

Original Research Article

Transforming maternal health services through quality improvement: a five-year experience from a rural community health centre in Northern India

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ABSTRACT

Background: Improving maternal health remains a major public health priority in low- and middle-income countries. Strengthening antenatal care, institutional delivery, emergency obstetric services, and quality improvement (QI) is particularly important in rural settings. This study evaluated the association of integrated QI interventions with institutional delivery services and maternal healthcare utilization at Community Health Centre (CHC) Faridpur, Uttar Pradesh, India.

Methods: A retrospective QI study used routinely collected health management information system (HMIS) data, institutional delivery registers, and programme records from April 2022 to July 2026. Interventions included high-risk pregnancy surveillance, strengthened antenatal care, maternal anaemia management, telephonic beneficiary follow-up, emergency obstetric preparedness, and continuous staff capacity building. Trends in institutional deliveries, normal deliveries, and Caesarean sections were analysed descriptively.

Results: Institutional deliveries increased from 2,404 in FY 2022–23 to 2,809 in FY 2025–26, while Caesarean sections increased from 36 to 177. During April–July FY 2026–27, 810 institutional deliveries, including 48 Caesarean sections, were recorded. These changes occurred alongside strengthened clinical governance, community engagement, and maternal service utilization.

Conclusions: A structured package of QI interventions was associated with increased institutional deliveries and strengthened emergency obstetric services at a rural CHC. This integrated, low-resource approach may provide a practical framework for strengthening maternal healthcare in similar rural settings.

Keywords: Maternal health, Quality improvement, Institutional delivery, Community health centre, Emergency obstetric care, Rural health, India

INTRODUCTION

Maternal mortality remains one of the most significant public health challenges worldwide despite substantial advances in obstetric care. According to the World Health Organization (WHO), an estimated 287,000 women died

during pregnancy or childbirth in 2020, with nearly 95% of these deaths occurring in low- and middle-income countries (LMICs). The majority of maternal deaths are preventable through timely antenatal care, skilled birth attendance, access to emergency obstetric and newborn care, and efficient referral systems. Consequently,

improving maternal health remains a central target of sustainable development goal (SDG), which aims to reduce the global maternal mortality ratio to fewer than 70 deaths per 100,000 live births by 2030.^{1,2}

India has achieved substantial reductions in maternal mortality over the past two decades through strengthened public health policies and large-scale maternal health programmes implemented under the National Health Mission (NHM).³ Key initiatives, including the Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), and the Labour Room Quality Improvement Initiative (LaQshya), have contributed to improved utilization of antenatal care services, increased institutional deliveries, and enhanced emergency obstetric care.^{3,4} However, significant inequities continue to exist, particularly in rural and underserved regions, where delayed pregnancy registration, inadequate identification of high-risk pregnancies, maternal anemia, transportation barriers, shortages of skilled healthcare providers, and delayed referrals remain important contributors to preventable maternal morbidity and mortality.^{1,3}

CHCs serve as the cornerstone of rural secondary healthcare in India by providing comprehensive emergency obstetric and newborn care to large populations.³ Strengthening maternal healthcare services at these facilities through systematic quality improvement (QI) interventions offers a practical and cost-effective approach to improving maternal and neonatal outcomes without major infrastructural expansion. Evidence suggests that quality improvement strategies-including early risk stratification, standardized clinical protocols, continuous staff training, supportive supervision, regular audit and feedback, data-driven decision-making, and community engagement can significantly improve service quality, patient safety, and utilization of institutional delivery services.^{2,5,6}

CHC Faridpur, located in Bareilly district of Uttar Pradesh, serves a predominantly rural population with substantial maternal healthcare needs. In response to persistent challenges in maternal health service delivery, the facility implemented a comprehensive quality improvement programme aimed at strengthening the continuum of maternal care. The interventions included universal early pregnancy registration, systematic screening and follow-up of high-risk pregnancies, intensified management of maternal anemia, telephonic tracking of pregnant women and postnatal mothers, strengthening of emergency obstetric preparedness, enhanced referral coordination, regular multidisciplinary quality review meetings, capacity building of healthcare workers, and community-based awareness activities promoting institutional deliveries.

Routine HMIS data demonstrated a progressive increase in institutional deliveries over the implementation period, accompanied by expansion of emergency obstetric care

services, including Caesarean section capability. These improvements indicate enhanced utilization of maternal health services and suggest that sustained quality improvement interventions were associated with strengthened service delivery at the facility level.

