

**UNDERSTANDING THE IMPACT OF STRUCTURED MONITORING AND
SUPPORTIVE SUPERVISION THROUGH THE 'ANAND DIWAS' INITIATIVE ON
COLD CHAIN MANAGEMENT AND IMMUNIZATION OUTCOMES IN MADHYA
PRADESH**

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Navdeep

Under the Supervision and Guidance of

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TO WHOM SO EVER IT MAY CONCERN

This is to certify that Dr. Navdeep worked as an Intern in Knowledge Management Division in National Health Systems Resource Centre, New Delhi from 10th March 2025 to 9th June 2025.

We wish her success in all future endeavours.

Brig. Sanjay Baweja
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CERTIFICATE

This is to certify that dissertation titled '*Understanding the Impact of Structured Monitoring and Supportive Supervision Through The 'Anand Diwas' Initiative on Cold Chain Management and Immunization Outcomes In Madhya Pradesh*' is a record of the research work undertaken by *Dr. Navdeep* in partial fulfillment of the requirements for the award of the degree of *MBA (Hospital and Health Management)* from *IIHMR University, Jaipur* under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

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Faculty Guide

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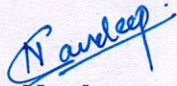
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DECLARATION BY STUDENT

I hereby declare that this dissertation titled '*Understanding the Impact of Structured Monitoring and Supportive Supervision Through The 'Anand Diwas' Initiative on Cold Chain Management and Immunization Outcomes In Madhya Pradesh*' is the Bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



Dr. Navdeep

Date: 18/06/25

ABSTRACT

Title: *Understanding the Impact of Structured Monitoring and Supportive Supervision Through the 'Anand Diwas' Initiative on Cold Chain Management and Immunization Outcomes in Madhya Pradesh*

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Keywords – Supportive supervision, cold chain management, immunization outcomes, Anand Diwas, vaccines, Madhya Pradesh

Background – The potency and efficacy of vaccines in public health depend significantly on effective cold chain management. Despite India's expanding immunization coverage, gaps in vaccine storage, monitoring, and equipment maintenance remain challenges, especially in resource-constrained settings. In response, Madhya Pradesh introduced the *Anand Diwas* initiative in October 2022 as an innovative, state-led strategy for structured monthly monitoring and supportive supervision of cold chain points, aiming to improve vaccine logistics, reduce equipment breakdown, and strengthen immunization delivery.

Objective – This study aimed to qualitatively assess the implementation and outcomes of the *Anand Diwas* initiative, exploring its influence on cold chain management practices, equipment functionality, and perceived immunization service improvements in Madhya Pradesh.

Methodology – An exploratory qualitative study was conducted using purposive sampling of key stakeholders including Vaccine Cold Chain Handlers (VCCHs), Auxiliary Nurse Midwives (ANMs), Medical Officers (MOICs), and program managers across selected cold chain points in Phanda Block, Bhopal. Data was collected through in-depth interviews (IDIs), facility observations, and document reviews, and analysed thematically.

Results – The findings revealed significant improvements in cold chain functioning post-Anand Diwas, including better equipment maintenance, continuous temperature logging, storage practices, and adherence to SOPs. Structured supervision created a routine culture of accountability and team-based monitoring. Staff showed enhanced technical knowledge, clearer role definitions, and more proactive problem-solving behaviours. However, the initiative faced challenges such as limited digital reporting due to technical issues since the past few months, insufficient infrastructure (e.g. cooling systems), and lack of public awareness. Monitoring data discrepancies and an absence of impact evaluation mechanisms were also noted.

Conclusion – The *Anand Diwas* initiative emerged as a zero-cost, scalable model for strengthening cold chain systems and immunization quality through structured, supportive supervision. To sustain and replicate its success, the study recommends enhanced digital integration, structured feedback loops for maintenance, community engagement, and formal program evaluation. Madhya Pradesh’s experience offers valuable insights for other states aiming to fortify their immunization logistics.

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ABBREVIATIONS

ANM	Auxiliary Nurse Midwife
AMC	Annual Maintenance Contract
ASHA	Accredited Social Health Activist
CCP	Cold Chain Point
CCE	Cold Chain Equipment
CCH	Cold Chain Handler
CCT	Cold Chain Technician
CHC	Community Health Centre
DIO	District Immunization Officer
DVS	District Vaccine Store
DF	Deep Freezer
e-VIN	Electronic Vaccine Intelligence Network
EPI	Expanded Programme on Immunization
EVM	Effective Vaccine Management
FEFO	First Expiry, First Out
FY	Financial Year
GoI	Government of India
HMIS	Health Management Information System
IEC	Information, Education and Communication
ILR	Ice Lined Refrigerator
iSC	Immunization Supply Chain
MoHFW	Ministry of Health and Family Welfare
MOIC	Medical Officer In Charge
NCCMIS	National Cold Chain Management Information System
NHM	National Health Mission
NFHS	National Family Health Survey
OVP	Open Vial Policy
PHC	Primary Health Centre

PQS	Performance, Quality and Safety
RI	Routine Immunization
RVS	Regional Vaccine Store
SDG	Sustainable Development Goal
SDD	Solar Direct Drive
SOP	Standard Operating Procedure
SS App	Supportive Supervision Application
Sub-DVS	Sub-District Vaccine Store
SVS	State Vaccine Store
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UIP	Universal Immunization Program
U-WIN	Unified Web Interface for Immunization Network
VCCH	Vaccine Cold Chain Handler
VCCM	Vaccine Cold Chain Management
VVM	Vaccine Vial Monitor
WIC	Walk-in Cooler
WIF	Walk-in Freezer
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background

“Though the world has gained notable achievement in child mortality reduction in the last two decades, there is still high under-five mortality. Globally, 29 percent of under-five mortalities are due to poor vaccine cold chain management in developing countries” (1). “About ten million under-five children are dying due to preventable causes each year globally, of which majority of deaths happened in developing regions” (2). “Vaccination is the intervention used to prevent or eradicate childhood diseases. It is the most cost-effective health intervention” (3). “The World Health Assembly established the expanded program on Immunization (EPI) in 1974, an action which marked a proactive commitment to extend the protective benefits of vaccination to all, where the cold chain system is used for storing, transporting and distributing vaccines and other biologicals in recommended temperatures until they reach beneficiaries” (4).

“Most public health programs are implemented primarily at the community level, and India’s Universal Immunization Program (UIP) has often provided a gateway for providing primary health services to all communities, irrespective of their geographic location, caste, and religion. A timely delivery of safe and potent vaccines, which relies on an efficient cold chain system, is the course of action for every health facility to effectively implement routine immunization and other health programs.” (5). “India’s Universal Immunization Program is one of the largest immunization programs globally in terms of the quantity of doses delivered, number of beneficiaries reached, number of immunization sessions organized, geographical spread, and diversity of areas covered. The program targets 27 million newborns and 30 million pregnant women each year. This requires more than 150 million doses of vaccines. Vaccines save lives and reduce the risk of infection and disease transmission by strengthening the body’s immune system. Currently, 3.5 to 5 million deaths per year are prevented from early childhood immunizations.” (6). “Achieving high coverage rates is considered one of the parameters to measure the success of the immunization program” (3).

“Success of national immunization program is highly dependent on supply chain system for delivery of vaccines and cold chain equipment” (7). “Any break in the cold chain may result in an unrecoverable loss in potency lowering effective coverage leading to outbreaks

of some vaccine-preventable diseases regardless of reported good coverage” (8). “Due to highly thermosensitive nature of vaccines, they have a fixed shelf life, and their potency is lost over time. To prevent this irreversible loss and wastage of vaccines proper storage and temperature conditions are to be maintained. Therefore, it is important to have a rigorous cold chain management for vaccines at each cold chain point to ensure that safe and potent vaccines are delivered to the beneficiaries. Also, an adequate number of knowledgeable, skilled and motivated human resources is critical in maintaining an effective and efficient vaccine cold chain” (8). “Sustainable Development Goals (SDGs) also highlight the well-being of vaccine recipients and equitable access for all. The SDG in the vaccine cold chain management enables adequate transportation and storage that increases operational, economic and environmental performances” (9). “The World Health organization recommends that vaccine should be stored in a refrigerator keeping the temperature reading between +2 and 8°C and transporting vaccines using vaccine carriers through properly prepared coolant packs at the health facility. Vaccine refrigerators, electronic refrigerators temperature loggers and vaccine vial monitoring are essential logistics for maintaining the potency of vaccines” (2). “Despite an increase in the number of cold chain points (CCPs), the network has not kept up with the India’s population growth. India’s more than 27,000 CCPs serve an average population of about 46,000 each and in some states, a CCP can serve more than 1,50,000. The biggest challenge is the safe storage of vaccines at remote locations due to disrupted supply of electricity from district to district, especially at village level and health facilities/CCPs rely on generators to provide backup power when electricity is erratic” (6).

“An efficient healthcare system is measured by the improved health outcomes of citizens by making quality services available to all through bridging of the gap in the supply of quality primary health care services. And to overcome challenges in the management of vaccine cold chain, supportive supervision can be used to provide high-quality services and enhanced performances of vaccine cold chain handlers (VCCH). Supportive supervision is a process of helping staff to improve their work performance regularly, as several studies have associated positive outcomes such as improved job performance, satisfaction and motivation with supportive supervision” (4). “The World Health Organization-United nations International Children’s Emergency Fund (WHO-UNICEF) effective vaccine management (EVM) initiative provides materials and tools required to assess the Immunization Supply Chains (iSCs) and help countries improve their supply chain performance. It is based on the principle that repeated assessments of iSC against

well-established standards of quality management can help guide policy makers and program managers, and hence improve the performance of country's iSC" (5).

