children are at increased risk for early childhood nutritional failures, high morbidity and mortality, poor growth, and poor long-term health outcomes.

These children are more likely to be part of marginalized and disadvantaged communities, facing deprivations like inadequate access to water, sanitation, and healthcare. Gender-based barriers, such as limited access to education and household decision-making power, further exacerbate the situation. As a result, these children are at heightened risk of vaccine-preventable disease outbreaks, which can spread rapidly, especially in communities with low immunization coverage. "Zero dose" highlights that these children have remained outside the radar of our immunisation coverage.

Global and Indian Scenarios of Zero-Dose Children

Globally, according to the WHO and UNICEF estimates, the number of zero-dose children increased from 12.9 million in 2019 to 16.1 million in 2020, and 18.1 million in 2021. However, in 2022, the number of zero-dose children decreased to 14.3 million, though this figure has not yet returned to pre-pandemic levels.

Most of the zero-dose children reside in low- and middle-income countries, with 10 countries accounting for 58% of the global zero-dose population. These countries are Nigeria, Ethiopia, India, the Democratic Republic of the Congo, the Philippines, Angola, Indonesia, Brazil, Pakistan, and Mozambique.

In India, the number of zero-dose children significantly increased during the COVID-19 pandemic. In 2020, the number of zero-dose children rose to 2.9 million due to the disruptions caused by the pandemic. However, there was a recovery in 2022, and the number decreased to approximately 1.1 million. According to National Family Health Survey (NFHS) data, the percentage of zero-dose children has declined over the years, from 33.4% in NFHS-1 to 6.4% in NFHS-5, reflecting the impact of intensified immunization efforts.

The Government of India has been actively working towards reducing the number of zero-dose children (children who have not received any vaccination, particularly Pentavalent 1). A comprehensive approach involving virtual meetings, field visits, data entry corrections, and special immunization campaigns has been undertaken to increase the vaccination coverage and ensure that children receive timely immunization.

Tamil Nadu's Comprehensive Efforts to Reduce Zero-Dose Children

Tamil Nadu has been making significant strides in reducing the number of zero-dose children. The State adopted a comprehensive and multi-faceted approach, combining virtual meetings, field visits, data entry improvements, and special immunization campaigns to enhance vaccination coverage and ensure timely immunization for all children.

Government of India's Role in Strengthening Tamil Nadu's Vaccination Efforts

The Government of India (GOI) stated that urgent attention was solicited to the HMIS data from Tamil Nadu, as this data was included in the global immunization database of WHO and UNICEF. This data was reviewed, analyzed, and published annually in the WHO and UNICEF Estimates of National Immunization Coverage (WUENIC) report. The report drew attention to critical vaccination gaps and highlighted the performance of countries, as well as the performance of individual states. The latest WUENIC report for 2023 indicated that the burden of zero-dose children who had not received the Pentavalent-1 vaccine had increased in Tamil Nadu compared to the year 2022. Based on the comparative HMIS data (January to October) for the years 2022, 2023, and 2024, a decrease in the number of children vaccinated with the Pentavalent-1 dose was reported in Tamil Nadu. To initiate and strengthen efforts to reduce the number of zero-dose children, Tamil Nadu actively engaged in virtual meetings organized by the Government of India. Held on 18th October 2024, these meetings served as a platform to review the state's immunization performance. The primary objective was to assess the vaccination coverage and explore effective strategies to address the issue of zero-dose children.

Table 1: Number of infants vaccinated with Pentavalent-1 in 2022 to 2024 based on HMIS (January to October)

State/UT	Jan-Oct 2022	Jan-Oct 2023	Jan-Oct 2024	% Decrease in 2024 from 2022	%Decrease in 2024 from 2023
Tamil Nadu	7,66,600	7,18,837	6,84,791	11%	5%

Addressing Discrepancies in Pentavalent 1 Coverage

The Government of India communicated a difference of 1,07,918 in Pentavalent 1 coverage between the periods January 2023 to December 2023 and January 2024 to October 2024. Despite this reported discrepancy, Tamil Nadu has made significant progress in achieving its vaccination targets.

There is a discrepancy in the denominator data while calculating the percent¬age of children in Tamil Nadu.

The Government of India had considered the SRS birth rate is 13.8% for calculation though the projected Crude Birth Rate is 11.6 for the year 2024 as per RGI which had been communicated to GOI.

The actual live births happened and registered in State Civil Registration System in Tamil Nadu in 2023-24 is 8,95,463 against the estimated 10,48,690 births. The difference between the estimated infant population for the FY 2023-24 and actual live births happened and registered in StateCivil Registration System in Tamil Nadu in 2023-24 is 1,53,227 births.

Table 2: Full Immunisation coverage based on Estimated Infant population and CRS (2019- 2023)

S.No	Year	Estimated Infant Population as per GOI	Live births as per HMIS	Live births as per State CRS	IHIP HMIS Performance	FI% based on Estimated Infant Population	FI% based on CRS
	a	b	c	d	e	f=e*100/b	g=e*100/d
1	2019	11,06,010	9,33,410	9,29,427	9,44,470	85.4	101.2
2	2020	11,04,140	9,28,336	9,28,158	9,02,796	81.8	97.3
3	2021	10,70,510	9,13,557	9,06,512	8,89,885	83.1	98.2
4	2022	10,45,590	9,16,340	9,28,699	9,33,498	89.3	100.5
5	2023	10,48,690	8,78,055	8,95,463	9,00,001	85.8	100.5

For the period of April 2024 to October 2024, Tamil Nadu achieved 484,143 out of the target of 511,562 (95%) in the TNHMIS system and 485,014 (95%) in the IHIP system. The CRS Birth count during the same period was approximately 5.00 lakhs, which aligns with the proportionate target for the state. This reflects the total number of births registered under the CRS system, ensuring that the registration was 100% accurate. Despite the initial discrepancies in the coverage data, Tamil Nadu has been successful in vaccinating nearly 95% of the children born in the state between April 2024 and October 2024 with the Pentavalent 1 vaccine, leaving only a minimal number of children unvaccinated.

Discussions with GOI Officials: Strengthening Immunization Systems

Further reinforcing its commitment, Tamil Nadu hosted a visit from two Government of India officials on 12th November 2024. The focus of the visit was to evaluate the state's coverage for Pentavalent 1 vaccinations, particularly in relation to zero-dose children. During their discussions with the State's Joint Director of Immunization, the officials identified areas where improvements could be made, especially concerning facilities that had not reported their vaccination data. The outcome of these discussions led to targeted actions aimed at addressing reporting gaps and ensuring that all children received their vaccinations as scheduled. These efforts underscore Tamil Nadu's commitment to improving immunization coverage and reducing zero-dose children across the state.

Virtual review meetings and Immediate actions

The very next day, on 13th November 2024, the Joint Director of Immunization /State Immunization Officer Tamil Nadu had conducted a Zoom video conference with District Health Officers (DHOs), Assistant Directors (ADs), and other health officials across the State. This meeting served to reinforce the importance of timely data uploads for immunization performance and to address missing reports from several health facilities. Clear instructions were given to ensure that data for all unreported facilities was uploaded immediately. This was an essential step in ensuring accurate tracking of immunization efforts and identifying areas requiring further intervention.

Repeated communications were sent to the districts to fill in all fields with either performance data or "Zero" for non-performing facilities and to enter “Not applicable” for the 749 units which does not provide vaccination.

Special Immunization Campaigns in Tamil Nadu

In its dedicated efforts to increase vaccination coverage and reduce the number of zero-dose children, Tamil Nadu implemented two phases of Special Immunization Campaigns aimed at vaccinating dropouts, left-outs, and zero-dose children, particularly focusing on areas that were underserved or at high risk. These campaigns played a crucial role in reaching every child and ensuring they received their timely vaccinations.

Phase 1: October-November 2024

The first phase of the Special Immunization Campaign was held across urban and rural areas in Tamil Nadu. Sessions were scheduled on 25th October, 8th November, 15th November, and 22nd November 2024. The focus during this phase was on vaccinating dropouts and left-out children, while ensuring that accurate data was promptly and effectively recorded for all those vaccinated. In total, 18,391 sessions were conducted throughout the State, successfully vaccinating 69,326 children. Key efforts during this phase included reaching children across both urban and rural areas, making sure that the data of all vaccinated children was accurately recorded, and targeting children who had missed their vaccinations or were overdue for their doses.

Table 3: Vaccination coverage in special Immunisation Campaigns during Phase 1 (25.10.2024 to 22.11.2024

S.No.	Date	No. of sessions planned	No. of sessions held	Total vaccinated children
1	25.10.2024	5,178	5,102	22,732
2	08.11.2024	4,855	4,722	14,717
3	15.11.2024	4,145	4,032	10,411
4	22.11.2024	4,645	4,535	21,466
	Total	**18,823**	**18,391**	**69,326**

Figure 1: Antigen wise coverage during the first phase of special Immunisation campaign (25.10.2024 to 22.11.2024)

Phase 2: December 2024

The second phase of the campaign took place later in the year, from 24th December to 31st December 2024. This phase focused on completing any missed vaccinations, with a particular emphasis on ensuring that zero-dose children were reached before the start of the IMI 6.0 campaign.

During Phase 2, 17,046 sessions were held, vaccinating 33,712 children across Tamil Nadu. Actions during this phase included intensifying outreach efforts to ensure no child was left behind, particularly in high-risk and uncovered areas. A significant focus was placed on children who had not received their first dose of Pentavalent 1, ensuring that timely immunization occurred without delay, even before the IMI 6.0 campaign.

Table 4: Vaccination coverage in special Immunisation Campaigns during Phase 2 (24.12.2024 to 31.12.2024)

S.No.	Date	No. of sessions planned	No. of sessions held	Total vaccinated children
1	24.12.2024	2,882	2,595	2,207
2	26.12.2024	3,788	3,271	4,755
3	27.12.2024	4,410	4,226	20,427
4	28.12.2024	2,829	2,557	3,315
5	30.12.2024	2,528	2,328	2,208
6	31.12.2024	2,080	2,069	800
	Total	**18,517**	**17,046**	**33,712**

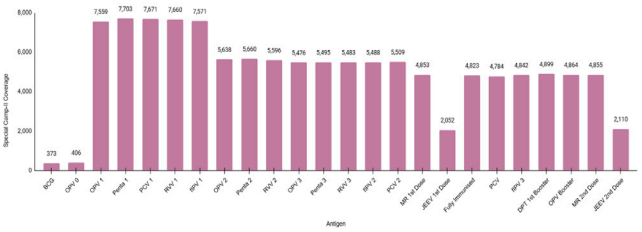

Figure 2: Antigen wise coverage during phase 2 of special Immunisation campaign (24.12.2024 to 31.12.2024)

Instructions and Focus Areas

To ensure the success of these campaigns, District Health Officers (DHOs) played a vital role in coordinating local health workers, including DMCHOs, CHNs, SHNs, and all VHNs/UHNs, to ensure the campaigns reached every child. They were instructed to conduct the campaigns across all areas, with special attention to high-risk zones and vacant or uncovered regions where immunization rates were low. A priority was given to vaccinating zero-dose children—those who had never been vaccinated. The health officers were also tasked with ensuring that no delays in vaccinations occurred, even before the IMI 6.0 phase, ensuring timely and consistent immunization for all eligible children.

Impact and Outcome

The results of these Special Immunization Campaigns were significant, as both phases contributed to a marked improvement in the coverage of Pentavalent 1 vaccines (Figure1). In total, 18,391 sessions were held during Phase 1 and 17,046 sessions during Phase 2, vaccinating over 100,000 children. These efforts, particularly focused on zero-dose children and hard-to-reach areas, led to better immunization outcomes across Tamil Nadu. By targeting dropouts, left-out children, and areas with gaps in vaccination coverage, these campaigns not only increased the overall vaccination rate but also ensured that Tamil Nadu was on track to meet its immunization goals and reduce the number of zero-dose children.

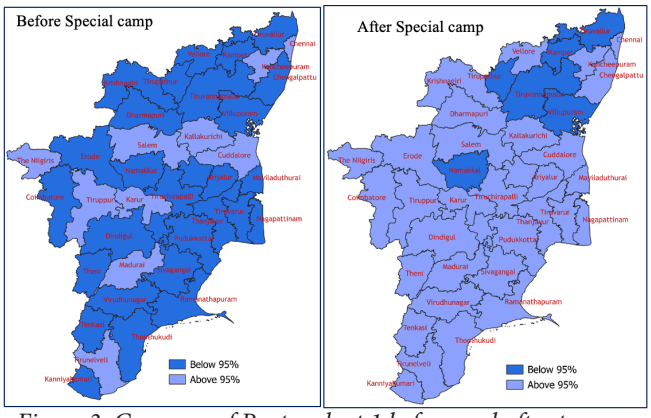

Figure 3: Coverage of Pentavalent 1 before and after two phases of Special vaccination campaign

Improvement in Facility Reporting Status

Tamil Nadu has taken proactive steps to improve the reporting status of immunization facilities and address data gaps. Initially, the GoI report indicated that out of 14,652 reporting units, 13,777 had submitted their data, leaving 875 units unreported. Similarly, as per the IHIP report November 2024, out of the total 14,665 state facilities, 749 are categorized as "Not Applicable," which includes Urban Health Wellness Centres, ESI Dispensaries leaving 13,916 facilities as actual reporting units. Recognizing the importance of improving data completeness, Tamil Nadu requested the Government of India to unfreeze the IHIP portal to allow districts to enter the data for these non-reported facilities. In response to Tamil Nadu's request, the GoI unfreezed the IHIP portal starting from January 2024. This decision enabled districts across the state to update the data for facilities that had not reported earlier. To ensure smooth implementation, Tamil Nadu issued clear instructions to District Health Officers (DHOs) and other relevant officials. They were directed to update the IHIP portal by the 10th of each succeeding month and to fill in all fields with either performance data or "Zero" for non-performing facilities and to enter "Not applicable" for the 749 units which does not provide vaccination. Additionally, the state emphasized that monthly performance entries in the IHIP portal should align with the State HMIS performance for each antigen, except for the Birth Dose. This alignment ensured consistency between the state and national reporting systems. Due to these efforts, the Facility reporting status of the state improved drastically, 13,916 reporting units out of 14,665 have now submitted their data, leaving 376 facilities still unreported. Tamil Nadu continues to work diligently towards closing these reporting gaps, ensuring that all facilities consistently update their data and contribute to the state's immunization efforts.

Table 5: Facility reporting status of Tamil Nadu as per IHIP, November 2024

State	Facility to be reported	Not applicable*	Actual Facility Reporting Units	Not reported as per GOI on October 2024	Not reported as on November 2024
Tamil Nadu	14665	749	13916	875	376

* Not applicable includes 749 units which does not provide vaccination Urban Health Wellness Centres, ESI Dispensaries and private hospitals

Leave No One Behind

The concerted efforts of both the Government of India and the Tamil Nadu State Health authorities have resulted in notable improvements in immunization coverage, particularly for zero-dose children. Through targeted strategies such as special immunization campaigns, data reporting improvements, and close monitoring and supportive supervision Tamil Nadu has made significant strides toward achieving its immunization goals. By addressing the gaps in vaccination coverage and ensuring that no child is left behind, the state has made substantial progress in reducing the number of zero-dose children. Moving forward, sustained efforts, regular evaluations, and continuous community engagement will be key to further enhancing immunization coverage and ensuring that every child receives the protection they deserve, thus safeguarding their health and contributing to a healthier future for all.

CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

A CROSS-SECTIONAL STUDY ON SOCIODEMOGRAPHIC FACTORS AND MORTALITY IN ACUTE POISONING CASES AT A TERTIARY CARE HOSPITAL IN NAMAKKAL, TAMIL NADU: INSIGHTS FROM 2024.

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ABSTRACT

INTRODUCTION : Acute poisoning remains a critical global concern among low- and middle-income population countries like India. Unauthorized purchase of agricultural pesticides, easy access to toxic substances and socioeconomic stressors contribute to high incidence rates. Poisoning-related morbidity and mortality vary across regions of India. Understanding the incidence, sociodemographic patterns and mortality rates associated with acute poisoning is essential for improving prevention strategies and healthcare interventions. The current research aims to analyze the patterns of incidence, sociodemographic factors and mortality rate among acute poisoning patients in Namakkal District, Tamil Nadu.