The present study describes the design, implementation, and outcomes of this facility-based quality improvement initiative and evaluates its association with trends in institutional delivery services over a five-year period. By documenting this experience from a rural community health centre, the study seeks to provide practical evidence that can guide policymakers, programme managers, and healthcare providers in strengthening maternal health services across similar resource-constrained settings in India and other low- and middle-income countries.^{2,5-7}

Primary objective

To evaluate the impact of a structured Quality Improvement (QI) programme on institutional delivery services at Community Health Centre (CHC) Faridpur, Bareilly, Uttar Pradesh, over a five-year period.

Secondary objectives

Secondary objectives were to assess trends in institutional deliveries from FY 2022–23 to FY 2026–27, evaluate changes in normal vaginal and Caesarean deliveries following QI implementation, describe the QI interventions used to strengthen maternal health services, identify operational strategies that improved accessibility and utilization of maternal healthcare services in a rural setting, and describe a potentially scalable model for strengthening maternal health services in resource-constrained public health facilities.

METHODS

This retrospective observational Quality Improvement (QI) study evaluated changes in maternal health service delivery following implementation of a structured quality improvement programme at Community Health Centre (CHC) Faridpur. Routinely collected institutional and Health Management Information System (HMIS) data were analysed to assess trends in service utilization over time.

Study setting

The study was conducted at Community Health Centre (CHC) Faridpur, Bareilly district, Uttar Pradesh, India. CHC Faridpur is a secondary-level public healthcare facility functioning under the National Health Mission (NHM) and operating according to the Indian Public Health Standards (IPHS) for Community Health Centres.⁹

The facility serves a predominantly rural population through a network of primary health centres (PHCs), health and wellness centres, accredited social health

activists (ASHAs), auxiliary nurse midwives (ANMs), and community health officers (CHOs).

The facility provides 24×7 institutional delivery services, Comprehensive Emergency Obstetric and Newborn Care (CEmONC), Caesarean section services, antenatal and postnatal care, high-risk pregnancy management, maternal anaemia screening and treatment, newborn stabilization and resuscitation, family planning services, universal immunization, and referral and emergency transport services.

These services are delivered in accordance with national maternal health guidelines and WHO recommendations for improving the quality of maternal and newborn care.^{9,11}

Study duration

The analysis included routinely collected maternal health service data from April 2022 through July 2026, comprising four complete financial years (FY 2022–23 to FY 2025–26) and the first four months of FY 2026–27.

Study population

The study included all women who underwent institutional delivery at CHC Faridpur during the study period.

No exclusions were applied based on maternal age, parity, referral status, obstetric risk category, or mode of delivery because the objective was to evaluate facility-level performance rather than individual clinical outcomes.

Data sources

Data were obtained from routinely maintained institutional records, including the HMIS, labour room registers, delivery registers, Caesarean section registers, maternal death review records, monthly programme monitoring reports, hospital administrative records, and national health mission reporting formats. The primary quantitative outcomes were extracted from the HMIS, which is the Government of India's standardized platform for routine health information reporting.¹⁰

Quality improvement intervention

Beginning in April 2022, CHC Faridpur implemented a structured quality improvement (QI) programme designed to strengthen maternal healthcare delivery. The programme employed continuous monitoring, multidisciplinary teamwork, supportive supervision, and iterative plan–do–study–act (PDSA) cycles to improve service quality and institutional delivery performance, consistent with internationally accepted quality improvement principles.^{8,11} The intervention comprised six interrelated domains.

Strengthening antenatal care

Activities included early pregnancy registration, timely antenatal visits, risk-based obstetric assessment, routine laboratory investigations, ultrasound referral linkage, and birth preparedness and complication readiness counselling.

These interventions align with the WHO recommendations for antenatal care to promote a positive pregnancy experience.¹²

High-risk pregnancy surveillance

Women identified with obstetric or medical risk factors received enhanced follow-up through high-risk pregnancy registers, colour-coded risk stratification, specialist consultations, priority antenatal review, planned institutional delivery, and referral coordination.

Enhanced surveillance of high-risk pregnancies is recommended to reduce preventable maternal and neonatal complications.^{11,12}

Maternal anaemia management

The anaemia control strategy included universal haemoglobin estimation, iron–folic acid supplementation, intravenous iron therapy where indicated, nutritional counselling, and follow-up haemoglobin monitoring.