Madhya Pradesh, the second largest state of India has 52 districts with an annual target of 22.5 lakhs pregnant women and child (0-1 years) population of 19.86 lakhs as per HMIS 2022 data. 77 percent of children of age group 12-23 months are fully immunized. This percentage has increased from 53.6 percent from NFHS 4 (2015-16) to 77 percent in NFHS 5 (2019-21). There are total 1249 cold chain points in 52 districts of the state as per NCCMIS Dec 2022 data. Under the immunization programme in the state vaccines for twelve preventable diseases is provided. There has been a consistent rise in the immunization coverage in Madhya Pradesh. However, for implementation of UIP effectively, factors such as cold chain and vaccine logistics management need a greater focus and consideration.

Vaccine management and gap identification is done through Effective Vaccine Management (EVM) which is a global initiative to strengthen the cold chain system, supply and ensure the safety and efficiency of vaccines up to the point of administration. First EVM in Madhya Pradesh was done in the year 2010, then in 2016 and third was done in the year 2022 in the month of march and April.

Anand Diwas was Madhya Pradesh government initiative, which started in the year 2022 in the month of October. It was introduced as an innovative approach, in which first working day of every month is designated for comprehensive supportive supervision. All the cold chain facilities in the state are visited and the observations are recorded in various formats in the Supportive Supervision 2.0 App developed by Ministry of Health and Family Welfare. Various health cadres are involved, and state, regional and district level facilities are visited by them. Officials fill out Sub DVS, DVS, RVS and SVS forms using the app. The visits are tracked by using the raw data files from NCCMIS portal and then data is analysed at state level. Findings are used to share feedbacks within the district teams so that they can track improvements and challenges can be addressed effectively. A multi-level monitoring system is formed that drives continuous improvements in the cold chain management. Month wise comparative findings are also discussed and shared at all levels of healthcare. This initiative helped improved supportive supervision dramatically, as reflected in 263 percent rise in FY 24-25, compared to just 17 percent in FY 19-20, 41 percent in FY 20-21 and 39 percent FY 21-22.

1.2 Rationale

“There is a paucity of data on the theme of how supportive supervision influences the vaccine cold chain management practices of service providers and vaccine handlers” (4), therefore, this study titled “Understanding the Impact of Structured Monitoring and Supportive Supervision Through the '*Anand Diwas*' Initiative on Cold Chain Management and Immunization Outcomes in Madhya Pradesh” aims to understand how state’s local initiatives of structured monitoring and comprehensive supportive supervision of cold chain points through ‘*Anand Diwas*’ impacts cold chain management and immunization outcomes and how such interventions can be replicated to other states with similar healthcare settings.

1.3 Objectives

- To understand the implementation process and structure of the *Anand Diwas* initiative at cold chain points.
- To explore the perceived impact of structured monthly monitoring on cold chain infrastructure, equipment maintenance, and vaccine storage practices.
- To understand how *Anand Diwas* has influenced vaccination quality from the perspective of frontline health workers.
- To identify enablers and barriers in the operationalization of the initiative across different facility contexts.

CHAPTER 2: REVIEW OF LITERATURE

Sr. No.	Author (Year)	Study Location	Sample size	Sampling techniques	Salient features /Key Finings
1.	(Dahir et al., 2025)	Hargeisa, Somaliland	42 public health facilities	Purposive sampling technique	The experience and knowledge of vaccine handlers significantly affects cold chain management practices. Supportive supervision significantly impacts supply chain management practices. Education significantly affects cold chain management practices, with a need for advanced education opportunities for diploma holders.
2.	(Isah et al., 2024)	Sokoto State, Nigeria	230 equipped health facilities	Descriptive cross-sectional	The study found a positive relationship between supportive supervision and better vaccine management practices among routine immunization service providers in

					Sokoto State. Only 37% of sampled health workers scored the desired mark for vaccine cold chain management practices, indicating a need for improvement. Partners provided the majority of supportive supervisory visits, but the state is encouraged to take ownership to enhance service delivery.
3.	(Daniel et al., 2024)	Uganda	57 health facilities	Cross-sectional	Vaccine cold chain management and knowledge scores were below the WHO target of 80%, with average scores of 65.33% and 62.42%, respectively. Training modalities had a positive effect on both knowledge and experience, with a synergistic effect when multiple

					modalities were used. Knowledge has effect on practice, indicating that efforts to increase knowledge can lead to better practices.
4.	(Jiang et al., 2024)	China	-	-	The paper presents an IoT-driven framework to advance the sustainability of medical cold chain management. The framework enhances safety and sustainability by promoting trust and transparency through IoT device authentication. Practical deployment has improved vaccine-related information collection, reduced costs, enhanced storage environment monitoring, reduced accidents, and minimized environmental pollution.

5.	(Thakur et al., 2024)				The study identifies prominent factors - affecting vaccine cold chain management (VCCM) in developing countries. It prioritizes these factors to develop a sustainable and robust healthcare delivery system during health outbreaks. - The study uses a hybrid methodology (Fuzzy-Delphi-AHP and k-means clustering) to analyze VCCM factors and develop managerial and policy implications.
6.	(Shults et al., 2024)	Egypt	Quasi-experimental	Households surveyed: 500 per governorate (5 governorates) Health facilities assessed: 237 Key	The initiative achieved a 40% surge in vaccination coverage over three years, significantly reducing preventable childhood diseases. Significant decreases in drop-out rates for multi-

				informants interviewed: 100	dose vaccines were observed, with the pentavalent vaccine dropout rate decreasing from 12.5% to 5.8%. Cold chain management improved, with functional equipment increasing from 78.5% to 97.2% of facilities.
7.	(Karol et al, 2023)	India	Review		The Universal Immunisation Programme (UIP) in India has undergone significant digital transformation with the introduction of U-WIN, aiming for 100% immunisation coverage. U-WIN is designed to be interoperable with existing management information systems, enhancing tracking and management of immunisation services. U-WIN is expected to be a game-changer in

					addressing inequities in immunisation services, providing digitally verifiable certificates and longitudinal health records.
8.	(Kasahun et al., 2023)	Ethiopia	Systematic-review and meta-analysis	10 studies	The inclusive prevalence of good vaccine cold chain management practice among health professionals in Ethiopia is 27.48%. Good knowledge on vaccine cold chain management and on-job training is positively associated with good practice. The current level of good practice is suboptimal, indicating a need for improvement in vaccine cold-chain management in Ethiopia.
9.	(Kumar et al., 2023)	India	Longitudinal study - Multi-site study - Stratified design - Non-	Total: 31 CCPs ILR: 9 SDD: 4 LTPD: 18	All three cold chain technologies (ILR, SDD, LTPD) maintained right temperatures, with

			controlled study - Phased or sequential design - Observational study		SDD refrigerators having no malfunctions. The establishment of new cold-chain points (CCPs) was a significant benefit, bringing immunization services closer to hard-to-reach areas. A key limitation was the inability to freeze ice packs, which are required for vaccine carriers, somewhat restricting their potential in underserved areas. The study highlights the need for tailored solutions to address diverse conditions in India's cold chain network.
10.	(Sharma et al., 2022)	India	Cross-sectional	Desk analysis	The overall scores of the national effective vaccine management (EVM) assessments improved from 53% in 2013 to 68% in 2018, indicating significant

					improvement in the immunization supply chain (iSC). - The implementation of EVM recommendations led to significant improvements, with 78% of the recommendations from the 2013 assessment being fully implemented. - Statistically significant improvements were observed in primary, subnational, and lowest distribution stores, with notable improvements in vaccine management and other areas.
11.	(Haldar et al., 2022)	West Bengal, India	Cross-sectional	5 cold chain points	Only 40% of cold chain points reported equipment breakdowns in the last year. ILRs and DFs were properly placed in 75% of the CCPs. All CCPs had contingency plans and job aids displayed, and all

					handlers had satisfactory knowledge about cold chain management. Overall, the performance of CCPs was satisfactory, but there is room for improvement through regular monitoring and supervision.
12.	(Feyisa et al., 2022)	Ethiopia	Cross-sectional	140 Health workers	Only one-third of vaccine cold chain handlers received training within the last six months. Fifty-four percent of health professionals had satisfactory knowledge regarding vaccine cold chain management. Nearly half of the primary health facilities experienced poor storage practices according to WHO codes, and two-fifths had undesirable

					management practices.
13.	(Nestory et al., 2022)	Tanzania	Descriptive cross-sectional	77 health facilities (each with one randomly selected vaccinator)	Most health facilities in the Morogoro region have functional refrigerators, but only 35% have alternative energy sources as backups. - Healthcare workers have good knowledge of cold chain management, but practices are poor in some facilities, particularly in temperature monitoring and data review. Significant issues include vaccine stockouts in 15.6% of facilities and average wastage rates of 7% to 19% for different vaccines. The study highlights the need for interventions such as mentorships, supervision, and training to improve healthcare workers'

					practices and ensure effective vaccine management.
14.	(Siddiqui et al., 2022)	India	Cross-sectional	20 Cold Chain Points	Only 25% of cold chain handlers had good knowledge, and 20% had poor knowledge about cold chain handling. There is a need to improve the knowledge level of CCHs through regular training sessions and monitoring visits. Effective management and supervision of the vaccine cold chain system is crucial for maintaining vaccine potency and reducing wastage.
15.	(Gurnani et al., 2022)	India	Pre-post design, observational study, multi-site	Total: 102 CCPs Assam: 19 Chhattisgarh: 12 Gujarat: 15 Jharkhand: 11 Nagaland: 7	A one-rupee investment in eVIN led to a return of INR 0.52 for traditional vaccines, with the highest cost savings coming from better vaccine stock management. When