METHODS : A prospective observational study was conducted in the emergency unit of a leading healthcare centre in Namakkal, Tamil Nadu over a six-month period from August 2024 to January 2025. The study focused on patients presenting with acute poisoning to assess poisoning patterns and sociodemographic factors.

All patients diagnosed with acute poisoning, regardless of type or intent, were included in the study. Data on poisoning patterns, sociodemographic factors and clinical details were recorded using case collection form. The collected data were entered into Microsoft Excel (Microsoft Corp., 2021) and analyzed using the Statistical Package for Social Sciences (SPSS) to derive meaningful interpretations and statistical outcomes.

RESULTS: More than 70% of the acute poisoning cases reported in this study were in individuals under 50. Major contributors were young students and homemakers. Half of the population were middle- and lower-income people. Family problems, failures, work stress and financial problems such as online scams and gambling were the major reasons for poisoning. The patient survival and death ratio are 24:1, which requires timely intervention and prevention from acute poisoning cases in Tamil Nadu.

CONCLUSION: This study underscores the increasing incidence of intentional acute poisoning, particularly among young women, driven by psychosocial stressors, financial instability, and emerging online risks. The findings emphasize the need for targeted mental health interventions, poisoning prevention programs, and comprehensive public health strategies to mitigate these risks and improve overall well-being.

KEYWORDS : Acute poisoning, incidence, sociodemographic, mortality rate, poisoning incident

INTRODUCTION

Acute poisoning cases remain intimidating in developing nations like India.[1] A report by the World Health Organization (WHO) reveals that 193,460 deaths occur each year worldwide due to unintentional poisoning, with low- and middle-income countries being the major contributors.[2] Intentional acute pesticide poisoning (APP) represents a major community problem, particularly in rural middle-income nations, where it is frequently employed as a means of suicide.[3] The suicide rate in India rose from 9.9 per lakh in 2017 to 12 per lakh in 2021, indicating a concerning upward trend. Economic stressors like poverty and unemployment have a major effect on students and daily wage workers, by raising their risk of mental health issues and substance abuse.[4,5] Tamil Nadu, a state with a strong agricultural sector, faces significant challenges due to widespread pesticide use and an increasing rate of suicides by poisoning.6 Regional data is still hard to come by, particularly at the district level. Although the number of poisoning cases in Namakkal, a district with a significant poultry industry and high agricultural activity, has increased, little is known about the incidence, sociodemographic characteristics and mortality outcomes in this region. Besides its agricultural and industrial significance, Namakkal hosts numerous schools and coaching

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institutes.[7–9] The district attracts a considerable student population, making it a hub for educational activities. This demographic shift has led to increasing stress levels, which may contribute to self-poisoning and suicides, particularly among students dealing with academic pressure.

Despite the educational focus, the intersection of these sociodemographic factors with the rising incidence of acute poisoning remains poorly understood. There are also numerous instances of poisoning cases in the district that are reported in emergency situations, but there is a shortage of information on sociodemographic patterns, causes and mortality results. This study intends to close important knowledge gaps by examining the incidence, sociodemographic characteristics and mortality rates related to acute poisoning in Namakkal. Therefore, there is a pressing need to explore these trends and identify the contributing factors specific to this district. Understanding the incidence, sociodemographic patterns and mortality trends of acute poisoning is essential for designing effective prevention protocols and improving clinical management. The current research seeks to assess the patterns of acute poisoning cases, analyze demographic factors and evaluate mortality rates in Namakkal district, Tamil Nadu.

The primary objective of this study is to explore the patterns of acute poisoning in Namakkal district, focusing on the incidence, types, sociodemographic factors, mortality rates, time between poison intake and admission in the hospital and the role of educational and occupational risk factors, particularly related to agriculture and academic stress.[6,10]

METHODS

This study was conducted in the emergency care department of a tertiary care hospital located in Namakkal district. This hospital serves as a major healthcare provider to a diverse population in this region, receiving a variety of acute poisoning cases.

A total of 250 patients were included in the study, based on the inclusion criteria. The patients were selected based on their medical records indicating acute poisoning and their willingness to participate. Exclusion criteria included patients with chronic poisoning or long-term exposure to toxins, as well as those with incomplete or missing medical records.

A Cross-sectional study design was employed to monitor cases of acute poisoning. Data were collected over six months, from August 2024 to January 2025. The primary focus was to document the types of poisons, sociodemographic characteristics, the time interval between poisoning and hospital admission, treatment outcomes and the influence of educational and occupational risk factors, particularly those associated with agriculture and academic stress. This study design enabled the collection of real-time data on the management of acute poisoning in a clinical setting.

The data were collected using patient information form, which was used to record the sociodemographic details of the patients, the type of poisoning, the source of the toxin/poison, time between poison intake and admission to the hospital, treatment outcomes and other relevant information. The data were gathered directly from patient medical records and from interaction with patients or their family members after admission. Patients were followed from the time of hospital admission until discharge, enabling real-time documentation of treatment responses and outcomes. The information was then systematically recorded into Microsoft Excel for initial processing. Advanced statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS), enabling the identification of trends and correlations in the data.

The sampling for this study was based on a consecutive sampling method, wherein all acute poisoning cases that met the inclusion criteria were included during the study period. Patients who presented to the emergency care department with acute poisoning and gave written consent to participate were considered for inclusion. This non-random sampling approach allowed for the inclusion of all relevant cases within the specified timeframe, ensuring a comprehensive representation of the acute poisoning cases in the region.

The study was approved by the Institutional Ethics Committee (Ref. no. (TH-IEC)-ECR/1069/Inst/TN/2018/RR-21), ensuring that all ethical guidelines for research involving human subjects were followed, including obtaining informed consent from participants.

RESULTS

The study provides a comprehensive analysis of acute poisoning cases, highlighting critical demographics, socioeconomic factors and clinical aspects.

The distribution by age of acute poisoning patients during the study duration is shown in Figure 2. The majority of the patients were in between 21–30 years, constituting 28% of the total population, subsequently patient age with 31–40 years, which comprised 24%. 11–20 age group represented 12% of the total cases, highlighting the vulnerability of

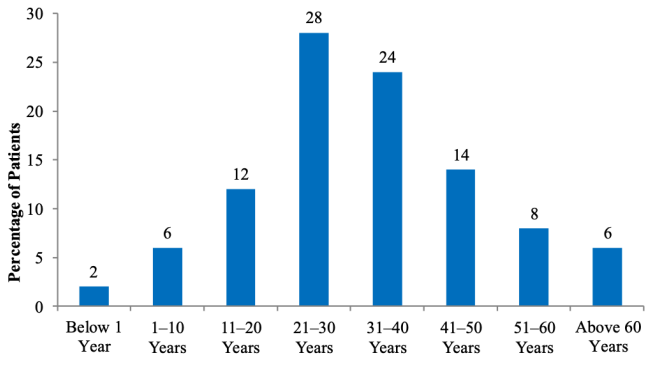
younger adults and adolescents. Middle-aged patients were moderately represented, with 14% of instances involving patients aged 41–50 and 8% involving patients aged 51–60. Like the 61–70 age group, which likewise made up 6% of the total cases, the 1–10 age group made up 6%. Only 2% of the cases are below 1-year age group. This distribution underscores the higher prevalence of acute poisoning among young adults and middle-aged individuals, emphasizing the need for targeted preventive strategies in these age groups.

Based on occupational status, students constituted the largest group, accounting for 32% of the total, followed by homemakers (28%), and business people (16%). Children (1%), farmers (4%), engineers (6%), and others (4%), made up a lesser percentage of patients. These results demonstrate the diverse work backgrounds of the study population's acute poisoning patients.

The socioeconomic status distribution among the 250 acute poisoning patients, classified based on the Modified Kuppuswamy Scale,11 revealed that 43 patients (17%) belonged to the upper class, 57 patients (23%) were from the upper middle class, 82 patients (33%) came from the middle class, 27 patients (10.80%) were upper lower class and 41 (16.40%) were lower class people. This indicates a higher representation of patients from the middle and lower socioeconomic groups in the study population.

Age wise distribution of the reported acute poisoning cases are shown in Figure:1

Figure 1: Age wise distribution of acute poisoning cases reported in a tertiary care hospital, Namakkal, Tamil Nadu, 2024 (N=250)



The acute poisoning cases were due to several reasons, with family problems being one of the significant contributors. A total of 90 patients were reported to have been affected by poisoning due to family-related issues. This was followed by a significant number of cases resulting from failures, with 70 patients experiencing acute poisoning linked to personal or relationship setbacks. Work stress was identified as 13.6 % of cases (34 patients), while financial problems were responsible for 14.4% of cases (36 patients). Out of 36 patients affected by financial problems, 23 were linked to acute poisoning due to fraudulent trading schemes and online rummy apps.

Accidental poisoning was the cause in 8% of cases (20 patients), making it the least frequent reason. Out of the total 250 patients, 32% (80 patients) were students. Among these, 43.75% (35 students) were affected by relationship issues, 37.5% (30 students) by stress, 12.5% (10 students) by family-related issues and 6.25% (5 students) by financial problems.

These numbers reflect a broad range of stressors and challenges that can drive individuals to resort to such extreme measures, underscoring the importance of addressing mental and emotional well-being in communities.

Table:1 Sociodemographic characteristics of acute poisoning cases reported in a tertiary care hospital, Namakkal, Tamil Nadu, 2024 (N=250)

Sociodemographic characteristics	n	%
Socioeconomic status		
Upper class	43	17
Upper middle class	57	23
Middle class	82	33
Upper lower class	27	10
lower class	41	16
Occupation status		
Student	80	32
Homemaker	70	28
Business	40	16
Child	25	1
Farmer	10	4
Engineer	15	6
Others	10	4
Reason for poisoning		
Accidental	20	8
Family problem	90	36
Work stress	34	14
Financial problem	36	14
Relationship Issues	70	28
Poisoning intention		
Unintentional poisoning	20	8
Intentional poisoning	230	92

Overall, the data (table 2) shows a high survival rate, particularly for ant-killer powder and yellow cow dung, while organophosphate poisoning had the highest mortality rate, with 7 deaths.

Table 2: Survival of patients with different types of poisoning reported in a tertiary care hospital, Namakkal, Tamil Nadu, 2024 (N=250)

S. No	Types of poisoning	No of patients consumed	No of patients survived
1	Ant-killer powder	100 (40%)	100(100%)
2	Organophosphates	50 (20%)	43 (86%)
3	Yellow cow dung	50 (20%)	50 (100%)
4	Oleander seed poisoning	50 (20%)	47 (94%)
Total		**250**	**240 (96%)**

The poisoning incidents shows that out of the total cases, 20 patients (8%) were admitted due to unintentional poisoning, while 230 patients (92%) were admitted due to intentional poisoning.

Vomiting was the predominant symptom, observed in 94.8% of cases, trailed by palpitations at 77.6% and giddiness (71.2%) Other notable symptoms included diarrhoea (33.6%) and dehydrated (34.4%) Less common symptoms included confusion (7.2%) and bronchospasm (6.4%). Overall, this symptom profile highlights the varied physiological effects of poisoning in the acute poisoning cases.

Table 3: Distribution of major symptom characteristics among acute poisoning cases reported in a tertiary care hospital, Namakkal, Tamil Nadu, 2024 (N=250)

S. No	Symptom characteristics	n	%
1	Vomiting	237	94.8
2	Palpitation	194	77.6
3	Giddiness	178	71.2
4	Chest pain	87	34.8
5	Dehydration	86	34.4
6	Diarrhoea	84	33.6
7	Throat pain	72	28.8
8	Epigastric pain	53	21.2
9	Bradycardia	51	20.4
10	Salivation	42	16.8
11	Sweating	40	16.0
12	Dizziness	38	15.2
13	Headache	34	13.6
14	Loss of appetite	32	12.8
15	Lacrimation	23	9.20
16	Tachycardia	23	9.20
17	Bronchorrhea	18	7.20
18	Confusion	18	7.20
19	Bronchospasm	16	6.40

The study in this tertiary care hospital reveals that a total of 250 patients were admitted. Among them, 240 patients survived, with a survival ratio of 24:1 (alive to death), while 10 patients unfortunately died. The study identifies four types of poisoning, with organophosphate poisoning exhibiting a 4% mortality rate, marking it as particularly lethal. The widespread use of organophosphates in agriculture highlights the urgent need for measures regarding their safe handling and usage.

The majority of participants (32%) were admitted more than 120 minutes after poisoning, with a survival rate of 97%. A smaller proportion (16.4%) was admitted within 90-120 minutes, achieving a 99% survival rate. A significant proportion (36.4%) was admitted within 30-90 minutes, with 100% survival. Only a small percentage (15.2%) was admitted within the first 30 minutes, also with 100% survival. These findings suggest that earlier admission to the hospital are with higher survival rates, while delayed admission showed decrease in survival outcomes.

DISCUSSION

Our study found that a greater percentage of females (58.8%) were affected by poisoning compared to males (41.2%), a trend consistent with other studies from South India, such as S. Suganthi et al. (2021), who reported 55.7% of cases involved females, attributing this to the social and emotional challenges faced by women in patriarchal societies.[12] The most affected age group was 21–30 years (28%), lower than the 46.8% reported by R. Swaminathan Veerasamy et al. (2020) in the same age group, emphasizing the vulnerability of young adults (72% below 40 years) due to academic, professional, and familial pressures, a finding echoed by studies from S. Suganthi, Bhuyyar Chandrashekhar, and Vijay V et al.[12–15] In terms of socioeconomic and occupational factors, students (32%) and homemakers (28%) were the most affected, with over 60.2% of patients belonging to the middle or lower-middle class, aligning with Mamta Gehlot et al., who highlighted financial struggles as a significant contributor to poisoning cases in low-income populations.[16] Psychosocial stressors were the predominant causative factors, with family problems (36%), personal failures (28%), and financial difficulties (14.4%) being the leading triggers, and suicidal intent (230 cases, 92%) was significantly more prevalent than accidental poisoning (20 cases, 8%), exceeding the findings of Vivek Gopinathan and K. Padmakumar in Kerala, where suicidal cases accounted for 74.73% and accidental cases 14.83%.[17] Financial instability, worsened by easy access to online gambling platforms like

rummy, increases impulsive decision-making and destructive financial habits, emphasizing the urgent need for mental health interventions. Regarding poisoning agents, ant killer powder was the most commonly ingested substance (100 cases, 100% survival), indicating its widespread accessibility and relatively low fatality, whereas organophosphorus compounds showed a higher mortality rate (14%), a trend consistent with Roberts D et al., who reported 10,000 to 20,000 hospital admissions for organophosphorus poisoning annually. Similarly, oleander poisoning resulted in a 6% mortality rate, highlighting its high toxicity and the necessity for rapid intervention.[18] The variation in outcomes underscores the importance of public awareness campaigns to restrict access to highly toxic substances and educate on household toxin risks. Clinically, vomiting (94.8%), dizziness (71.2%), and palpitations (77.6%) were the most common symptoms, aligning with Cahfer G et al.'s findings in Turkey, where tachycardia (34.7%), vomiting (32.4%), and loss of consciousness (24.7%) were predominant in poisoning cases, reinforcing the need for prompt symptom recognition to enable timely medical intervention.[19] Time to hospital admission significantly influenced patient outcomes, with 19.6% of cases arriving within one hour, 51.2% within 2–3 hours, and 29.2% after more than three hours, mirroring Lalit Kumar Rajbanshi et al.'s findings that survival rates were significantly higher in patients admitted within two hours of poisoning, highlighting the need for faster pre-hospital care, improved transportation and increased public awareness.20 The overall mortality ratio of 24:1 reflects the effectiveness of first aid and hospital care, including the administration of antidotes like atropine for organophosphorus poisoning; however, fatalities associated with organophosphorus (7 deaths) and oleander poisoning (3 deaths) underscore the limitations of existing treatment protocols, particularly in resource-limited settings. Studies like R. C. Dart et al. stress the necessity for enhanced healthcare professional training in poisoning management and improved availability of advanced antidotes in rural and semi-urban hospitals to mitigate poisoning-related mortality.[21]

CONCLUSION

This study provides valuable insights into the trends, sociodemographic characteristics and mortality rates associated with acute poisoning incidents at a tertiary care facility. Our research reveals that poisoning is more common among young women, with psychosocial stresses such as personal struggles, family issues, exam pressure, fear of the future and financial difficulties as significant contributing factors. The rising incidence of suicidal ideation underscores the critical need for focused interventions aimed at students and professionals, especially those grappling with prolonged stress and emotional turmoil. In recent years, the widespread availability of online gambling platforms has contributed to financial instability, further aggravating mental health challenges.

