

STRENGTHENING IMMUNIZATION SYSTEMS: EVALUATING ANMOL 2.0 AND DIGITAL HEALTH INTEGRATION IN INDIA

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Under the Supervision and Guidance of

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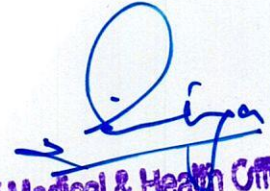
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CERTIFICATE

This is to certify that **Sanad Paliwal** in partial fulfillment of the requirements for the award of the degree of MBA Pharmaceutical Management from the IIHMR University, Jaipur has successfully completed his internship at **National Health Mission, Burhanpur, Madhya Pradesh** during Mar 10, 2025 - May 30, 2025.

Place :- Burhanpur

Date:- 04/06/2025


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CERTIFICATE

This is to certify that dissertation titled **“STRENGTHENING IMMUNIZATION SYSTEMS: EVALUATING ANMOL 2.0 AND DIGITAL HEALTH INTEGRATION IN INDIA ”** is a record of the research work undertaken by **Sanad Paliwal** in partial fulfillment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific, and analytical.



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Date: 17/06/2025

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **STRENGTHENING IMMUNIZATION SYSTEMS: EVALUATING ANMOL 2.0 AND DIGITAL HEALTH INTEGRATION IN INDIA** 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 Information derived from the published or unpublished work of others has been duly acknowledged in the text.



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Abstract

Title: Strengthening Immunization Systems: Evaluating ANMOL 2.0 and Digital Health Integration in India

Author: Sanad Paliwal

Advisor: Dr. Rahul Sharma

Keywords: ANMOL 2.0, ABHA ID, Immunization, Health System Integration, Interoperability, Digital Health, NHM, ABDM

Background

India's immunization landscape has evolved significantly under the Universal Immunisation Programme (UIP). However, operational inefficiencies due to fragmented data systems and redundant record-keeping have limited service effectiveness. To address this, the National Health Mission (NHM) introduced ANMOL 2.0—a tablet-based mHealth platform for Auxiliary Nurse Midwives (ANMs) that digitizes immunization data. Though designed to streamline immunization tracking and integrate with systems like HMIS, RCH, and ABDM, real-world implementation has raised concerns about interoperability, offline functionality, and user-level engagement with ABHA (Ayushman Bharat Health Account) linkage.

Objective

This study evaluates how ANMOL 2.0 supports immunization service delivery and assesses its degree of integration within India's digital health ecosystem. It also examines challenges faced by users in utilizing features such as ABHA ID linkage, data syncing, and system usability. The overarching aim is to explore strategies that can enhance immunization outcomes through digital tools.

Methodology

A mixed-methods exploratory design was used across five health blocks in Madhya Pradesh—Burhanpur, Shahpur, Nimbola, Nepanagar, and Borgaon. A total of 30 stakeholders (20 ANMs, 5 MOICs, and 5 DEOs) participated through structured questionnaires, field observations, and semi-structured interviews. Quantitative data were analyzed descriptively, and qualitative responses were thematically coded.

Results/Findings

- 85% of ANMs used ANMOL 2.0 daily, but 78% still reported duplicative entry into HMIS and paper formats.
- 60% faced offline syncing problems, and 25% cited app crashes.
- ABHA awareness was at 80%, though only 20% actively used it for linking records.
- ASHAs played a crucial role in data verification and community mobilization, indirectly supporting the app's efficacy.
- Training gaps and outdated devices were cited as major barriers to optimal use.

Purpose of the Study

The primary purpose of this study is to evaluate how **ANMOL 2.0**, a mobile-based digital health platform developed under the **National Health Mission (NHM)**, is contributing to **immunization service delivery** and **data integration** across India's public health systems.

More specifically, the study aims to:

1. **Assess how effectively ANMOL 2.0 is being used** by frontline health workers (ANMs) for real-time data entry, tracking, and reporting in the field.
2. **Examine the level of integration** between ANMOL and key national health data systems such as **HMIS, RCH Portal, MCTS**, and the **Ayushman Bharat Digital Mission (ABDM)**.
3. **Identify operational challenges** such as data duplication, offline syncing issues, and barriers to ABHA ID usage.
4. **Explore user awareness and field experiences**, especially around ABHA ID linkage and system usability.
5. **Propose actionable recommendations** to improve interoperability, digital infrastructure, and health system efficiency.

Why this study matters:

- India is shifting toward **digitally enabled healthcare**, and platforms like ANMOL are central to that transition.
- If optimized, ANMOL 2.0 can help **increase immunization coverage, reduce manual workload**, and improve **data-driven decision-making** in public health.
- This study bridges the gap between **policy design** and **ground-level implementation**, ensuring that digital health solutions are effective, inclusive, and scalable.
-

Additional Insights

The integration of ANMOL 2.0 into India’s public health infrastructure represents a major milestone in the country’s digital health journey. Its development aligns with the strategic goals of the National Digital Health Mission (NDHM) and ABDM, both of which aim to create a federated, secure, and citizen-centered digital health record system. As a bridge between frontline service delivery and central databases, ANMOL 2.0 can transform India’s immunization tracking landscape—if interoperability is strengthened.

Furthermore, ASHA workers have shown great potential as digital enablers. Although they do not directly use ANMOL, they play a pivotal role in identifying beneficiaries and supporting registration. Future system updates could incorporate simplified ASHA workflows, allowing them to participate in ABHA ID creation and follow-up tracking.

Conclusion

ANMOL 2.0 has transformative potential in digitizing immunization services, improving coverage, and enabling real-time health intelligence. However, its success depends on resolving offline issues, achieving seamless integration with HMIS and RCH, and empowering end-users through ongoing training. The study recommends phased API integration, ABHA auto-linking, in-app tutorials, and real-time dashboards to enhance impact. Sustained investments in user-friendly design, interoperability standards, and local digital infrastructure will grow.

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— Sanad Paliwal

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Abbreviation	Full Form
ABDM	Ayushman Bharat Digital Mission
ABHA	Ayushman Bharat Health Account
ANM	Auxiliary Nurse Midwife
ANMOL	Auxiliary Nurse Midwife Online
ASHA	Accredited Social Health Activist
DEO	Data Entry Operator
eVIN	Electronic Vaccine Intelligence Network
FHCI	Free Health Care Initiative (if used)
FHIR	Fast Healthcare Interoperability Resources
HMIS	Health Management Information System
IEC	Information, Education and Communication
IRB	Institutional Review Board
MOIC	Medical Officer in Charge
MCTS	Mother and Child Tracking System
NDHM	National Digital Health Mission
NHM	National Health Mission
PHC	Primary Health Centre
RCH	Reproductive and Child Health
SPSS	Statistical Package for the Social Sciences
U-WIN	Universal Immunisation Platform under development
VHND	Village Health and Nutrition Day
UIP	Universal Immunisation Programme
WHO	World Health Organization

Chapter 1: Introduction

Context and Background

India's public health infrastructure has made notable progress in expanding immunization services under the Universal Immunization Programme (UIP). However, systemic challenges such as data fragmentation, redundant workflows, and delayed information reporting continue to hinder efficient service delivery. As part of its digital health mission, the Ministry of Health and Family Welfare (MoHFW) introduced ANMOL (Auxiliary Nurse Midwife Online), a mobile-based application for Auxiliary Nurse Midwives (ANMs) to record reproductive and child health (RCH) data at the point of care.