				Odisha: 20 Rajasthan: 18	incorporating savings from new vaccines, the return on investment increases to INR 1.41 per rupee invested, indicating a sound investment. In the future, with only recurrent costs, the return on investment will be even higher, at INR 2.93 per rupee invested. The implementation of e-VIN has shown promising results in streamlining vaccine distribution and ensuring equity in vaccine stock management,
16.	(Ren, t et al, 2021)	United Kingdom	Systematic Review	340 papers	The paper identifies the need for improvement in the vaccine cold chain due to the expansion of vaccines and the COVID-19 pandemic. - New technologies and innovations have emerged, including

					improved temperature monitoring and alternative freeze detection methods like wNMR relaxometry. - The study highlights that not all temperature excursions lead to vaccine damage, emphasizing the need for data-driven decision-making in the cold chain.
17.	(Panika et al., 2019)	Madhya Pradesh, India	Cross-sectional	3 Community Health Centres (CHCs)	Dedicated room/space for dry storage was not available in any of the CHCs. ILRs and DFs were properly placed and maintained within normal temperature ranges in all CHCs. Records of power failures and defrosting were maintained in only one-third of the CHCs, indicating a need for improved record-keeping and training. The study

					emphasizes the need for better infrastructure, regular training, and improved record-keeping practices to enhance the quality of immunization services.
18.	(Bogale et al., 2019)	East Gojam zone, Amhara Region	Cross-sectional	60 health institutions	Only 38.3% of respondents had sufficient knowledge about vaccine cold chain management. 58.3% of health institutions had appropriate vaccine cold chain management practices, while 41.7% had inappropriate practices. Knowledge gaps and professional qualifications were significantly associated with vaccine cold chain management practice. The study emphasizes the need for improved supervision,

					training, and infrastructure to address these gaps and ensure effective cold chain management. The availability of vaccine storage equipment and the monitoring status of the cold chain are also identified as areas needing improvement.
19.	(Pandey et al., 2018)	Bihar, India	Cross-sectional	14 PHCs	The primary health centers in the Bhojpur district of Bihar had an average performance in terms of the cold chain system, which is a concern for vaccine potency and immunization effectiveness. Vaccine storage practices and availability of complete RI micro-plans were satisfactory in most PHCs, but temperature

					monitoring and waste disposal were significantly lacking. Continuous training and supportive supervision are recommended to improve the cold chain system, particularly in areas like temperature monitoring and waste disposal.
20.	(Robertson et al., 2017)	Global	Systematic review	-	PQS acts as both a gatekeeper and enabler for cold chain equipment technologies, influencing their development and adoption. PQS plays a crucial role in early product development by using target product profiles to communicate desired attributes to manufacturers. Establishing systematic post-market surveillance systems and improving

					communication efforts are identified as areas for improvement to enhance technology uptake and performance. The paper suggests that establishing systematic post-market surveillance systems could improve the performance of cold chain equipment, indicating a need for better monitoring after deployment.
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CHAPTER 3: METHODOLOGY

Anand Diwas initiative was presented by the state in ‘9th National Summit on Good, Replicable practices and Innovations in Public Healthcare Systems in India’ held at Odisha 2025, therefore, a field-based qualitative study in Madhya Pradesh was conducted using a descriptive technique to investigate how the *Anand Diwas* initiative's organized monitoring and supportive supervision influenced cold chain management and immunization outcomes. A qualitative design was adopted to collect rich, context-specific observations from vaccine cold chain handlers and supervisors. Extensive visits were also made to selected health facilities and areas where *Anand Diwas* was implemented.

3.1 Research questions

- How is the *Anand Diwas* initiative being implemented at cold chain point level in Madhya Pradesh?
- What are the perceived changes in cold chain management practices and infrastructure since the implementation of *Anand Diwas*?
- How do healthcare workers and program managers perceive the impact of structured monitoring on vaccine quality and immunization service delivery?
- What operational challenges and facilitating factors influence the effectiveness of *Anand Diwas* in different settings?

3.2 Study Design

This study used an exploratory qualitative design to gain an in-depth understanding the role of comprehensive supportive supervision and monitoring of cold chain points via ‘*Anand Diwas*’ initiative in the selected study area. The qualitative approach was chosen to explore perceptions, experiences, knowledge, attitude and practices of vaccine cold chain handlers, administrative personnel other stakeholders involved in the state specific initiative, allowing for rich and contextual insights.

3.3 Study Area and Population

The study was conducted in the Phanda block in the Bhopal region of Madhya Pradesh, where *Anand Diwas* has been operational since its implementation. The study population

comprised government Cold chain and immunization personnel directly involved in vaccine logistics and service delivery.

Specifically, the interviewee included the State officials and;

- **Vaccine Cold Chain Handlers (VCCH)**- who operate and maintain the cold chain equipment at health facilities.
- **Medical Officers in Charge (MOICs)**- health officers who oversee PHC/CHC operations and supervise the cold chain maintenance at the facility they are posted.
- **District immunization Officer (DIO)**- who is responsible for planning, implementing, supervising, and monitoring immunization activities at the district level.
- **Auxiliary Nurse midwives (ANMs)**- nurses/ link person responsible for conducting routine immunization sessions at health centres. They sometimes appear as a link person and assist with cold chain maintenance in absence of VCCH.
- **Cold Chain Technicians and Storekeepers**- responsible for maintenance, installation and operations of Cold Chain Equipment (CCE) at Cold Chain Points (CCPs)

These cadres were selected for their direct involvement in cold chain process. Including facility-based providers and community health workers allowed us to capture a comprehensive, ground level view of how '*Anand Diwas* influenced supportive supervision and monitoring outcomes.

3.4 Sampling Technique

Purposive sampling was used to select the active sites of cold chain and participants, emphasising on those information rich cases most relevant to the study. In collaboration with state and district health officials, cold chain points were selected where *Anand Diwas* monitoring visits had occurred. At each site, staff members were selected who had participated in the supervisory visit. These members included Deputy Director- Cold chain and Immunization, development partners, District Immunization Officer, MOICs, VCCHs, cold chain technicians, storekeepers, pharmacists, ANMs and ASHAs.

3.5 Data Collection Methods

Multiple qualitative methods were used to gather data and obtain comprehensive information:

- **Key Informant Interview (KII):**

Qualitative in-depth one-on-one interviews with officials and other selected participants who were aware of the initiative. An interview checklist followed a framework using a guiding set of open questions. This checklist included questions related to problem identification; emphasizing the main issues in cold chain pre implementation of *Anand Diwas*, program design, programs output and outcomes, financial aspects, present status, mechanisms and pathways for future.

Another Semi-structured checklist based on the WHO's Effective Vaccine Management and NCCVMRC guidelines covered topics such as cold chain training, vaccine handling practices, experiences of supervision, and perceived changes after *Anand Diwas*. Questions were kept open-ended to encourage detailed responses and allowed flexibility to follow up on issues raised by respondents. The adopted approach also helped to explore each participants perspective in depth and explore any unexpected topics.

- **Field Observation:**

During field visit, cold chain management practices and immunization sessions were observed in situ. Key indicators such as refrigerators and vaccine carrier temperatures, stock organization, condition of back-up power were recorded systematically using the structured checklist. Behaviours and interactions between staff during immunization activities (for example, how supervisors guided the VCCH and vaccinators, how ANMs communicated with caregivers or how cold chain was maintained at session sites). These contextual observations were captured as field notes, providing a reality check on the interview data.

- **Documentary Review:**

Documents such as temperature record registers, *Anand Diwas* visit record registers, equipment maintenance records, reports by development partners, latest *Anand Diwas* factsheet, pre implementation fact sheets and reports were reviewed to assess record keeping and understand the operations.

Importantly, relevant program documents such as Effective vaccine Management assessment reports, pre and post intervention fact sheets from state were obtained, which summarized key indicators (e.g. session coverage, equipment functionality scores, vaccine stockout incidents). These documents were used descriptively to understand any

reported trends in coverage or equipment performance, helping to interpret and ground the qualitative findings. (They were not subjected to formal statistical analysis.).

- **In-Depth Interviews:**

Two state officials, two members of development partners, one district official, one MOIC and other administrative stakeholders were interviewed in greater depth using semi structured questionnaire, enabling a detailed understanding of administrative processes and implementation challenges.

During each interview, the interviewer took detailed notes and immediately expanded them into full transcripts afterwards. At some places audio recording of interviews was also done using mobile phone. Observational data were likewise logged by hand on structured checklists and later entered into digital files. his manual process required researchers to pay very close attention to respondents' words and nonverbal cues, and daily debriefing helped ensure completeness of the data.

Table 3.1: Locations of field data collection with respondent details

S.No.	Location	Activities undertaken
1	National Health Mission, Madhya Pradesh	Introductory interactions with; 1. Deputy Director Immunisation Dr. Saurabh Purohit 2. Deputy Director Cold Chain Er. Vipin Shrivastava 3. Dr. Ram Kumar (Development Partner, UNICEF) 4. Dr. Kapil Jadon (Development Partner, UNDP)
2	Cold-chain points across Bhopal	• District Vaccination Store – Bhopal DVS (<i>total- 7 DVS stores</i>) <i>District Immunization Officer, Cold Chain Technician, Storekeepers</i>) • State Vaccination store (<i>Cold Chain Technicians, Storekeepers</i>) • PHC, Block Phanda (<i>MOIC/ CCT/ ANMs</i>)
3	Anganwadi Centre (urban)	Interaction with ANMs and observed RI session for cold chain maintenance at session site
4	Anganwadi Centre (urban)	Interaction with ANMs and observed RI session for cold chain maintenance at session site

5	Anganwadi Centre (rural)	Interaction with ANMs and observed RI session for cold chain maintenance at session site
6	Anganwadi centre (urban)	Interaction with ANMs and observed RI session for cold chain maintenance at session site
7	Cold chain point	AAM , Ratibarah, Bhopal (VCCH- Pharmacist)

3.6 Ethical considerations

Prior to data collection, it was explained that participation was voluntary and informed verbal and written consent were obtained from all participants after explaining study's purpose. Participants were reassured that their responses would remain confidential. No personal identifiers (names, exact job titles, or facility names) were attached to the data, and transcripts were stored securely with limited access. Since many participants were government health staff (some known to the interviewers), we emphasized confidentiality and framed questions around system practices (not individual performance) to minimize any discomfort.