Additionally, the growing fraudulent online trading schemes has led to substantial financial losses, intensifying feelings of despair and hopelessness and in some cases, triggering suicidal thoughts. These factors collectively highlight the importance of implementing comprehensive public health initiatives, including enhanced access to mental health services, educational programs on poisoning prevention and therapeutic support for emotional well-being.

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CONFLICTS OF INTEREST

None

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ORIGINAL ARTICLE

TRENDS IN MORTALITY STATISTICS OF TAMIL NADU, 2000 - 2022

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ABSTRACT

INTRODUCTION : Mortality trends shed light on the impact of social determinants of health and inform the planning of healthcare services, particularly for chronic diseases and aging populations. This study aims to examine the distribution and trends of mortality statistics in Tamil Nadu from 2000 to 2022.

METHODS : The study was a time series study on the MCCD (Medical Certification of Cause of Death) annual reports of Tamil Nadu State for the period 2000 to 2022. The data was taken by ICD 10 chapters by age, gender, and Major cause groups available in the reports which were collated in Excel sheet. The data was analyzed by calculating proportions by major cause groups for each year by overall, age & gender from 2000 to 2022.

RESULTS: The MCCD coverage in the state increased to 45% in 2022. Chapter IX increased to 50.8% in 2022. Chapter XIX has reduced to 3.6% in 2022. Chapter XVI, third in 2000 (8.6%), was at around 2% since 2018. Chapter XXII peaking at 8.1% in 2021 and dropped to 0.8% in 2022. In 2022, the proportions of deaths increased in chapter by IX (Male: 12%, Female: 23%) and had change in gender proportions. Chapter IX was the leading cause of death among age group 15 years and above in 2022, and in those aged 45 years and above in 2000. Chapter I, the third-leading cause overall, was the leading cause of death for the age group 1–14 years in 2022.

CONCLUSION: MCCD coverage has increased with marked rise in deaths due to circulatory diseases, particularly in older populations. Age and gender-specific mortality patterns further reveal important public health trends, with infectious diseases still being a leading cause of death in children, while non-communicable diseases like cardiovascular diseases are becoming increasingly prominent in older age groups and have started to raise in younger age groups.

KEYWORDS : Mortality statistics, MCCD, ICD codes

INTRODUCTION

Mortality statistics is the best source of information and a vital event to assess the health status of the community. It provides an overview of the current health problems, patterns of risk persistent in the community, and trends in the mortality of a specific cause over time.[1] The mortality statistics are collected in India through the Medical Certification of Cause of Death (MCCD) form. The MCCD form must be provided only by a registered medical practitioner who has attended to the deceased during the last illness of the deceased. MCCD is provided in Form 4 for institutional deaths and deaths occurring other than institutions it is provided in Form 4A. It is vital to compare the current health systems data of the same country with the previous years to identify the trends and patterns.[2]

The significance of analyzing mortality patterns is clear in global health statistics. For example, the World Health Organization (WHO) reports that non-communicable diseases (NCDs) are responsible for 74% of deaths worldwide, with cardiovascular diseases accounting for nearly 18 million fatalities each year. On the other hand, the incidence of mortality due to infectious diseases has decreased in affluent nations thanks to advancements in healthcare, while many low- and middle-income countries continue to face a substantial burden from infectious diseases. The COVID-19 pandemic led to a temporary decline in life expectancy in various countries, underscoring the crucial role of ongoing mortality monitoring.[3]

At a national scale, grasping mortality trends enables policymakers to distribute healthcare resources more effectively. For instance, the increasing prevalence of NCDs in India—causing over 60% of total deaths—has prompted a shift in policy towards preventive healthcare and chronic disease management initiatives. Likewise, examining mortality trends at the state level in India can guide targeted interventions, such as addressing the high maternal mortality rates in specific states or tackling healthcare access disparities between rural and urban areas. By tracking mortality trends,

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governments can enhance disease surveillance, anticipate healthcare demands, and develop policies that tackle both urgent and long-term health issues. Furthermore, these trends allow for international comparisons, assisting policymakers in aligning national health strategies with global initiatives like the WHO's Sustainable Development Goals (SDGs).[4] The objective of the study was to learn the distribution and trends of mortality statistics for the state of Tamil Nadu during 2000 – 2022.

METHODS

The study design was a time-series analysis of the MCCD annual reports of Tamil Nadu State for the period 2000 to 2022. The MCCD form consists of the main cause of death in Part 1 and other causes that are not relevant to this main cause but are associated with death in Part 2. The underlying cause of death recorded in Part 1 along with demographic data is collected by district. The cause of death was classified according to the International Classification of Diseases, Tenth Revision (ICD-10) which consists of 22 chapters as major cause groups with subchapters and codes. The major 22 chapters are

Table1: Description of Major cause groups and ICD codes

Major Cause Groups	Description and ICD Codes
I	Certain Infectious and Parasitic Diseases (A00 - B99)
II	Neoplasm (C00 - D48)
III	Diseases of Blood and Blood forming organs & certain disorders involving the Immune mechanism (D50-D89)
IV	Endocrine, Nutritional and Metabolic Diseases (E00-E89)
V	Mental and Behavioural Disorders (F01- F99)
VI	Diseases of the Nervous System (G00 - G98)
VII	Diseases of the Eye and Adnexa (H00-H59)
VIII	Diseases of the Ear and Mastoid (H60-H95)
IX	Diseases of the Circulatory System (I 00-I 99)
X	Diseases of the Respiratory System (J00 -J98)
XI	Diseases of the Digestive System (K00 - K92)
XII	Diseases of the Skin and Subcutaneous Tissue(L00-L98)
XIII	Diseases of the Musculoskeletal system and Connective tissue(M00-M99)
XIV	Diseases of the Genito Urinary System (N00 - N99)
XV	Pregnancy Childbirth and Puerperium (O00 - O99)
XVI	Certain conditions originating in the Perinatal Period (P00 - P96)
XVII	Congenital Malformations, Deformations and Chromosomal abnormalities (Q00 - Q99)
XVIII	Symptoms Signs & Abnormal Clinical & Laboratory Findings, not elsewhere classified (R00 - R99)
XIX	Injury Poisoning and Certain Other Consequence of External Causes (S00 - T98)
XX	External Causes of Morbidity and Mortality V01-Y89)
XXI	Persons encountering health services for examination and investigation (Z00-Z13)
XXII	Codes for Special purposes (U00-U99)

The data is collated annually by the State Bureau of Health Intelligence and the reports are submitted to the Registrar General of India in the prescribed format provided every year. The MCCD annual reports from 2000 to 2022 were collected as soft copies from the department of SBHI. The data was taken by ICD 10 chapters for all the 23 years by age, gender, and major cause groups available in the reports which were collated in a single Excel sheet by Nosologist. A total of 41,19,347 deaths were taken for analysis ranging from 71,794 in 2000 to 3,11,661 in 2022. 10,241(0.3%) deaths were excluded due to incompleteness (age was not stated). The major leading causes of death for the years 2000 and 2022 were identified, and data were analyzed using proportional distribution across major cause groups for each year. Analysis was conducted overall, as well as stratified by age and gender, to observe trends from 2000 to 2022. Data were processed using Excel to calculate proportions and trends.

Ethical Considerations

This study utilized secondary data from MCCD reports, which contain aggregated and anonymized information. As no individual identifiers were involved, a waiver of informed consent was obtained.

RESULTS

The MCCD (Medical Certification of Cause of Death) coverage in the state was 19% in 2000 and gradually improved over the following two decades, reaching 45% in 2022. However, this percentage is lower than the previous year (52% in 2021). The coverage rates for male and female medically certified deaths have remained relatively unchanged from 2000 to 2022. On average, males had higher certification of 61%, while females had an average proportion of 39%certification during this period. Overall, from the trend of male and female certification, there have been no notable changes in the certification for either gender from 2000 to 2022.

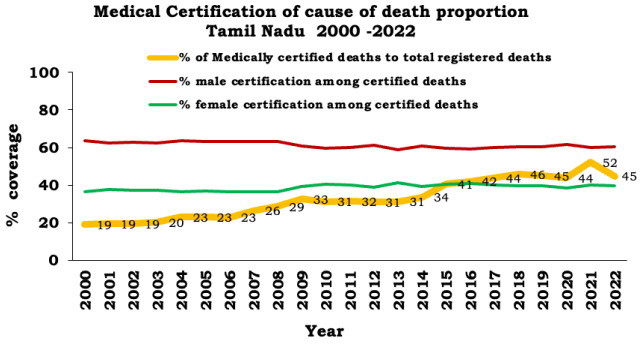


Figure1: Medical Certification of cause of death proportion Tamil Nadu 2000 -2022

Over the past 23 years, the distribution of medically certified deaths in the state has shifted significantly across 22 major cause groups. Notably, Chapter IX has become

the leading cause, increasing from 35.2% in 2000 to 50.8% in 2022. Chapter XIX, the second leading cause (17.3%) in 2000, has drastically reduced to 3.6% in 2022, though it remains higher than in 2021. Chapter XVI, ranked third in 2000 (8.6%), dropped to 5% in 2010, rose to 8.2% in 2013, and has remained static at around 2% since 2018. Chapter I have declined slightly from 7.0% in 2000 to 6.5% in 2023, moving from the fourth to third leading cause. Chapter X, the fifth leading cause (4.8%) in 2000, became the second leading cause from 2018-2022, but has started to decrease in 2022. Chapter II saw their highest percentage (9.4%) in 2017 and the lowest (2.1%) in 2021. Chapter IV grew from 3.8% in 2000 to 6.0% in 2020 but declined to 2.9% by 2022. Once at 3.8% in 2000, Chapter XIV reached its lowest (1.7%) in 2013 and was at 2.9% in 2022. Chapter XVIII, initially at 8.2% in 2000, peaked at 28.5% in 2013, and dropped to 9% by 2022. Chapter XX, which had minimal impact until 2016, gradually rose to 3.9% in 2022. Chapter XXII started increasing in 2020, peaking at 8.1% in 2021 before dropping to 0.8% in 2022. Deaths from other cause groups consistently represented less than 0.5% across the 23 years (Table 2).

Table 2: Proportion of deaths by Major Cause Groups, Tamil Nadu, 2000-2022

Major cause groups	Year																						
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
I	7.0	6.4	6.9	7.3	7.2	6.3	6.5	6.7	6.0	5.6	5.9	5.3	6.1	6.4	5.1	4.5	4.4	4.7	4.3	4.3	4.5	5.9	6.5
II	4.2	4.1	4.2	4.1	4.4	4.6	3.6	3.6	3.6	3.5	3.2	2.9	2.8	2.6	2.5	2.8	3.5	9.4	2.9	3.0	2.6	2.1	3.0
IV	3.8	3.9	4.5	4.9	4.6	4.2	3.9	3.3	4.1	4.4	4.1	3.7	3.6	1.0	3.3	4.8	6.1	6.3	5.5	5.7	6.2	4.4	2.9
IX	35.2	36.7	37.2	35.7	37.0	37.8	38.5	36.7	39.2	42.7	41.8	36.0	41.4	37.7	48.8	50.0	49.2	51.5	49.4	45.5	47.5	40.4	50.8
X	4.8	5.4	6.4	7.7	7.0	7.4	6.9	6.1	6.7	7.2	7.8	6.8	6.5	3.6	2.8	6.1	8.1	7.0	8.4	9.6	9.2	13.0	8.3
XIV	3.7	2.9	3.2	3.0	3.4	3.2	3.4	2.9	3.1	3.1	3.0	2.6	2.6	1.7	2.3	3.3	3.9	2.8	3.3	3.2	2.8	1.9	2.9
XVI	8.6	8.0	7.0	4.5	4.6	4.1	6.0	6.7	5.5	4.6	5.0	4.4	3.6	8.1	4.6	3.7	3.3	2.3	2.0	2.0	1.9	1.7	2.0
XVIII	8.2	9.1	11.4	14.8	16.3	18.6	19.7	22.0	19.8	19.1	18.8	18.2	22.5	28.5	21.1	16.3	11.4	6.1	14.7	17.0	13.8	14.6	9.0
XIX	17.3	15.8	12.7	11.2	9.5	8.4	6.7	7.2	7.8	6.2	6.3	5.8	7.2	7.0	6.0	3.9	4.4	3.6	3.3	3.1	2.7	2.5	3.6
XX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.0	2.3	2.1	2.2	3.9
Other groups	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.6	1.0	0.6

The proportion of deaths by major cause groups for each gender was calculated from the gender mortality for the years 2000,2006,2011,2016 and 2022. The gender-specific mortality data from 2000 to 2022 reveals notable trends. In 2022, the proportions of deaths increased in chapters by IX (Male: 12%, Female: 23%), X (Male: 3.7%, Female: 3.2%), and XX (Male: 5.1%, Female: 2.1%) for both genders compared to 2000. Conversely, deaths decreased in chapters by (XIX (Male: 11.1%, Female: 18%), XVI (Male: 5.7%, Female: 8.3%), IV (Male: 1.2%, Female: 0.6%), XIV (Male: 0.7%, Female: 1%), II (Male: 1.1%, Female: 1.4%), and XI (Male: 0.2%, Female: 0.4%)) for both genders by 2022. Chapter I remained unchanged for females but saw a slight increase (0.8%) for males in 2022 when compared to 2000. Meanwhile, Chapter XVIII remained the same for males, while it increased by 2.2% for females compared to 2000. In 2000, the chapters where the proportion of deaths was higher in males than females by Chapter I (1.1%), Chapter X (0.9%), and Chapter XIV (0.2%). By 2022, these differences were prevalent with males being still higher by Chapter I (0.3%), Chapter X (1.4%), & Chapter XIV (0.5%) when compared with females. Conversely, in 2000, the chapters with a higher proportion of deaths in females than males by Chapter XVI (2.7%), Chapter IV (0.1%), and Chapter II (1.3%) which was still higher in the same gender by (XVI- 0.1%, IV -0.7% & 1%) by 2022. Additionally, in 2000 had higher proportions of deaths in males by Chapters IX (6.3%), XI (1.5%), and XVIII (0.4%), but by 2022, these chapters saw higher proportions in females by (IX: 5.6%, XI: 1.7%, XVIII: 1.8%). (Table 3).

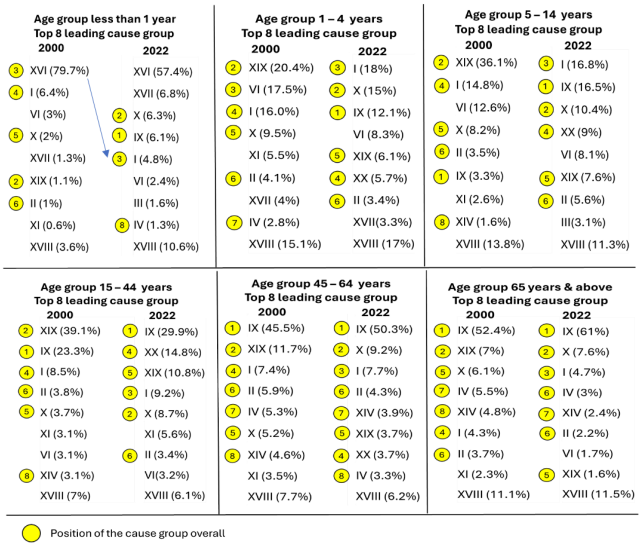
The proportion of deaths by major cause groups for specific age groups was calculated for the years 2000,2006,2011,2016 and 2022 and compared with the leading causes of death overall. It was observed that Chapter IX (the leading cause group overall) was the leading cause of death in individuals aged 15 years and above in 2022, and in those aged 45 years and above in 2000. Chapter I, the third-leading cause overall, was the leading cause of death for the age group 1–14 years in 2022, while Chapter XIX, the second-leading cause overall, was the top cause for those aged 1–44 years in 2000. It was also noted that the age group 45 years and above showed a similar pattern to the overall top three leading cause groups in 2022, and the overall top two leading

cause groups in 2000. In contrast, the age group 1–44 years exhibited a more varied pattern in both 2000 and 2022, with the overall leading cause groups appearing in a somewhat jumbled order with two exception for Chapter IX, which remained the same position as overall leading group in age group15- 44 years, and at same time it was not present among the leading causes in the 1–4 years age group. Additionally, in 2000, Chapter IX was absent from the leading causes in the 1–14 years age group but was present in 2022 as 4th leading group. In 2022, for the less than 1 year age group, the top leading cause groups, Chapters XVI and XVII, were not among the overall major leading cause groups. Chapter XVIII showed little change across most age groups, except for the less than 1year group, where it increased by nearly 7%. (Table 4).