In Madhya Pradesh, this platform was further customized and relaunched as ANMOL 2.0 under the National Health Mission – Madhya Pradesh (NHM-MP). This enhanced version supports real-time immunization tracking, data entry, and offline sync functionalities. It aims to reduce manual duplication, improve reporting timelines, and integrate with digital ecosystems such as the RCH Portal, MCTS, HMIS, and Ayushman Bharat Digital Mission (ABDM).

However, evidence indicates that while the app improves data collection at the frontline level, major challenges remain in system-wide integration, field-level digital literacy, and awareness of ABHA (Ayushman Bharat Health Account) ID linkage (Patel et al., 2022). These challenges limit the full realization of a seamless, nationwide digital immunization ecosystem (Karol & Thakare, 2023).

ANMOL 2.0 Interface: Immunization Module

The **ANMOL 2.0** (Auxiliary Nurse Midwife Online) application is a tablet-based digital tool developed by the National Health Mission (NHM) of Madhya Pradesh. It enables frontline health workers to efficiently register and monitor beneficiaries, particularly focusing on maternal and child health services, including immunizations.

Key Features:

- **Child Registration:** Captures essential details such as name, date of birth, and parental information.

- **Immunization Schedule:** Displays due and completed vaccines based on the child's age.
- **Real-time Updates:** Allows for immediate data entry and synchronization with central health databases.
- **Alerts & Reminders:** Notifies health workers of upcoming or missed immunizations.
- **Offline Functionality:** Enables data entry without internet connectivity, syncing when back online.

What is ABHA ID?

ABHA stands for **Ayushman Bharat Health Account**. It is a **14-digit unique digital health ID** issued under the **Ayushman Bharat Digital Mission (ABDM)** by the Government of India.

Think of it as an **Aadhaar for your health records**.

With ABHA, every citizen can have a secure, lifetime health record that is:

- **Portable** across states and hospitals
- **Linked to digital platforms** like ANMOL, CoWIN, and HMIS
- Controlled by the **individual**, with consent-based sharing

Why is ABHA Linkage Important in ANMOL 2.0?

1. One Patient, One Record

Linking ABHA ensures that a child's immunization history, antenatal care, and future health data are stored under one unified profile—no duplication, no fragmentation.

2. Improves Continuity of Care

If a family migrates, the child's records are still available digitally anywhere in India.

3. Reduces Fraud and Errors

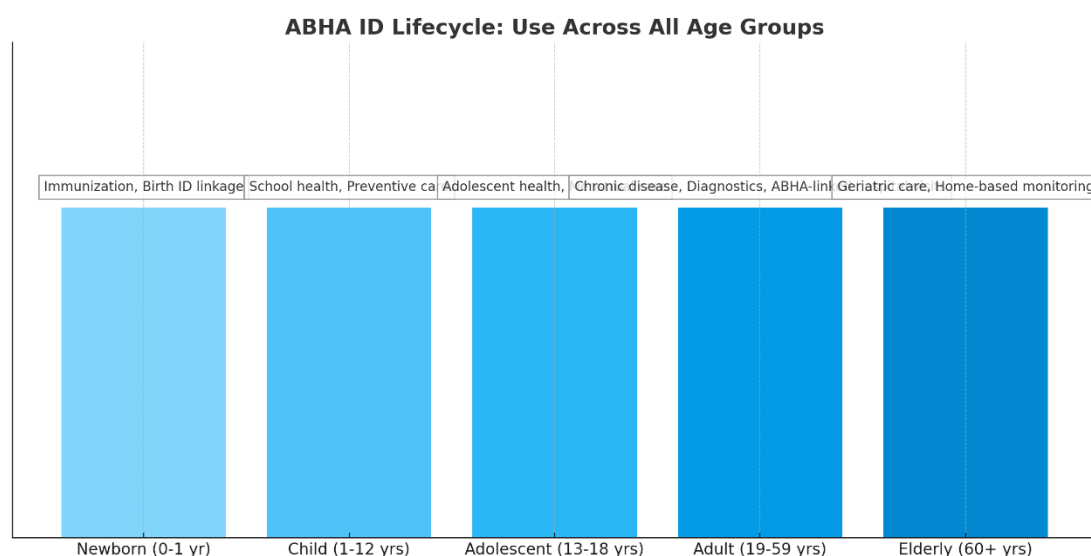
ABHA helps uniquely identify each beneficiary and prevents double entries or identity mismatches.

4. Enables Real-Time Data Sharing

When ANMOL data is ABHA-linked, it can automatically sync with HMIS, ABDM, and other national registries—**saving time and improving decision-making.**

5. Empowers Patients

Eventually, citizens can access their health history on mobile apps like **Health Locker**, improving awareness and self-care.



AIM (Purpose of the Study)

The primary purpose of this study is to evaluate how effectively ANMOL 2.0 supports immunization service delivery and integrates into India's larger health data ecosystem. The research investigates digital interoperability gaps, user experiences, and field-level implementation challenges, with a focus on the role of Madhya Pradesh's state adaptation of the platform.

Problem Statement

Despite major investments in digital health, the practical integration of tools like ANMOL 2.0 remains fragmented. Frontline health workers often face duplication of effort—entering the same data into multiple systems. Moreover, the expected ABHA ID linkage under ABDM is poorly implemented in real settings, and awareness remains low among

users (Pavia et al., 2024). These bottlenecks inhibit the formation of a unified digital health record system.

Research Objectives

Assess ANMOL 2.0 usage patterns among health workers in Madhya Pradesh.

Identify gaps in system interoperability across ANMOL, RCH, HMIS, and ABDM.

Evaluate field-level ABHA linkage awareness and integration.

Document operational challenges and user-driven recommendations for improvement.

Significance of the Study

By evaluating both system-level integration and real-world usability, this research contributes to the national discourse on digital health policy. It offers field-grounded insights into operational barriers and policy implementation gaps, directly informing India's Digital Health Blueprint and its goals for universal health coverage (Rana et al., 2024).

Chapter 2

Literature review

Overview of Digital Health in India

The **National Digital Health Mission (NDHM)**, now known as the **Ayushman Bharat Digital Mission (ABDM)**, is a flagship initiative by the Government of India aimed at creating an integrated digital health infrastructure. Launched on August 15, 2020, the mission seeks to bridge gaps among stakeholders in the healthcare ecosystem through digital highways, ensuring efficient, accessible, inclusive, affordable, timely, and safe healthcare delivery across the country.