3.7 Data Analysis

Qualitative data collected through interviews, observations and document reviews were analysed using thematic content analysis. All interview transcripts and field notes were first read repeatedly to identify, analyse and report patterns within qualitative data. Importantly, all coding and analysis were done manually (**no** use of qualitative analysis software was made). This approach enabled a detailed exploration of themes related to "equipment checks," "record keeping," "supervisory visits," etc. all audio-recorded interviews were transcribed verbatim. The data portions were coded and reviewed in an iterative manner to improve reliability and minimize individual bias. Overall, triangulation of multiple data sources and analyst perspectives increased the trustworthiness of conclusions.

CHAPTER 4: RESULTS AND FINDINGS

To understand the effect of the *Anand Diwas* initiative on cold chain management and immunization rates, this study conducted a thematic analysis of field data from Phanda district of Madhya Pradesh. The study investigated the ways in which a structured, monthly supporting supervision mechanism changed many aspects of immunization logistics through in-depth interviews and field observations. State Health Officials, Medical Officers, District Immunization Officers (DIOs), Vaccine Cold Chain Handlers (VCCBs), Auxiliary Nurse Midwives (ANMs), ASHAs, and were interviewed in order to gather data. These exchanges exposed notable changes in frontline health worker morale, supervisory procedures, and infrastructure management.

This study used purposive sampling to select key informants across different cold chain points. This strategy was intentionally designed to capture diverse perspectives from stakeholders who are directly involved in the planning, execution and monitoring of *Anand Diwas* initiative. This approach enabled the researchers to gather rich, context-specific insights into operational practices, supervisory mechanisms, and frontline challenges. The primary aim of the study was to assess the impact of *Anand Diwas* on strengthening cold chain management and enhancing immunization service delivery. Functioning as a fixed monthly event, *Anand Diwas* institutionalizes structured visits to cold chain points using standardized checklists, real-time feedback, and capacity-building interactions. An organized representation of these findings and the many results of the *Anand Diwas* program may be found in the following thematic categories.

Table 4.1: Themes and Sub-themes for understanding *Anand Diwas* initiative

Theme	Sub themes
T1. Pre <i>Anand Diwas</i> implementation Challenges	T1.1 Infrastructure gaps T1.2 Inadequate supervision/training T1.3 Poor storage and handling practices T1.4 Infrequent documentation
T2 Design and Implementation of <i>Anand Diwas</i>	T2.1 Initiative objectives T2.2 Stakeholder involvement T2.3 Training and resource allocation T2.4 Monitoring structure

	T2.5 Cost structure T2.6 Digital platform integration
T3 Supportive Supervision Practices	T3.1 Visit frequency and structure T3.2 Use of checklists T3.3 Staff responsiveness T3.4 Behavioural changes T3.5 Feedback mechanisms
T4 Frontline Worker Knowledge assessment and Experiences	T4.1 Technical knowledge of vaccine storage and handling T4.2 Adherence to SOPs T4.3 Refresher and training T4.4 Skill enhancement and Role clarity
T5 Post-<i>Anand Diwas</i> Changes	T5.1 Improved equipment functionality T5.2 Improved continuous temperature logging T5.3 Improved storage practices
T6 Challenges	T6.1 Data Management and Monitoring Challenges T6.2 Evaluation and Impact Assessment T6.3 Cold Chain Equipment (CCE) Maintenance Issues T6.4 Infrastructure and Environmental Constraints T6.5 Vaccine Quality and Cold Chain Integrity T6.6 Community Awareness and Engagement

T1. Pre *Anand Diwas* implementation Challenges

As stated by the Deputy Director--Cold Chain, NHM Madhya Pradesh, the Effective Vaccine Management (EVM) assessments conducted in 2010, 2016, and 2022 revealed persistent challenges across several critical areas including supportive supervision, training, storage, infrastructure, human resources, cold chain equipment, temperature monitoring, vaccine management, cold chain maintenance and documentation. These challenges directly impacted the quality and potency of vaccines, thereby affecting routine immunization outcomes.

In 2022 after Effective vaccine management (EVM) assessment, in collaboration with UNICEF, a Supportive Supervision App was used which monitored the cold chain management system using State Vaccine Store (SVS), District Vaccine Store (DVS), Regional Vaccine Store (RVS), and Sub-District Vaccine Store (Sub-DVS) forms to evaluate and monitor the functioning CCMS on every first working day of each month at every Cold Chain Point.

T1.1 Infrastructure gaps

Most prominent challenges before *Anand Diwas* was the non-uniform and inadequate infrastructure at Cold Chain Points (CCPs). Cold chain equipment, such as ILRs (Ice Lined Refrigerators), DFs (Deep Freezers), and voltage stabilizers, were often outdated, dysfunctional, or completely non-operational. Facilities lacked adequate space, ventilation, and cleanliness.

Electricity supply was also erratic in rural and tribal blocks, with no power backups or solar alternatives, leading to repeated vaccine shifting between CCPs using cold boxes, sometimes causing breaks in the cold chain.

There were low and irregular monitoring of cold chain points.

T1.2 Inadequate supervision/training

Prior to *Anand Diwas*, supportive supervision was sporadic and reactive rather than systematic and preventive. Visits by supervisors were infrequent and usually inspection-oriented.

Many frontline workers and ANMs were operating with outdated knowledge about equipment functioning, Vaccine Vial Monitor (VVM) stages, and safe storage techniques.

Most had not received recent training or refresher sessions on cold chain management.

T1.3 Poor storage and handling practices

Opened vials were stored without following Open Vial Policy (OVP) guidelines. VVMs were not monitored regularly. Supervisors also admitted that documentation was not cross-verified during earlier visits and feedback on register maintenance was rare, contributing to the cycle of neglect.

T1.4 Infrequent documentation

Documentation was one of the weakest areas observed in the pre-*Anand Diwas* period. Most ANMs and CCHs considered documentation a secondary task and prioritized fieldwork, often due to heavy workload and multiple responsibilities.

T2 Design and Implementation of *Anand Diwas*

One of the state officials explained, concept of *Anand Diwas* was first coined by Santosh Shukla (Director NHM, Madhya Pradesh). The word '*Anand Diwas*' was used which means everyone is happy doing work. He got inspired by this ideology depicted in one of the entrances of Sanchi Stupa.

The initiative is taken by the state RI Cell, NHM, Madhya Pradesh using Supportive Supervision App 2.0. This state-led intervention aimed at improving cold chain performance and immunization outcomes across Madhya Pradesh. Its design is rooted in routine monitoring, supportive supervision, and capacity building at cold chain points (CCPs).

T2.1 Initiative Objectives

It was conceptualized with a clear aim: to ensure the optimal functioning of cold chain systems through regular, structured monitoring and on-site problem-solving. Conducted on the first working day of every month, *Anand Diwas* involves state, district and block-level supervisory staff visiting cold chain points to assess equipment status, documentation practices, stock adequacy, and adherence to cold chain protocols.

“Pehle aisa koi din fix nahi hota tha jab inspection ho. Anand Diwas ne ek tareek fix kar diya jisme hum ready rehte hain aur sab kuch check hota hai.” — State Official

“Earlier, there was no fixed day for inspections. Anand Diwas has set a specific date, which keeps us prepared and ensures everything gets checked.” — State Official

T2.2 Stakeholder Involvement

The successful implementation of *Anand Diwas* hinges on multi-level stakeholder engagement. Key actors include:

- District Immunization Officers (DIOs)
- Cold Chain Technicians (CCTs)
- Vaccine and Cold Chain Handlers (VCCHs)
- ANMs and CCHs
- Supervisors at CHC/PHC level

Each one of them plays a defined role in planning, executing, and following up on the monitoring exercise.

“Hum sab milke checklist bharte hain. Supervisor sirf dekhne nahi aate, sikhate bhi hain. Anand Diwas ek team effort ban gaya hai.”— ANM

“We all fill out the checklist together. The supervisor doesn’t just come to observe, they also teach us. Anand Diwas has become a team effort.”— ANM

Development partners providing technical and handholding support is by UNICEF, UNDP and WHO.

T2.3 Training and Resource Allocation

Initial training sessions were held in cascade mode from state to district to block levels. Refresher trainings are continually being introduced after the first year of implementation. All the Vaccine Cold Chain Handlers (VCCHs) who were interviewed confirmed that they had received formal training or a refresher course related to their roles and responsibilities.

“Anand Diwas se pehle ILR ka dhang se use nahi pata tha. Training mein bataya gaya ke vaccines ko kaise arrange karna hai.” — CCH

“Before Anand Diwas, I didn’t properly know how to use the ILR. During the training, we were taught how to arrange the vaccines correctly.”— CCH

T2.4 Monitoring Structure

All cold chain facilities across the state are routinely visited, and observations are systematically recorded using the Supportive Supervision 2.0 App developed by the

Ministry of Health and Family Welfare. The visits involve various health cadres operating at the state, regional, and district levels. During these supervisory visits, officials document their findings using standardized formats such as Sub-DVS, DVS, RVS, and SVS within the app. The visits are further tracked through raw data files extracted from the NCCMIS portal, which are subsequently analysed at the state level. These analyses facilitate the sharing of structured feedback with district teams, enabling them to monitor progress and address emerging challenges effectively. This process establishes a multi-tiered monitoring mechanism that fosters continuous improvement in cold chain management. Additionally, month-wise comparative findings are reviewed and disseminated across all levels of the healthcare system to ensure coordinated action and accountability.

