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The Effect of Midwifery-Led Care Intervention on Maternal and Neonatal Outcomes in Low-Risk Pregnancies: A Prospective Cohort Study

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Abstract.*Background: Midwifery-led care (MLC) is a continuity of care model that positions midwives as the primary responsible providers in managing low-risk pregnancies. Despite endorsement by the World Health Organization, its implementation in Indonesia remains limited. This study aimed to analyze the effect of MLC intervention on maternal and neonatal outcomes in low-risk pregnancies.Methods: A prospective cohort study was conducted at four primary health centers in Surabaya, Indonesia, from January to December 2024. A total of 240 low-risk pregnant women meeting inclusion criteria were allocated into two groups: MLC intervention (n=120) and conventional care control (n=120). Outcomes measured included preeclampsia, preterm delivery, cesarean section, postpartum hemorrhage, low birth weight, neonatal asphyxia, and maternal satisfaction. Data were analyzed using chi-square test, independent t-test, and multivariate logistic regression with significance set at p<0.05.Results: The MLC group demonstrated significantly better maternal outcomes, including lower cesarean section rate (15.7% vs 28.2%; p=0.018), lower preeclampsia incidence (5.2% vs 13.7%; p=0.024), and lower postpartum hemorrhage (3.5% vs 10.3%; p=0.034). Neonatal outcomes also showed significant differences in low birth weight (4.3% vs 12.0%; p=0.029) and neonatal asphyxia (2.6% vs 8.5%; p=0.041). Overall maternal satisfaction was higher in the MLC group (92.2% vs 71.8%; p<0.001). Multivariate analysis identified MLC as a protective factor against adverse maternal-neonatal outcomes (OR=0.42; 95% CI: 0.24–0.73; p=0.002).Conclusion: Midwifery-led care intervention significantly improves maternal and neonatal outcomes in low-risk pregnancies and enhances maternal satisfaction with care. This model is recommended for broader implementation within the Indonesian maternal and child healthcare system.*

Keywords: *Low-risk pregnancy; Maternal outcomes; Midwifery-led care;Neonatal outcomes; Prospective cohort*

1. INTRODUCTION

The Maternal Mortality Ratio (MMR) and Infant Mortality Rate (IMR) serve as critical indicators for assessing the health status of a nation. According to the Indonesian Intercensal Population Survey (SUPAS) of 2020, the MMR in Indonesia remains at 305 per 100,000 live births, far exceeding the Sustainable Development Goals (SDGs) target of 70 per 100,000 live births by 2030 (Ministry of Health of the Republic of Indonesia, 2021). The persistently high MMR in Indonesia is attributable to a complex interplay of factors, including delays in recognizing pregnancy danger signs, delays in decision-making to seek care, and delays in receiving adequate management at healthcare facilities (Achadi, 2019).

One approach that has demonstrated effectiveness in reducing maternal and infant mortality across numerous countries is the implementation of midwifery-led care (MLC). This care model positions midwives as the primary managers and coordinators of care for low-risk pregnant women, spanning the continuum from pregnancy through childbirth to the postnatal period (Sandall et al., 2016). According to Renfrew et al. (2014), MLC transcends a mere

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service delivery model; it embodies a philosophy of care that is woman-centered, founded upon the principles of continuity, partnership, and empowerment.

The World Health Organization (WHO), in its recommendations for a positive pregnancy experience, emphasizes the importance of continuity of care models led by midwives for low-risk pregnancies (WHO, 2016). These recommendations are grounded in scientific evidence demonstrating that MLC is associated with reduced unnecessary medical interventions, increased rates of spontaneous vaginal birth, and higher maternal satisfaction without elevating the risk of complications (Sandall et al., 2016).

In Indonesia, maternity care continues to be dominated by a conventional care model characterized by fragmentation, wherein pregnant women may receive care from different healthcare providers at each visit without integrated coordination (Ensor et al., 2019). This fragmented approach potentially leads to discontinuity in clinical information, inconsistencies in care planning, and deterioration of the therapeutic relationship between midwives and pregnant women. As articulated by Perdani and Sulastri (2020), continuity of care represents a key element determining the success of midwifery services in reducing pregnancy and childbirth complications.

