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Collaborative antenatal care assessment and action planning for low-birth-weight prevention in Kulisusu, Indonesia

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ABSTRACT

Background: Low birth weight (LBW) remains a maternal and newborn health concern requiring continuity of care throughout pregnancy and after childbirth. Gaps between antenatal risk detection and follow-up may undermine coordinated care. Objective: To assess antenatal care responses to maternal risk factors and develop recommendations supporting LBW prevention at Kulisusu Primary Health Center, Indonesia.

Methods: A descriptive, collaborative field assessment was conducted on 23–30 September 2026 through program record reviews and semi-structured interviews with six informants representing healthcare personnel, community volunteers, and mothers. Records covered 25 LBW infants born in 2025 and 17 born during January–August 2026. Descriptive statistics and thematic analysis using a Five Lenses framework informed proposed action priorities.

Results: Antenatal screening, education, iron supplementation, and referral services were available. Among mothers of LBW infants, the last recorded hemoglobin level was below 11 g/dL in 47.8% in 2025 and 56.3% in 2026. However, risk detection dates, missed appointments, tracing outcomes, referral completion, and maternal–newborn care linkages were not consistently documented. Reported barriers included stigma, nausea, mobility, and dispersed follow-up responsibilities. Proposed actions included an at-risk maternal register, missed-appointment tracking, referral feedback, and linked maternal–newborn records.

Conclusion: The assessment identified documentation and coordination gaps and generated phased recommendations for strengthening care continuity. Implementation and outcome evaluation are required before effectiveness can be established.

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INTRODUCTION

Low birth weight (LBW), defined as a birth weight below 2,500 grams, remains a substantial public health concern. The UNICEF–World Health Organization estimates indicate that 19.8 million newborns, representing 14.7% of live births worldwide, had LBW in 2020. Global prevalence declined from 16.6% in 2000, indicating slow progress over two decades. LBW can result from preterm birth, restricted fetal growth, or both, highlighting the importance of maternal health and care throughout pregnancy (Okwaraji et al., 2024). These figures reinforce the need to examine how primary healthcare services translate risk identification into timely, coordinated action.

In Indonesia, the 2023 Indonesian Health Survey reported an LBW proportion of 6.1%. This indicator describes children aged 0–59 months whose birth weight was established from health records or caregiver recall; it should therefore be interpreted within that survey framework (Indonesia, 2024). Nevertheless, the national findings underscore the continuing importance of maternal and newborn health services (Alamsyah et al., 2026). For local programs, the practical challenge extends beyond recording birth outcomes to understanding whether mothers with identified risks receive appropriate management and continued support (Kurniadi et al., 2023). National data provide a reference point, while facility records help identify specific service gaps requiring locally appropriate responses (Adnani et al., 2025).

Antenatal care provides an opportunity to connect health promotion, maternal and fetal assessment, preventive interventions, and individualized support. This guidance emphasizes women's experiences and person-centred care alongside the prevention of illness and death. This approach is particularly relevant when a clinical finding requires repeated contact, referral, or coordination between providers (Beressa et al., 2024). From a program perspective, identifying a risk should initiate a traceable care pathway: the woman receives an explanation, an appropriate action is arranged, responsibility is assigned, and subsequent progress is reviewed (Bradford et al., 2022). Assessing these connections can reveal improvement priorities that routine counts of antenatal contacts may overlook.

At Kulisusu Primary Health Center, the community service partner, program records documented 25 LBW infants in 2025 and 17 during January–August 2026 (Kulisusu, 2026). These figures represent recorded cases rather than prevalence because the total number of live births was unavailable. The records also identified maternal concerns requiring follow-up. Among mothers who delivered LBW infants, the last recorded hemoglobin level was below 11 g/dL in 11 of 23 mothers in 2025 and nine of 16 in 2026. These descriptive findings cannot establish causation, but they provide a concrete basis for reviewing how maternal risks are detected, managed, and followed across service contacts (Indonesia, 2024; Gustini & Akib, 2025).

The partner's immediate concern was the limited traceability of care after screening. Existing services included antenatal examinations, education, iron supplementation, nutritional coordination, and referral. However, available documentation did not consistently connect risk detection dates with scheduled appointments, missed attendance, tracing outcomes, referral feedback, and postnatal care (Hasni et al., 2026). Interviews also identified nausea, stigma, mobility, and dispersed follow-up responsibilities as possible barriers to continuity. Missing documentation does not prove that care was absent (Indonesia, 2020). It does, however, limit the team's ability to determine which women still require attention and whether responsibility has been transferred successfully between providers.