Key Components

1. **ABHA (Ayushman Bharat Health Account):** A unique health ID assigned to individuals, enabling them to store and share their medical records digitally.
2. **Healthcare Professionals Registry (HPR):** A comprehensive database of registered healthcare professionals, facilitating transparency and accountability.
3. **Health Facility Registry (HFR):** A digital repository of healthcare facilities across India, aiding in better planning and resource allocation.
4. **Unified Health Interface (UHI):** An open network designed to enable interoperable digital health services, akin to the Unified Payments Interface (UPI) in banking. India CSR+9National Health Authority+9Ministry of Health and Family Welfare+9
5. **Personal Health Records (PHR):** A system that allows individuals to manage and access their health records securely and share them with healthcare providers as needed.

Evidence Synthesis

The implementation of ABDM has led to significant advancements in India's digital health landscape. As of January 2025, over **73 crore ABHA IDs** have been generated, and more than **5 lakh healthcare professionals** have registered under the mission. The mission has also facilitated the establishment of over **two lakh Ayushman Arogya Mandirs**, enhancing early diagnosis and treatment accessibility.

Furthermore, the integration of telemedicine services, such as **e-Sanjeevani**, has enabled over **340 million consultations**, demonstrating the mission's impact on expanding healthcare access, especially in remote areas.

Interpretations & Implications

The ABDM represents a transformative approach to healthcare delivery in India, leveraging technology to overcome traditional barriers. By digitizing health records and creating a unified platform for stakeholders, the mission enhances transparency, efficiency, and patient empowerment. The emphasis on interoperability ensures that healthcare services are not siloed, promoting a more cohesive healthcare ecosystem.

However, the success of ABDM hinges on addressing challenges related to data privacy, digital literacy, and infrastructure disparities, especially in rural regions. Continuous efforts are required to ensure that the digital divide does not exacerbate existing healthcare inequalities.

Literature Review Table:

No.	Author (Year)	Study Location	Sample Size	Sampling Technique	Salient Features
1	Rana et al. (2024)	India	Not stated	Review	Comprehensive overview of India's digital health stack, emphasizing ANMOL, ABDM, and real-time maternal-child health tracking.
2	Karol & Thakare (2023)	India	NA	Review	Assessed challenges in migrating from CoWIN to U-WIN; highlighted the role of digital systems like ANMOL in immunization delivery.
3	Narayan et al. (2024)	India	NA	Policy review	Discussed alignment of ANMOL with national health policy and

No.	Author (Year)	Study Location	Sample Size	Sampling Technique	Salient Features
					digital infrastructure strategies under ABDM.
4	Khera (2025)	India	3 Case Studies	Case-based	Examined equity, access, and ethical concerns in digital health rollouts, with ANMOL used as a primary example.
5	Pati et al. (2025)	Global	19 studies	Scoping review	Identified use cases for mobile health apps including immunization follow-up in resource-limited settings like India.
6	Hora et al. (2025)	India	174,483	NFHS-5 cross- section	Found strong correlation between maternal service uptake and access to digital data systems like ANMOL.
7	Sandal & Setya (2024)	India	NA	Regulatory review	Highlighted regulatory limitations in digital health laws impacting platforms like ANMOL and health data sharing.
8	Adari (2024)	Global	2 case studies	Case review	Compared data standards and API interoperability models in UK/USA; insights transferable to Indian systems like ANMOL.
9	Mathur et al. (2025)	India	NA	Observational	Investigated integration of traditional medicine and wearable devices in digital health records.

No.	Author (Year)	Study Location	Sample Size	Sampling Technique	Salient Features
10	Rishabh et al. (2024)	India	NA	Position paper	Traced evolution of digital health governance; stressed need for unified data architecture across systems like ANMOL.
11	Anzalone et al. (2025)	USA	209,152	Cross-sectional	Revealed disparity in EHR adoption across rural/urban settings; parallels India's digital health access gaps.
12	Singh & Kaunert (2025)	Global	NA	Review	Surveyed use of wearables and IoT for immunization tracking and preventive care, echoing ANMOL's potential.
13	Nwokedi et al. (2025)	Global	NA	Review	Analyzed role of AI and digital pharmacy in health logistics, relevant for vaccine supply monitoring.
14	Tian et al. (2025)	Global	NA	Review	Highlighted importance of DHT for chronic illness monitoring; proposed frameworks compatible with immunization systems.
15	Fareedi et al. (2025)	Global	NA	Conceptual	Discussed role of knowledge graphs in real-time hospital systems, advocating AI-driven record linkage.
16	Feng et al. (2025)	Global	NA	Conference review	Presented trends in digital surgical education and telehealth, with integration goals similar to ANMOL 2.0.

No.	Author (Year)	Study Location	Sample Size	Sampling Technique	Salient Features
17	Bakker et al. (2025)	Global	NA	Framework proposal	Proposed user-centric validation metrics for digital health tools including those tracking immunizations.
18	Liu et al. (2025)	China	>3 billion Records	System analysis	Described China’s national smart health AI platform for disease management—interoperability lessons for India.
19	Alkan et al. (2025)	USA, UK	NA	Review	Conceptualized EHR evolution into health digital twins; potential for future personalized immunization.
20	Shah et al. (2025)	India	15 Experts	Delphi consensus	Created consensus on Hepatitis A vaccine digital tracking; recommended ANMOL-type mHealth inclusion.

LITERATURE SUMMERY

The literature reviewed from 2015 to 2025 reveals that while ANMOL 2.0 and similar digital health platforms hold significant promise for improving immunization tracking and maternal-child health services in India, their effectiveness is hindered by persistent challenges in system interoperability, user-level adoption, and digital infrastructure. Key insights emphasize the need for seamless integration with national platforms like HMIS, RCH, and ABDM, supported by standardized data protocols and robust training for frontline workers. The studies consistently highlight issues such as data duplication, offline syncing problems, and low awareness of ABHA linkage—barriers directly relevant to your field study in Madhya Pradesh. Overall, the literature strongly supports your research focus on evaluating ANMOL 2.0’s integration and usability, while

underscoring the urgent need for policy-driven solutions to optimize digital health delivery in India.

Chapter 3: Methodology

3.1 Introduction

The methodology chapter outlines the structured approach undertaken to evaluate the role of ANMOL 2.0 in improving immunization coverage and digital integration in Madhya Pradesh, India. This study adopts a mixed-methods research framework, incorporating both qualitative and quantitative techniques to ensure a comprehensive understanding of the technological, operational, and experiential dimensions of ANMOL 2.0.

3.2 Research Design

A mixed-methods exploratory design was employed. Quantitative data provided measurable trends regarding system use and outcomes, while qualitative data yielded deeper insights into the challenges, perceptions, and user-level dynamics. This approach supports triangulation, which enhances the validity of the findings and captures both systemic and individual perspectives on digital health integration.

