



## District-Level Quality Improvement Collaborative to Reduce Maternal and Neonatal Complications in Indonesia

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### Abstract

Maternal and neonatal mortality remain critical public health challenges in Indonesia, particularly within decentralized health systems where early detection, referral coordination, and continuity of care are often fragmented. This study aimed to evaluate the implementation and outcomes of a district-level Quality Improvement (QI) Collaborative to strengthen maternal and neonatal services and reduce major obstetric and neonatal complications in Jember Regency, Indonesia. A quasi-experimental implementation study was conducted using aggregated routine data from primary healthcare centers and referral hospitals. The QI Collaborative was implemented in two phases from December 2023 to April 2025, focusing on standardized risk screening, early clinical recognition, strengthened referral pathways, and district-level supervision. Trends in postpartum hemorrhage, preeclampsia/eclampsia, and neonatal asphyxia were analyzed using run charts and median-based trend analysis. The findings demonstrated improved adherence to standardized screening and referral protocols, indicating strengthened district clinical governance. Reductions below baseline medians were observed for postpartum hemorrhage and neonatal asphyxia. An initial increase in preeclampsia/eclampsia cases reflected improved detection, followed by declining trends as supervision and service integration improved. This study provides empirical evidence that district-level QI Collaboratives can enhance service performance and clinical governance, offering a scalable model to strengthen decentralized maternal and neonatal health systems in low- and middle-income settings.

### Introduction

Maternal and neonatal mortality remain major public health challenges in low- and middle-income countries (LMICs), despite substantial global progress in expanding access to essential maternal and newborn health services (Carlo & Travers, 2016; Kassie *et al.*,

2024). Cardiovascular disease, preeclampsia/eclampsia, postpartum hemorrhage (PPH), with pregnancy complications, intrapartum complications, and neonatal asphyxia are among the leading direct causes of maternal and neonatal deaths, significantly contributing to these outcomes (Kurniawan *et al.*, 2017; Say

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*et al.*, 2014). Despite the availability of evidence-based clinical guidelines, substantial gaps persist in early risk detection, stabilization, and referral coordination across different levels of the health system (Kruk *et al.*, 2018). These gaps are increasingly recognized as health system failures rather than solely clinical deficiencies, reflecting weaknesses in governance, supervision, referral readiness, and use of routine service data for decision-making (Kruk *et al.*, 2018). A recent scoping review found that systemic deficiencies in coordination and referral pathways contribute to preventable delays in maternal health care, which are closely associated with severe maternal and neonatal outcomes in LMICs (Ghosh, 2025).

Maternal and neonatal mortality in Indonesia also remain major public health challenges, particularly in decentralized health systems where gaps in early detection, referral coordination, and continuity of care persist across levels of service (Hyre *et al.*, 2019; Syabullah *et al.*, 2025). In Indonesia's decentralized health system, district health offices play a pivotal role in coordinating maternal and neonatal services across primary and referral levels. While national clinical guidelines for obstetric and neonatal emergencies are widely available, their implementation often varies due to differences in district governance capacity, supervision mechanisms, and integration of services. Fragmented referral pathways and inconsistent use of routine service data further constrain timely response to maternal and neonatal complications, underscoring the need for system-oriented approaches that go beyond facility-level clinical training alone. Moreover, population-level risk factors further compound maternal health challenges. Recent evidence shows that the majority of housewives are classified as pre-obese or obese, with hypertension (stage one and two) emerging as a serious cardiovascular and maternal health concern (Ali *et al.*, 2020). These conditions increase vulnerability to obstetric complications, reinforcing the urgency of district-level strategies that integrate preventive care with emergency readiness. Evidence from a recent study shows that decentralization has positioned district health offices as pivotal actors in medicine management, bridging

national policy with local implementation and ensuring service delivery across primary health centres (Fanda *et al.*, 2025). Under Indonesia's decentralization framework, district health offices are responsible for service planning, supervision of primary care facilities, and coordination of referral hospitals, positioning them as key actors in translating national policies into effective local implementation. However, empirical studies have documented wide inter-district variation in emergency obstetric and neonatal care performance, largely driven by differences in managerial capacity, referral preparedness, and monitoring systems rather than availability of clinical guidelines alone (Rakmawati *et al.*, 2019).