T2.5 Cost Structure

Anand Diwas is a zero funded activity with existing resources and human resource. Therefore, there is no separate budget head under NHM exclusively for *Anand Diwas*.

T2.6 Digital platform integration

Some districts use WhatsApp groups to share real-time photos of cold chain monitoring, checklist completion, or equipment faults. Standard formats like Supportive Supervision 2.0 App is used to during the visits. Factsheets are developed with support of UNICEF. Monitoring of monitors, temperature loggers is done and regular review is done using Electronic Vaccine Intelligence Network (eVIN). However technical glitches, limited smartphones for ANMs, and poor internet connectivity in remote areas limit scale-up potential.

App to hai, par kai baar signal nahi milta. Phir register likhna padta hai.”— VCCH

“The app is there, but often we don’t get a signal. Then we have to use the register instead.”—VCCH

T3 Supportive Supervision Practices

Supportive Supervision is a central pillar of the initiative of *Anand Diwas*. The motive was to strengthen cold chain management and improve vaccine quality through structured monitoring practices. Supportive supervision here is not just an administrative task but a strategic tool to build capacity, ensure compliance and motivate staff to improve their morale across cold chain points.

T3.1 Visit frequency and structure

Monthly visits are organized which created a routine expectation among the cold chain handlers and official cadre. It was observed that the visit is not only punctual but also followed a structured agenda, including equipment checks, data validation and one-on-one staff interactions. Out of all the CCPs visited in the field 100% monitoring visits were conducted in the last 3 months. *Anand Diwas* activity was also documented and report was prepared. DIO was also visiting the CCPs and health facilities without prior information for surprise check.

A District Immunization Officer (DIO) shared:

“Earlier visits were not this punctual and was made whenever possible. Now, with Anand Diwas, we have a monthly system—it brings consistency, and staff are more prepared.”— DIO

This predictability has also improved preparedness allowing for a more positive approach.

T3.2 Use of checklists

One of the key instruments/tools introduced during *Anand Diwas* is the standardized supervision checklist. This checklist contained 100 questions were are to be filled every month during the visit. Checklist included various parameters like temperature logbook maintenance, cold chain equipment condition, power backup arrangements, etc. This checklist is available on MoHFW Supportive Supervision App 2.0. Various forms such as SVS, RVS, DVS and Sub DVS are available according to the facility being visited. Their consistent use has enabled supervisors to identify performance gaps and provide necessary feedbacks.

“Checklist se kaam asaan ho gaya hai. Har visit mein jo dekhna hai, woh clear hota hai, staff bhi aware rethe hai.” — DIO

“The checklist has made the work easier. It clearly outlines what needs to be checked during each visit, and the staff stay aware as well.” — DIO

This approach seemed to ensure that no critical aspect is missed and enhances the quality of supervision and documentation.

T3.3 Staff responsiveness

Field observations revealed that the staff’s responsiveness to supervision has improved significantly. Initially some were skeptical or viewed monitoring as disciplinary or strict.

However, due to repeated and supportive engagements and direct conversation, a culture of openness has emerged.

***"Pehle lagta tha jaise koi nigrani karne aa rahe hai. Ab lagta hai jaise help karne aaye hain. Ab kisi bhi samasya ke liye Sir se sedhe baat krna bhi asaan lagta hai."* — CCH**

"Earlier, it felt like someone was coming just to monitor us. Now, it feels like they're here to help. It's also easier to speak directly to Sir about any problem."— CCH

This behavioural transformation shift due to shift in perception has made frontline staff more cooperative and enthusiastic about learning.

T3.4 Behavioural changes

Anand Diwas has brought about observable behavioural changes among the cold chain staff. Better hygiene practices, sense of responsibility, consistent use of temperature logbooks and timely equipment maintenance were noted across most CCPs.

Now, supervision process is perceived less as a surveillance and more as a partnership for better service delivery.

T3.5 Feedback mechanisms

This initiative has also developed real time feedback mechanisms. Supervisors often provide verbal feedback during their visits. This two-way communication helps address issues immediately.

***"Feedback milta hai toh samajh aata hai kaha kami thi. Agli baar sudharne ki koshish karte hain."* — Cold Chain Assistant**

"When we receive feedback, it helps us understand where we went wrong. We try to improve the next time."— Cold Chain Assistant

Feedback loop has ensured continuous improvements and a sense of accountability amongst staff.

T4 Frontline Worker Knowledge assessment and Experiences

This theme captured how knowledge, perceptions and capacity of vaccine cold chain handlers have evolved through the initiative. Technical knowledge, behaviour ownership and role clarity has improved significantly due to *Anand Diwas*.

T4.1 Technical Knowledge of Vaccine Storage and Handling

A detailed structured checklist was used to assess the knowledge of VCCHs. The results concluded that *Anand Diwas* facilitated regular assessments of CCHs understanding of cold chain protocols. It included temperature range maintenance, shake test procedures, VVM monitoring, etc. many workers displayed improved competence due to repeated reinforcement during supervisory visits.

***"Humko pata hai ki 2 se 8 degree Celsius ka temperature maintain karna hota hai. Anand Diwas mein ye baar-baar bataya gaya."*— CCH**

"We know that the temperature must be maintained between 2 to 8 degrees Celsius. This has been repeatedly emphasized during Anand Diwas."— CCH

Workers were observed correctly identifying temperature readings, VVM readings, remembering cold chain prayer, etc., showing the impact of consistent technical engagement.

The analysis of the data collected from the field and interviews conducted when analysed, revealed that ***Anand Diwas* has significantly contributed to the enhancement of technical knowledge and skills** among cold chain handlers and auxiliary staff. Triangulating survey responses with field observations showed that 100% of respondents demonstrated awareness of key cold chain protocols, including temperature maintenance, VVM stage identification, the shake test, and standard operating procedures. These findings indicate the effectiveness of repeated, structured supervisory visits and targeted training in reinforcing technical competencies at the facility level, consistent with the objectives of supportive supervision.

T4.2 Adherence to SOPs

Through *Anand Diwas*, strict adherence to standard operating procedures became a routine expectation. Supervisors frequently checked these SOPs in real time like power backup testing, cold box conditioning, data logbook entries, All the VCCH interviewed were aware of cold chain guidelines and SOPs and were following them.

T4.3 Refresher and Training

During the field visit 87.5 percent of the VCCH received the refresher and in-service training on cold chain while 12.5 percent did not receive any refresher training.

T4.4 Skill Enhancement and Role Clarity

Supervisors reported that continuous interactions clarified the individual responsibilities of CCHs, MOs and ANMs in cold chain logistics. Role clarity helped in reducing the **blame shifting and encouraged teamwork.**

***"Pehle lagta tha ki kaam kisika hai ye clear nahi tha. Ab pata hai ki kisiko kya karna hai."*— MO**

"Earlier, it wasn't clear whose responsibility the work was. Now, we know exactly who has to do what."— MO

***"Ab lagta hai ki vaccine sahi se rakhne ki zimmedari meri hai. Har cheez sahi rakhne ki aadat ban gayi hai."*— CCH**

"Now, I feel responsible for storing the vaccines properly. It has become a habit to keep everything in order."— CCH

Skill enhancement was observed in VVM interpretation and temperature logging, cold chain equipment's maintenance, etc.

T5 Post-Anand Diwas Changes

Implementation of *Anand Diwas* has brought tangible and systematic transformations in the cold chain management at various levels of public health infrastructure in Madhya Pradesh. These transformations are not limited to administrative compliance but have translated into operational improvements, enhanced service quality and stronger accountability mechanisms among cold chain handlers, ANMs and facility level supervisors.

Major improvements are observed in 3 major areas; improved equipment functionality, improved storage practices, improved and continuous temperature logging.

T5.1 Improved Equipment Functionality

Before the implementation of *Anand Diwas*, many cold chain points in Madhya Pradesh reported equipment related challenges, including non-functional deep freezers, malfunctioning Ice Lined Refrigerators (ILRs), etc. With regular supervision and lack of timely reporting mechanisms got delayed in escalation.

Post implementation of *Anand Diwas*, District Immunization Officers, and Vaccine cold chain handlers used checklists to monitor the functional status of CCE, ensuring that

every visit was used to assess technical faults, repair status and preventive maintenance needs.

“Pehle freezer kabhi kabhi kharab rehta tha aur ham report karte the par repair team time pe nahi aati thi. Anand Diwas ke baad har month checking hoti hai, aur repair bhi time pe hone laga hai.”— Cold Chain Handler

“Earlier, the freezer used to malfunction, and we reported it, but the repair team didn’t arrive on time. After Anand Diwas, monthly checks are done, and repairs have started happening promptly.”— Cold Chain Handler

The study revealed that *Anand Diwas* has helped reduce mean time to repair for cold chain equipment. Cold chain technicians now receive fault reports and acknowledge them timely. State has a tie up with AOV International Ltd. As maintenance partners for cold chain equipment repairs.

“Pelhe chhoti moti problem months tak pending rehti thi. Ab Anand Diwas mein issue record hota hai aur ek hafte ke andar hi solution mil jata hai.”— State Cold Chain Technician

“Earlier, small problems used to remain pending for months. Now, with Anand Diwas, issues are recorded and resolved within a week.”— State Cold Chain Technician

VCCHs and CCTs expressed that preventive maintenance habits, such as regular defrosting, weekly maintenance checks were reinforced through repeated observations. In some of the high functioning centers like State Vaccination Store, minor issues were self-resolved due to growing confidence among CCTs. One of the CCT also explained how he created WhatsApp groups to link with all the CCT in state and resolved issues by discussing with them and applying innovative approaches. This ownership led to a drop in equipment negligence, a notable behaviour shift from pre-*Anand Diwas* times.