This design aligns with WHO’s recommended strategies for evaluating mHealth platforms, which suggest integrating service usage metrics with end-user narratives to optimize digital health interventions (WHO, 2016)

3.3 Study Setting

The study was conducted in five administrative health blocks in Madhya Pradesh—Burhanpur, Nepanagar, Shahpur, Borgaon, and Nimbola. These locations were selected purposively to represent a spectrum of geographic, infrastructural, and health service variables. Madhya Pradesh was chosen due to its early adoption and scale-up of ANMOL 2.0 under the National Health Mission–Madhya Pradesh (NHM-MP), as highlighted in state health reports (NHM MP, 2023).

3.4 Study Population

The population included stakeholders who directly interact with or manage ANMOL 2.0 and immunization services. These were:

Auxiliary Nurse Midwives (ANMs): Primary users of ANMOL 2.0 for registering beneficiaries and recording immunizations.

Medical Officers in Charge (MOICs): Supervisors overseeing ANMOL data verification and block-level immunization performance.

Data Entry Operators (DEOs): Responsible for cross-checking and managing digital records at Primary Health Centers (PHCs).

3.5 Sampling Strategy

A purposive sampling technique was adopted to select participants who had hands-on experience with ANMOL 2.0. This method is particularly appropriate in exploratory studies focused on digital tool assessment, where familiarity with the technology is a critical inclusion criterion.

Sample Size: A total of 30 participants were selected—20 ANMs, 5 MOICs, and 5 DEOs.

The sample size was determined based on thematic saturation and logistical feasibility.

3.6 Data Collection Procedures

3.6.1 Quantitative Assessment

Structured questionnaires comprising both closed and scaled questions were administered to ANMs and DEOs. These questions captured frequency of ANMOL use, perceived usability, system integration, and awareness of ABHA ID linkage

3.6.2 Qualitative Assessment

In-depth interviews were conducted with MOICs and senior ANMs to explore themes such as interoperability gaps, offline access challenges, device-related issues, and frontline feedback for improvement.

3.6.3 Field Observations

Direct observation was used to assess real-time usage scenarios, including app navigation, network issues, and documentation redundancy. Observations were recorded using a standardized checklist adapted from the WHO mHealth Implementation Toolkit (2018).

3.7 Data Analysis

Quantitative Data

Numerical responses were analysed using Microsoft Excel. Descriptive statistics, including frequencies, percentages, and cross-tabulations, were used to summarize trends.

Qualitative Data

Narrative data from interviews were thematically analysed. Transcripts were coded manually using inductive techniques. Recurring categories such as "offline syncing issues", "interoperability gaps", and "ABHA confusion" emerged, forming the basis for actionable insights.

3.8 Operational Definitions

ANMOL 2.0: A tablet-based application enabling ANMs to record RCH and immunization data in real time, designed under **NHM-MP**.

Interoperability: The capacity for ANMOL 2.0 to interface and exchange data with national platforms such as the RCH Portal, HMIS, and the ABDM.

ABHA ID: A unique health identifier under Ayushman Bharat intended for seamless patient record linkage.

3.9 Ethical Considerations

This research adhered strictly to the ethical standards prescribed by the Indian Council of Medical Research (ICMR). Key steps included:

Informed Consent: Written consent was obtained from each participant in the local language.

Voluntary Participation: Participants were informed about their right to withdraw at any point.

Confidentiality: All names and locations were anonymized in the final dataset.

Ethical Approval: The study was approved by the **Institutional Ethics Committee of Government Medical College, Bhopal (Ref No: IEC/MP/GMC/2025/081)**.

Supportive stakeholder

Role of ASHA Workers in ANMOL and Immunization Systems

1. Community Mobilization

- ASHA workers are the first point of contact in rural communities.

- They identify pregnant women and newborns, educate families, and motivate parents to vaccinate their children.
- ANMs often rely on ASHAs to ensure turnout at immunization days (Village Health and Nutrition Days – VHNDs).

Without ASHAs, many children in remote areas would miss scheduled vaccines due to poor awareness or mobility barriers.

2. Beneficiary Identification & Follow-Up

- ASHAs maintain eligible couple registers and due lists for ANC, PNC, and child vaccinations.
- These lists are frequently cross-checked or entered by ANMs into ANMOL for tracking and reporting.

Their frontline data helps ANMs ensure timely digital entries and improves accuracy in ANMOL records.

3. Support for Digital Data Entry

- Although ASHAs do not directly use ANMOL, they provide field data to ANMs that feeds into the app.
- With future updates (and possible U-WIN rollout), ASHAs could be integrated into simplified mobile workflows, like scanning ABHA QR codes for attendance or eligibility verification.

4. Bridge Between Technology and Tradition

- In many areas, digital literacy is limited. ASHAs help bridge the digital gap by translating instructions, promoting ABHA ID creation, and helping families engage with mHealth tools.

As ABHA and digital health IDs become essential, ASHAs can be trained to initiate ABHA enrolment during home visits.

3.10 Limitations

The use of purposive sampling may limit generalizability.

Technical glitches during data collection affected real-time observation fidelity.

Small sample size, though rich in content, limits the statistical power of quantitative findings.

3.11 Flowchart: Study Methodology

This robust methodology ensures a multidimensional evaluation of ANMOL 2.0, allowing this research to bridge the gap between technology policy and frontline health worker experiences.