Table 3: Proportion of deaths of Major Cause Groups by gender, Tamil Nadu, 2000-2022

Major cause group	Year									
	2000		2006		2011		2016		2022	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
I	7.4	6.3	6.6	6.4	6.4	5.3	3.9	5.1	6.6	6.3
II	3.7	5	3.1	4.5	2.7	4.1	3.2	3.9	2.6	3.6
IV	3.8	3.9	3.8	4.2	4	4.5	6.1	6.1	2.6	3.3
IX	37.5	31.2	39.2	37.4	40.2	40.8	51	46.5	48.6	54.2
X	5.1	4.2	7.1	6.5	7.8	7.4	7.1	9.5	8.8	7.4
XIV	3.8	3.6	3.5	3.3	2.9	2.9	3.5	4.6	3.1	2.6
XVI	7.6	10.3	5.6	6.7	4.7	5.4	3.3	3.3	1.9	2
XVIII	8.3	7.9	19.4	20.2	20.2	19.8	10.6	12.4	8.3	10.1
XIX	15.5	20.4	6.9	6.4	6.8	6.1	4.5	4.1	4.4	2.4
XX	0	0	0	0	0	0	0	0	5.1	2.1
Other groups	0.7	0.6	0.4	0.4	0.4	0.3	0.6	0.4	0.7	0.5

Table 4: Proportion of deaths by Major Cause Groups by age group, Tamil Nadu 2000-2022



DISCUSSION

The trends in MCCD (Medical Certification of Cause of Death) coverage and the distribution of deaths by major cause groups in the state from 2000 to 2022 highlight several key developments in public health reporting and mortality patterns over the past two decades. First, the gradual increase in MCCD coverage from 19% in 2000 to 45% in 2022 is a positive indication of improving cause-of-death certification. However, despite this increase, the coverage remains relatively low compared to the previous year (52% in 2021). This may suggest that while progress has been made in improving data quality and certification practices, there is still a need for further improvements in medical certification processes, especially in underreported or rural areas. An approach in collaboration with WHO-India known as District CRS Approach has been initiated in the districts of Karur and Krishnagiri for the year 2023 to cover deaths which are not medically certified through verbal autopsy in two districts of Tamil Nadu. The gaps in the existing MCCD framework is also studied and a minimum of one master trainer has been created from each district to strengthen the MCCD quality and quantity. This project will not only improve cause of death availability but also may give insights regarding the death certification and the existing patterns. The 52% hike during 2021 may be also due to COVID-19 as medical seeking behaviour was high during this period. The gender-wise coverage remained relatively stable during this period, with male deaths having a higher proportion of certified causes of death (61%) compared to female deaths (39%). This persistent gender disparity in MCCD coverage could reflect differences in healthcare access, reporting practices, or cultural factors that may influence death certification for females.

The substantial changes in the distribution of medically certified deaths across different cause groups between 2000 and 2022 reveal notable shifts in the state's health landscape. Of particular significance is the rise of Chapter IX (which refers to diseases of the circulatory system) as the leading cause of death, increasing from 35.2% in 2000 to 50.8% in 2022 with a noticeable shift increasing in both genders over the 22 years especially higher among females and also emerged as the dominant cause of death for those aged 15 years and older in 2022, which aligns with the overall rise of cardiovascular diseases but however in 2000 it was the dominant cause only from age group 45 years and above. Chapter XIX (Injury Poisoning and Certain Other Consequence of External Causes) and Chapter XVI (Certain conditions originating in the Perinatal Period) saw significant declines in their proportion of deaths, which could reflect changes in the prevalence of those conditions, with either advancements in treatment, or even improved prevention and early detection measures. The marked reduction in Chapter

XIX (Injury Poisoning and Certain Other Consequence of External Causes), for instance, could be due to advances emergency response and medical care, changes in workplaces and occupational safety or preventive Health and safety interventions. In contrast, some other chapters like Chapter XX (external causes of morbidity and mortality), which had minimal impact until 2016, showed a gradual rise, likely due to increased awareness of external injuries, violence, and road traffic accidents.

The rise of Chapter XXII in 2021, followed by a decline in 2022, can be largely attributed to the impact of the COVID-19 pandemic, which significantly affected mortality rates in Tamil Nadu during this period. The surge in 2021 was marked by a substantial increase in deaths directly attributed to COVID-19, as well as indirect factors such as disruptions in healthcare services and delayed medical care for non-COVID conditions. According to studies on excess mortality during the pandemic, the number of deaths in 2021 exceeded expected levels, even when accounting for deaths directly attributed to COVID-19.[5,6] The surge in 2021 was exacerbated by overwhelmed healthcare systems, reduced access to routine medical care, and delays in treatments for chronic diseases such as cardiovascular diseases, diabetes, and cancer.[7] A study by the World Health Organization[8] found that disruptions in health services during the pandemic led to significant reductions in routine medical procedures and screenings, contributing to increased mortality in both COVID and non-COVID cases.

In 2022, as COVID-19 cases began to decline and the healthcare system started recovering, there was a noticeable reduction in COVID-related deaths, leading to a decrease in Chapter XXII deaths. However, the long-term effects of the pandemic, such as lingering disruptions in healthcare infrastructure and delayed interventions for certain conditions, may continue to influence mortality trends in the years to come.[9] These findings highlight that while the immediate impact of COVID-19 on mortality may have declined, the enduring consequences of healthcare disruptions, increased mental health issues, and long-term effects of untreated non-COVID conditions may continue to influence mortality statistics in the future.

In terms of gender-specific mortality, the data reveals interesting patterns in mortality trends over the past 22 years, with notable gender differences. Chapters XIX (Diseases of the Digestive System) and XVI (Certain Infectious and Parasitic Diseases) have decreased notably, particularly among females. This may be due to improved access to healthcare, changes in lifestyle, or better management of specific conditions, such as a decline in infections and digestive diseases due to enhanced public health measures and improvements in sanitation and nutrition.[10] However, certain chapters, such as Chapter I (Certain Infectious and Parasitic Diseases), X (Diseases of the Circulatory System), and XIV (Diseases of the Musculoskeletal System), have been notably more prevalent among males since 2000. This trend may be related to the higher prevalence of risk factors like smoking, alcohol consumption, and occupational hazards among men, which increase susceptibility to conditions such as circulatory diseases and musculoskeletal disorders.[11]

Conversely, for Chapters XVI (Certain Infectious and Parasitic Diseases), IV (Endocrine, Nutritional, and Metabolic Diseases), and female gender predominance, the shift in prevalence might reflect changing health behaviours and greater healthcare access among women, particularly regarding diseases like diabetes and metabolic disorders. This could also be related to increased awareness of diseases that disproportionately affect women, such as autoimmune conditions, and enhanced health-seeking behaviour among women.[12]

Notably, the gender distribution in certain chapters (IX - Diseases of the Circulatory System, XI - Diseases of the Respiratory System, and XVIII - Diseases of the Nervous System) has shifted, reflecting changing gender dynamics in health risks and access to care. This could be due to a combination of factors, including evolving patterns in lifestyle risk factors, such as the increasing prevalence of smoking among women[13], or better access to early diagnosis and care for certain diseases that have traditionally affected men more, such as cardiovascular diseases.

The rising burden of non-communicable diseases (NCDs) among women may also be influenced by societal factors like urbanization, changing dietary patterns, and work-related stress.[14] This has led to initiatives such as Makkalai Thedi Maruthuvam in Tamil Nadu which brings doorstep medication and multiple screening programmes have been initiated in the state.

The age-specific mortality patterns from 2000 to 2022 indicate that while the broad distribution of deaths remains similar across age groups, there are some notable exceptions. Chapter I (infectious diseases) was the top cause in children aged 1–14 years in 2022, reflecting the continued vulnerability of children to infectious diseases in some regions despite advances in vaccination and hygiene. Age group patterns further underscore the changes in mortality trends. The distribution of leading causes across different age groups in 2022 suggests that while there is overlap, there

are distinct patterns, particularly with Chapter I (infectious diseases) being the leading cause of death in children aged 1–14 years in 2022, and Chapter XIX (Injury Poisoning and Certain Other Consequence of External Causes) being prominent in the 1–44 years age group in 2000 which has decline in the recent timeline.

The potential underreporting of certain causes of death, such as maternal mortality and suicides, remains a significant challenge in mortality data accuracy. Factors such as social stigma, lack of proper death certification, and limited access to healthcare in rural areas contribute to this underreporting.

These findings suggest that infectious diseases, particularly in younger populations, remain an important public health concern, although non-communicable diseases like cancer are becoming increasingly significant in middle-aged adults.

CONCLUSION

In conclusion, the state has made notable progress in increasing MCCD coverage. However, continued efforts are needed to further improve the quality and accuracy of medical death certification, especially to address the persistent gender disparities in coverage.

The distribution of deaths by cause group has shifted significantly over the past two decades, with a marked rise in deaths due to circulatory diseases, particularly in older populations, while deaths from respiratory diseases, and certain infectious diseases have fluctuated.

Age and gender-specific mortality patterns further reveal important public health trends, with infectious diseases still being a leading cause of death in children, while non-communicable diseases like cardiovascular diseases are becoming increasingly prominent in older age groups and have started to raise in younger age groups.

Public awareness campaigns should be implemented to highlight the importance of MCCD for improving public health data and policy planning. Engaging community leaders, local governments, and NGOs in this process can help increase the awareness of the value of accurate death certification among the public.[15]

Specific focus should be given to marginalized and rural populations, where MCCD coverage is often lower due to challenges such as poor healthcare access, lack of trained professionals, and limited infrastructure. Mobile health clinics and telemedicine services could be deployed to bridge these gaps, ensuring that cause-of-death data is captured in remote and underserved areas.[16]

LIMITATIONS

The study has variable and incomplete coverage across the 22-year period. In 2000, the coverage was only 19%, which limits the representativeness of the data for the entire population. Rural or remote populations are less likely to have complete cause-of-death reporting compared to urban areas, introducing potential geographic bias. Quantifying the rural-urban disparity in MCCD reporting is essential to highlight the unequal access to healthcare and reporting infrastructure. Rural areas often face challenges such as limited healthcare facilities, fewer trained professionals, and logistical barriers, leading to lower MCCD coverage compared to urban regions. The trends were not tested statistically for significance.

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CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

EPIDEMIOLOGICAL PROFILE OF JAPANESE ENCEPHALITIS IN TAMIL NADU, 2022-2024: A SECONDARY DATA ANALYSIS OF IDSP-IHIP PROGRAMME DATA

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ABSTRACT

INTRODUCTION : The Japanese encephalitis virus (JEV) is a significant etiological agent of viral encephalitis in Asia. JEV is a zoonotic, vector-borne virus transmitted mostly by Culex (Cx) subgroup of mosquitoes. This study aims to delineate the epidemiological profile and assess the trends of JE incidence from 2022 to 2024.

METHODS : To analyse the epidemiological profile of Japanese encephalitis cases in Tamil Nadu, India, during 2022 - 24. The data of confirmed Japanese encephalitis (JE) cases in Tamil Nadu was retrieved from the IDSP- IHIP portal and entered in MS- Excel. Statistical analysis was done using SPSS version 21.0. Descriptive statistics was used.

RESULTS: From January 2022 to December 2024, 306 confirmed cases of Japanese encephalitis were reported in Tamil Nadu, with the majority aged 10-19 years. The proportion of male cases reported was higher than females. Chennai had the highest proportion at 40.5%, followed by Thiruvallur at 8.2% and Thiruvarur at 6.2%. The highest number of cases (120) occurred in 2022, followed by 112 in 2023 and 74 in 2024. The Health and Family Welfare Department of Tamil Nadu has identified 14 districts as endemic, but between 2022 and 2024, there was a noticeable increase in cases outside these districts also.

CONCLUSION: Japanese encephalitis virus shows a recurring seasonal trend with more cases from December and January, and it correlates with the post monsoon season of the region. This recurring seasonal trend underscores the importance of implementing preventive measures, such as mosquito control and public vaccination campaigns, before the monsoon season begins.

KEYWORDS : Japanese encephalitis, Vector-borne

INTRODUCTION

The Japanese encephalitis virus (JEV) is a significant etiological agent of viral encephalitis in Asia. JEV is a zoonotic, vector-borne virus transmitted mostly by Culex (Cx) subgroup of mosquitoes like Cx.vishnui, Cx. Vishnui, Cx.pseudovishnui, and Cx.tritaeniorhynchus. It is an arbovirus belonging to family Flaviviridae, closely related to West Nile, St. Louis & Kunjin viruses. Numerous avian species serve as the natural reservoir; however, swine are regarded as the primary maintenance or amplifying host. Man is the accidental host.[1,2.]

JE persists as a public health concern owing to vector proliferation, reservoir host availability, deficiencies in vaccine coverage, environmental influences, and insufficient surveillance and reporting mechanisms. Vaccination initiatives in Asia encounter obstacles, particularly in resource-constrained environments. Environmental elements such as rice agriculture and irrigation establish optimal breeding conditions for mosquitoes.

JEV infection in humans typically results in mild febrile sickness, whereas around 1% of infected individuals progress to Japanese encephalitis (JE), which has a death rate nearing 30%. The disease has a significant incidence of neurological sequelae, with 25–30% of survivors experiencing enduring disability or cognitive impairments.[3,4]

The World Health Organisation (WHO) estimates that there are 68,000 cases of Japanese Encephalitis (JE) worldwide each year. Additionally, around three billion individuals are projected to reside in regions endemic to JE5,6. Asymptomatic instances to severe encephalitis with fever, headache, and vomiting are possible with Japanese Encephalitis (JE).

Cervical rigidity, disorientation, seizures, spastic paralysis, and coma may develop as the condition progresses.[7] Approximately 75 percent of the impacted persons generally develop seizures. To date, no specific treatment exists for JE,

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and immunisation remains the sole dependable method for its prevention and control. The predominant vaccination utilised against JEV genotype III (GIII) is employed in endemic nations.[8-10]

The virus is extensively prevalent in Southeast Asia, mostly in rural and peri-urban areas where humans reside in close proximity to vertebrate hosts such as pigs and waterfowl.[11,12]

In temperate sections of Asia, transmission primarily happens during the warm season, although in tropical and subtropical places, it can transpire throughout the year, frequently escalating during the rainy season and pre-harvest period in rice-cultivating regions.[13,14]

In India, Japanese Encephalitis has persisted as a significant public health issue since its initial identification in Nagpur, Maharashtra, in 1952.

Consequently, the aggregation of serological evidence in southern India in 1955 led to the reporting of cases from approximately 16 states, including Andhra Pradesh, Assam, Bihar, Delhi, Goa, Haryana, Karnataka, Kerala, Maharashtra, Manipur, Nagaland, Punjab, Uttarakhand, Tamil Nadu, Uttar Pradesh, and West Bengal.[15,16] Currently, 24 States and Union Territories in the country have recorded instances of Japanese Encephalitis (JE), with Uttar Pradesh accounting for almost 75 percent of cases in 2007. The outbreak has caused widespread infection nationwide, with case fatality rates nearing 50 percent.

Following the significant outbreak documented in Tirunelveli, southern India, in 1978, JEV was identified as endemic in many regions of Tamil Nadu17. JE is endemic in multiple districts of Tamil Nadu. The aforementioned retrospective investigation documented JE instances from multiple districts, including Chennai, Thiruvallur, Kancheepuram, Vellore, and Thiruvannamalai. The predominant instances originated from the northern regions of Tamil Nadu.

In addition to Tamil Nadu, JE has been recorded in Andhra Pradesh and Karnataka. Conversely, it has been identified as a significant public health issue with an increasing trend of case incidence in northern India. Insufficient surveillance systems and underreporting impede effective public health measures.[18,19]

A comprehension of the seasonal pattern of JE would facilitate the anticipation of the disease burden. This would assist public health authorities in implementing suitable measures to control and avoid future outbreaks. This study aims to delineate the epidemiological profile and assess the trends of JE incidence from 2022 to 2024.