Quality Improvement (QI) collaboratives offer a structured mechanism to address these system challenges by aligning multiple facilities under a shared improvement agenda, strengthening accountability, and embedding continuous learning into routine district supervision. Evidence from LMIC settings suggests that when QI collaboratives are integrated into existing health system structures, they can enhance service coordination, improve adherence to standards, and contribute to reductions in preventable maternal and neonatal morbidity and mortality (Zaka *et al.*, 2018; Zamboni *et al.*, 2020). QI collaboratives are structured networks of health facilities and teams that use shared aims, multidisciplinary collaboration, regular data review, and iterative improvement cycles to accelerate the translation of evidence into practice and reduce variation in care delivery (Pallotto *et al.*, 2025). These collaboratives emphasize the use of collective data registries, facilitated learning, and coordinated implementation support to drive measurable improvements in clinical practices and outcomes (Lee King *et al.*, 2020). Although QI approaches have demonstrated improvements in care processes and selected outcomes in LMICs, the existing evidence remains heterogeneous, with limited documentation of district-led QI implementation and its effects on major causes of maternal and neonatal mortality in decentralized health systems (Rowe *et al.*, 2018; Zamboni *et al.*, 2020).

Recent global evidence emphasizes

that improvements in maternal and neonatal outcomes depend not only on access to services but also on the quality, continuity, and reliability of care delivered across the health system. Kruk *et al.* (2018) highlighted that poor-quality care now accounts for more deaths than lack of access in many LMICs, including deaths from obstetric and neonatal complications that are otherwise preventable with timely and coordinated care. Household-level factors also contribute; husband's preparedness in supporting postpartum contraceptive use is strongly influenced by health beliefs, which shape decision-making and readiness to participate in maternal health practices (Feriani *et al.*, 2025). Evidence from maternal health systems indicates that fragmented and siloed communication across hospitals, outpatient prenatal care, and community-based services can limit the effective use of real-time data for care coordination (Declercq *et al.*, 2024). These challenges reflect broader systemic issues, where fragmented service delivery, weak accountability mechanisms, and limited use of routine performance data undermine the effectiveness of clinical guidelines and emergency care readiness. Reflecting on the emergency period during the COVID-19 pandemic, maternal deaths in Indonesia were frequently associated with late handling due to workforce limitations, lack of provider guidance on monitoring infected pregnant women, and suboptimal care for immunocompromised patients admitted to referral hospitals (Jati *et al.*, 2023). These experiences highlight systemic weaknesses that district-level quality improvement collaboratives are well-positioned to address. These findings underscore the need for quality-focused, system-level interventions that explicitly address how care is organized, monitored, and improved over time, particularly within decentralized governance arrangements.

Despite growing interest in QI collaboratives, most published studies focus on facility-level initiatives or externally driven projects, with limited attention to district-led implementation models and their sustainability within routine governance systems. Moreover, relatively few studies have linked QI collaborative processes to outcomes

for the major causes of maternal and neonatal mortality, such as PPH, PE/E, and neonatal asphyxia, using routinely collected service data in real-world settings (Leatherman *et al.*, 2010; Zamboni *et al.*, 2020). This evidence gap is particularly pronounced in decentralized health systems, where districts are expected to play a central coordinating role but often lack empirically tested models to operationalize quality improvement at scale. Addressing this gap is essential to inform policy-relevant strategies that move beyond pilot interventions toward institutionalized quality improvement within district health systems. This study describes the implementation and outcomes of a district-level QI Collaborative in Jember Regency, Indonesia, focusing on its contribution to strengthening maternal and neonatal service delivery and reducing postpartum hemorrhage (PPH), preeclampsia/eclampsia (PE/E), and neonatal asphyxia. By examining both implementation processes and outcome trends, this study seeks to address existing evidence gaps on how district-level leadership and coordinated quality improvement mechanisms can influence maternal and neonatal outcomes in decentralized health systems, thereby informing future scale-up and policy integration efforts.