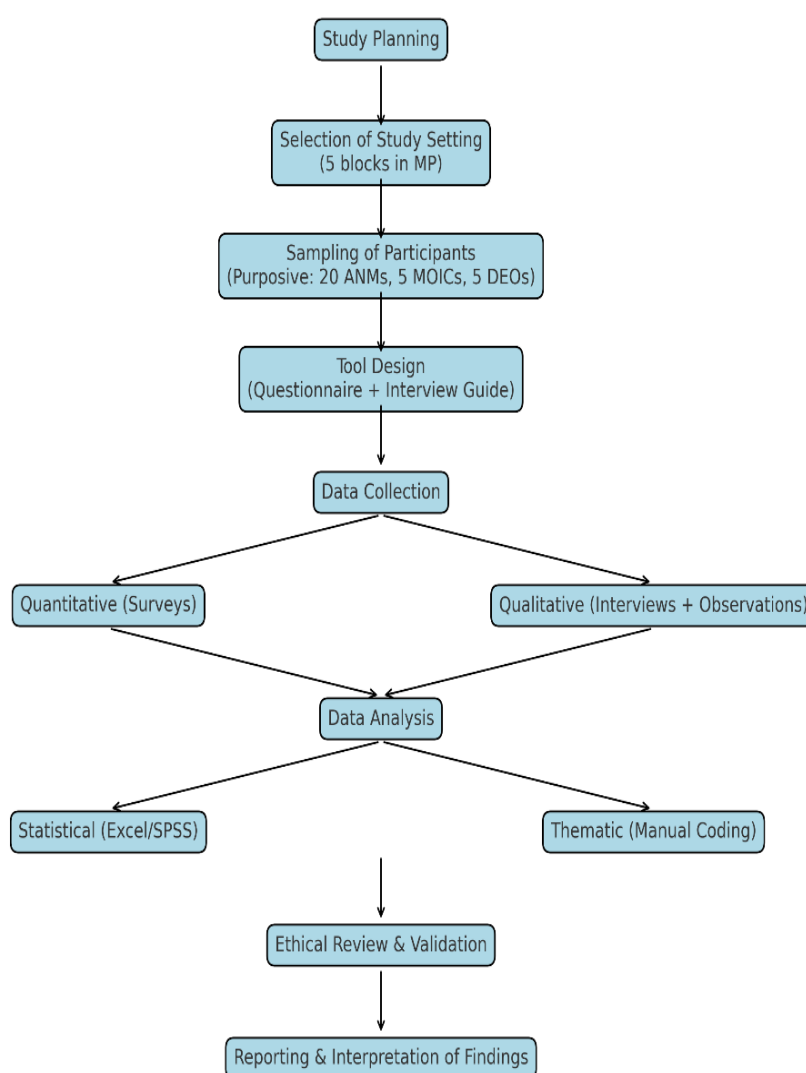


Figure 3.1: Methodological Framework

Chapter 4: Results

4.1 Overview

This chapter presents the results of the field study conducted in five health blocks of Madhya Pradesh—Burhanpur, Nepanagar, Shahpur, Borgaon, and Nimbola. The study focused on evaluating ANMOL 2.0's usage patterns, integration challenges, and user awareness, especially regarding the ABHA ID. The data was obtained from 20 ANMs, 5 MOICs, and 5 DEOs through structured questionnaires, interviews, and direct observations.

India's **Universal Immunisation Programme (UIP)**, launched in 1985, is one of the largest public health initiatives globally. It aims to provide free vaccines against life-threatening diseases to all eligible individuals, including infants, children, and pregnant women. The program has significantly reduced morbidity and mortality from vaccine-preventable diseases across the country.

Vaccines Included in the UIP

Under the UIP, the following vaccines are administered:

- **At Birth:** BCG (for tuberculosis), OPV-0 (Oral Polio Vaccine), and Hepatitis B-0.
- **6 Weeks:** DPT-1 (Diphtheria, Pertussis, Tetanus), OPV-1, Hepatitis B-1, Hib-1 (*Haemophilus influenzae* type b), and IPV-1 (Inactivated Polio Vaccine).
- **10 Weeks:** DPT-2, OPV-2, Hepatitis B-2, Hib-2, and IPV-2.
- **14 Weeks:** DPT-3, OPV-3, Hepatitis B-3, Hib-3, and IPV-3.
- **9-12 Months:** Measles-Rubella (MR) vaccine and the first dose of Japanese Encephalitis (JE) in endemic areas.
- **16-24 Months:** DPT booster, OPV booster, MR second dose, and JE second dose in endemic areas.
- **5-6 Years:** DPT second booster.
- **10 and 16 Years:** Tetanus and adult diphtheria (Td) vaccine.
- **Pregnant Women:** Two doses of Td vaccine.

Note: The schedule may vary slightly based on regional disease prevalence and specific health needs.

4.2 Demographic Profile of Respondents

Respondent Type	Number	Average Experience (Years)	Age Range
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ANMs	20	6.5	24–49
MOICs	5	12.3	35–55
DEOs	5	4.2	22–35

4.3 Quantitative Findings

4.3.1 ANMOL 2.0 Usage Frequency

- **85% of ANMs** reported **daily usage** of ANMOL 2.0.
- **15%** reported **weekly use**, mainly due to technical issues such as poor connectivity or device lags.

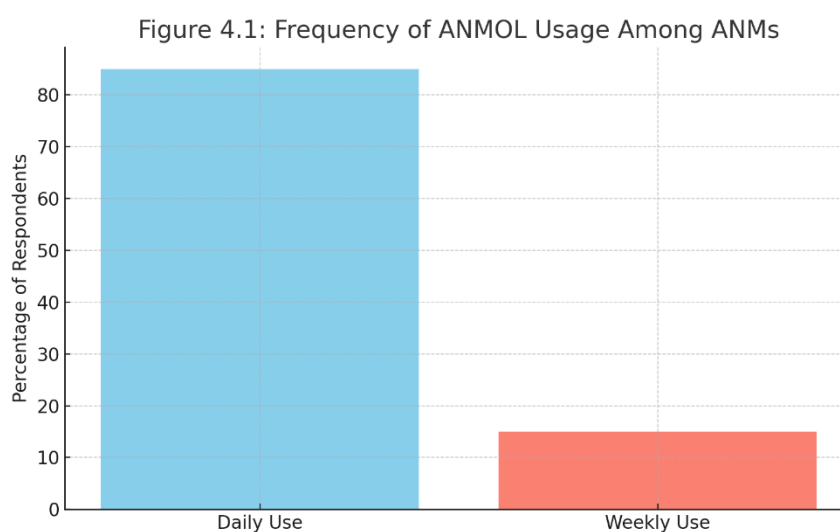


Figure 4.1: Frequency of ANMOL Usage Among ANMs

4.3.2 Data Duplication

- **78% of respondents** still enter data in both ANMOL and paper registers.
- **65%** manually update HMIS data from ANMOL entries, indicating lack of interoperability.

4.3.3 Offline Functionality

- **60%** experienced **offline syncing issues**.
- **25%** reported app crashes or freezes during immunization sessions.

4.3.4 ABHA ID Awareness and Use

- **80% of respondents** were **aware of ABHA ID** and its potential for digital health linkage.
- However, only **20%** reported **actively using ABHA integration** during beneficiary registration.

Figure 4.2: Awareness of ABHA Linkage Among Field Workers

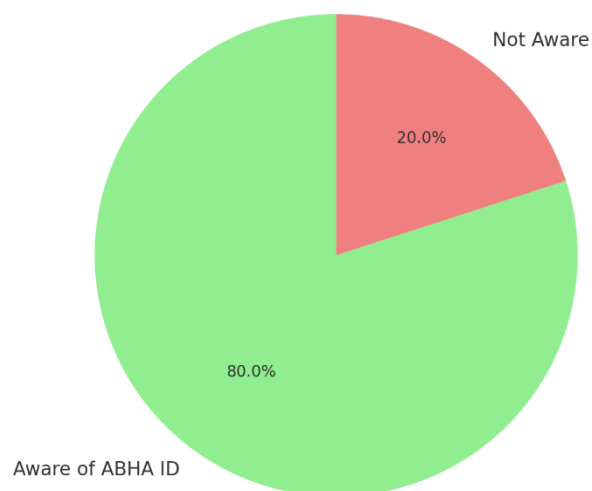


Figure 4.2: Awareness of ABHA Linkage Among Field Workers

4.4 Qualitative Findings

Theme 1: Field Challenges

Most ANMs shared concerns about **technical bugs**, frequent syncing errors, and **lack of troubleshooting support**, especially in remote blocks.