METHODS

This retrospective analysis utilised surveillance data of Japanese Encephalitis cases. The data was obtained from the IDSP – IHIP portal (Integrated Disease Surveillance Programme - Integrated Health Information Platform) of Tamil Nadu, from January 2022 to December 2024. Authorisation was secured from the Director of Public Health and Preventive Medicine (DPH & PM), Tamil Nadu, for the utilisation of secondary surveillance data. During the study period from January 2022 to December 2024, a total of 306 cases of Japanese Encephalitis were identified through various Rapid antigen tests and IgM ELISA for Japanese Encephalitis. The line list included the epidemiological and laboratory profiles of all the cases. The details of the patients were not disclosed in this study.

The monthly and yearly data of Japanese Encephalitis cases was manually entered into MS Excel, and statistical analysis was conducted utilising IBM SPSS Statistics, version 21. Data on a categorical scale was expressed in numerical values and percentages, whereas data on a continuous scale was represented as Mean ± SD.

Trend analysis was done from January 2022 to December 2024. District wise prevalence of Japanese encephalitis was analysed. However, vaccination status and outcome data were available for only 95 cases, so only descriptive analysis was performed.

RESULTS

From January 2022 to December 2024, the IDSP-IHIP portal reported 306 confirmed cases of Japanese encephalitis. The mean age of the JE cases was 23.59 years (± 21.4). Table 1 illustrates the age and gender wise distribution of Japanese encephalitis cases. The majority of cases were in the age group of 10 to 19 years (24.2%), followed by those under 5 years (19.0%). Table 1 indicates that, among the 306 recorded cases of Japanese encephalitis, the proportion of males (62.04%) exceeded that of females (37.06%).

Table 1: Distribution of Japanese encephalitis cases by Age and Gender in Tamil Nadu between 2022 and 2024. (N=306)

Age (Years)	Frequency (N=306)	Percentage (%)
Under 5	58	19
6 to 9	51	16.7
10 to 19	74	24.2
20 to 40	51	16.7
40 to 60	39	12.7
Above 60	33	10.8
Sex		
Male	191	37.6
Female	115	62.4

The district-wise distribution of Japanese encephalitis cases in Tamil Nadu indicates that Chennai

accounts for the highest proportion at 40.5%, followed by Thiruvallur at 8.2%, Thiruvarur at 6.2%, Thiruvannamalai at 5.6%, Chengalpattu at 4.9%, Thanjavur at 4.6%, Villupuram at 3.6%, and Madurai at 2.6%. The remaining districts depicted in Figure 1 exhibited less than 2%. The highest number of cases occurred in 2022, with 120 cases, followed by 2023 with 112 cases, and 2024 with 74 cases. (Figure 1)

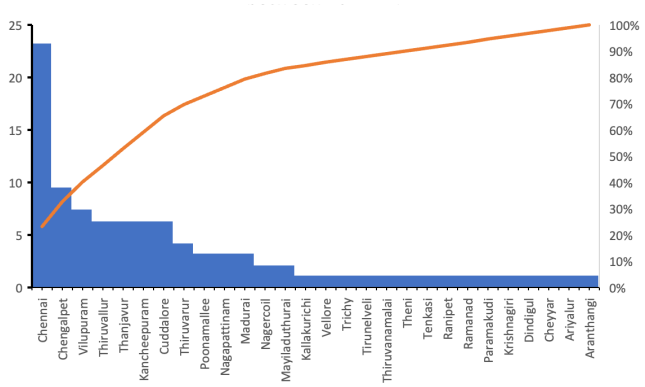

Figure 1: Distribution of Japanese encephalitis cases by district in Tamil Nadu between 2022 and 2024 (N=306)

Comparing the monthly data of Japanese encephalitis cases from 2022 to 2024 reveals that JE cases begin to increase from June with a slight decrease of cases in September, increasing thereafter with an increase in December and January. This bimodal peak is consistent for all three years. (Figure 2)

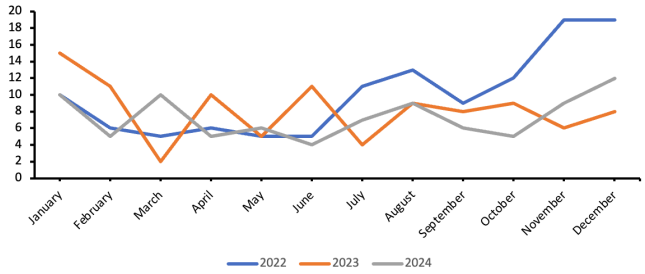

Figure 2: Trend of Japanese encephalitis in Tamil Nadu between 2022 and 2024

The Health and Family Welfare Department of Tamil Nadu has identified 14 districts as endemic such as Tiruvallur, Tiruvannamalai, Villupuram, Cuddalore, Kallakurichi, Perambalur, Karur, Thanjavur, Ariyalur, Tiruvarur, Pudukkottai, Madurai, Virudhanagar, and Tiruchirappalli. Between 2022 and 2024, there has been a noticeable increase in cases (>5 cases) in districts outside of endemic areas such as Chennai, Kanchipuram, Chengalpattu and Tenkasi. Assessing the outcomes of 95 cases (which could only be done due to feasibility) from 2022 to 2024 shows a significant recovery rate, with 82 patients (86.3%) recovering completely. However, 5 patients (5.3%) experienced neurological sequelae despite survival, and 8 patients (8.4%) succumbed to the condition as shown in Table 2.

Table 2: Outcomes of Japanese encephalitis cases in Tamil Nadu between 2022 and 2024.

Outcome	Frequency (N=95)	Percentage (%)
Recovered	82	86.3
Recovered with neurological sequelae	5	5.3
Death	8	8.4

Among the 95 cases of JE reported between January 2022 and December 2024, 17 patients had received the vaccine, whereas 78 remained unvaccinated as mentioned in Table 3.

Table 3: Vaccination Status of Japanese encephalitis cases in Tamil Nadu between 2022 and 2024.

Vaccination Status	Frequency (N=95)	Percentage (%)
Yes	17	17.8
No	78	82.2

DISCUSSION

Japanese encephalitis (JE) is a viral illness that is transmitted by mosquitoes and presents a serious problem in Tamil Nadu in terms of public health. Throughout the years, the Directorate of Public Health and Preventive Medicine of the state has tracked the number of cases and fatalities associated with JE. There were 33 cases and five fatalities in 2012; 33 cases without death in 2013; 36 cases and three deaths in 2014; 53 cases with no death in 2015; and 51 cases with no death in 2016.

To improve the surveillance of the disease, JE cases are reported in the IDSP – IHIP portal on daily real-time basis in India. Surveillance data was retrieved from the IDSP-IHIP portal to understand the trends of leptospirosis in the state of Tamil Nadu. The study reveals that 306 confirmed cases of Japanese encephalitis (JE) were reported in Tamil Nadu, with the majority aged between 10 and 19 years. The highest proportion of cases (24.2%) was recorded in the 10 to 19 year age group, while children under 5 years (19.0%) were the second highest affected group. Campbell et al. examined the global burden of Japanese encephalitis and found that most of symptomatic JE cases occur in children under the age of 15 years, particularly in areas where vaccination coverage remains suboptimal. This aligns with the current findings in Tamil Nadu, where a significant proportion of cases (24.2%) is observed in children and adolescents under

19 years, suggesting importance of mandatory vaccination of JE.[20] According to WHO, in endemic areas adults have likely developed natural immunity due to childhood infection, but children under 15 haven't had the chance to develop this immunity yet, making them more susceptible.

The data also shows gender disparity in JE cases, with males having a higher incidence (62.04%) compared to females (37.06%). This could be due to greater outdoor exposure; Similar observations were made by Kumar et al. who on analysing JE trends in India reported that males accounted for approximately 60% of JE cases. The study linked this gender disparity to increased outdoor activities such as farming and livestock tending, particularly in rural areas where mosquito density is higher.[21] The seasonal pattern of Japanese encephalitis (JE) cases observed between 2022 and 2024 aligns with findings from previous studies conducted in endemic regions of Tamil Nadu by Tiroumourougane et al., where higher JE cases during the post-monsoon and winter months are attributed to increased mosquito breeding, particularly of Culex species, which are primary JE vectors.[22] The geographical distribution of JE cases is mainly urban, with Chennai recording the highest number (40.5%). Other districts have varying proportions, with Chennai having the highest number (40.5%). A region-specific study by Tiwari et al. on JE in South India found that while rural districts accounted for a majority of cases historically, metropolitan areas, including Chennai, showed a rising trend. This was attributed to the encroachment of agricultural practices in peri-urban zones, climate-related changes increasing mosquito activity, and migration patterns that expose urban populations to rural reservoirs of infection.[23] Districts namely Tiruvallur, Thiruvarur, Tiruvannamalai and Thanjavur share common agricultural characteristics, with a strong dependence on farming and irrigation. The Cauvery Delta region (Thanjavur & Thiruvarur) is more dependent on paddy, while Tiruvallur & Tiruvannamalai have a mix of crops. The presence of water bodies, monsoonal dependency, and rural agricultural livelihoods connect them, making them more vulnerable for JE. The increasing number of cases in previously non-endemic regions can be attributed to several environmental and ecological factors that contribute to the spread of Japanese Encephalitis Virus (JEV). Key factors include the presence of paddy fields, bird sanctuaries, field wells, pig populations, and ardeid bird habitats, all of which create an ideal environment for mosquito breeding and disease transmission. Additionally, bird sanctuaries and ardeid bird habitats (such as herons and egrets) play a crucial role in the JEV transmission cycle, as these birds serve as reservoir hosts for the virus. The presence of pig populations, which act as amplifying hosts, further escalates the risk of transmission, as infected pigs can significantly increase the virus load in local mosquito populations. Despite the results indicating a high recovery rate among patients, a significant concern remains the development of serious neurological sequelae in recovered individuals. These neurological complications can lead to long-term disabilities, severely affecting the patients' ability to perform daily activities independently. As a result, many survivors experience cognitive, motor, or speech impairments, which hinder their normal lifestyle and significantly reduce their quality of life. The burden of such disabilities extends beyond the affected individual, placing a significant financial and emotional burden on family and the society. Therefore, preventing JE through effective vaccination is crucial to reducing the disease burden and its long-term consequences. However, due to limited data association between vaccination status, occurrence and outcomes could not be done which paves a scope for further study. This study reveals that Japanese encephalitis (JE) in Tamil Nadu is a persistent public health challenge, with a significant age group vulnerability, post monsoon seasonal trend and gender disparity. The study recommends enhanced vaccination coverage and monitoring, targeted public health interventions, geographically-focused control measures, investigation into urban risk factors, and the need for pre-monsoon preventive measures, including intensified mosquito control, vaccination drives, public awareness campaigns, real-time surveillance, and further research and policy development. By implementing these measures, Tamil Nadu can strengthen its public health response to JE, reduce disease incidence, and protect vulnerable populations more effectively.

CONFLICT OF INTEREST

None

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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.

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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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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.

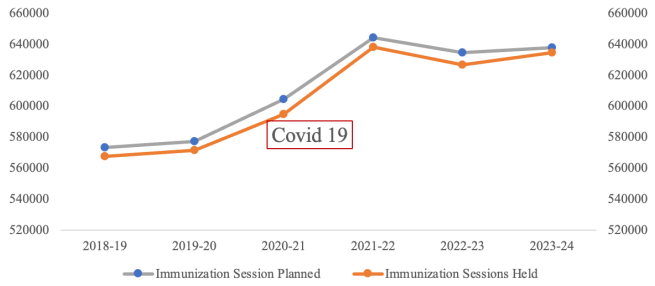

Figure 1: Trend of Planned vs. Held Immunization Sessions in Tamil Nadu (2018-19 to 2023-24)

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%)

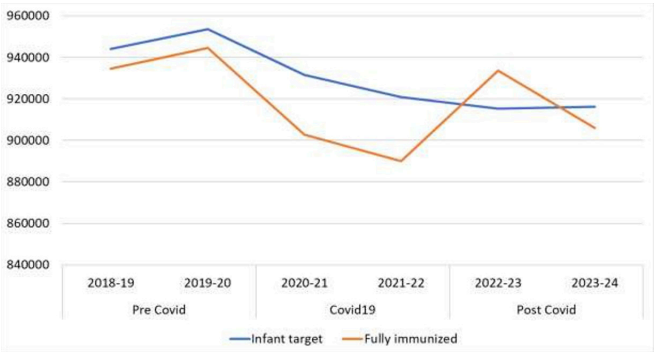

Figure 2: Trend of Infant target vs fully immunized infants in Tamil Nadu (2018-19 to 2023-24) and Impact of COVID-19

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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ORIGINAL ARTICLE

PERCEPTIONS FROM FIELD-LEVEL HEALTHCARE PROVIDERS ON DIGITALIZATION OF HOME-BASED ANTENATAL CARE: A MIXED-METHODS STUDY IN KUNDRATHUR BLOCK, KANCHEEPURAM DISTRICT

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ABSTRACT

INTRODUCTION : Despite significant global advancements, maternal mortality remains a pressing public health issue, particularly in low- and middle-income countries like India. Effective antenatal care (ANC) is vital for reducing maternal deaths, especially in underserved areas.
OBJECTIVES : This study aims to explore the perceptions and experiences of field-level healthcare providers regarding the digitalization of home-based antenatal care in Kundrathur Block, Kancheepuram District.
METHODS : The study utilized both quantitative and qualitative approaches. A semi-structured questionnaire was administered to assess providers' knowledge, attitudes, and practices concerning digital tools. Focus group discussions (FGDs) complemented the quantitative data, offering deeper insights into the facilitators and barriers of digitalization in ANC services.
RESULTS: Our study revealed that 92.8% of participants were aware of digitalization initiatives, with 85.8% using mobile health apps and 14.2% using electronic health records (EHR). However, 90.5% reported challenges related to insufficient training, and 88% faced technical issues. Despite these challenges, 66.7% had a positive attitude towards digital antenatal care, while 33.4% viewed it negatively. Additionally, 61.9% believed digitalization improved the quality of antenatal care services, and 64.3% reported daily usage of digital tools. However, 59.5% identified a need for standardized data protocols. Participants highlighted the necessity of digital tools for monitoring pregnancies and reported partial digitalization, with some services still relying on manual methods. Common barriers included poor infrastructure, lack of training, internet connectivity issues, and community resistance.
CONCLUSION: The study highlighted practical challenges and benefits associated with digital tools. Addressing barriers such as training needs and digital literacy is essential for successful implementation. Enhancing healthcare providers' engagement and support will improve the effectiveness of digital interventions. Leveraging technology in maternal healthcare has the potential to significantly reduce maternal mortality rates and improve overall health service delivery in underserved communities.

KEYWORDS : Digitization, Antenatal care, Healthcare workers, Perceptions.

INTRODUCTION

The Sustainable Development Goals (SDGs) highlight maternal mortality as a critical global public health issue. One of the primary objectives of SDG-3 is to reduce the worldwide maternal mortality ratio (MMR) to fewer than 70 per 100,000 live births by 2030 (WHO, 2015). Despite significant global progress, maternal deaths remain alarmingly high, especially in low- and middle-income countries, with an estimated 800 women dying daily from avoidable causes related to pregnancy and childbirth (WHO, 2019)1. This emphasizes the need for comprehensive maternal health services, particularly in impoverished and rural areas where access to quality healthcare is often limited.

In India, maternal mortality has decreased significantly, with a remarkable 77% reduction in the MMR, falling from 301 per 100,000 live births in 2001–2003 to 97 in 2018–2020 (Government of India, 2022)2. This decline is consistent with the goal of reducing the MMR to 139 per 100,000 live births by 2015. India has made substantial strides in maternal health, driven by national initiatives such as the Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) and the Janani Suraksha Yojana (JSY), which have significantly contributed by providing free antenatal care (ANC) checks and promoting institutional births (National Health Mission, 2016).[3] Tamil Nadu, in particular reported an MMR of 54 per 100,000 live births, surpassing the SDG target (Government

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of India, 2022).[2] The Muthulakshmi Reddy Maternity Benefit Scheme (MRMBS) in Tamil Nadu has been a pivotal initiative in improving maternal and child health outcomes, significantly contributing to the increase in institutional deliveries and the reduction of maternal mortality in the state. Launched in 1987 and subsequently modified, the scheme provides financial assistance to pregnant women from economically disadvantaged backgrounds, encouraging timely antenatal care (ANC) registration, institutional delivery, and postnatal care.