Benefits included,

- Cold chain equipment sickness rate reduced from 2.6 percent to 0.6 percent.
- Improved vaccine safety and utilization.
- Enhanced data quality and accountability.
- Better identification of issues and timely interventions
- Targeted review mechanism.

T5.2 Improved Continuous Temperature Logging

Continuous temperature logging is the most vital for the potency of vaccines. In case vaccines are exposed to suboptimal temperatures; their efficacy gets compromised. When discussed about this with the VCCHs they explained that prior to *Anand Diwas* temperature was logged, adherence to the ‘twice-a-day’ rule was inconsistent. *Anand Diwas* initiative brought significant improvements in the regularity, quality and understanding of temperature monitoring practices. Now temperature logbooks are cross checked with actual thermometer readings, ensuring real time compliance. Temperature loggers are installed with each CCE, which provide the real time data; any change in temperature alerts are received and necessary action is taken.

“Agar temperature 8 degree ke upar chala jaata hai toh hum turant CMO ko report karte hain.”— ANM

*“If the temperature goes above 8 degrees, we immediately report it to the CMO.”
— ANM*

In some CCP, temperature monitoring evolved from a mechanical routine to an informed practice. Staff were able to explain not just the reading but also what actions to be taken in case of deviations. Digital data loggers are introduced and used effectively to supplement manual entries. Supervisors highlighted that combining analog and digital logs helped detect manipulation or oversight.

One key finding was that CCHs felt greater accountability once they knew their logs would be audited monthly. This behavioral reinforcement created a positive cycle of diligence and peer learning.

In terms of documentation and equipment maintenance, the field data corroborates a substantial improvement post-implementation. All facilities reported maintaining temperature logbooks, conducting twice-daily recordings, and carrying out regular weekly maintenance checks—reflecting a shift toward systematized operational routines. This aligns with the broader intent of *Anand Diwas* to embed discipline, accountability, and proactive oversight into cold chain management.

T5.3 Improved storage practices

Proper storage of vaccines—based on the ‘first-expiry-first-out’ (FEFO) principle, VVM stage recognition, and space management within ILRs is fundamental to ensuring safe immunization services.

Post initiative, healthcare workers are trained to perform correct storage techniques. ‘*Cold chain prayer*’ helped a lot in remembering the proper organization of vaccine placement”—said one ANM.

Notably, VVM interpretation improved significantly. Workers could now differentiate between usable and discarded vials based on the color stages of the VVM.

“VVM stage 2 tak allowed hai—ye Anand Diwas ke training mein seekha. Ab kisi ko poochhna nahi padta.”— ANM

“VVM is allowed up to stage 2—this we learned during Anand Diwas training. Now, there is no needs to ask about it from someone else.”— ANM

Despite these improvements, certain infrastructural limitations—such as limited dry storage area or lack of enough dedicated storage area for conditioning of ice packs—still restricted ideal practices in a few facilities. However, the staff attitude was visibly proactive.

T6 Challenges

Anand Diwas initiative has led to notable improvements in cold chain management across Madhya Pradesh. Field observations and stakeholder interactions revealed several persisting and emerging challenges that impact the intervention.

T6.1 Data Management and Monitoring Challenges

Supportive Supervision App has been non-functional since December 2024; data is being recorded manually with no online data entry.

Integration of **digital platforms such as eVIN and the Supportive Supervision App** was found to be widely adopted in principle—100% of respondents confirmed usage. Yet, field narratives revealed that in several locations, technical challenges such as poor internet connectivity, smartphone unavailability, or app malfunctioning hindered real-time reporting. This reflects a structural disconnect between digital policy mandates and ground-level feasibility, highlighting the need for technological support infrastructure and capacity-building to ensure consistency in digital reporting practices.

According to a state-level report jointly presented by the National Health Mission (NHM), Madhya Pradesh, and UNICEF on the *Anand Diwas* initiative, notable discrepancies were observed in the monitoring data for the month of November 2024. Specifically, the scores recorded during *Anand Diwas* visits did not align with the scores

obtained through subsequent physical verification conducted across 11 districts of the state.

T6.2 Evaluation and Impact Assessment

The impact of the *Anand Diwas* initiative on immunization rates has not been studied by the state, although dropout rates have reportedly improved.

T6.3 Cold Chain Equipment (CCE) Maintenance Issues

State has a tie-up with AOV International Ltd. for maintenance of cold chain equipment, but no feedback or complaint tracking system exists.

Complaints regarding cold chain equipment remain unresolved due to:

- Unavailability of spare parts.
- Usage of discontinued CCE models for which spare parts are no longer available.

T6.4 Infrastructure and Environmental Constraints

Cold Chain Room temperatures were excessively high due to heat emitted by cold chain equipment.

No air conditioning or cooling systems were installed, which are essential for:

- Maintaining optimal CCE performance.
- Ensuring comfortable working conditions for staff.

State vaccination store's cleanliness was poor due to moulds on walls and there was too much noise and heat emitted in the room from WIFs and WICs.

T6.5 Vaccine Quality and Cold Chain Integrity

Rota Virus vaccine vials were received in VVM stage II at some sites; slight vaccine wastage occurred due to expired VVMs.

In some Cold Chain Points (CCPs), ice packs used for Routine Immunization (RI) were found at room temperature, indicating a break in the cold chain.

T6.6 Community Awareness and Engagement

Beneficiaries are unaware of the *Anand Diwas* initiative, as it is considered an internal administrative process, despite its community-level impact.

However, the study also uncovered critical gaps in community engagement and information dissemination. Despite improvements in service delivery, only 28.5% of respondents stated that beneficiaries were aware of the *Anand Diwas* initiative. This suggests that while the intervention is administratively robust, its visibility and potential to build public trust or community participation remain underdeveloped. The absence of IEC materials or public displays at most cold chain points reinforces this gap, aligning with field observations that no posters or awareness campaigns were found at peripheral sites.

CHAPTER 5: DISCUSSION

This study explores the effects of the *Anand Diwas* initiative on the cold chain management and immunization service delivery across cold chain points in Bhopal, Madhya Pradesh. Thematic analysis of the field observations and interviews conducted revealed that regular, structured supervision and training under this initiative led to visible improvements in cold chain infrastructure, equipment functionality, worker accountability, temperature monitoring practices, etc. These findings extend the insights from international and national studies, presenting a context-specific yet globally relevant case for structured supervision models.

5.1 Role of Supportive Supervision in Cold Chain Management

A consistent theme across the literature found is the positive impact of supportive supervision on cold chain efficiency. The study by Isah et al. (2024)(4) in Nigeria found a significant correlation between supportive supervision and improved cold chain practices, though only 37% of healthcare workers reached adequate competency. *Anand Diwas* in Madhya Pradesh addressed this gap by creating a pre decided, structured supervisory cycle that occurred on the first working day of every month. This frequency instilled routine readiness among staff and minimized the ad hoc nature of supervision—an approach praised in the Gurnani et al. (2022)(11) study as part of the eVIN strategy that also promoted structured logistics management.

Moreover, the behaviour shift noted in this study—from supervision as an inspection to supervision as a mentoring mechanism—mirrors the experience of Dahir et al. (2025)(1) in Somaliland, where positive supervisor-worker relationships were essential to improving morale and performance in vaccine handling.

5.2 Enhancing Technical Competence Through Structured Training

Anand Diwas also led to significant skill enhancement among VCCHs and ANMs, a finding aligned with Daniel et al. (2024)(8) in Uganda, where multiple training modalities had synergistic effects on knowledge and practice. The 87.5% coverage of refresher training observed in this study contributed directly to improvements in VVM interpretation, temperature logging, and SOP adherence.

Kasahun et al. (2023) and Feyisa et al. (2022)(2,12) from Ethiopia, also highlighted that knowledge and hands-on training are strong predictors of good cold chain practices.

Kasahun's systematic review also noted that job training was directly associated with better storage practices—reflected in our study where field workers demonstrated adherence to FEFO, regular defrosting, and precise vaccine placement.

5.3 Addressing Infrastructure Constraints and Equipment Functionality

Despite evident gains, infrastructure challenges persist in Madhya Pradesh. Field data showed issues with outdated cold chain equipment, limited dry storage space, and inadequate ventilation or cooling in cold chain rooms—particularly in high-burden facilities. These constraints are widely documented in literature. Like reported in Panika et al. (2019)(7), where he explains about absence of dedicated storage space and poor record-keeping in Madhya Pradesh CHCs. Similarly, Pandey et al. (2018)(13) observed poor waste disposal and erratic temperature monitoring in Bihar PHCs—mirrored here in facilities lacking digital temperature loggers or where equipment repairs were delayed due to lack of spare parts.

The tie-up with AOV International Ltd. for CCE maintenance in Madhya Pradesh is a step forward, but the absence of a feedback mechanism or complaint tracking system poses sustainability concerns. Bogale et al. (2019)(3) emphasized the need for proactive infrastructure and supervision mechanisms in Ethiopian cold chain systems—a lesson applicable here too.

5.4 Leveraging Digital Platforms: Benefits and Limitations

The Supportive Supervision 2.0 App and eVIN platform were intended to create real-time data loops for cold chain performance. Literature supports these interventions—Jiang et al. (2024)(14) in China showed how IoT-based cold chain monitoring improved data transparency and reduced storage accidents. Karol et al. (2023)(15) also outlined how India's U-WIN initiative is designed to streamline data integration with real-time vaccine tracking.

However, in this study, technical issues—such as app non-functionality since December 2024 and poor internet access—hindered consistent data entry and analysis. Thakur et al. (2024)(9) warned of similar issues in LMIC contexts, where technical integration without infrastructure readiness risks failure. This underlines the need for robust backend support and digital capacity building to scale digital interventions like SS App used in *Anand Diwas* monitoring.