Accordingly, this community service activity aimed to assess antenatal care responses to maternal risk factors and develop practical recommendations with Kulisusu Primary Health Center. Conducted on 23–30 September 2026, the activity combined program record reviews, stakeholder interviews, and clarification of findings with the partner. Its specific objectives were to describe recorded maternal risks, identify gaps in detection and follow-up, explore barriers experienced by service users, and formulate phased action priorities. Proposed outputs included an at-risk maternal register, missed-appointment tracking, referral feedback, and linked maternal–newborn records. This initial assessment and planning phase established priorities for subsequent implementation and evaluation without claiming demonstrated reductions in LBW.

METHOD

Implementation Methods

This community service activity used a descriptive, collaborative field assessment combining quantitative program record reviews and qualitative interviews. The activity focused on identifying gaps in antenatal risk detection, management, and follow-up and developing recommendations with the partner. A Five Lenses framework guided the assessment: service problems and gaps, explanatory factors, groups most affected, health system responses, and priorities for improvement. Recommendations were developed during this phase; their implementation and effectiveness were not evaluated.

Location and Period

The activity was conducted in the service area of Kulisusu Primary Health Center, Indonesia, on 23–30 September 2026. The assessment examined antenatal services and their connections with village-based maternal care, referral facilities, and postnatal–neonatal services. Program records covered January–December 2025 and January–August 2026.

Target Participants and Data Sources

The primary target was the antenatal care system and its maternal and child health service network. Six informants represented different service perspectives: one maternal and child health program coordinator, one village midwife, one community health volunteer, one pregnant woman with identified risks, one mother with experience of delivering an LBW infant, and the head of the primary health center. Documentary sources included monthly antenatal contact summaries and records of 25 LBW infants in 2025 and 17 in January–August 2026. These corresponded to 23 and 16 mothers, respectively, because twin births were counted as two infants but one mother. Maternal and infant data were therefore analyzed separately to avoid duplicate maternal counts. The activity combined program record reviews and stakeholder interviews to assess antenatal care continuity and identify improvement priorities. Table 1 summarizes the design, setting, participants, instruments, data analysis, and ethical considerations.

Table 1. Design and methods of the community service activity

Component	Description
Activity design	A descriptive field assessment using a mixed-methods approach was conducted collaboratively with the primary health center. The Five Lenses framework covered: (1) service problems and gaps, (2) explanatory factors, (3) groups most affected, (4) system responses, and (5) priorities for change. The framework was mapped onto the continuum of care: entry into antenatal care (ANC), risk detection, initial management, follow-up and tracing, referral, childbirth and discharge, and postnatal and neonatal care. System responses were examined across the domains of inputs, processes, outputs, context, and responsiveness.

Partners, location, and period	The partners were Kulisusu Primary Health Center and the local health office. The activity took place within the health center's service area on 23–30 September 2026.
Target and informants	The assessment targeted the ANC system and maternal and child health (MCH) service network. Mothers, healthcare personnel, community health volunteers, and program documents served as information sources. Six informants participated: one MCH program coordinator, one village midwife, one community health volunteer, one pregnant woman with identified risks, one mother who had delivered a low-birth-weight (LBW) infant, and the head of the primary health center.
Materials and data sources	Materials comprised individual records of LBW infants, defined as weighing less than 2,500 g at birth, and monthly summaries of first antenatal contacts (K1), sixth antenatal contacts (K6), and LBW cases. The analysis included 25 infant records from 2025 and 17 from January–August 2026. Twin births—two pairs in 2025 and one pair in 2026—were counted as two infants but one mother, yielding 23 and 16 mothers, respectively.
Tools and instruments	Instruments included a Five Lenses interview guide, separate infant-level and maternal-level data extraction matrices, an interview thematic matrix, an audio recorder, and field notes.
Data collection and triangulation	Data were collected through document reviews and semi-structured interviews. Findings were triangulated across healthcare personnel, community health volunteers, mothers, and program records.
Quantitative analysis	Quantitative data were analyzed descriptively using frequencies and proportions, with separate analyses for infants and mothers. Hemoglobin below 11 g/dL and mid-upper arm circumference below 23.5 cm were the operational thresholds used to identify anemia and risk of chronic energy deficiency, respectively 2024a; Ministry of Health of the Republic of Indonesia, 2020). Referral was counted whenever a record indicated that a referral had occurred, without distinguishing the phase of care.
Qualitative analysis	Interview data were organized by assessment lens and health system domain. Informant accounts were distinguished from administrative evidence. No statistical association testing or cohort matching was performed.
Permission, consent, and confidentiality	Permission was obtained from the primary health center, and informants provided consent. Only aggregated, de-identified data were reported. Ambiguous statements or responses elicited through leading questions were not treated as established clinical facts.