The increased uptake of institutional deliveries has had a direct impact on the decline of Tamil Nadu's Maternal Mortality Rate (MMR), which dropped from 90 per 100,000 live births in 2005 to 54 per 100,000 live births in 2020.

Recognizing the value of digitization in healthcare, GoI and Govt of Tamil Nadu have initiated programs to enhance health outcomes through technology. Tamil Nadu has implemented the PICME (Pregnancy and Infant Cohort Monitoring and Evaluation) portal, designed to monitor the health of pregnant women and infants in 2008. This portal tracks vital health data to ensure timely interventions, improving maternal and infant health outcomes. Annually, it captures data from approximately 8,713 Village Health Nurses in rural areas and 1,846 Urban Health Nurses in urban areas. Building on these initiatives, Mother Life Antenatal Care, an application developed in 2023 to offer a comprehensive obstetric evaluation that includes vital parameters such as Weight of the Pregnant Mother, Hemoglobin Level, Fetal Heart Rate, Single Lead ECG Reading, Blood Glucose, Blood Pressure, SpO2, Temperature, HCT (Mean). The app aims to reduce maternal mortality and diagnose disease conditions early, featuring AI-based analysis, geofencing notifications, automatic trimester updates, EDD alerts, and teleconsultation capabilities, ensuring data security and compliance with HIPAA and ISO 27001 standards.

The application was pilot tested in Kundrathur Block, Kancheepuram District, among 495 pregnant women who were in their 10th week of pregnancy or above, and had no severe comorbidities or preexisting systemic illnesses over a period of 180 days with three follow up. All the 5 PHCs and 37 HSCs of the Kundrathur Block, Kancheepuram District were included. Healthcare workers (SHNs, VHNs, and ANMs) received training during March to May 2023 on app usage, interpretation of abnormal readings (e.g., high blood pressure), and appropriate escalation protocols to SHN/MO/BMO using the teleconsult feature.

During the pilot, tele kits were provided for data collectionduring home visits, SHN/VHN/ANM carried the kit along with them during home visits and recorded the health data of the pregnant mothers on the mobile application. The recording of vital parameters was done automatically but there was also a provision for manual entry by the healthcare workers. All data were saved automatically as long as the device is connected to the internet, minimizing manual entry errors common in existing portal like PICME. Weekly reports highlighting abnormal data were sent to officials, with operational support from app developer for a year.

Hence, this study aims to explore the perceptions and experiences of field-level healthcare providers regarding the digitalization of home-based antenatal care in Kundrathur Block, Kancheepuram District.

METHODS

A mixed methods study was conducted from March 2023 to February 2024. Initially we conducted a quantitative questionnaire- based survey to assess the knowledge, attitude and perceptions of field-level healthcare providers regarding the digitalization of home-based antenatal care and followed this up with a qualitative research method to gain a deeper understanding of the healthcare workers perceptions towards experiences, and challenges of digitalization in ANC services.

Study setting and population:

The study was conducted in the Kundrathur block, Kancheepuram district of Tamil Nadu, across five main Primary Health Centers (PHCs). The study was conducted among all the VHNs and SHNs in the Kundrathur block. Thus, 37 Village Health Nurses (VHNs) from 37 Health Sub-Centers (HSCs) and 5 Sector Health Nurses (SHNs) from the PHCs were involved in this study. VHNs and SHNs in Tamil Nadu are female healthcare providers, who work to deliver primary health care to the community and serve as a bridge between the community and the public health system. Their responsibilities include: Providing medical care, Educating the community on health, and working closely with the community. Village Health Nurses (VHNs) play a vital role in delivering maternal and child health care including antenatal care, postnatal care, family planning, immunisation and child health services, health monitoring and surveillance, referral and coordination.

Data collection:

A preliminary quantitative survey was conducted with all the 37 VHNs and 5 SHNs using a semi-structured questionnaire containing details on socio-demographic information, knowledge, attitudes, and practices (KAP) regarding digitization of antenatal care. After analyzing

the quantitative study findings, we obtained a broad understanding of the perceptions related to digitization of antenatal care. Based on the understanding, we wanted to explore their perceptions, experiences and challenges.

Focus group discussions (FGDs) served as the primary data collection method, for capturing collective understanding of the VHNs' experiences and perspectives on digital antenatal care. Participants were selected using convenience sampling.

Two FGDs each consisting of 9-10 participants, inclusive of 7 to 8 VHNS and 2-3 SHNs were conducted using interview guide that explored VHNs' knowledge, attitudes, and practices concerning digital ANC services across four key domains: individual-level factors (knowledge, attitudes, behaviors), interpersonal factors (peer, supervisor, and community interactions), community and social factors (societal views, community influence), and institutional factors (organizational support, infrastructure, access to digital tools). Entire discussion was recorded and transcribed verbatim with verbal consent. First author acted as facilitator for the discussion. She used probes in the beginning to elicit the discussions. When discussions went off track, the facilitator intervened, summarized the discussions and used specific probe questions to bring the discussions back to track. All the participants were given a chance to agree or challenge the interpretations and reflect on the key points summarized. Each discussion lasted around 1 hour.

Data analysis:

Quantitative variables were analyzed using frequencies and percentages. The data from the FGDs were transcribed as verbatim and analyzed using a deductive approach based on the Socio-Ecological Model (SEM). Atlas TI-23 software was used in organizing and coding the data, incorporating emerging themes into a comprehensive model that highlighted the multi-level influences on ANC digitization.

Ethical considerations:

Ethical approval was obtained from the Institutional Ethics Committee DPHPM/IEC/2024/012. Informed consent was obtained from participants, ensuring they understood the study's purpose, procedures, and their right to withdraw without consequences. Confidentiality and anonymity were maintained throughout the research process.

RESULTS

This study explores healthcare workers' views on the digitization of home-based antenatal care through quantitative survey and focus group discussions (FGDs).

Table 1: Socio-Demographic Characteristics of participants in the Kundrathur PHC Block, 2024

Socio-demographic data		Frequency (n=42)	Percentage (%)
Age in years	30-40 years	23	54.7
	>40 years	19	45.3
Marital status	Married	39	92.8
	Single		
	Widow	3	7.2
Education	Bachelors in nursing	26	61.9
	Diploma in nursing	16	38.1
Working experience	1-10 years	29	69.1
	>10 years	13	30.9
Place of residence	Urban	24	57.1
	Rural	18	42.9
Distance from workplace	<5 km	18	42.9
	>5km	24	57.1
Training on digital antenatal care provided by organization	Yes	39	92.8
	No	3	7.2

Table 1 provides a detailed overview of the socio-demographic characteristics of the 42 participants. Among the 42 participants, 54.7% are aged between 30-40 years, and 45.3% are older than 40 years. All participants are female, with 92.8% being married and 7.2% being widows. Regarding work experience, 69.1% have between 1-10 years of experience, and 30.9% have more than 10 years. Additionally, 92.8% of the participants received training on digital antenatal care provided by the, whereas 7.2% did not receive any training.

Table 2: Knowledge, Attitude, and Practice about digitalization of home based antenatal care

Knowledge		Frequency (n=42)	Percentage (%)
Are you aware of the digitalization initiatives for home-based antenatal care in Kundrathur block?	Yes	39	92.8
	No	3	7.2
What digital tools or platforms are used for antenatal care documentation and communication?	Mobile health apps	36	85.8
	Electronic health records (EHR)	6	14.2
How do these digital tools help in tracking and monitoring the health of pregnant women?	By providing real-time health data	40	95.3
	By enabling remote consultations with specialists	2	4.7
Attitude			
How do you feel about the shift from traditional to digital methods in antenatal care?	Positive	28	66.7
	Negative	14	33.4
Do you believe that digitalization can improve the quality of antenatal care services?	Yes	26	61.9
	No	16	38.1
What challenges do you face while using digital tools for antenatal care?	Technical issue	38	90.5
	Insufficient training	4	9.5
Practice			
How often do you use digital tools for antenatal care activities?	Daily	27	64.3
	Weekly	15	35.8
How do you ensure the accuracy and completeness of digital records for antenatal care?	Regularly cross-checking data	17	40.5
	Using standardized data entry protocols	25	59.5
Have you had any technical problems with digital tools?	Yes	37	88.0
	No	5	11.9

Table 2 shows that among the 42 participants, 92.8% are aware of the digitalization initiatives for home-based antenatal care, and 85.8% use mobile health apps for documentation. Most (95.3%) believe these tools provide real-time health data. While 66.7% feel positively about the shift to digital methods, 90.5% face challenges like technical Issues (enlist issues), and 88% encounter technical issues related to digital tools (Enlist issues). In practice, 64.3% use digital tools daily, with 59.5% using standardized protocols to ensure data accuracy.

The identified themes in FGDs under four levels of Socio-Ecological Model (SEM) include.

1. Individual Level.

a. Knowledge and Awareness of Digital Antenatal Care

Health care workers expressed they have received inadequate hands-on training and their knowledge of the specific features of these tools was limited. Some of their responses include:

I've heard about it from our training.
We received limited information.
Yes, I'm aware but haven't used it much & I don't fully understand how it works.
Some of my colleagues mentioned it during our meeting.
We haven't been briefed enough; it's still a bit vague.
I've seen posters in the PHC, but I need more information.
I am aware, but I have no hands-on experience.

b. Awareness of Content and Necessity

Most providers expressed that the app adds value to the antenatal services provided, but poses challenges in adapting. They also felt that certain antenatal care aspects, like mental health screening and nutrition, were underrepresented.

It is crucial for tracking pregnancies in remote areas.
It would definitely make our work faster in emergencies.
I think it's essential for tracking multiple pregnancies.
It's necessary but seems challenging for us to adapt.

2. Interpersonal Level:

a. Perception of Services and community views

Healthcare workers expressed that while digital tools improved service efficiency, especially in follow-ups, some providers felt the personal connection with patients had decreased. Responses were mixed, with older women often preferring traditional tracking methods over digital tools.

We are starting to implement it slowly.
Not all services are integrated yet.
Limited to basic record management & Only data entry is digitalized.
We use it, but the system is slow.
We've been given tablets, but we rarely use them fully.
The system needs to be more user-friendly for us.
Some of the services are digital, but there's no consistency.
We mostly still rely on paper-based records.
It's mostly used for documentation, not for the actual care delivery.

3. Organizational:

a. Challenges and barriers for providers

Providers faced issues like poor infrastructure, slow internet, limited devices, and technical glitches. The increased workload of entering data digitally added stress, and system failures delayed record updates. They recommended regular training and user-friendly platforms with better technical support.

Lack of training is a major issue.
We don't have enough infrastructures.
Internet connectivity is poor.
Not enough technical support.
We need more training on these tools & Frequent power cuts disrupt usage.
We lack the right training to use the devices efficiently.
Sometimes the systems freeze or don't load properly.
Internet issues are very common in our area.
There's no dedicated staff to help us with technical issues.
We face frequent disruptions due to power cuts.

b. Readdress mechanisms for provider challenges

Simplify the tools for rural health workers & Access to better devices is key.
We need refresher training on using the digital tools.
Technical support should be available, even remotely.
Simplifying the apps would make it easier for us.

4. Community level:

Rural communities, especially older women, struggled with mobile apps due to low digital literacy and concerns about privacy. Outreach programs to educate the public, simpler interfaces, and field worker assistance were suggested to improve engagement.

a. Challenges and barriers from the community side

Lack of awareness is a barrier.
People don't understand the technology & There's resistance due to unfamiliarity.
Some don't have access to smartphones & People fear losing their records.

Many people are not comfortable with technology.
There's a language barrier when using digital platforms.
Low literacy rates make it difficult for them to engage with digital tools.

b. Readdress mechanisms for community challenges

Community leaders should be involved & Education campaigns are needed.
We should use local languages for training & Digital literacy training is essential.
We should focus on educating them about the advantages.
Introducing digital tools in local languages would help.
Workshops and demonstrations could encourage them to use it.
Conducting awareness programs at the village level would be beneficial.

5. Policy Level: Strategies and Suggestions

Providers urged for better digital infrastructure, especially in rural areas, and more comprehensive training. They called for updated digital tools that cover all aspects of antenatal care and ensure that personal interaction remains central to care. Continuous training, improved privacy measures, and community sensitization were also recommended to build trust in digital systems.

We need tools for monitoring vitals.
Flagging high-risk cases is important & Maternity tracking should be included.
Include checklists for risk factors & Simplify recordkeeping tools.
We need tools that can track patients' progress easily. Make mobile apps for antenatal care.
It should include reminders for check-ups and follow-ups.
Vital sign monitoring should be integrated into the system.
It's important to have data analytics features for better care.
We need to manage both digital and manual systems.
We need to be trained properly before we can teach the community.
Health workers should have a say in how the tools are developed.
Improve internet access in rural areas. & More tablets for home visits would help.
Provide access to cloud storage for data. We need better devices for rural healthcare workers.

DISCUSSION

Our study found that 92.8% of the participants were aware of digitalization initiatives, with 85.8% using mobile health apps and 14.2% using electronic health records (EHR). Electronic Health Records (EHR) store all the information collected during antenatal visits and save it in an Excel sheet. This approach is especially helpful in situations where internet connectivity is low, ensuring that data remains accessible and organized for healthcare providers. This high level of awareness is crucial as it establishes a foundation for the successful implementation of digital health interventions. This finding aligns with a study conducted in Tamil Nadu where primary healthcare workers demonstrated similar awareness and reliance on mHealth tools for tracking maternal health data, highlighting the widespread acceptance of such technologies in improving maternal care across India. [4, 5] This consistent use of mobile platforms underscores the potential of digital tools to streamline healthcare processes and enhance maternal care services. Despite the high awareness, our findings revealed significant challenges related to insufficient training and technical issues, with 90.5% of participants reporting inadequate training and 88% mentioning technical difficulties. These challenges are mirrored in a study from Uttar Pradesh, where frontline health workers faced similar issues, including poor network connectivity and frequent technical glitches (internet connectivity, limited digital literacy, and inadequate infrastructure).[6] These obstacles highlight the need for comprehensive training programs and robust technical support to ensure that healthcare providers can effectively utilize digital tools. The study showed that 66.7% of the participants had a positive attitude towards the shift to digital antenatal care, though 33.4% viewed it negatively. This mixed response is consistent with findings from studies in Karnataka and Maharashtra, where healthcare workers acknowledged the benefits of digital tools but also raised concerns about increased workloads, usability issues, and device reliability.[7]

To foster a more positive attitude, it is essential to address these concerns through user-friendly designs and adequate support systems. A significant 61.9% of participants believed that digitalization improved the quality of antenatal care services. This belief aligns with a study in Odisha, which found that mobile health tools significantly enhanced the tracking of high-risk pregnancies and facilitated timely referrals8. Digital platforms contribute to better monitoring, improved data management, and enhanced communication between health providers and patients, which are crucial for quality care delivery. Our study indicated a daily usage rate of 64.3% for digital tools in routine antenatal care tasks, reflecting a relatively high integration of these tools. This finding is consistent with experiences from Andhra Pradesh, where similar digital health interventions showed increased daily usage among health workers9. However, the need for standardized data protocols to ensure accuracy,

as identified by 59.5% of participants, remains a persistent challenge across various studies in India. Participants had varying degrees of awareness but often lacked detailed knowledge about digital tools. A study in Himachal Pradesh noted similar findings, where healthcare workers were aware of digital health initiatives but had limited understanding due to insufficient training.[10] This emphasizes the need for ongoing education and support to bridge knowledge gaps and enhance the effectiveness of digital health interventions. Participants highlighted the necessity of digital tools for monitoring pregnancies, particularly in tracking high-risk cases. This aligns with a study in Jharkhand, which emphasized the importance of digital tools in improving antenatal care and maintaining accurate health records11. Ensuring that digital platforms are equipped to handle comprehensive care, including mental health and nutritional support, is crucial for holistic maternal healthcare. The study noted partial digitalization, with some services still relying on manual methods, and low demand from the community with resistance to digital tools especially among older women and those with lower digital literacy. This aligns with the study done in Rajasthan.[12] Similar challenges were observed in Gujarat, where community members preferred paper-based systems and were skeptical about digital records13. To address these issues, targeted outreach programs that educate communities about the benefits of digital health tools are essential. Participants reported challenges related to poor infrastructure, lack of training, and internet connectivity issues. These barriers were also highlighted in a study from Madhya Pradesh, where healthcare workers faced significant obstacles due to inadequate digital infrastructure.[14] Our participants suggested infrastructure improvements, ongoing training, and better technical support to overcome these barriers similar to study done in West Bengal.[15] Low literacy and unfamiliarity with digital tools were significant barriers to community engagement. A study in Bihar found that these issues led to resistance, particularly among older populations in rural areas.[16] Our study highlighted the need for awareness programs and local language training to improve digital literacy and community acceptance similar to study done in Karnataka.[17] Participants emphasized the need for digital tools that track high-risk pregnancies and monitor vital signs. This recommendation aligns with a study in Kerala that suggested digital health tools should focus on these critical aspects.[18] Additionally, empowering healthcare workers to lead community education on digital tools, as found in a study from Maharashtra, could enhance community trust and digital engagement.[19]

LIMITATIONS

The study was conducted in a single block (Kundrathur) within the Kancheepuram District, limiting the generalizability of the findings to other regions or districts. While FGDs provided in-depth insights, the qualitative data collection was limited to only two focus groups, which may not capture the full range of experiences and perspectives among all VHNs and SHNs in the state. Further studies with in depth interviews are required. The relatively short duration of the study may not capture long-term challenges and benefits associated with the digitization of antenatal care services.