5.5 Evident Operational Improvements Post-Implementation

Post-*Anand Diwas* changes reported in the field—such as reduced equipment downtime, better temperature control, and improved vaccine storage—demonstrate the operational success of this initiative. These outcomes also resemble results from Shultz et al. (2024)(16), whose quasi-experimental study in Egypt noted that functional equipment improved from 78.5% to 97.2% of facilities, and dropout rates fell sharply due to improved logistics.

Madhya Pradesh showed similar improvements: CCE sickness rate dropped from 2.6% to 0.6%, real-time temperature alerts became operational, and stock practices improved.

5.6 Gaps in Evaluation and Public Engagement

A significant gap found in the *Anand Diwas* initiative is the absence of a structured evaluation system to directly correlate improvements with immunization outcomes. Sharma et al. (2022)(5) demonstrated how EVM recommendations, once monitored, led to measurable increases in India's immunization supply chain performance. Without similar evaluation metrics, the impact of *Anand Diwas* on immunization coverage remains inferred rather than validated.

Moreover, the lack of IEC materials and public awareness about the initiative represents a missed opportunity. As Siddiqui et al. (2022) and Nestory et al. (2022)(17,18) highlight, community awareness, even of administrative practices, enhances service accountability and uptake. Integrating public-facing communication into *Anand Diwas* could foster community ownership, reinforce trust, and elevate demand for better services.

Limitations

The study was confined to a single block (Phanda block, Bhopal region) in Madhya Pradesh, which may not reflect the diversity of implementation or challenges in other districts or blocks across the state. Also, the sample size was relatively small and non-random. This limits the generalizability of findings.

Participants and sites were selected purposively, focusing on “information-rich” cases where *Anand Diwas* had been implemented actively. This may have introduced selection bias by potentially overlooking sites where implementation was weak or absent, thus skewing the overall assessment.

Data collected through interviews depended on self-reported experiences and perceptions, which are subject to social desirability bias. Respondents—especially government staff—might have portrayed the initiative more positively due to fear of professional repercussions. Observations of RI sessions and cold chain practices were conducted at a few sites only, limiting the ability to assess variation across settings (urban vs. rural, high vs. low load facilities).

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The *Anand Diwas* initiative in Madhya Pradesh is a low-cost, high-impact model that transformed cold chain management through structured monthly supervision and team-based monitoring. It led to significant improvements in equipment functionality, vaccine storage, and frontline worker capacity. While the initiative boosted accountability and coordination, challenges like poor digital infrastructure, lack of formal impact assessment, and limited community awareness persist. Overall, it offers a replicable approach to strengthen immunization logistics and public health systems in similar contexts.

6.2 RECOMMENDATIONS

1. The present system of filling the forms of the monitoring app (developed by the GOI), by the supportive supervision team, on the Anand Divas, can be further improved. The final check-lists (100 point) submitted by them, can be collated to generate gaps, and action points. The system for follow-up on action taken on gaps identified, should be strengthened.
2. It is recommended to develop a two-way feedback loop for registering complaints related to maintenance of Cold Chain equipment. And a reference number/unique ID should be generated and received to both the maintenance partner (AOV International Limited) and the technician who registers the complaint. This will help in continuous tracking of the status of complaint registered and the duration it takes to resolve the issue. It will also play an important role in removing any discrepancies occurring at any stage of maintenance.
3. The supply system of Rotavirus vaccine needs to be reviewed thoroughly, as the supply of vaccine in VVM stage II (as happening presently), could impact the vaccine's potency.
4. CCM Recording and tracking needs to be made more robust to ensure sustainability.
5. VCCH/ ANMs/ASHAs need to be re-trained for clear reading of VVM 2 and to check, similar sensitive VVMs, to make sure before use, that the vaccine is in usable condition. Otherwise, it needs to be discarded.
6. Maintaining the cold chain is zero fault protocol, therefore all the VCCH/ANMs/ASHAs should be thoroughly trained for usage of ice packs even at

session sites to ensure vaccine potency and delivery of high-quality vaccine avoiding vaccine wastage.

7. As per guidelines, non-working parts of CCE can only be replaced by original brand's part. It is suggested that in case existing CCE models being used are out of making and no original parts are available in market, it should be allowed to use spare parts from generic models and bring the CCE back to use immediately. This will reduce the response time for maintenance, extra expenditures on Branded parts, and any penalties on maintenance partners due to exceeding response time. The present system, and its loopholes need to be reviewed thoroughly.

GLIMPSE FROM THE FIELD

Figure:1



Rotavirus vaccine VVM



Open vial storing box



VVM stages



Old vaccine carrier box



Freeze free vaccine carrier box



Vaccine carrier boxes after return



Walk in cooler



Thermometer in WIC



Walk in freezer

Figure: 2

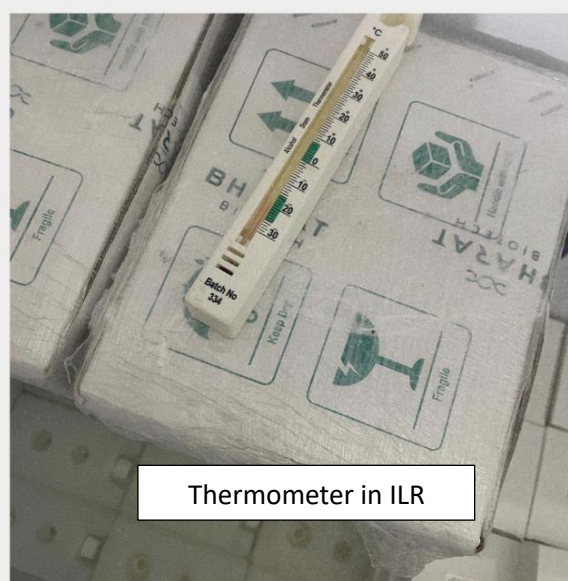
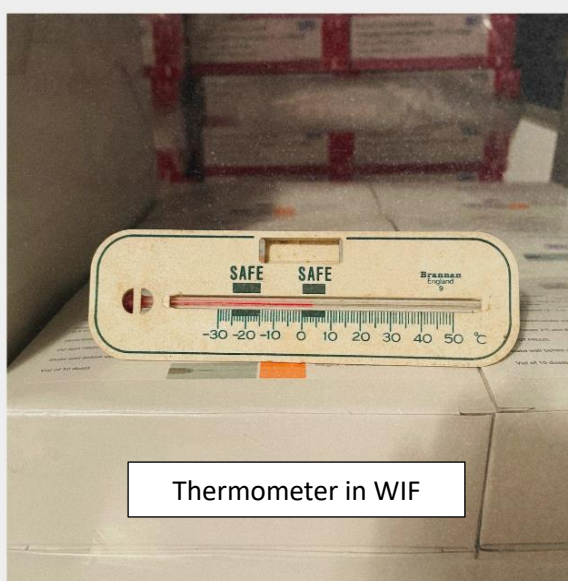
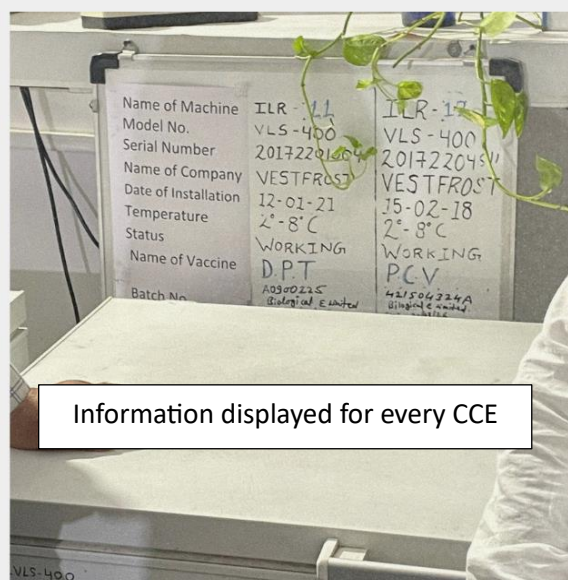
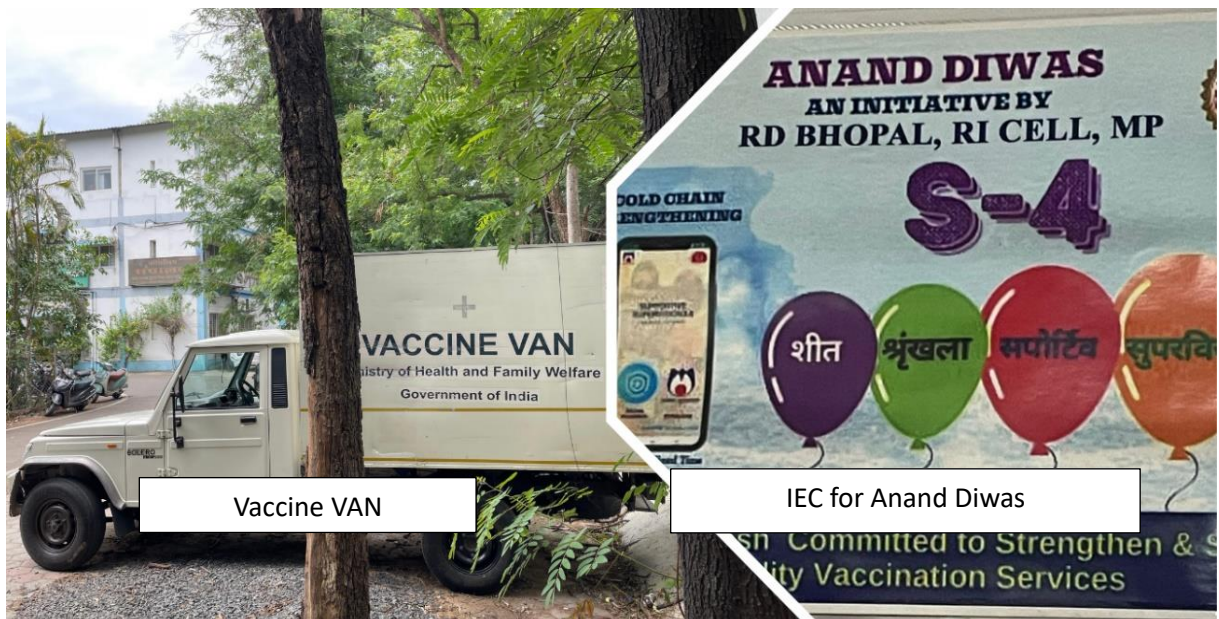


