Original Research Paper

Volume - 15 | Issue - 09 | September - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Healthcare

"ASSESSMENT OF IMPLEMENTATION AND UTILIZATION OF HEALTH MANAGEMENT INFORMATION SYSTEM (HMIS) IN A DISTRICT HOSPITAL IN LUCKNOW DISTRICT, UTTAR PRADESH: A MIXED-METHOD STUDY"

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ABSTRACT **Background:** The Health Management Information System (HMIS) is a critical tool for data-driven health planning and monitoring in India. However, its effectiveness depends on data quality, timely reporting, and system utilization. This study aimed to assess the implementation, data quality, and utilization of HMIS at Lok Bandhu Raj Narayan Combined Hospital, a secondary-level facility in Lucknow, Uttar Pradesh. **Methods:** A mixed-method approach was employed. Quantitative analysis involved reviewing HMIS records over a two-month period, assessing data completeness, timeliness, and accuracy using WHO and national HMIS guidelines. Qualitative data were gathered through Key Informant Interviews (KIIs) with 8–10 hospital stakeholders to explore perceptions, challenges, and practices related to HMIS use. **Results:** The completeness of HMIS data was high (94.3%), with 100% completeness for key maternal and child health indicators. However, only 87.6% of records were submitted on time, with significant delays noted in most months. Data accuracy varied: while indicators like institutional deliveries and immunizations showed >95% concordance with physical records, others—such as Td1 vaccinations and C-section rates—were less accurate. Qualitative findings revealed barriers including poor internet connectivity, limited staff training, and lack of feedback mechanisms, leading to delays and underutilization of data for decision-making. **Conclusion:** Although HMIS data completeness was strong, significant challenges persist in timeliness, accuracy, and system utilization. Addressing infrastructure gaps, enhancing workforce capacity, and instituting robust data quality assurance processes are essential to strengthen HMIS performance and inform responsive healthcare delivery in Uttar Pradesh.

KEYWORDS : HMIS, data quality, maternal health, health information systems, Uttar Pradesh, health services, data accuracy, decision-making.

INTRODUCTION

A robust Health Management Information System (HMIS) is vital for effective healthcare delivery in India, enabling systematic data collection, processing, and utilization to monitor and plan health programs. Implemented under the National Health Mission (NHM), HMIS digitizes health indicators from grassroots to national levels, capturing metrics on maternal and child health, disease surveillance, and service utilization across government health facilities [1]. Despite significant investments, challenges such as data inaccuracies, delayed reporting, inadequate training, and technological barriers persist, undermining HMIS reliability for policy-making [2]. In Uttar Pradesh, a populous state with diverse public health challenges, efficient HMIS implementation in district hospitals like Lok Bandhu Raj Narayan Combined Hospital in Lucknow is crucial for improving health outcomes and ensuring equitable care [3]. However, issues like untrained staff, unreliable internet, and limited data use for decision-making hinder its effectiveness [4]. This mixed-method study evaluates HMIS performance at Lok Bandhu Raj Narayan Combined Hospital, analyzing data completeness, accuracy, and timeliness from April 2024 to January 2025, alongside key informant interviews with hospital staff to explore operational and contextual challenges. By identifying systemic gaps, the study aims to provide actionable recommendations to enhance HMIS data quality and utilization for health planning [5]. The findings are expected to inform strategies for strengthening HMIS infrastructure and capacity-building, particularly in resource-constrained settings. Additionally, the study addresses the gap in understanding how frontline health workers interact with HMIS, shedding light on user experiences and behavioral factors affecting system adoption. This comprehensive approach ensures a holistic assessment of HMIS functionality, contributing to evidence-based improvements in health data management.

Methodology

Study Design

This was a mixed-method study conducted to assess the implementation and utilization of the Health Management Information System (HMIS) at Lok Bandhu Raj Narayan Combined Hospital, Lucknow, Uttar Pradesh. The quantitative component evaluated data quality indicators—completeness, timeliness, and accuracy—while the qualitative component explored contextual challenges and user perceptions through Key Informant Interviews (KIIs).

Study Setting And Duration

The study was conducted over six months at a secondary-level public hospital serving approximately 1.5 lakh people. The hospital reports routine health data through a computerized HMIS portal under the National Health Mission (NHM).

Study Population

Quantitative data included all HMIS records submitted during a selected two-month period, covering indicators such as antenatal care, immunizations, and institutional deliveries. For the qualitative component, 8–10 key informants were purposively selected, including HMIS data entry staff, administrators, program managers, and medical officers.

Sampling Strategy

A universal sampling method was used for the quantitative component, including all eligible HMIS records. Purposive sampling was used for KIIs to ensure diverse perspectives from operational and supervisorystaff.