CONCLUSION

The digitalization of home-based antenatal care in Kundrathur block represents a vital step towards improving maternal health outcomes in rural settings. By engaging field-level healthcare providers, this study sheds light on their perspectives, which are crucial for understanding the practical challenges and benefits associated with digital tools. Healthcare providers believed that digitalization improved the quality of antenatal care services that facilitated daily usage of digital tools. Community views and demands, such as less demand from community need to be focused. While the field level healthcare providers feel positively about the shift to digital methods, insufficient training, technical issues, poor internet connectivity, and inadequate infrastructure are the perceived challenges in digitizing home based antenatal care. Addressing the identified barriers such as training needs and digital literacy will be essential for successful implementation. As these healthcare providers play a pivotal role in delivering quality antenatal care, fostering their engagement and support will enhance the effectiveness of digital interventions. Ultimately, leveraging technology in maternal healthcare has the potential to significantly reduce maternal mortality rates and improve overall health service delivery in underserved communities.

RECOMMENDATIONS

To address the challenges identified in the study, it is recommended to implement comprehensive training programs for healthcare providers, improve technological infrastructure, develop standardized data protocols, and conduct community awareness campaigns. Establishing robust support systems and engaging healthcare providers in the development of digital tools can enhance usability and acceptance. Additionally, providing incentives and localized training materials, along with regular monitoring and

evaluation, will ensure the ongoing effectiveness of digital antenatal care services in the Kundrathur Block and beyond. Policy support is also essential for the integration of digital health tools into routine healthcare practices.

CONFLICT OF INTEREST

None

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ORIGINAL ARTICLE

TRANSFORMING IMMUNIZATION SERVICES THROUGH U-WIN IMPLEMENTATION - TAMIL NADU'S DIGITAL LEAP FORWARD

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ABSTRACT

INTRODUCTION : The Universal Immunization Programme (UIP) in India aims to protect new-borns and pregnant women by administering vaccines against 12 Vaccine Preventable Diseases (VPDs). Tamil Nadu has excelled in immunization performance, achieving over 98% coverage, translating to approximately 1.4 crore vaccine doses administered annually. The Fully Immunized (FI) coverage for 2023-24 is reported at 98%, supported by the National Family Health Survey (NFHS) Round 5, which shows an improvement to 90.4%.

To enhance immunization tracking and management, the U-WIN platform was launched in January 2023, integrating successful features from the Co-WIN system used during the COVID-19 vaccination drive. U-WIN focuses on individualized tracking of beneficiaries' vaccination statuses, digitization of session planning, real-time updates on immunization record and generation of e-Vaccination certificate.

In Tamil Nadu the U-WIN platform was piloted in Dindigul and Erode on January 27, 2023, following extensive training from January 20-27. By August 1, 2023 U-WIN was successfully rolled out across Tamil Nadu, with significant training conducted for around 17,000 health personnel. However, challenges persist, including reluctance to input data, inconsistent scheduling of vaccination sessions, and delays in delivery outcome reporting.

Tamil Nadu has implemented a comprehensive strategy to improve the performance of the UWIN portal, enhancing digital tracking and immunization coverage. Key initiatives include regular performance reviews, refresher and scenario-based training for health workers, technical support for data entry, head-count surveys for accurate beneficiary registration, and expansion of vaccination sessions through Health and Wellness Centres. As a result, significant improvements were achieved in pregnant women registration, infant registration, and birth dose vaccination. Infrastructure and session site creation exceeded targets. Going forward, the introduction of a digital micro-plan with geo-tagging and enhanced supervisory tools aims to further optimize immunization services statewide.

Henceforth, U-WIN platform will be the platform for real time immunization recording and reporting and eVIN platform will oversee vaccine Stock and Cold Chain Management. API linkage between PICME and U-WIN is prioritized to reduce data entry for health workers, allowing more focus on community health.

KEYWORDS : UWIN, digital tracking

INTRODUCTION

Immunization programme in India was introduced in 1978 as Expanded Programme of Immunization (EPI). The program gained momentum in 1985 and was expanded as Universal Immunization Programme (UIP). UIP is one of the largest public health programmes targeting close of 2.67 crore newborns and 2.9 crore pregnant women annually (1). It is one of the most cost-effective public health interventions and largely responsible for reduction of Vaccine Preventable under-5mortality rate.

Immunization in Tamil Nadu:

In Tamil Nadu, under the UIP, 11 Vaccines are being provided against the 12 Vaccine Preventable Diseases (VPDs) for all children and pregnant mothers which includes Tuberculosis, Diphtheria, Pertussis, Hepatitis B, Hemophilus Influenza, Tetanus, Poliomyelitis, Measles, Rubella, Rota Virus, Pneumococcal and Japanese Encephalitis (in 14 selected endemic districts).[2]

Annually, around 10 lakhs pregnant women, 9.16 lakhs children/ infants are being covered under this UIP programme in Tamil Nadu[3] and the state stands out as one of the few states in India with exemplary immunization performance, showcasing a steadfast commitment to

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public health. Our dedicated public health staff have made remarkable strides in immunization coverage, consistently achieving over 98% across the state.[3] This outstanding effort translates to an average of 1.4 crore vaccine doses administered each year, safeguarding the health of our communities.

As per Sustainable Development Goals (SDG) India index 2023-24, published on 15.07.2024, Tamil Nadu has achieved 12th position with a composite score of 77 points in SDG 3 - Good health and wellbeing.[4]

Further, according to the Tamil Nadu Health Management Information System (TNHMIS), the Fully Immunized (FI) coverage for the year 2023-24 stands at an impressive 98%. This achievement is further supported by the National Family Health Survey (NFHS) Round 5, published in 2021, which confirms an overall improvement in the state's Full Immunization Coverage, now at 90.4%.[5] Table 1 shows the comparison of immunization performance as per TNHMIS 2023-24 and NFHS-5 survey.

Table 1: Immunization performance as per TNHMIS 2023-24 and NFHS -5 survey

Vaccines	TNHMIS 2023-24 (April to March)	NFHS-5 (2019-20)
BCG	95%	97.6%
OPV 3	98%	91.5%
Pentavalent 3	98%	94.8%
MR 1st dose	100%	95.8%
Fully Immunized	98%	90.4%

While the Tamil Nadu Health Management Information System (TNHMIS) and Integrated Health Information Platform effectively collect data on vaccination coverage, both have notable limitations. They do not generate the line list of beneficiaries, or provide due lists for vaccinators. These shortcomings can lead to decreased reliability of the data, hindering the ability to track individual vaccination statuses and follow up effectively.

Evolution of UWIN:

COVID-19 pandemic emerged in late 2019 spread worldwide rapidly evoked unprecedented response leading to an accelerated use of new technologies including newer vaccine technologies.[6] Apart from being a vaccine powerhouse, India made a technological stride when it launched the indigenously developed software application called CoWIN.[7] Co-WIN (Winning over COVID-19), the digital backbone of India's COVID-19 vaccination program, was implemented to facilitate the planning, execution, monitoring, and evaluation of the national vaccination drive. This scalable IT platform served as a comprehensive solution for COVID-19 vaccination across the entire country, featuring both citizen and administrator interfaces.

The Co-WIN platform proved to be all-inclusive and provided an end-to-end solution for the entire public health system, from vaccinators to national-level officials.[8] Due to the high commitment and support from each state and union territory, Co-WIN enabled the seamless launch and rapid implementation of the world's largest COVID-19 vaccination campaign.

From Co-WIN to U-WIN:

Harvesting the benefits of Co-WIN, Public Health department of Tamil Nadu Government requested the Government of India to replicate the Co-WIN platform for Routine Immunization monitoring (RI) (Annexure). Incidentally in September 2022, Government of India, informed that the government was planning to repurpose digital health platforms Arogya Setu and Co-WIN, adding that Co-WIN would be used for carrying out the 12 essential vaccination programs under the Universal Immunization Programme. The key features and information from the Co-WIN implementation were set to be leveraged for UWIN, which included aspects such as the registration and vaccination of each pregnant woman, registration of Pregnancy outcome and birth including Still birth, the administration of birth doses for newborns, and subsequent vaccination events.[9]

Electronic Vaccine Intelligence Network (eVIN) platform supports the Government of India's Universal Immunization Programme by delivering real-time information on vaccine stocks, flows, and storage temperatures at cold chain points across states and union territories. Leveraging these 2 pillars eVIN and Co-WIN, the 3rd pillar UWIN was launched by MoHFW. in January 2023.[10]

Benefits of UWIN:

UWIN aims to provide individualized tracking of beneficiaries' vaccination statuses digitization of session planning, and real-time updates on vaccination status from the last mile of service delivery by the vaccinator. It was introduced in a phased manner to capture data on immunization services, ensuring a smooth rollout and allowing for mid-course corrections during implementation. This initiative built upon the lessons learned from Co-WIN, further enhancing the efficiency and effectiveness of immunization programs across the country.

Features of UWIN:

U-WIN acts as a single source of information for immunization services, updating vaccination status, delivery outcome, planning of RI sessions and reports like antigen-wise coverage, etc.

There will be digital registrations of all pregnant women and newborns for individualized tracking for vaccination, reminders for upcoming doses and follow-up of dropouts. Healthcare workers and programme managers will be able to generate real-time data of routine immunization sessions and vaccination coverage for better planning and vaccine distribution.[11]

All Pregnant women can self-register on U-WIN vaccination platform to create onetime registration. If already registered on CoWIN, need to use same mobile number to access U-WIN wherein woman can tag herself as Pregnant women and new registration of child can also be done using existing guardian's account. Registration can be also done through walk-in/on-site mode at nearest vaccination centre. Registered New-borns & Children can also have an ABHA based on their parent's Aadhaar Number.

The beneficiary can search nearby vaccination center using State/District filter in order to get vaccination at desired center. The beneficiary can take online appointment for desired vaccination session & vaccination center as per his/her choice. All vaccines are available at all sessions. Each vaccine dose is administered to an identifiable individual only, after due verification.

Digital vaccination record of all pregnant women & children gets created real time. Beneficiary will get digital acknowledgement for vaccination every time dose would be administered and receive digital e-Vaccination certificate. Beneficiary can download & save the certificate in mobile phone applications which would be easily available for future use.

Beneficiaries will get text SMS notifications and reminders with next due dates of their subsequent vaccination. Adherence will be further strengthened with minimum dose interval between two doses through U-WIN system.

With digitalization of vaccination system, vaccination services can be availed " Anywhere " in the country at scheduled vaccination sessions. UWIN has been integrated with SAFEVAC for reporting any Adverse Events Following Immunization (AEFI). UWIN produces a comprehensive line list of beneficiaries and provides due lists for vaccinators, enhancing the tracking of individual vaccination statuses and facilitating timely follow-ups.

UWIN Implementation in India:

U-WIN was implemented in a phased manner.

1. Pilot phase:

UWIN was launched on 11th January 2023 by Secretary, Health and Family Welfare Department, Government of India, (MoHFW). All modules including the Admin Module, Session Planning Module, Vaccinator Module, Delivery Module, Mobiliser Module, and Self-Registration Module were tested. Based on inputs from the states, 65 pilot districts were identified, with 32 districts in urban settings and 33 districts primarily in rural areas. Virtual training to Pilot districts was done by the National team on 16thJanuary.

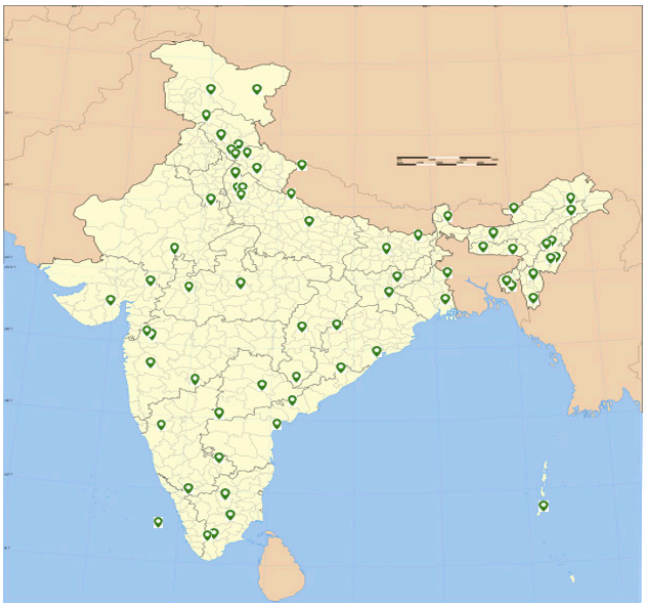

Figure1: UWIN implementation in the selected districts in India for pilot phase

UWIN Implementation in India:

1. Pilot phase:

Under U-WIN, mapping of health facilities in pilot districts was carried out, utilizing the Local Government (LG) Directory and LG codes. Districts, sub-districts, and villages/wards were created accordingly. The system automatically generated sub-districts and villages/wards, tagging non-LGD blocks, villages, and urban local bodies to their respective health service delivery structures (health blocks/health villages).

Pilot launch of U-WIN platform were carried out in two districts Dindigul and Erode on 27th January 2023 by Director of Public Health & Preventive Medicine, Joint Director (Immunisation), District Health Officers and UNDP Team.

State level, district level and block trainings were conducted prior to the launch of UWIN from 20th January 2023 to 27th January 2023 for pilot districts.

Picture 1: Pilot launch of U-WIN platform in two districts Dindigul and Erode (2023)

UWIN Up Scaling in India:

The platform was scaled up nationwide, with Nagaland being the first state to conduct a training program on the subject. Nationwide Rollout of U-WIN Portal for Tracking Routine Immunizations were planned.

Picture 2: Participants during the training of trainers on nationwide scale-up of U-WIN, Kohima, Nagaland (2023)

Upscaling in Tamil Nadu:

A State level sensitization workshop on U-WIN platform for Deputy Director of Health Services, City Health Officers was conducted in two batches at Chennai from 27th June 2023 to 1st July 2023 for 134 participants (Annexure 6).

Picture 3: State level sensitization workshop of U-WIN platform at Chennai (2023)

Regional workshops were held at Regional Training Institutes, with a total of 206 participants.

Picture 4: Regional workshop on U-WIN platform at HFWTC and Salem HDMI (2023)

Further, District level and Block level trainings were conducted in the month of July, 2023 with 2,871 and 16,463 participants respectively.

Picture 5: District level training on UWIN platform held at Salem (2023)

The UWIN digital platform underwent a significant expansion, reaching all districts of Tamil Nadu by August 1, 2023. This strategic rollout aimed to enhance the state's immunization efforts by providing a comprehensive system for tracking vaccination coverage and ensuring efficient data management.

Key Issues and Challenges identified during the implementation phase:

Reluctance to Input Data into the UWIN Portal remained a major challenge, as VHNs and UHNs often hesitated due to overwhelming workloads. Vaccination Sessions 'Not Scheduled consistently by health facility managers caused confusion and led to missed vaccination opportunities.