Figure:3

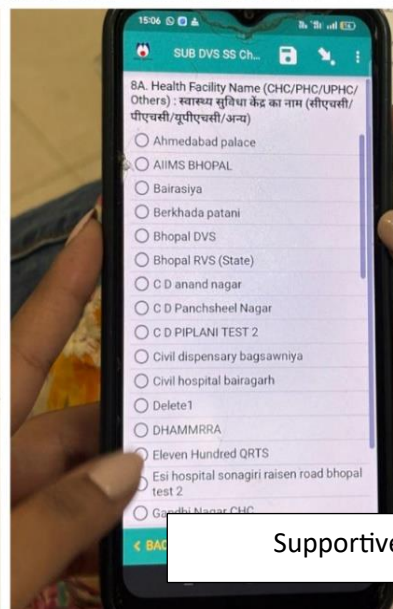


Vaccine VAN

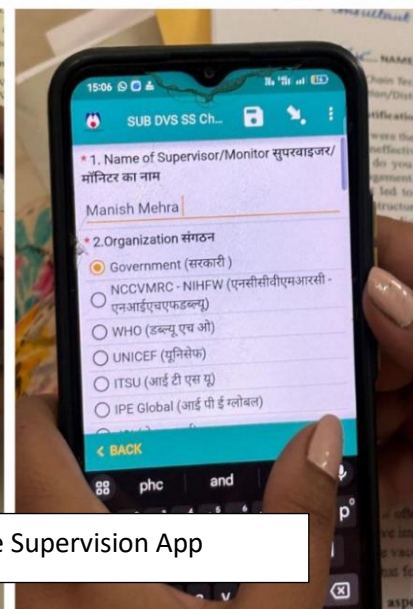
IEC for Anand Diwas



Freeze tag WIF



Supportive Supervision App



Dry Store



Loggers for continuous temperature monitoring

CHAPTER 7: REFERENCES

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ANNEXURES

ANNEXURE A

Checklist I

Anand Diwas – Cold Chain Vaccine Management

State: Madhya Pradesh

Date of Visit: _____ Facility Name: _____

Block: _____

PART A: Demographic Details of Respondent

- Name: _____
- Age: _____
- Gender: ☐ Male ☐ Female ☐ Other
- Designation: _____
- Years of Experience: _____ Years
- Did you receive any In-Service Training on Cold Chain? ☐ Yes ☐ No
- Do you have knowledge of Cold Chain Guidelines? ☐ Yes ☐ No
- Did you receive any Supportive Supervision in Last 6 Months: ☐ Yes ☐ No
- What type of Fridge is used? ☐ ILR ☐ Deep Freezer ☐ Both ☐ Other:

PART B: Knowledge Assessment- Source of information.....

S. No.	Question	Response (✓/X)
1	Are you aware that vaccines are sensitive to heat?	
2	Are you aware that vaccines are sensitive to light?	
3	Are you aware that vaccines are sensitive to freezing?	
4	What is the Ideal temperature range for vaccine storage (2°C to 8°C)?	

S. No.	Question	Response (✓/X)
5	What action should be taken when VVM is darker than outer circle, should vaccine be discarded?	
6	do you know how to perform a shake test?	
7	Do you know the Time of use after reconstituting vaccines?	

PART C: Infrastructure Assessment

Table 1: Cold Chain Infrastructure

Parameter	Yes	No	Remarks
Is there any Dedicated cold chain room at the facility?	☐	☐	
Is there any Dedicated dry storage area at the facility?	☐	☐	
Is there dedicated Icepack conditioning table?	☐	☐	
Are Clean clothes for wiping icepacks after conditioning available?	☐	☐	
Is there a uninterrupted supply of electricity?			Duration
Is Power backup available in the facility?	☐	☐	

Table 2: Storage & Handling Practices

Parameter	Yes	No	Remarks
Is there separate Functional thermometer in all equipment?	☐	☐	

Parameter	Yes	No	Remarks
Is cold chain Equipment placed on wooden blocks?	☐	☐	
Is cold chain equipment placed at ≥ 10 cm gap from wall and adjacent equipment?	☐	☐	
Are all equipment Connected to voltage stabilizer?	☐	☐	
Is Temp log book being maintained?	☐	☐	
Is Temp recorded twice daily?	☐	☐	
Is temperature Recorded on Sundays/holidays too?	☐	☐	
Is there any Power failure & defrosting records?	☐	☐	
Was there any DIO review in last 3 months?	☐	☐	

Vaccine-Specific Check

Parameter	Yes	No	Remarks
Are labels readable on vials?	☐	☐	
Are vaccines found with expiry date?	☐	☐	
Do all vaccines have VVM usable? (I/II)	☐	☐	
Are Any vials found in frozen condition?	☐	☐	
Are there any Open vials stored in ILR?	☐	☐	
Are open Vials stored in separate zipper box?	☐	☐	

Parameter	Yes	No	Remarks
Is Opening time/date marked on the vials?	☐	☐	
are Open vial used within 28 days of opening?	☐	☐	

Cold Chain Handler Knowledge

Area	Response (Yes/No)	Comments
Can you correctly identify and explain VVM interpretation?	☐ Yes ☐ No	
Can you demonstrate the Shake test process?	☐ Yes ☐ No	
Are you aware of Cold chain prayer?	☐ Yes ☐ No	
Do you know the time limit for using reconstituting vaccine?	☐ Yes ☐ No	
Do you know when to place Diluents placement in ILR?	☐ Yes ☐ No	
Can you identify which Vaccines requires diluents?	☐ Yes ☐ No	
Are you aware of Open vial policy?	☐ Yes ☐ No	

PART D: Site-Level Observations

Indicator	Yes	No	Remarks
Is a Contingency plan for vaccine storage visibly displayed?	☐	☐	

Indicator	Yes	No	Remarks
Is an Updated micro plan available for CCP for FY available?	☐	☐	
Is Adequate space available for icepack conditioning?	☐	☐	
What is the level of Cleanliness of cold chain area?	☐ Poor ☐ Avg ☐ Good		

PART E: Specific to *Anand Diwas*

Indicator	Yes	No	Comments
How many <i>Anand Diwas</i> monitoring visits conducted in last 3 months?	☐	☐	
Have you Documented report of last <i>Anand Diwas</i> activity?	☐	☐	
What is the level of Engagement of community (ASHA, PRI members) (Lowest) 1 2 3 4 5 (highest)	☐	☐	
Are Beneficiaries aware of <i>Anand Diwas</i> ?	☐	☐	
Are Posters/banners displayed on <i>Anand Diwas</i> inside the premises?	☐	☐	
Is Digital reporting done on ANMOL/CoWIN/U-WIN/etc?	☐	☐	
Is there Correct demonstration of temp. reading by VCCH?	☐	☐	
Is Correct icepack conditioning demonstrated?	☐	☐	
Was Maintenance conducted by AMC/CCT in last 4 months?	☐	☐	

Indicator	Yes	No	Comments
Is Weekly/daily maintenance check by VCCH conducted?	☐	☐	

PART F: Qualitative Notes

- **Overall experience post initiative**

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- **Challenges faced by staff during *Anand Diwas* activities:**

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- **Suggestions given by field staff for improvement:**

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- **Team Observations/Insights:**

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ANNEXURE B

Detail Checklist II

Problem identification

1. What were the main issues in cold chain and vaccine handling before *Anand Diwas*?
2. Was ineffective vaccine delivery due to poor storage or handling a frequent issue?
3. Why do you feel there was a need of regular supportive supervision in cold chain management process?
4. What led to the understanding of gaps in supportive supervision, training, storage, infrastructure and cold chain maintenance?
5. What indicators suggested that these gaps were directly impacting the routine immunization program?
6. What were the gaps in monitoring and supervision?

Program design

1. How was *Anand Diwas* initiated and how was it conceptualized?
2. What objectives were set to implement *Anand Diwas*?
3. Was there any training or orientation given to staff/VCCH?
4. What kind of training/orientation was given to staff?
5. What activities are carried out on *Anand Diwas*?
6. Who all participate in the monitoring visits?
7. What checklist/tools are used?

Program outputs and outcomes

1. What changes have occurred in cold chain functioning?
2. How often are gaps rectified now?
3. Have immunization coverage rates improved post *Anand Diwas*?
4. Are vaccines now considered more reliable by staff?
5. What feedback has been received from field workers?

Financial aspects; initial investment and present and long-term costs

1. Was there an initial investment to roll out *Anand Diwas*?
2. Are there any recurring costs?
3. How is it being financially sustained?

Present status, mechanisms, process continued and pathways for future

1. Is the initiative being conducted regularly across all cold chain points?
2. How is data recorded, reported, reviewed?
3. Are there feedback mechanisms?
4. Are there any plans to expand or modify *Anand Diwas*?
5. What additional support or resources are needed?

Key learnings from the program and its scalability at district, state and national level

1. What are the most successful components of the initiative?
2. How can this model be replicated in the other states?
3. What adaptations might be necessary for wider implementations?