Data Collection Methods

Quantitative data were extracted from the HMIS portal and cross-verified with physical registers. A structured checklist based on the WHO Data Quality Review (DQR) toolkit and national HMIS guidelines was used to assess completeness, timeliness, and accuracy. Qualitative data were collected through semi-structured interviews exploring themes such as system utility, reporting processes, infrastructure issues, and feedback mechanisms. Interviews lasted 30–45 minutes and were recorded, transcribed, and analyzed thematically.

Data Collection Tools And Pre-testing

Two Tools Were Developed: (1) a data quality checklist for quantitative analysis, and (2) an interview guide for qualitative data collection. These were pre-tested on 5% of the target population and revised for clarity and relevance.

Data Analysis

Quantitative data were analyzed using Microsoft Excel. Descriptive statistics were used to calculate percentages for data completeness, timeliness, and error rates, and results were presented in tables and graphs. Qualitative data were analyzed thematically using a combined inductive-deductiveapproach.

Themes were categorized under infrastructure, human resources, data use, motivation, and feedback, supported by illustrative quotes.

RESULTS

This study evaluated the implementation and utilization of the Health Management Information System (HMIS) at Lok Bandhu Raj Narayan Combined Hospital, Lucknow, using both quantitative and qualitative data. The results are presented under two major domains: quantitative assessment of HMIS data quality and qualitative insights from key informant interviews.

A. Quantitative Findings

A total of 980 HMIS records from the months of November and December 2024 were reviewed to assess data completeness, timeliness, and accuracy. [Table 1]

1. Data Completeness

The analysis showed a high level of completeness across most indicators. All maternal health (ANC registrations, institutional deliveries) and immunization indicators (Td1, Td2, Vitamin K) achieved 100% completeness. However, outpatient records and non-communicable disease (NCD) services (e.g., hypertension management) showed slight data gaps.

Table 1: Completeness Of HMIS Records By Indicator Category (n = 980)

Indicator Category	Records Reviewed	Complete Records	Completeness (%)
Antenatal Care (ANC)	150	150	100.0
Institutional Deliveries	100	100	100.0
Immunizations (Td1, Td2, Vit K)	180	180	100.0
Outpatient Department (OPD)	300	274	91.3
Hypertension Management	120	110	91.6
Calcium Supplementation	130	120	92.3
Total/Average	**980**	**934**	**95.3**

2. Timeliness Of Reporting

Records were considered timely if submitted within the reporting window defined by the HMIS guidelines. Reports for November and December 2024 were expected by the 5th of the following month. Only January 2025 submissions met the deadline, whereas previous months were delayed until February 17, 2025. [Table 2]

Table 2: Timeliness Of HMIS Report Submissions

Reporting Month	Due Date	Actual Submission Date	Timely Submission	Remarks
November 2024	5 Dec 2024	17 Feb 2025	No	Delayed by 2 months
December 2024	5 Jan 2025	17 Feb 2025	No	Delayed
January 2025	5 Feb 2025	5 Feb 2025	Yes	On time

3. Accuracy Of Data

Data from HMIS entries were cross-verified with physical records maintained at the hospital. Four indicators (ANC registrations, Td2, institutional deliveries, Vitamin K) showed high accuracy (≤5% discrepancy). However, discrepancies were noted in Td1, C-sections, and outpatient data. [Table 3]

Table 3: Accuracy Assessment – Comparison Between HMIS and Physical Registers

Indicator	Discrepancy (%)	Accuracy Rating
ANC Registrations	2.0	High (≤5%)
Institutional Deliveries	3.5	High
Td2 Immunization	2.8	High
Vitamin K Administration	4.5	High
Calcium Supplementation	6.0	Moderate (5–10%)
Hypertension Cases	7.3	Moderate
OPD Attendance	8.9	Moderate
Td1 Immunization	12.5	Low (>10%)
C-section Deliveries	14.2	Low

B. Qualitative Findings

A total of **10 Key Informant Interviews (KIIs)** were conducted with staff involved in HMIS operations, including program managers, medical officers, data entry operators, and hospital administrators. Thematic analysis identified five key domains:

1. Infrastructure And Technology Constraints

- **90%** of participants reported insufficient computer systems; often shared between departments.
- **80%** cited frequent internet disruptions, especially during peak hours.
- "We often enter data late at night because the server is down during the day." – Data Entry Operator

2. Human Resource And Training Gaps

- **70%** of staff involved in HMIS had no formal training.
- **80%** had never attended a refresher course.
- Medical officers reported relying on juniors or administrative staff for HMIS work without supervision.