Delivery Outcome Tracking required better coordination among Medical College Hospitals, Government Hospitals, PHCs, and private facilities. Delay in Delivery Outcome Entries was significant, often due to frequent HR changes and challenges in data collection, while Inadequate Notification of Private Hospital Delivery Outcomes in IHIP resulted in gaps in the data. Poor Vaccination Entries at Outreach Session Sites further compromised program assessment and resource planning. Lack of Regular Review Meetings at District Level also hampered progress, as participation and follow-through were inconsistent.

Finally, the Transition Between the Portals created reporting deficiencies during the shift from HMIS and IHIP to U-WIN.

Tamil Nadu's Comprehensive efforts to improve UWIN performance:

Tamil Nadu has followed a comprehensive set of strategies to improve the performance in the UWIN portal.

i. Regular review of Vaccination Performance in UWIN

Since November 2024, the vaccination performance of all districts are being strictly reviewed on the UWIN portal by the State Immunisation Officer and the Director of Public Health and Preventive Medicine on a weekly basis. The review focuses on key indicators such as Pregnant Women Registration, Pregnancy Vaccination (Vaccinated), Pregnancy Outcomes, Infant Registration, Birth Dose Vaccination, Child Registration, and Sessions Planned vs Held. The antigen wise vaccination coverage data in UWIN is compared with IHIP, and TNHMIS to address the inconsistencies.

ii. Cascade of Refresher Trainings:

To strengthen outreach vaccination efforts and reduce resistance among field health workers (VHNs/ UHNs), the state organized refresher training programs at various levels. This began with Training of Trainers sessions at the state level, involving second-level district officers such as District Training Medical Officers and District Maternal and Child Health Officers.

Multiple levels of training were rolled out to enhance familiarity and confidence in using the UWIN portal. Refresher training on the Administrator and Vaccinator modules was conducted virtually for Block Medical Officers,

Cluster Health Nurses, and Block DEOs.

This was followed by block-level refresher trainings for PHC Medical Officers, Vaccinators, Mobilizers, Cold Chain Handlers, MPHWs, ASHAs, LHVs, and Staff Nurses, led by Project Officers and VCCMs across districts in batches. Nearly 11,320 training sessions were conducted statewide and this cascade of trainings were held from November till December.

iii. Scenario-based learning:

To further ease the challenges faced by vaccinators during data entry into the UWIN portal, a scenario-based approach was adopted to explain the process more clearly and simply. Detailed explanations covering different data entry situations in the form of videos were compiled and shared with vaccinators through a Google Drive link. These materials were made available in Tamil, ensuring better understanding, and vaccinators were encouraged to download and save them for future reference whenever needed.

iv. Support for Improved UWIN Data Entry

In addition, to provide on-the-ground support, instructions were given that if VHNs or UHNs encountered difficulties while entering data in the UWIN portal, Block DEOs will assist them by entering the data using the login credentials of the concerned VHN or UHN. Despite this support, the ultimate responsibility for ensuring the accuracy, validation, and authentication of the data entered into the UWIN portal continued to rest with the VHN/UHN, as they are the primary care providers. Through these combined efforts, hesitation among VHNs regarding data entry was significantly reduced, leading to marked improvements in both the accuracy and timeliness of updates in the UWIN portal.

v. Reinforcing Importance Through Regular Communication

A continuous communication strategy was adopted to ensure UWIN remained a high-priority agenda at all levels. The State Immunisation Officer (SIO) regularly disseminated updates, reminders, and SOPs to all District Health Officers (DHOs). DHOs were further instructed to frequently reinforce UWIN's importance in review meetings and to monitor and support VHNs and Urban Health Nurses (UHNs) in using the portal effectively.

vi. Head-Count Survey and Systematic Pre-Registration Strategy in Tamil Nadu

As part of Tamil Nadu's initiatives to strengthen outreach vaccination and improve data management under U-WIN, District Health Officers (DHOs) were instructed to ensure the annual updating of the Family Register by VHNs/ UHNs under the supervision of Sector Health Nurses (SHNs) and Medical Officers.

Following communications from the Government of India, it was emphasized that to achieve substantial reduction in the number of zero-dose children, a Head-Count Survey (HCS) or House-to-House Survey (HTH) must be conducted across all districts, serving as a critical first step in microplanning activities.

Also as directed by GOI, it was instructed to all District Health Officers that all identified beneficiaries must be systematically incorporated into the U-WIN portal for effective vaccination session planning and monitoring. Accordingly, VHNs and UHNs were instructed to pre-register pregnant women, infants (0–1 year), and children (1–2 years) during or at the end of the HCS activity.

DHOs were also advised to ensure that VHNs/ UHNs update the vaccination status of these beneficiaries in the U-WIN portal under the "Previous Record Vaccination" tab, based on vaccination card entries. This systematic approach has been crucial for improving beneficiary tracking, strengthening vaccination coverage, and enhancing the

overall quality of immunization services across Tamil Nadu.

vii. Expansion of Vaccination Services and additional UWIN sessions planning through Health and Wellness Centres

A strategic plan was developed in anticipation of the Tamil Nadu Budget announcement for the year 2025-26 to enhance vaccination services. The plan includes providing vaccination facilities every Wednesday at all 4,848 Health and Wellness Centres (HWCs) in rural areas and 500 Urban Health and Wellness Centres (UHWCs) in urban areas, in addition to the existing outreach sessions.

To ensure smooth implementation, District Health Officers (DHOs) were instructed to ensure that Sub-district administrators (Block Medical Officers/Community Health Officers) create 708 health facilities in UWIN, including 500 functional and 208 to be made functional facilities, as per the Standard Operating Procedures (SOPs). Additionally, Health Facility Managers are responsible for creating vaccination sessions in UWIN, including 14,544 additional sessions for rural HWCs (4848 × 3) and the required sessions for UHWCs, scheduled for the next three months.

These sessions must be planned well in advance to ensure timely vaccination services. The creation and management of these sessions in UWIN will allow for effective session planning, monitoring, and improved coverage, ultimately strengthening vaccination efforts across Tamil Nadu.

Current status and progress in UWIN performance:

As of March 2025, 6,103 health facilities have been enrolled under UWIN, slightly surpassing the expected 6,075. The number of Delivery Point Managers stands at 2,354, falling short of the target of 2,651. However, the number of Government health facilities and Delivery Managers creation exceeded expectations, with 3,028 created against an expectation of 2,623.

Additionally, 11,331 sub-centers have been registered under UWIN, surpassing the anticipated 11,046, contributing to improved vaccination access.

The creation of session sites also exceeded expectations, with 51,520 compared to the target of 46,805. While the number of vaccinators registered stands at 16,337, slightly below the expected 17,835, it remains a substantial workforce for supporting vaccination efforts. The healthcare professional registry shows 18,614 registered, falling short of the expected 19,276, largely due to vacancies.

Table 2: U-WIN Infrastructure status in Tamil Nadu, 2024- 2025

S.No	Infrastructure	Expected	Created
1.	Number of Health Facility	6,075	6,103
2.	Number of Delivery Point Manager	2,651	2,354
3.	Number of Both Health Facility & Delivery Manager	2,623	3,028
4.	Number of Sub-Center	11,046	11,331
5.	Number of Session Sites	46805	51520
6.	Number of Vaccinators	17,835	16,337
7.	Healthcare Professionals registry Health Facility registry	19276	18614
8.	Health Facility registry (Govt)	2640	2368
9.	Health Facility registry linked in UWIN (Govt)	2368	581

Table 3 presents the performance report of UWIN during 2024-2025 in Tamil Nadu. Out of an expected 9,58,843 pregnant women registrations, 9,18,541were achieved, resulting in 96% of the target being met. For pregnancy vaccination, out of the same expected number, 5,04,003 women were vaccinated, achieving 53% of the target. Regarding pregnancy outcomes, 5,79,314 outcomes were recorded, reaching 60% of the target. In terms of infant registration, 7,24,336 infants were registered out of an expected 8,76,964 achieving 83%. For birth dose vaccination, 5,88,516 doses were administered reaching 67%. Child registration was significantly lower, with only 42,593 children registered out of the expected 8,06,421, achieving just 5% of the target. Lastly, for sessions planned versus held, out of 3,45,207 planned sessions, 1,43,165 sessions were actually held, achieving 41% of the target.

Table 3: U-WIN Performance report of Tamil Nadu, 2024-2025

S.No	Parameters	Expected	Achieved	%
1.	Pregnant Women Registration	9,58,843	9,18,541	96
2.	Pregnancy Vaccination(Vaccinated)	9,58,843	5,04,003	53
3.	Pregnancy outcome	9,58,843	5,79,314	60
4.	Infant Registration	8,76,964	7,24,336	83
5.	Birth Dose Vaccination	8,76,964	5,88,516	67
6.	Child Registration	8,79,732	42,593	5
7.	Session targeted vs Planned	5,66,460	3,45,207	61
8.	Session Planned vs Held	3,45,207	1,43165	41

In 2024–2025, the percentage of Pregnant Women Registration significantly improved from 46% in 2023–2024 to 96%, Pregnancy Vaccination, increased from 22% in 2023–2024 to 53% in 2024–2025. Pregnancy Outcome entry also, from 42% in 2023–2024 to 60% in 2024–2025. Infant Registration saw an improvement, moving up from 69% to 83%. Similarly, Birth Dose Vaccination increased from 41% to 67%. Child Registration, though still low overall, increased from 8% in 2023–2024 to 5% in 2024–2025. However, the achievement for Sessions Planned versus Held improved from 25% to 41% over the two periods. Overall, while there

was good progress in several areas like Pregnant Women Registration and Infant Registration, challenges remain in improving vaccination coverage and child registration.

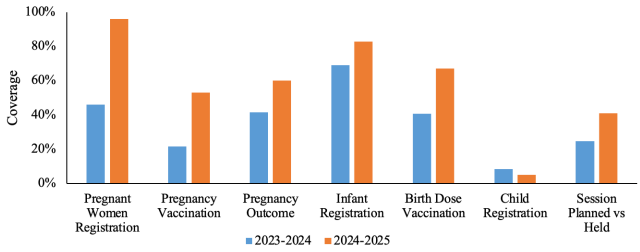

Figure 2: UWIN performance progress report, 2024-2025, Tamil Nadu

The progression of UWIN's Outreach Vaccination performance over the months is demonstrated in Figure 6. From April to October 2024, vaccination entries in UWIN remained at 1%. However, with the implementation of strategies aimed at improving UWIN in Tamil Nadu starting in November 2024, there was a noticeable increase in performance. This improvement became evident from December 2024, with UWIN performance rising from 4% to a significant surge of 28% by March 2025, reflecting a rapid and substantial progress.

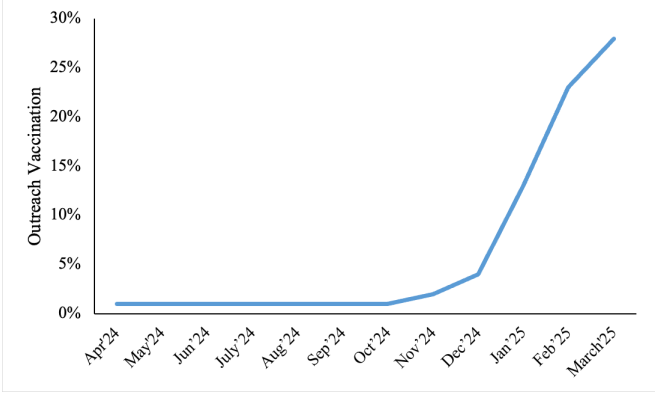

Figure 3: Outreach Vaccination performance in UWIN, 2024-2025, Tamil Nadu

U-WIN vaccination coverage by institutions, Tamil Nadu, 2023-2025:

In 2024–2025, there was a significant improvement in UWIN vaccination coverage compared to 2023–2024. Under Directorate of Public Health and Preventive Medicine, the total number of antenatal (AN) registrations increased from 49,244 in 2023–2024 to 87,342 in 2024–2025. Similarly, the number of infants (0–1 year) vaccinated improved from 2,18,806 to 2,92,881. The vaccination of children above one year also showed a decline, with 44,201children vaccinated in 2023–2024 compared to 25, 646 in 2023–2024, though this category showed a decline likely due to a shift in focus towards early infant immunization. Notably, significant contributions came from the Directorate of Medical Education and Research and Directorate of Medical and Rural Health Services. Private sector participation also improved, with 226,829 infants vaccinated in 2024–2025 compared to 104,125 in 2023–2024. These trends suggest that the strategies implemented since late 2024 have effectively strengthened vaccination coverage across Tamil Nadu under different directorates particularly for infants, aligning with broader public health goals.

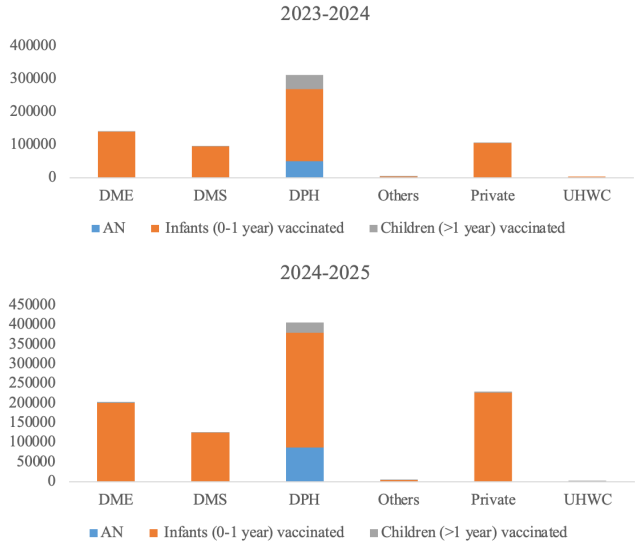

Figure 4: U-WIN vaccination coverage by institutions, Tamil Nadu, 2023-2024 vs 2024-2025

Way Forward Digital Micro-plan in U-WIN:

The Government of India, in collaboration with UNDP, is gearing up to implement the digital micro plan under the UWIN initiative to strengthen immunization services which will eventually be implemented in Tamil Nadu. As part of this, vaccinators will capture geo-coordinates at session sites, enhancing the tracking and monitoring of immunization activities. High-risk areas will be identified within selected villages and wards for targeted interventions, with an additional feature to record the names of local influencers for future collaboration. During session creation, vaccinators will be able to tag AEFI (Adverse Events Following Immunization) and other key details using an easy dropdown menu; AEFI registration options will be available at both the Vaccinator and DIO dashboards. Furthermore, users can link AEFI centres while setting up sessions, choosing from a pre-populated line list. Supervisory oversight will be strengthened with the implementation of a supervisory plan through UNICEF's U Mentor platform. To support logistics, a cold chain contingency plan will be introduced where users can fill in details once and download

the plan as a PDF for streamlined printing and reference. Additionally, the Immunization Waste Disposal Plan will ensure accountability by prompting users to confirm whether waste is disposed of terminally by the health facility; if not, they must specify the responsible agency or mark it as 'Not disposed'. Together, these enhancements aim to bring greater transparency, efficiency, and responsiveness to immunization service delivery under UWIN.

UWIN and eVIN: Transforming Immunization Through Digital Innovation:

Moving forward, immunization coverage will be reported and reviewed through the UWIN platform, enhancing the accuracy and efficiency of data management. Vaccine stocks and cold chain logistics will continue to be monitored via the eVIN platform, ensuring optimal vaccine storage and distribution. To streamline processes and reduce double data entry, efforts will be intensified to establish API linkage between PICME and UWIN, with repeated reminders being sent to the Government of India. This integration is expected to ease the workload of Village Health Nurses (VHNs) and Urban Health Nurses (UHNs), enabling them to dedicate more time to community health activities. Additionally, with technical issues identified in PICME 3.0, UWIN will play a key role in ensuring seamless information flow, allowing for accurate and easily accessible vaccination data. Together, these measures are poised to significantly strengthen the efficiency and effectiveness of immunization programs.

ACKNOWLEDGEMENT

We express our heartfelt gratitude to the Government of India (GoI) and UNDP for the invaluable Standard Operating Procedures document, which served crucial for the formulation of the UWIN process document.

Additionally, we extend our sincere appreciation to UNDP for their continuous efforts in implementing the eVIN, CoWIN and UWIN across all the states of the country. Also, the insightful presentations during the National Workshop on Improved and Inclusive RI Microplanning not only clarified the objectives of inclusive planning but also highlighted the necessary improvements to be made within UWIN, which greatly assisted us in formulating the process document.

CONFLICT OF INTEREST

None

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