RESULT

Program Records and Infant Characteristics

The record review identified 25 low-birth-weight (LBW) infants in 2025 and 17 during January–August 2026. These represented recorded cases rather than prevalence because the total number of live births was unavailable. During January–August, the number of first antenatal contacts (K1) decreased from 246 in 2025 to 227 in 2026, whereas sixth antenatal contacts (K6) increased slightly from 211 to 215. The number of recorded LBW infants was identical across these comparable periods, at 17. Mean birth weight was 2,123.2 g in 2025 and 2,132.9 g in 2026. Approximately one-third of recorded infants weighed ≤2,000 g or were born before 37 weeks of gestation. The proportion with a recorded referral increased from 60.0% to 76.5%, while hospital births increased from 64.0% to 76.5% (Table 2). Referral records did not consistently distinguish antenatal, postpartum, and neonatal referrals.

Table 2 summarizes antenatal contacts and the characteristics of recorded low-birth-weight infants at Kulisusu Primary Health Center in 2025 and January–August 2026, including birth weight, gestational age, referral status, and place of birth.

Table 2. Antenatal contacts and characteristics of recorded LBW infants

Indicator	2025 (January–December)	2026 (January–August)
First antenatal contacts (K1)	365	227
Sixth antenatal contacts (K6)	326	215
Recorded LBW infants	25	17
Mean birth weight	2,123.2 g	2,132.9 g
Birth weight ≤2,000 g	8 (32.0%)	6 (35.3%)
Gestational age <37 weeks	9 (36.0%)	6 (35.3%)
Recorded referral	15 (60.0%)	13 (76.5%)
Hospital birth	16 (64.0%)	13 (76.5%)

Maternal Characteristics

The infant records corresponded to 23 mothers in 2025 and 16 in 2026. Twin pregnancies accounted for the difference between maternal and infant totals. The last recorded hemoglobin (Hb) level was below 11 g/dL in 47.8% of mothers in 2025 and 56.3% in 2026. Mid-upper arm circumference (MUAC) was below 23.5 cm in 52.2% and 25.0%, respectively. Concurrent Hb <11 g/dL and MUAC <23.5 cm occurred in five mothers in 2025 and four in 2026 (Table 3). Six mothers in each period were aged <20 or >35 years. Initial risk detection dates and serial Hb measurements were unavailable; therefore, the duration of these conditions and the interval between detection and management could not be established.

Table 3. Maternal characteristics among mothers who delivered **LBW** infants

Characteristic	2025 (n = 23)	2026 (n = 16)
Last recorded Hb <11 g/dL	11 (47.8%)	9 (56.3%)
MUAC <23.5 cm	12 (52.2%)	4 (25.0%)
Concurrent Hb <11 g/dL and MUAC <23.5 cm	5 (21.7%)	4 (25.0%)
Maternal age <20 years	3 (13.0%)	2 (12.5%)
Maternal age >35 years	3 (13.0%)	4 (25.0%)
Twin pregnancy	2 (8.7%)	1 (6.3%)
Mothers whose infants had a recorded referral	13 (56.5%)	12 (75.0%)

Antenatal screening and follow-up

Interviews indicated that antenatal examinations, education, vital sign assessments, iron supplementation, nutritional coordination, and referral were provided. The maternal and child health (MCH) program coordinator described screening during initial and subsequent visits and coordination with nutrition personnel when maternal nutritional concerns were identified. All 42 infant records contained the last maternal Hb value and referral status. However, the reviewed documents did not consistently connect risk detection dates, management, scheduled return visits, attendance, and subsequent outcomes. Some mothers had multiple antenatal contacts, but the available records did not provide a complete chronological account of their care. Follow-up responsibilities were partly delegated to village midwives. The MCH program coordinator could not consistently verify which mothers had received home visits. The head of the primary health center reported that home visits were not routine and had not reached all intended recipients. Lists of missed appointments, contact attempts, tracing outcomes, and response times were unavailable. Consequently, the number of mothers requiring unresolved follow-up could not be quantified.