## Method

This study employed an implementation study design using a Quality Improvement (QI) Collaborative approach based on the Institute for Healthcare Improvement (IHI) Breakthrough Series model and iterative Plan–Do–Study–Act (PDSA) cycles. The study aimed to evaluate the implementation and outcomes of a district-level QI Collaborative in reducing major maternal and neonatal complications, including postpartum hemorrhage (PPH), preeclampsia/eclampsia (PE/E), and neonatal asphyxia. The study was conducted in Jember Regency, East Java, Indonesia, involving primary healthcare facilities and secondary referral hospitals. The QI Collaborative was implemented in two phases: Batch I (December 2023), involving three referral hospitals, and Batch II (October 2024), expanding to ten primary healthcare centres and three additional hospitals. Multidisciplinary teams were formed

in each facility, consisting of clinicians, nurses, midwives, and quality officers.

The Quality Improvement (QI) Collaborative intervention was implemented through a structured Plan–Do–Study–Act (PDSA) cycle. During the planning phase, systematic case audits of postpartum hemorrhage, preeclampsia/eclampsia, and neonatal asphyxia were conducted to identify modifiable clinical and system-level factors contributing to adverse outcomes. The implementation phase comprised targeted mini learning sessions aimed at strengthening standardized screening practices, enhancing early recognition of complications, and reinforcing adherence to evidence-based management protocols. In the study phase, routine monitoring and evaluation were carried out using monthly aggregated data to track predefined quality indicators and assess performance trends over time. Finally, the action phase focused on refining effective practices and scaling up successful interventions through expansion to additional facilities, accompanied by structured feedback mechanisms to support continuous improvement.

Aggregated facility-level data were collected from medical records, quality indicator reports, and QI documentation. The independent variable was the implementation of the QI Collaborative. Dependent variables

included incidence of neonatal asphyxia, postpartum hemorrhage, and preeclampsia/eclampsia. Trends were analyzed using descriptive statistics, run charts, and median comparisons. Qualitative information from audit discussions was analyzed thematically to identify barriers and enabling factors. The study used anonymized aggregated data and did not involve individual patient identifiers. Ethical approval and research permission were obtained from the Research Ethics Committee of Universitas Airlangga Hospital on 30 March 2026 (Approval No: UA-02-26061).

## Result and Discussion

This study demonstrates that a district-level Quality Improvement Collaborative can strengthen maternal and neonatal service delivery in decentralized health systems, where decision-making authority is transferred closer to local levels to improve service responsiveness, efficiency, and quality (Witcahyo *et al.*, 2025). Reductions in postpartum hemorrhage and neonatal asphyxia, alongside improved detection of preeclampsia/eclampsia, reflect the value of coordinated, system-oriented approaches. The QI Collaborative was initiated in December 2023 with three referral hospitals and expanded in October 2024 to include ten primary healthcare centers and three additional hospitals. At baseline, neonatal asphyxia