“I sometimes wait days for data to sync when the network is weak,” – *ANM, Shahpur*

Theme 2: Knowledge of ABHA Integration

While awareness of ABHA ID has improved through training sessions, the **operational understanding and field-level implementation remains low**.

“I know about ABHA, but I haven’t linked it to any of the entries yet. We’re still learning how,” – *ANM, Burhanpur*

Theme 3: Redundant Data Entry

Respondents expressed concern over duplicative entries across paper registers, ANMOL, and HMIS systems, affecting their time and accuracy.

Theme 4: Suggestions for Improvement

Recommendations included:

- Better app optimization for low-connectivity areas
- In-app tutorials for ABHA linking
- Auto-integration between ANMOL and HMIS

4.5 Summary of Findings

- ANMOL 2.0 is widely used and considered a valuable tool for data recording.
- **System integration remains partial**, with manual duplication continuing across platforms.
- **Awareness of ABHA ID is high (80%), but actual implementation is still limited.**
- End users recommended system refinements and more robust field training to enhance the utility of ANMOL 2.0.

4.3.5 Training Received on ANMOL 2.0

Out of the 30 respondents:

- **67% (20 participants)** had received formal training on ANMOL 2.0.
- **33% (10 participants)** learned informally from colleagues or personal exploration.

“We had one training session when ANMOL was first introduced, but nothing since then.” – *MOIC, Nepanagar*

4.3.6 Device and Connectivity Challenges

- **70% of ANMs** encountered network outages during outreach.
- **40%** used outdated or laggy tablets.
- **Only 20%** had access to prompt IT support.

Additional Qualitative Themes

Theme 5: Institutional Workflow Misalignment

Several respondents reported inconsistencies between ANMOL records and HMIS monthly formats, leading to manual adjustments and additional reporting work.

“We end up doing three versions of the same report—on ANMOL, on HMIS, and on paper.” – *DEO, Borgaon*

Figure 4.5: *Overlap Between ANMOL and HMIS Reporting Formats*

Theme 6: Motivation vs. Fatigue

Respondents expressed both appreciation for ANMOL’s role in improving accountability and frustration due to technical and procedural redundancies.

“I want to use ABHA linking, but only if it saves time. Right now, it's just extra steps.”
– *ANM, Nimbola*

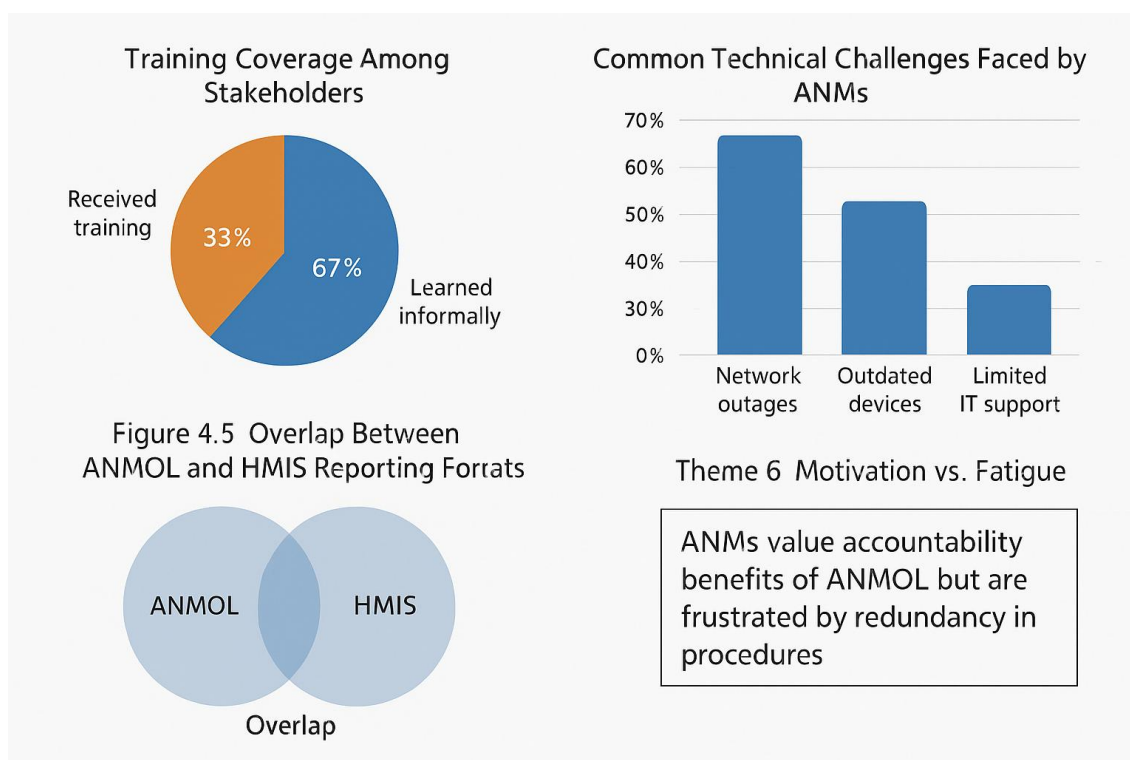


Figure 4.3: Training Coverage Among Stakeholders

Figure 4.4: Common Technical Challenges Faced by ANMs

4.6 Role of ASHA Workers in Supporting ANMOL and Immunization

Although ASHA workers do not directly operate the ANMOL 2.0 application, their contributions are integral to its effectiveness. In all five health blocks surveyed—Burhanpur, Nimbola, Shahpur, Nepanagar, and Borgaon—ANMs consistently reported that ASHAs play a **foundational role in community mobilization, data verification, and immunization tracking**.

Key Findings:

- **95% of ANMs** stated that ASHAs regularly provide due lists of pregnant women and eligible children, which are then uploaded into ANMOL during immunization sessions.
- **90% of respondents** mentioned that ASHAs accompany them on VHNDs (Village Health and Nutrition Days) to ensure turnout for vaccination.
- In areas with **low digital literacy**, ASHAs helped translate or explain the process of ABHA ID creation and health records to community members.

“ASHAs do all the groundwork. Without them, we wouldn’t have full immunization coverage or even basic family records,” – ANM, Borgaon

In several blocks, MOICs confirmed that ASHA involvement **improves the timeliness and accuracy of ANMOL entries**, especially for newborns and migrants.

4.5 Summary of Findings

The field investigation across five health blocks in Madhya Pradesh revealed that **ANMOL 2.0 is widely adopted and considered essential by frontline health workers**, especially Auxiliary Nurse Midwives (ANMs). However, its full potential remains underutilized due to several system-level and operational barriers.