Reported barriers to care

Maternal interviews identified physical discomfort and social concerns affecting attendance. One pregnant woman with identified risks reported that nausea and weakness made attending integrated health posts (Posyandu) difficult. She also recalled little of the information delivered during antenatal classes. A mother who had delivered an LBW infant described embarrassment about pregnancy outside marriage and fear of ridicule. She reported approximately two antenatal visits beginning late in pregnancy and childbirth at around 32 weeks

of gestation. These accounts reflected individual experiences; their frequency across the wider population was not measured. Interviews also identified challenges related to mobility and care received outside the village midwife's service pathway. Absence from Posyandu could therefore not be interpreted as an absence of antenatal care, as some mothers consulted physicians or hospitals elsewhere.

Referral and postnatal–neonatal linkages

Referral was recorded in 28 of the 42 infant records. However, referral phase, indication, date, receiving-facility confirmation, outcome, and return plan were not consistently available as a connected sequence. The records therefore did not establish whether each referral had been completed. Hospital birth information was sometimes communicated to village midwives. Post-discharge infant monitoring was reported in one case, but consistent documentation linking discharge plans, receiving providers, scheduled visits, and monitoring outcomes was unavailable. Documentary evidence confirming provision of the MCH Handbook or its special edition for small babies was also unavailable.

System responses and documentation gaps

The assessment identified existing service resources and activities alongside gaps in documentation and coordination. Reported availability was distinguished from independently verified evidence (Table 4).

Table 4. Identified system responses and evidence gaps

Domain	Findings	Evidence gaps
Inputs	The head of the primary health center reported available midwives, facilities, standard operating procedures, registers, and management support.	Resource adequacy and use of procedures across villages were not independently audited.
Processes	Antenatal care, education, referral, and some home visits were reported.	Risk detection dates, missed-appointment lists, visit logs, and follow-up outcomes were unavailable.
Outputs	Forty-two LBW infants were recorded across the two reporting periods.	The number of mothers not reached and completeness relative to the target population were unknown.
Context	Village networks and village midwives supported service delivery.	Information exchange was not always complete or timely; mobility and stigma were reported challenges.
Responsiveness	Telephone calls, messaging groups, and volunteer reminders supported some mothers.	Response times, follow-up coverage, and availability of private communication options were not measured.

Assessment Outputs and Proposed Action Priorities

Clarification with the partner on 28 September confirmed limitations in detection and follow-up documentation and corrected the 2025 LBW total to 25 infants. The assessment generated five proposed priorities: an at-risk maternal working register, missed-appointment tracking, referral feedback, reconciliation of maternal–newborn records, and consistency checks between individual records and monthly summaries.

The assessment identified five priorities for improving antenatal care continuity. Table 5 presents the proposed follow-up actions, timelines, responsible personnel, and monitoring indicators. These actions had not yet been implemented or evaluated.

Table 5. Proposed follow-up actions generated by the assessment

Proposed period	Responsible personnel	Proposed action	Monitoring indicator

Weeks 1–4	MCH program coordinator and village midwives	Pilot an at-risk maternal register, audit the 2025 monthly summaries, and establish referral definitions.	Proportion of registered active at-risk mothers with documented detection dates, appointments, and responsible personnel
Months 2–3	Village midwives and MCH program coordinator	Record missed appointments, document private contact attempts, and review unresolved cases weekly.	Proportion of at-risk mothers missing appointments with documented contact attempts and outcomes
Months 2–3	Midwives and hospital personnel	Reconcile referral status with receiving-facility feedback and document return plans.	Proportion of referrals with documented receipt, outcomes, and follow-up plans
Month 3 onward	MCH, neonatal, and nutrition personnel	Link birth, postnatal, neonatal, and handbook records.	Proportion of registered LBW infants with assessed handbook status and documented follow-up plans

DISCUSSION

This assessment identified a gap between the availability of antenatal services and the traceability of care after maternal risks were detected. Screening, education, supplementation, and referral were reported, but documentation did not consistently connect these activities with subsequent appointments, tracing outcomes, and referral completion. The findings therefore suggest a coordination and information challenge rather than demonstrating an absence of care. For Kulisusu Primary Health Center, the immediate improvement priority is to make each woman's care pathway visible across providers and service transitions. This interpretation is consistent with Indonesian evidence on discontinuities in maternal and child healthcare. Using four Indonesian Demographic and Health Survey waves, Rammohan et al. (2024) found that fewer than half of children received all four assessed components of the continuum: antenatal care, institutional delivery, postnatal care, and complete immunization. Their population-level analysis differs from the present facility assessment, but both highlight that contact with one service does not guarantee continued care. Kulisusu's findings add an operational perspective: incomplete appointment, tracing, and handover records can make discontinuities difficult to identify and address.