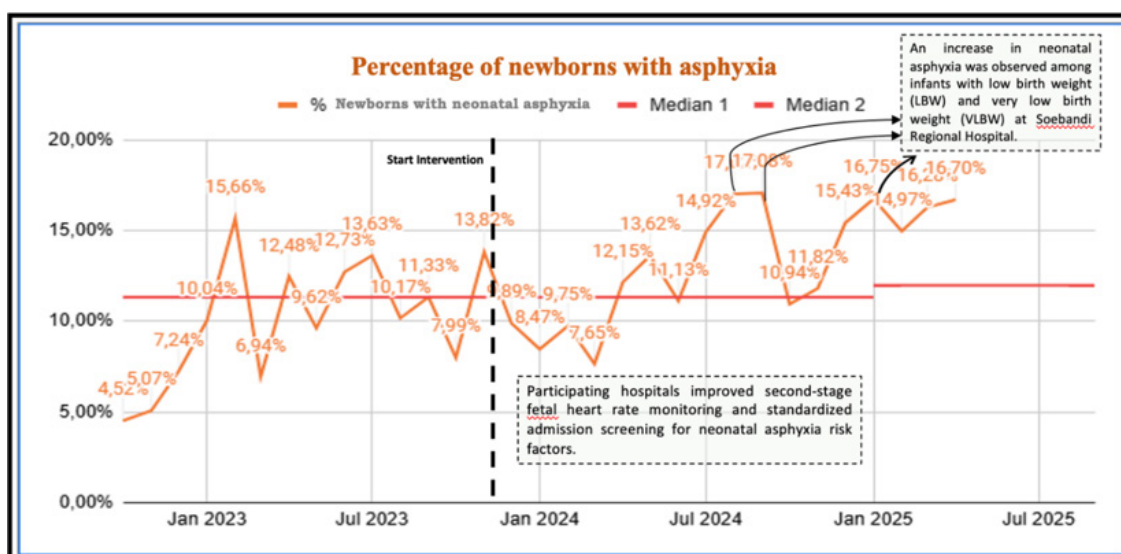


FIGURE 1. Trend of Neonatal Asphyxia Before and After QI Collaborative Implementation

TABLE 1. Neonatal Asphyxia Outcomes and Process Indicators by Facility Level

| QI Indicators for Neonatal Asphyxia | Batch I  |         | Batch II |         | Primary Health Care |         |
|-------------------------------------|----------|---------|----------|---------|---------------------|---------|
|                                     | Baseline | Outcome | Baseline | Outcome | Baseline            | Outcome |
| Case fatality rate                  | 8,46 %   | 8,43 %  | 3,70%    | 0 %     | 0 %                 | 0 %     |
| Asphyxia rate                       | 11.99%   | 11,99 % | 11.52%   | 10,15%  | 0 %                 | 1,30 %  |
| % fetal heart rate monitoring       | 21.20%   | 100,58% | 10,24%   | 11,86%  | 0 %                 | 7,14 %  |
| % timely ventilation                | 45,45%   | 30,21 % | 59,09%   | 28,26 % | 0 %                 | 0 %     |

Source: Author (2026)

reached 11.99% [Figure 1]. Although the overall prevalence showed modest fluctuation, key improvements were observed in clinical processes and outcomes. Referral hospitals reported a decline in case fatality rates and improved compliance with fetal heart rate monitoring and early respiratory support. In Batch II hospitals, case fatality dropped to zero, and the proportion of asphyxia decreased from 11.52% to 10.15% [Table 1]. Primary care facilities demonstrated improved early detection and referral, contributing to better neonatal stabilization.

The observed decline in neonatal asphyxia and improvement in case fatality rates across referral hospitals suggest that strengthening intrapartum monitoring and timely neonatal resuscitation can substantially improve neonatal outcomes. Similar findings have been reported in recent multi-country implementation studies showing that QI collaboratives improve adherence to essential newborn care practices, particularly in low- and middle-income settings where gaps in clinical readiness remain substantial (Hagaman *et al.*, 2020; Zaka *et al.*, 2018). The increase in fetal heart rate monitoring coverage and standardized ventilation practices in this study aligns with evidence that structured mentoring and routine performance feedback are critical enablers of sustained practice change (Hagaman *et al.*, 2020).