Maternal anaemia screening and treatment were implemented in accordance with national maternal health guidelines and WHO recommendations.^{11,12}

Community follow-up and beneficiary tracking

Continuity of maternal care was strengthened through telephonic follow-up of pregnant women, tracking missed antenatal visits, reminder calls before the expected date of delivery, active ASHA coordination, referral tracking, and postnatal follow-up after discharge. Community-based tracking and continuity of care have been shown to improve institutional delivery and maternal health service utilization.

Emergency obstetric preparedness

Emergency obstetric readiness was enhanced through twenty-four-hour labour room services, a functional operation theatre, availability of emergency obstetric drugs, Caesarean section capability, newborn resuscitation preparedness, standard treatment protocols, and strengthened referral mechanisms. These activities are consistent with the WHO standards for improving quality of maternal and newborn care and the Indian public health standards for emergency obstetric services.^{9,11}

Continuous quality improvement

Quality improvement activities included monthly maternal health review meetings, clinical audits, supportive supervision, on-site mentoring, monitoring of key performance indicators, identification of operational gaps, and corrective action planning using iterative PDSA cycles.

Continuous monitoring and iterative quality improvement methods are central components of healthcare improvement science and are recommended by the SQUIRE framework.⁸

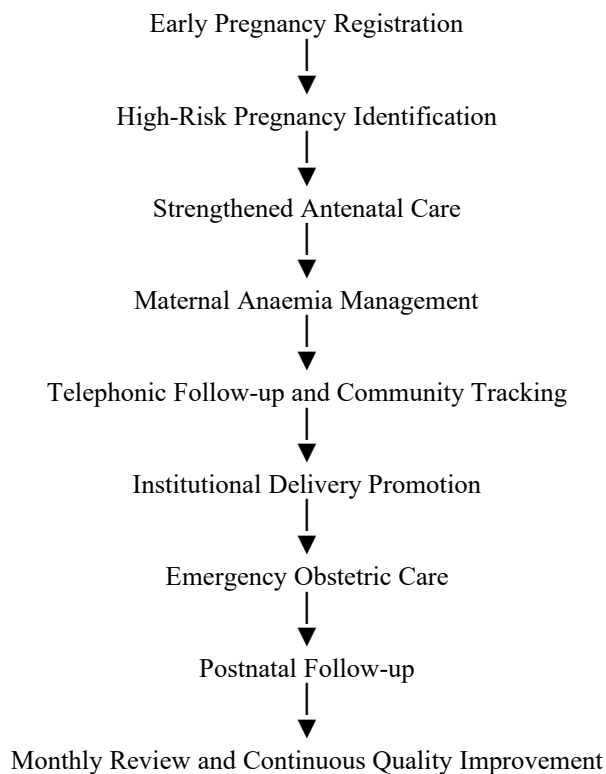


Figure 1: Framework of quality improvement interventions at CHC Faridpur.

Outcome measures

Primary outcome

The primary outcome was the annual number of institutional deliveries.

Secondary outcomes

Secondary outcomes were annual normal vaginal deliveries, annual Caesarean section deliveries, trends in maternal health service utilization, and expansion of emergency obstetric services over time.

Statistical analysis

Data were entered into Microsoft Excel and analysed using descriptive statistical methods.

Annual frequencies, proportions, and percentage changes were calculated for institutional deliveries, normal vaginal deliveries, and Caesarean section deliveries. Temporal trends were assessed using graphical time-series analysis across financial years. Because this study represents a facility-based quality improvement evaluation rather than an analytical epidemiological study, inferential statistical testing was not performed, consistent with reporting recommendations for quality improvement studies.⁸

Ethical considerations

The Institutional Ethics Committee reviewed the project and determined that formal ethical approval was not required because anonymized routine programme data were analyzed as part of a quality improvement initiative.

Quality improvement framework

The intervention package was based on six interrelated components guided by the plan–do–study–act (PDSA) model and continuous quality improvement principles.^{8,14}

Table 1: Major quality improvement interventions implemented at CHC Faridpur.