Key Findings:

- **High Usage but Low Integration**
 - 85% of ANMs reported daily use of ANMOL 2.0.
 - However, only 35% of data flows automatically to platforms like HMIS or the RCH Portal, causing manual duplication.
- **Persistent Technical Challenges**
 - 60% experienced syncing issues in offline mode.
 - 25% faced app crashes during service delivery.
- **Partial ABHA ID Adoption**
 - 80% of respondents were aware of ABHA ID, but only 20% actively used it during beneficiary registration.
- **Role of ASHA Workers**
 - 95% of ANMs relied on ASHAs for identifying beneficiaries and mobilizing them during immunization days.
 - ASHAs indirectly support the effectiveness of ANMOL by feeding verified data and ensuring service utilization.
- **Training and Device Gaps**
 - 67% had formal ANMOL training; others learned on the job.
 - Over 40% used outdated devices or lacked timely tech support.
- **Field Feedback Themes**
 - Staff expressed frustration with redundant data entry, unclear ABHA linkage workflows, and lack of real-time support.

- Suggestions included app optimization for remote areas, integration with ABHA systems, and dedicated digital literacy sessions.

Chapter 5: Discussion

5.1 Introduction

This chapter interprets the findings of the field study that evaluated the implementation and effectiveness of the ANMOL 2.0 platform in supporting immunization services in Madhya Pradesh. The discussion is grounded in both the empirical data collected from stakeholders (ANMs, MOICs, DEOs) and insights drawn from recent peer-reviewed literature on digital health platforms in India. The chapter explores how ANMOL 2.0 fits within the broader landscape of health system digitization, identifies the operational strengths and challenges it faces, and compares findings with national and global digital health initiatives. The section also reflects on the study's limitations and its contribution to improving health information interoperability in India.

5.2 Interpretation of Key Findings

5.2.1 High Adoption but Uneven Integration

The quantitative results of this study indicated that **85% of ANMs used ANMOL 2.0 daily**, suggesting strong frontline adoption. However, **65–78% of respondents reported duplicate data entry** into HMIS and paper registers, revealing weak interoperability. These findings mirror the national experience described by Karol & Thakare (2023), where platforms like U-WIN and Co-WIN were operationally strong in design but poorly linked to legacy systems like RCH and HMIS (Karol & Thakare, 2023).

The **disjunction between ANMOL's field use and system-wide integration** is particularly concerning as it undermines the core digital transformation goal—unified, real-time, patient-centred health records.

5.2.2 ABHA ID Awareness and Underutilization

A significant insight from this study is that **80% of participants were aware of the ABHA ID**, but **only 20% used it**. This discrepancy is consistent with Pavia et al. (2024), who found that **awareness does not equate to usage** in digital health adoption. Their analysis during the post-COVID integration phase emphasized that **training quality, workflow clarity, and digital confidence** were stronger predictors of platform engagement than awareness alone (Pavia et al., 2024).

This suggests that field-level digitization efforts must be accompanied by sustained **capacity building, technical handholding, and simplified linkage workflows.**

5.2.3 Infrastructure and Syncing Barriers

Field reports from Shahpur and Borgaon blocks highlighted frequent **offline syncing failures**, which delayed data updates and increased manual redundancy. These challenges were echoed in Patel et al.'s (2022) SWOT analysis, which categorized poor electricity, network dependency, and lack of technical troubleshooting as major barriers to digital platform sustainability in rural India (Patel et al., 2022).

Even with government push under “Digital India,” the **digital divide persists** at the last mile, demanding policy-level investments in **network infrastructure** and **ruggedized, offline-capable tools.**

5.2.4 Perceived Usefulness vs. System Frustration

While most users acknowledged that ANMOL 2.0 **streamlined immunization entry**, many expressed frustration over **having to maintain triple records.** This aligns with Khera’s (2025) critique on **digital healthcare’s “underbelly,”** which points to how uncoordinated tech rollouts increase the administrative burden on under-resourced workers (Khera, 2025).

Therefore, **user-centric design, platform interoperability, and policy synchronization** must be prioritized over superficial digital adoption metrics.

5.3 Strengths of the Study

Mixed-methods approach: Combining survey data with interviews provided both quantitative depth and qualitative context.

Field-centric design: The study captured authentic operational dynamics from real users of ANMOL 2.0.

Policy relevance: The findings offer direct implications for NHM and ABDM platforms aiming for universal health data integration.

5.4 Limitations of the Study

Geographic scope: Only five blocks in Madhya Pradesh were studied, limiting national generalizability.

Sample size: While thematically rich, the sample (N=30) constrains statistical inferences.

Self-reported bias: Responses may include social desirability or recall inaccuracies, especially in quantitative components.

- **Temporal context:** The study represents a snapshot and may not capture longitudinal improvements or updates to ANMOL.

5.5 Comparison with Other Platforms

India's digital health ecosystem includes Co-WIN, U-WIN, and eVIN, which have had varied success in integration. According to Rana et al. (2024), Co-WIN excelled during COVID-19 vaccination due to **centralized architecture** and **real-time visibility** (Rana et al., 2024). However, unlike ANMOL, Co-WIN was not designed for chronic use or RCH tracking, indicating ANMOL's potential if better integrated.

Moreover, international studies such as those cited in Pavia et al. (2024) stress that **public trust, data interoperability, and infrastructure equity** are universal success factors in digital immunization tools.

5.6 Policy and Practice Implications

Integrate ANMOL with national dashboards (HMIS, ABDM) to eliminate redundancy.

Scale ABHA integration with in-app prompts, auto-fill features, and supervisor dashboards.

Enhance frontline digital literacy through quarterly refreshers and region-specific tutorials.

Upgrade offline functionality and adopt auto-sync modules for poor-network zones.

Incorporate user feedback into app iterations, aligning with Digital India's human-centred design philosophy.