At the primary care level, improvements in early detection and referral pathways likely contributed to better neonatal stabilization. This is consistent with findings from an Indonesian district-based study, which identified fragmented referral coordination, delayed transfers, and weak audit mechanisms as key contributors to delays in maternal emergency

care (Mahmood *et al.*, 2018, 2021). These results reinforce the importance of district leadership and cross-facility collaboration in addressing the “second delay” in maternal and neonatal emergencies. The proportion of postpartum hemorrhage decreased from 2.13% to 1.82% [Figure 2] following the intervention. This improvement was associated with strengthened antenatal anemia screening, routine implementation of active management of the third stage of labor, increased availability of uterotonics and tranexamic acid, and improved postpartum monitoring. At the primary care level, postnatal follow-up increased, supporting continuity of care and early complication management.

The reduction in postpartum hemorrhage observed in this study was associated with increased coverage of active management of the third stage of labor (AMTSL), expanded use of tranexamic acid, and improved postnatal monitoring. These findings are consistent with recent global evidence indicating that QI-driven interventions targeting standardization of obstetric emergency protocols can significantly reduce severe maternal morbidity (Borders *et al.*, 2025). In low-resource settings, where availability of life-saving commodities does not always translate into optimal use, the combination of audit, mentoring, and data feedback—as implemented in this collaborative—appears particularly effective in closing the “know-do gap” (Zaka *et al.*, 2018).

Notably, improvements were more consistent in referral hospitals than in some primary healthcare centres, suggesting that additional system support is required to ensure equitable gains across levels of care. Strengthening supervision, supply chain reliability, and post-training follow-up at

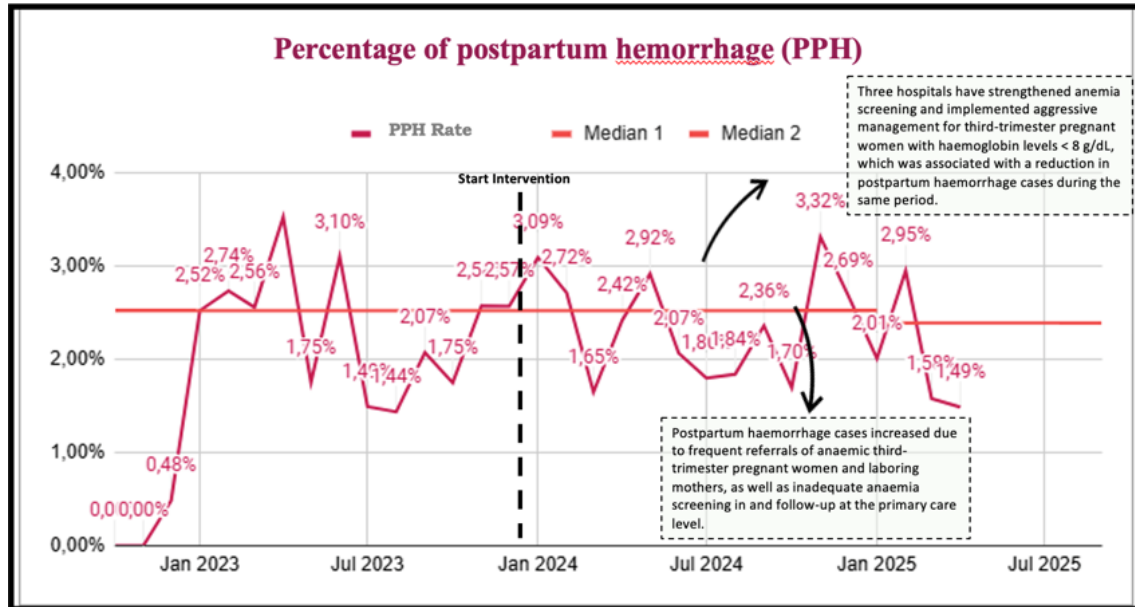


FIGURE 2. Trend of Postpartum Haemorrhage Before and After QI Collaborative Implementation