Intervention	Key activities	Expected outcomes
Early pregnancy registration	Timely ANC enrolment, risk assessment	Increased ANC coverage
High-risk pregnancy surveillance	Risk identification, specialist review	Early detection of complications
Maternal anaemia management	Haemoglobin screening, iron therapy, counselling	Reduced anaemia-related complications
Telephonic follow-up	Appointment reminders, beneficiary tracking	Improved ANC attendance and institutional delivery
Emergency obstetric preparedness	24×7 labour room, emergency protocols, Caesarean capability	Improved management of obstetric emergencies
Capacity building	Staff training and mentoring	Enhanced quality of clinical care
Community engagement	ASHA counselling and outreach	Increased community awareness and service utilization
Monitoring and review	Monthly audits, performance feedback	Continuous quality improvement

RESULTS

The implementation of the QI programme at CHC Faridpur was associated with sustained improvements in institutional delivery services over the study period. Analysis of routinely collected Health Management Information System (HMIS) data demonstrated increasing utilization of facility-based maternal health services and expansion of emergency obstetric care capacity from FY 2022–23 through the first four months of FY 2026–27. The following results are derived from the HMIS delivery records maintained at the facility.

Maternal age was available in aggregate HMIS reporting from FY 2023–24 onward. In the analyzable full-year records, all reported deliveries were classified in the >19–49-year age category. The FY 2022–23 report did not contain the corresponding age-wise fields. Age-wise reporting for April–July 2026 is presented separately in the

HMIS extraction file and was not used in this table because the current extraction requires reconciliation with the manuscript's previously reported institutional-delivery total.

Institutional delivery trends

A total of 11,270 institutional deliveries were conducted at CHC Faridpur during the four complete financial years (FY 2022–23 to FY 2025–26). An additional 810 institutional deliveries were recorded during the first four months (April–July) of FY 2026–27.

Overall, institutional deliveries increased from 2,404 in FY 2022–23 to 2,809 in FY 2025–26, representing an absolute increase of 405 deliveries (16.8%) over four years. Although a modest decline was observed during FY 2024–25, delivery numbers subsequently reached the highest-level during FY 2025–26.

Table 2: Maternal age distribution among deliveries reported in HMIS.

Financial year	Age-recorded deliveries (n)	<15 years N (%)	15–19 years N (%)	>19–49 years N (%)	>49 years N (%)
FY 2023–24	2657	0 (0.0)	0 (0.0)	2657 (100.0)	0 (0.0)
FY 2024–25	2590	0 (0.0)	0 (0.0)	2590 (100.0)	0 (0.0)
FY 2025–26	2809	0 (0.0)	0 (0.0)	2809 (100.0)	0 (0.0)

Table 3: Annual institutional deliveries at CHC Faridpur.

Financial year	Normal deliveries	Caesarean sections	Total institutional deliveries
2022–23	2368	36	2404
2023–24	2532	125	2657
2024–25	2426	164	2590
2025–26	2632	177	2809
2026–27*	762	48	810

*April–July only

Table 4: Percentage increase in maternal service indicators.

Indicator	Baseline (2022–23)	Final Year (2025–26)	% change
Institutional deliveries	2404	2809	+16.8%
Normal deliveries	2368	2632	+11.1%
Caesarean sections	36	177	+391.7%

Table 5: Selected monthly institutional delivery totals.

Month	Institutional deliveries
August 2025–26	305
September 2025–26	321
July 2026–27*	266

Interpretation

The annual institutional delivery trend demonstrated a progressive increase over the observation period,

suggesting improved community utilization of facility-based maternity services following implementation of the quality improvement programme. Increased utilization of institutional delivery services is considered an important

indicator of improved maternal health service access and quality.

Normal vaginal deliveries

Normal vaginal deliveries remained the predominant mode of childbirth throughout the study period.

The number of normal deliveries increased from 2,368 (FY 2022–23) to 2,632 (FY 2025–26), representing an increase of approximately 11.1%. Despite year-to-year fluctuations, the sustained upward trend indicates increased confidence among pregnant women in utilizing institutional delivery services.

Caesarean section services

One of the most notable findings was the substantial increase in emergency obstetric surgical capacity.

Caesarean section deliveries increased from 36 in FY 2022–23 to 177 in FY 2025–26, representing nearly a five-fold increase over the study period. This increase reflects strengthening of comprehensive emergency obstetric and newborn care (CEmONC) services, improved availability of skilled personnel, and enhanced capacity to manage complicated pregnancies at the CHC level, consistent with WHO recommendations for quality maternal healthcare.