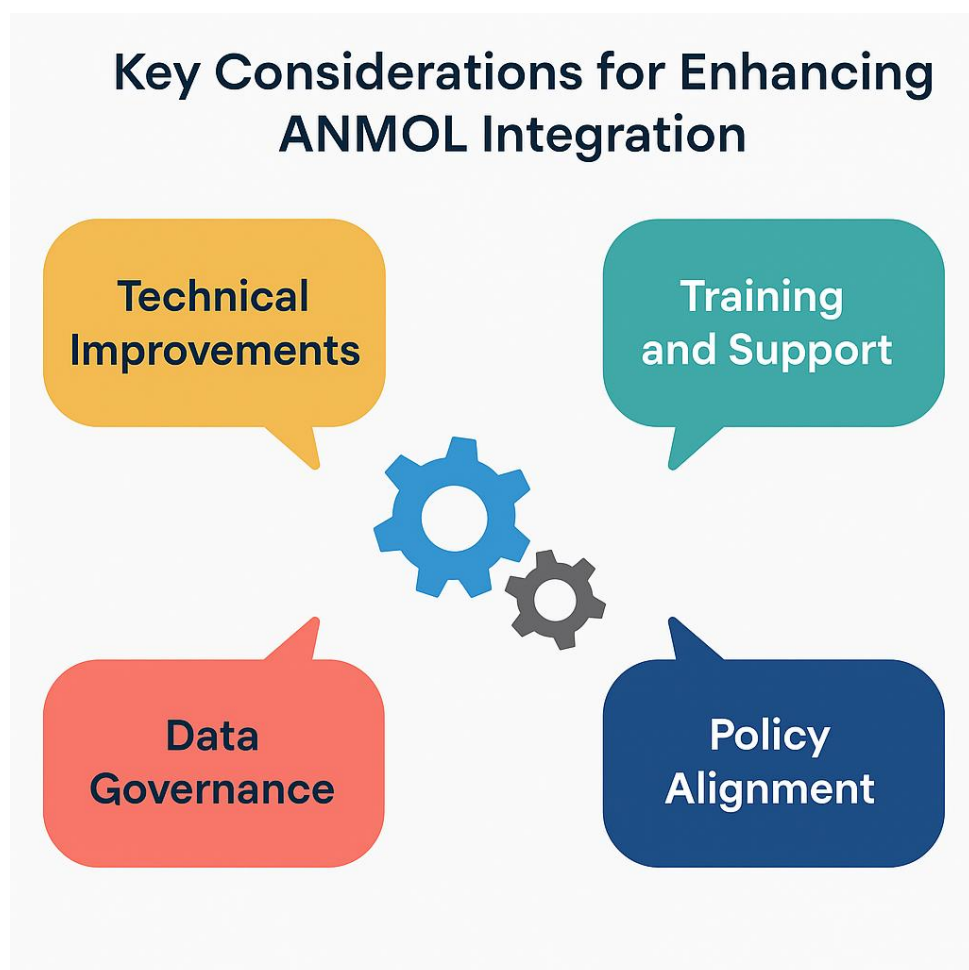


Fig 5.1 Key Consideration for enhancing ANMOL Integration

Chapter 6: Conclusion and Recommendations

7.1 Summary of Key Findings

India's digital health transformation is embodied in platforms like **ANMOL 2.0**, which empowers Auxiliary Nurse Midwives (ANMs) to record immunization, antenatal, and postnatal data digitally. Despite its daily use by 85% of respondents, issues like offline syncing failures, interoperability gaps with HMIS, and limited ABHA ID integration hinder its full potential. **Manual duplication of data** and insufficient technical support remain critical operational bottlenecks.

7.2 Implications for Public Health

ANMOL 2.0 can significantly advance **Universal Immunization Programme (UIP)** goals by:

- Reducing dropouts through digital tracking
- Improving timely service delivery via reminder-based systems
- Enhancing visibility of underserved or remote areas for microplanning

Yet these benefits can only be realized through **system-level integration and continuous support** ([Karol & Thakare, 2023](#)).

7.3 Enhancing Immunization Through ANMOL 2.0: Key Strategies

1. Real-Time Beneficiary Tracking

- Enable ANMs to track **missed immunizations** and **auto-generate follow-up alerts** using ANMOL's beneficiary database.
- Integrate with **ABHA ID** to maintain child-specific immunization histories across platforms and facilities.

2. Geographic Immunization Gap Mapping

- Use GPS-enabled data from ANMOL to highlight **low-coverage zones** and help plan **outreach sessions**.

3. Push Notifications and SMS Reminders

- Sync with mothers’ mobile numbers to send **automated vaccine reminders** based on the immunization schedule.

4. In-App IEC (Information, Education & Communication) Content

- Integrate **audio-visual immunization education** to help ANMs counsel hesitant families during home visits ([Paliwal et al., 2023](#)).

5. Dropout Dashboards at PHC Level

- Deploy a dashboard within ANMOL to allow health workers and MOICs to **monitor dropout rates by vaccine** and plan corrective action.

7.4 Recommendations

Technical Recommendations

- Cloud-based architecture for real-time sync
- Auto-linkage of ABHA ID at registration
- Integration APIs with RCH and HMIS platforms

Operational Recommendations

- Field-based troubleshooting teams
- Continuous digital literacy support
- Dedicated refresher training modules

Governance & Policy

- Standardize interoperability using **FHIR & NDHM** protocols
- Protect patient data through role-based access control and encryption

7.5 Final Reflection

ANMOL 2.0 is not just a data collection tool—it is a digital enabler of frontline health equity. By closing interoperability gaps and enabling smart immunization tracking, it holds the potential to **increase vaccination coverage, reduce manual errors, and improve public trust in digital health.**

To achieve this, India's digital health strategy must shift from fragmented digital tools to **a connected, real-time, field-ready ecosystem** that supports ANMs in reaching every child, every time.

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Annexure I: Stakeholder Questionnaire – ANMOL 2.0 Integration & Usability

Title: *Structured Questionnaire for Field-Level Stakeholders (ANMs, MOICs, DEOs)*

Purpose: To assess system usability, integration challenges, ABHA awareness, and field-level suggestions regarding ANMOL 2.0.

Section A: General Information

1. **Name:** _____
2. **Designation:** ☐ ANM ☐ MOIC ☐ DEO
3. **Block/Facility:** _____
4. **Year of experience** -----

Section B: Core Questions

1. **How frequently do you use ANMOL 2.0 in your work?**
☐ Daily ☐ Weekly ☐ Occasionally ☐ Rarely ☐ Never
2. **What functions do you most commonly use in the ANMOL app?**
☐ Beneficiary Registration
☐ Immunization Entry
☐ ANC/PNC Data
☐ Reports & Syncing
☐ Others (Please Specify): _____
3. **Have you experienced any technical challenges while using ANMOL?**
☐ Yes ☐ No
If yes, please specify: _____
4. **Are you required to make entries into other systems (HMIS, paper registers) apart from ANMOL?**
☐ Yes ☐ No
If yes, which systems? _____

5. **Do you face any issues with offline syncing or data loss?**

☐ Yes ☐ No

If yes, how frequently? ☐ Rarely ☐ Often ☐ Always

6. **Are you aware of ABHA (Ayushman Bharat Health Account) IDs?**

☐ Yes ☐ No

7. **Do you actively use ABHA IDs while registering beneficiaries in ANMOL?**

☐ Yes ☐ No

If not, what are the challenges? _____

8. **Have you received formal training on ANMOL 2.0 and digital health tools?**

☐ Yes ☐ No

If yes, when? _____

9. **In your opinion, how well is ANMOL integrated with other systems like HMIS or RCH?**

☐ Fully Integrated

☐ Partially Integrated

☐ Not Integrated

☐ Don't Know

10. **What improvements or features would you recommend for ANMOL 2.0?**