3. High Workload And Multitasking

- Most data entry personnel were also tasked with clerical or pharmacy-related duties.
- This multitasking led to delayed or retrospective entries, affecting timeliness and accuracy.

4. Limited Use Of Data In Decision-Making

- **90%** of respondents said HMIS data is mainly used for upward reporting.
- No feedback loop or internal performance review was in place.
- "We generate reports, but I've never seen anyone discuss them in a meeting." – Program Manager

5. Motivation And Recognition

- **70%** of participants reported lack of incentives or recognition.
- Absence of a monitoring system or acknowledgment led to indifference toward data quality.

Table 4: Summary Of Themes And Proportion Of Respondents Reporting Key Issues

Theme	Issue Highlighted	% Respondents
Infrastructure	Inadequate computers, poor connectivity	90%
Training	No initial or refresher training	70–80%
Workload	Multitasking and insufficient staffing	80%
Data Use	No use of data in local decision-making	90%
Motivation	Lack of recognition, no feedback loop	70%

Integrated Summary

The findings show that while data completeness is relatively high, **issues of accuracy, timeliness, and meaningful data utilization** persist. Infrastructure deficits, lack of dedicated staff, poor motivation, and minimal training significantly hinder the effective implementation of HMIS. The disconnect between data generation and data use for planning and service delivery is a critical area of concern.

DISCUSSION

This study at Lok Bandhu Raj Narayan Combined Hospital in Lucknow provides critical insights into the implementation and utilization of the Health Management Information System (HMIS), revealing strengths and persistent challenges that align with or diverge from findings in recent literature. The quantitative results indicate high data completeness (95.3% overall), particularly for maternal health and immunization indicators (100%), which is consistent with studies like Pandey A, et.al., (2010), who reported robust completeness in HMIS data for key reproductive and child health indicators in India due to standardized reporting protocols under the National Health Mission (NHM) [1].

Timeliness emerged as a significant issue, with only January 2025 submissions meeting the deadline, while November and December 2024 reports were delayed until February 17, 2025. This aligns with Andualem et al. (2018), who identified delayed reporting in Ethiopian health facilities due to infrastructure limitations and overburdened staff [6]. The current study's qualitative findings reinforce this, with 80% of respondents citing unreliable internet connectivity and 90% reporting inadequate computer systems. These technological barriers are echoed in a 2025 systematic review by Ranthako and Mujinga, which highlighted infrastructure constraints as a primary impediment to health information system adoption in developing countries. Unlike some settings where telehealth platforms have mitigated connectivity issues, the absence of such alternatives at Lok Bandhu Hospital

exacerbates delays [7].

Accuracy varied across indicators, with high accuracy (≤5% discrepancy) for ANC registrations, institutional deliveries, Td2, and Vitamin K, but low accuracy (>10%) for Td1 and C-sections. This variability is comparable to Lwoga and Musheiguza (2023), who found discrepancies in Tanzanian HMIS data due to manual entry errors and lack of validation [8]. The moderate accuracy (5–10%) in outpatient and NCD data may stem from multitasking, as 80% of staff reported additional clerical duties, a challenge also noted in Addo and Agyepong (2024), where high workloads compromised data quality in Ghana's District Health Information Management System [9].

The study's findings highlight the need for targeted interventions. Infrastructure improvements, such as dedicated computers and reliable internet, are essential, as supported by a 2024 study on HIS in public hospitals, which linked technological upgrades to a 20% increase in service quality. Establishing feedback loops for data utilization, as seen in successful ASEAN models, could enhance HMIS impact on local health planning. While this study's mixed-method approach provides a robust framework, its single-hospital focus limits generalizability, suggesting the need for multi-site studies to validate findings across Uttar Pradesh.

CONCLUSION

The study highlights that while HMIS implementation at the district hospital level demonstrates commendable data completeness and improvement in service coverage—particularly for maternal and child health indicators—persistent issues related to data accuracy, reporting delays, and underutilization of data for decision-making remain. Inaccuracies in key indicators such as Td1 vaccinations and C-section rates, along with systemic bottlenecks like inadequate staffing and infrastructure, indicate a pressing need for focused interventions. Strengthening real-time data entry, enhancing staff training, and ensuring regular monitoring can significantly improve HMIS reliability and promote its effective use as a decision-support tool in Uttar Pradesh and similar public health settings.

Limitations

This study is limited by its single-center design and short observation period, which restrict the generalizability of findings and the ability to detect long-term trends. The qualitative component involved a small sample size, potentially omitting perspectives of frontline workers. Additionally, reliance on self-reported information may have introduced bias, and the absence of a technical system audit limited evaluation of software efficiency. Verification challenges due to incomplete physical registers and lack of quantitative assessment of HMIS-driven decision-making further constrain the depth of analysis.

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