TABLE 2. Coverage of Key PPH Prevention and Management Interventions

| QI Indicators for PPH | Batch I  |         | Batch II |         | Primary Health Care |         |
|-----------------------|----------|---------|----------|---------|---------------------|---------|
|                       | Baseline | Outcome | Baseline | Outcome | Baseline            | Outcome |
| Case fatality rate    | 0%       | 0%      | 0%       | 0%      | 0 %                 | 0 %     |
| PPH rate              | 2,13 %   | 1,82%   | 2,59 %   | 2,87%   | 1,56 %              | 3 %     |
| Tranexamic acid use   | 44,24%   | 100%    | 50 %     | 100%    | -                   | -       |
| AMTSL coverage        | 66.67%   | 100%    | 0 %      | 46,15 % | 0 %                 | 66,67 % |

Source: Author (2026)

the primary care level should therefore be prioritized in future scale-up efforts. The introduction of standardized screening tools improved early detection of hypertensive disorders in pregnancy. Although referral hospitals initially recorded higher case proportions due to improved identification, clinical outcomes improved. All women with preeclampsia received timely delivery, and no maternal deaths due to preeclampsia or eclampsia were reported during the study period. In Batch II hospitals, the proportion of severe preeclampsia declined from 10.15% to 6.29% [Table 3]. Follow-up at the primary care level should therefore be prioritized in future scale-up efforts.

An initial increase in reported preeclampsia/eclampsia cases following implementation likely reflects improved screening and case identification rather than

a true rise in incidence. Similar patterns have been described in recent QI evaluations in Southeast Asia, where enhanced surveillance often leads to a temporary increase in reported complications before subsequent declines in severity and mortality (Hagaman *et al.*, 2020). Hypertensive disorders of pregnancy, including preeclampsia and eclampsia, are well-established contributors to maternal morbidity and mortality (Hidayah *et al.*, 2025), highlighting the clinical importance of effective detection and management strategies. Importantly, this study documented zero maternal deaths due to preeclampsia/eclampsia during the implementation period, underscoring the value of early recognition, timely referral, and standardized management.

The decline in severe preeclampsia cases in Batch II hospitals suggests that the collaborative approach may contribute not