Monthly service trends

Monthly HMIS records demonstrated seasonal variation in institutional deliveries. Selected monthly institutional delivery totals are presented in Table 5.

FY 2026–27 data were available through July 2026 only. The consistently high monthly delivery load during later years indicates improved service utilization and increasing trust in CHC Faridpur as a delivery point.

Figure 2 includes complete financial years up to March 2026 (FY 2025–26).

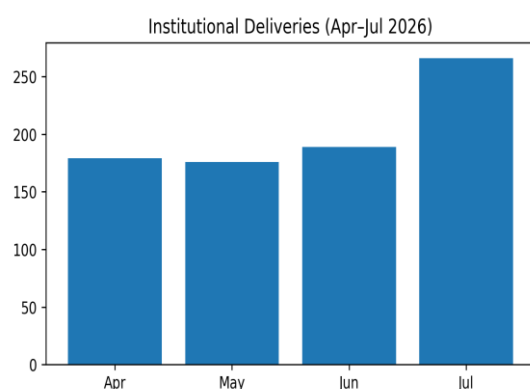


Figure 2: Trend in institutional deliveries.

Early performance during FY 2026–27

During the first four months (April–July 2026), CHC Faridpur recorded 810 institutional deliveries, 762 normal deliveries, and 48 Caesarean sections.

Programme outcomes

Following implementation of the quality improvement package, programme-level improvements included increased institutional delivery volume, enhanced emergency obstetric care capacity, increased Caesarean section capability, strengthened maternal referral pathways, improved continuity of antenatal follow-up, and greater utilization of facility-based maternal services.

These outcomes are consistent with the objectives of quality improvement interventions described in the Methods section and align with internationally recommended strategies for strengthening maternal and newborn healthcare. However, the observational study design does not permit causal attribution.

Statistical summary

Across the four complete financial years, there were 11,270 institutional deliveries, 9,958 normal deliveries, and 502 caesarean sections. The overall caesarean section proportion among institutional deliveries increased from approximately 1.5% in FY 2022–23 (36/2404) to 6.3% in FY 2025–26 (177/2809), reflecting increased surgical capability and expanded availability of comprehensive emergency obstetric care.

These descriptive statistics were generated from routine HMIS data and were not subjected to inferential statistical testing, consistent with reporting of quality improvement evaluations.

Key findings

The quality improvement programme at CHC Faridpur was accompanied by a sustained increase in institutional deliveries, an increase in normal vaginal deliveries, a marked expansion in caesarean section services, continued growth in service utilization during the first four months of FY 2026–27, and improved capacity of the rural CHC to provide comprehensive maternal health services.

These findings support the feasibility of strengthening maternal health services through integrated quality improvement interventions in resource-constrained rural public health facilities.

DISCUSSION

Principal findings

This quality improvement study demonstrates that a structured, multi-component intervention implemented at

a rural CHC was associated with sustained improvements in institutional maternal health services over a five-year period. Analysis of HMIS data showed a progressive increase in institutional deliveries from 2,404 in FY 2022–23 to 2,809 in FY 2025–26, while Caesarean section services expanded from 36 to 177 procedures during the same period. These findings indicate strengthening of both service utilization and emergency obstetric care capacity at CHC Faridpur.

Unlike interventions that focus on a single component of maternity care, the programme at CHC Faridpur integrated multiple strategies across the continuum of care. Early pregnancy registration, systematic identification of high-risk pregnancies, maternal anaemia management, telephonic beneficiary follow-up, strengthened emergency obstetric preparedness, regular performance review, and community engagement collectively addressed barriers that commonly limit access to safe maternity services in rural India.^{8,11,12,15}

Comparison with previous studies

The observed increase in institutional deliveries is consistent with national and international evidence demonstrating that strengthening primary and secondary healthcare systems can improve maternal health service utilization.^{11,13,22} The WHO emphasizes that quality of care is determined not only by infrastructure and availability of services but also by timely identification of complications, continuity of care, effective referral mechanisms, and respectful maternity care.^{11,23} Studies from India have shown that quality improvement initiatives incorporating clinical audit, supportive supervision, standardized treatment protocols, and staff mentoring contribute to increased institutional deliveries and improved obstetric outcomes.^{8,21,24}

Similar findings have been reported from rural health facilities where strengthening comprehensive emergency obstetric and newborn care (CEmONC) services increased the capacity to manage complicated pregnancies locally, thereby reducing unnecessary referrals and treatment delays.^{9,20,25}