The maternal findings also support closer attention to longitudinal risk management. Among mothers of LBW infants, the last recorded Hb level was below 11 g/dL in 47.8% in 2025 and 56.3% in 2026. Merzalia & Syafiq (2024) reported an association between maternal anemia and LBW in an Ethiopian systematic review and meta-analysis, although evidence quality was low and heterogeneity was substantial (WHO, 2024). This literature supports the relevance of maternal Hb assessment, but its effect estimates cannot be transferred directly to Kulisusu. Because the present records included only mothers of LBW infants, lacked a comparison group, and did not contain serial measurements, they cannot establish whether anemia increased local LBW risk or whether treatment was delayed.

Repeated antenatal contacts should likewise be interpreted cautiously. Some mothers had multiple contacts yet delivered LBW infants; this does not establish that screening failed. Contact counts cannot show whether risks were identified early, management was appropriate, or follow-up was completed. Moreover, Sandall et al. (2024) found no clear reduction in LBW under midwife continuity models compared with other care models (RR = 0.92, 95% CI [0.79, 1.08]). Thus, strengthening continuity is a reasonable service objective, but it should not be presented as a proven means of reducing LBW in this setting. Process improvements and birth outcomes require separate evaluation.

The interviews indicate that continuity also depends on how services respond to women's circumstances. Nausea, weakness, fear of ridicule, and pregnancy-related stigma were reported barriers. These individual accounts cannot establish prevalence, but they identify concerns that routine registers may miss. WHO's global position paper emphasizes equity, quality, continuity, and interdisciplinary collaboration as guiding principles for midwifery models of care (World Health Organization (WHO, 2024a). In Kulisusu, applying these principles would involve offering confidential communication, clarifying preferred contact methods, and distinguishing missed Posyandu attendance from receiving no antenatal care. Follow-up should support access without exposing sensitive personal information.

Referral documentation represents another important improvement opportunity. Although referrals were recorded for 28 infants, the available information did not consistently establish the phase, indication, receiving facility, outcome, or return plan. The higher recorded referral proportion in 2026 therefore cannot independently demonstrate improved referral quality. WHO's networks-of-care guidance emphasizes relationships, teamwork, leadership, and communication between health system stakeholders (WHO, 2016). Consistent with this guidance, Kulisusu's proposed referral feedback mechanism should connect the referring and receiving teams and identify who remains responsible after transfer (Wulandari et al., 2022). A referral entry becomes more useful when it records what happened next.

The limited linkage between childbirth, discharge, and postnatal–neonatal records is particularly relevant for LBW infants. WHO (2022) recommends additional family support beginning in health facilities and continuing after discharge. This supports the proposed reconciliation of maternal and infant records, including follow-up plans and handbook status. However, unavailable documentation of handbook provision should not be interpreted as proof that handbooks were withheld (Suriyani et al., 2026). The practical implication is to verify their availability and use and to ensure that families and receiving providers understand the next care steps.

The main contribution of this community service activity was a locally grounded set of improvement priorities rather than evidence of intervention effectiveness. An at-risk register, missed-appointment log, referral feedback, and linked maternal–newborn records could be piloted within existing workflows. Initial evaluation should examine feasibility, staff workload, documentation completeness, and timely resolution of outstanding cases. Interpretation remains limited by six informants, incomplete records, unequal reporting periods, and the absence of all-birth denominators. Subsequent evaluation should establish baseline process measures and prospectively track implementation before assessing changes in service continuity or birth outcomes.

CONCLUSION

The assessment found that Kulisusu Primary Health Center provided antenatal screening, education, initial management, and referral. However, available records did not consistently link risk detection with follow-up, referral outcomes, and postnatal–neonatal care. Interviews identified physical discomfort, stigma, and mobility as potential barriers to continuity. These descriptive findings informed improvement priorities but do not establish the causes of LBW or demonstrate intervention effectiveness. To sustain the initiative, the primary health center should pilot an at-risk maternal register, document missed appointments and tracing outcomes, and establish referral feedback with receiving facilities. Responsibilities should be assigned within

existing workflows, with weekly reviews of unresolved cases and monthly checks of maternal–newborn records. Follow-up communication should respect women's preferences and confidentiality. The local health office should support coordination and resources, while subsequent evaluation should assess feasibility, documentation completeness, and timely follow-up before examining longer-term birth outcomes.

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Conflict of Interest

The authors declare no conflicts of interest.

Declaration of Generative AI Use

The authors used ChatGPT (OpenAI) to assist with drafting, translation, and language editing. All AI-assisted content was reviewed and revised by the authors, who take full responsibility for the accuracy, integrity, and final content of the manuscript.

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