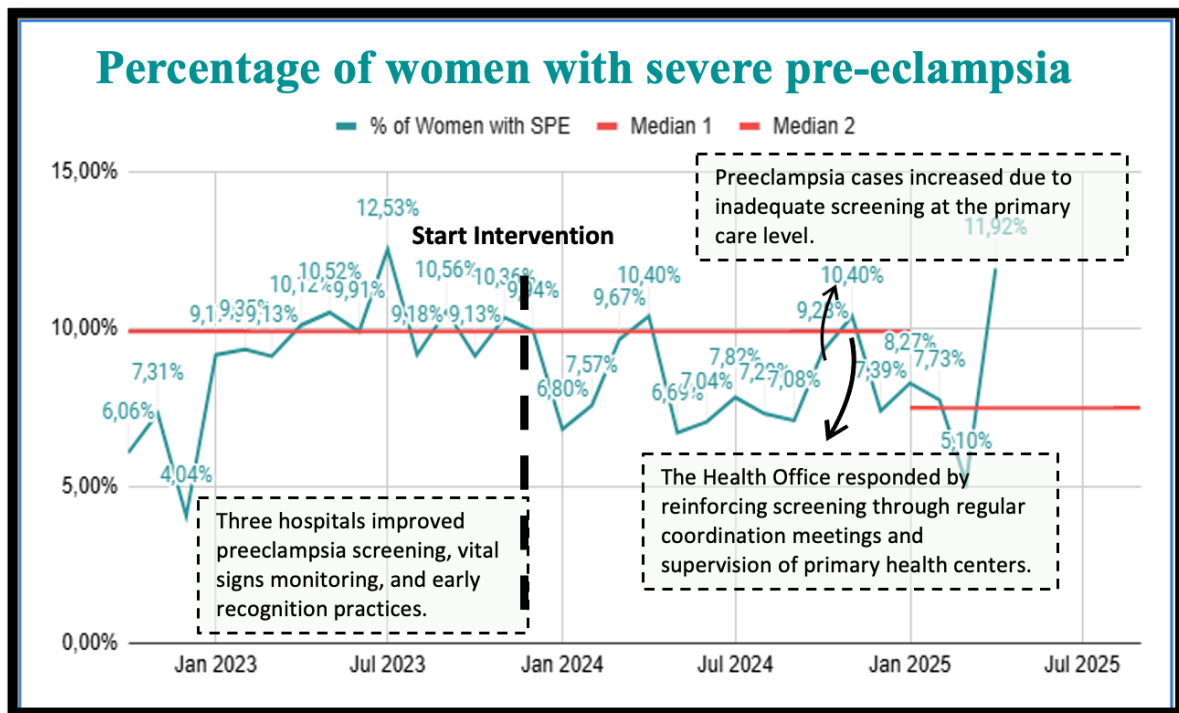


FIGURE 3. Trend of Severe Preeclampsia/Eclampsia Cases Before and After QI Collaborative Implementation

TABLE 3. Maternal Outcomes Related to Preeclampsia and Eclampsia

| QI Indicators for PE/E     | Batch I  |         | Batch II |         | Primary Health Care |         |
|----------------------------|----------|---------|----------|---------|---------------------|---------|
|                            | Baseline | Outcome | Baseline | Outcome | Baseline            | Outcome |
| Case fatality rate         | 0%       | 0%      | 0%       | 0%      | 0%                  | 0%      |
| % severe PE/E              | 7,48%    | 11,92%  | 10,15%   | 6,29%   | 11,56%              | 21%     |
| % timely delivery          | 100%     | 95,24%  | 72,97%   | 77,83%  | -                   | -       |
| % post discharge follow-up | 77,95%   | 35,94%  | 0%       | 56,67%  | 70%                 | 82,31 % |

Source: Author (2026)

only to improved detection but also to earlier intervention, preventing disease progression. These findings support national priorities to strengthen antenatal risk screening and reinforce the role of primary care as the frontline to prevent maternal complications (Gayatri *et al.*, 2026; Ocktariyana *et al.*, 2023). Beyond clinical outcomes, the QI Collaborative strengthened district-level service governance. Routine case audits and interdisciplinary learning sessions improved accountability, while standardized referral protocols enhanced continuity of care between primary and referral levels (Syairaji *et al.*, 2024). Increased use of

routine service data supported more responsive supervision. District-level QI collaboratives can function as governance mechanisms to translate national maternal and neonatal policies into routine practice (Mandu *et al.*, 2023; Salam *et al.*, 2014). Embedding collaborative cycles into district supervision structures may enhance accountability, standardize referral practices, and promote data-informed decision-making without major additional investment.

This study relied on aggregated routine data, which may be subject to reporting bias and limit causal inference. The quasi-experimental design without a concurrent

control group also constrains the ability to attribute observed changes solely to the intervention. Nevertheless, the consistent improvements in care processes and aligned trends across multiple indicators strengthen the plausibility of the program impact. Future research should incorporate mixed-methods evaluations to better understand contextual factors influencing implementation success, as well as cost-effectiveness analyses to inform scale-up decisions. Expanding the collaborative model to additional districts and integrating digital health tools for real-time monitoring may further enhance impact.

## Conclusion

The districtlevel Quality Improvement Collaborative in Jember Regency was associated with improved maternal and neonatal service performance and outcomes. By aligning facilities under shared improvement goals, strengthening referral coordination, and embedding data use into routine supervision, the collaborative contributed to reductions in major complications such as postpartum hemorrhage, preeclampsia/eclampsia, and neonatal asphyxia. For decentralized health systems such as Indonesia, districtled QI collaboratives represent a scalable public health strategy to enhance service integration, reinforce accountability, and accelerate progress toward national and global maternal and neonatal health targets.

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