The substantial increase in caesarean section services observed at CHC Faridpur likely reflects improved emergency surgical preparedness and greater confidence among referring providers and pregnant women in the facility's ability to manage obstetric emergencies. However, the study did not evaluate the clinical indications for Caesarean section or maternal and neonatal outcomes; therefore, no conclusions regarding the appropriateness or effectiveness of surgical intervention can be drawn.^{20,26}

Public health significance

Maternal mortality remains an important public health challenge in many low-resource settings despite

considerable progress over recent decades.^{27,28} Delays in recognizing obstetric complications, inadequate transportation, shortages of skilled personnel, and limited emergency obstetric services continue to contribute to preventable maternal morbidity and mortality.^{11,20,28}

The experience of CHC Faridpur demonstrates that meaningful improvements in maternal health service utilization can be achieved through organizational and process-oriented interventions rather than major capital investments, consistent with WHO health system strengthening principles.^{13,14} The programme strengthened existing services by improving coordination between frontline workers and facility staff, standardizing clinical pathways, enhancing beneficiary follow-up, and monitoring performance through routine programme data.^{8,10,14}

Such approaches are particularly relevant for district and sub-district public health facilities where resources are constrained but opportunities exist to improve service delivery through better organization, leadership, and continuous quality improvement.^{13,14,21}

Possible mechanisms of improvement

Several plausible mechanisms may have contributed to the increase in institutional deliveries, including improved identification and monitoring of high-risk pregnancies, strengthened antenatal care and counselling, better coordination among ASHAs, ANMs, CHOs, and facility staff, enhanced community awareness regarding institutional delivery, expansion of emergency obstetric services including caesarean capability, continuous review of programme performance using HMIS indicators, and increased public confidence in CHC Faridpur as a maternity care facility.

Although these mechanisms are plausible and consistent with the programme design, the observational nature of this study does not allow causal attribution.

Strengths

This study has several strengths. First, it reports the real-world implementation of a quality improvement programme within a government rural health facility, making the findings directly relevant to public health practice.

Second, the study includes multiple years of routinely collected programme data, enabling assessment of trends over time rather than relying on cross-sectional observations.

Third, the intervention package addressed multiple stages of maternal care, reflecting a comprehensive systems-strengthening approach. Fourth, the study demonstrates how routinely available HMIS data can be used for

programme evaluation and continuous quality improvement.

Limitations

Several limitations should be acknowledged. The study was conducted at a single CHC, which may limit the generalizability of the findings to other settings. The analysis relied on routinely collected HMIS and administrative data, which may be subject to reporting errors or incomplete documentation. Because this was an observational quality improvement study without a comparison group, improvements cannot be definitively attributed to the interventions alone. Other factors, including broader district or state maternal health initiatives, may also have influenced service utilization.

The study primarily evaluated service utilization indicators and did not include important maternal and neonatal outcome measures such as maternal mortality, maternal near-miss events, neonatal mortality, stillbirth rates, postpartum complications, patient satisfaction, or cost-effectiveness, which are recommended indicators for assessing maternal health programmes.

Finally, inferential statistical analyses were not performed; therefore, associations should be interpreted descriptively rather than causally.

Policy implications

The findings suggest that structured quality improvement programmes can strengthen maternal health services within existing public health infrastructure. Health administrators and programme managers may consider adopting similar interventions in comparable rural settings, including systematic identification of high-risk pregnancies, strengthened antenatal follow-up, coordinated community outreach, continuous monitoring using HMIS indicators, and regular multidisciplinary review of service performance using quality improvement methods.

Future multicentre studies incorporating maternal and neonatal outcome measures, patient-reported experiences, and economic evaluations would provide stronger evidence regarding the effectiveness and scalability of these interventions.

CONCLUSION

Over the five-year observation period, CHC Faridpur experienced sustained growth in institutional maternity services alongside implementation of a comprehensive quality improvement programme. Routine HMIS data demonstrated increases in institutional deliveries and expansion of emergency obstetric surgical capacity.

While the observational design precludes conclusions regarding causality, the findings suggest that integrated

quality improvement strategies implemented within routine public health services may contribute to strengthening maternal healthcare delivery in rural settings. Continued monitoring, rigorous evaluation, and replication of similar models in other districts are warranted to better understand their impact on maternal and newborn health outcomes.

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