Substantial international evidence supports the effectiveness of MLC. A Cochrane systematic review involving 17,674 participants demonstrated that MLC significantly reduced the risk of preterm birth, decreased the use of regional analgesia, and increased the likelihood of spontaneous vaginal birth (Sandall et al., 2016). Similar findings were reported by Homer et al. (2017) in Australia, who found that MLC reduced cesarean section rates by up to 22% in a low-risk pregnancy population. However, evidence from Southeast Asian contexts, particularly Indonesia, remains remarkably scarce.

Previous research in Indonesia has predominantly focused on evaluating individual midwife performance or specific programs such as the Village Midwife Program and the Birth Preparedness and Complication Prevention Program (P4K), without comprehensively evaluating midwife-led continuity of care models (Titaley et al., 2020). Yet, the unique sociocultural context of Indonesia—characterized by geographical diversity, cultural heterogeneity, and varying levels of access to healthcare facilities—necessitates local evidence to support evidence-based policy in maternal and child healthcare.

A study by Anggraini et al. (2021) in East Java demonstrated that the implementation of a continuity of care model by midwives for low-risk pregnancies improved antenatal visit compliance and reduced birth complications. This finding aligns with the concept of continuity of care that forms the cornerstone of MLC, wherein the sustained therapeutic relationship

between midwife and pregnant woman contributes to early risk detection and more timely management (Sari & Kusmiyati, 2022).

Beyond clinical outcomes, maternal satisfaction with care represents an equally important variable warranting evaluation. According to Wulandari et al. (2023), maternal satisfaction with midwifery services is influenced not only by the midwife's technical competence but also by communication quality, empathy, and the mother's involvement in care-related decision-making. The MLC model, which emphasizes partnership and empowerment of pregnant women, is expected to comprehensively enhance these dimensions.

Based on the foregoing background, a significant knowledge gap exists regarding the effectiveness of MLC within the Indonesian healthcare system context. Therefore, this study aimed to analyze the effect of MLC intervention on maternal and neonatal outcomes in low-risk pregnancies through a prospective cohort study design. This research is expected to provide relevant scientific evidence to support the development of midwifery care policies in Indonesia that are more woman-centered and evidence-based.

METHODS

Study Design and Setting

This study employed a prospective cohort design with a quantitative approach. The selection of a prospective cohort design was predicated upon its strengths in identifying temporal relationships between exposure (MLC intervention) and outcomes (maternal and neonatal) and its superior capacity to control confounding variables compared to retrospective designs (Notoatmodjo, 2018). The study was conducted at four primary health centers (Puskesmas) in Surabaya, East Java, Indonesia, selected based on criteria including the availability of trained midwives, adequate antenatal care volume, and willingness to participate in the research. The study was conducted over a 12-month period from January to December 2024.

Population and Sample

The target population comprised all low-risk pregnant women receiving antenatal care at the four selected primary health centers during the study period. Inclusion criteria were: (1) pregnant women with gestational age ≤12 weeks at recruitment; (2) classified as low-risk pregnancy based on the Poedji Rochjati Score Card (score ≤6); (3) aged 20–35 years; (4) primigravida or multigravida with favorable obstetric history; and (5) willing to participate and provide written informed consent. Exclusion criteria included: (1) pregnant women with

comorbidities (diabetes mellitus, chronic hypertension, cardiac disease, or autoimmune disorders); (2) multiple gestations; (3) history of previous cesarean section; and (4) smoking or alcohol consumption during pregnancy.

Sample size was calculated using the formula for difference between two proportions with a 95% confidence level ($Z\alpha$=1.96), 80% power ($Z\beta$=0.84), and based on cesarean section proportions of 15% in the MLC group and 30% in the control group (derived from preliminary data). Calculation yielded a minimum requirement of 107 subjects per group. Accounting for a 10% potential dropout rate, a total of 240 pregnant women (120 per group) were recruited. Consecutive sampling was employed, with group allocation determined by health center location (two health centers for the intervention group and two for the control group).

Midwifery-Led Care Intervention

The intervention group received an MLC model developed through adaptation of The Lancet Midwifery Series framework (Renfrew et al., 2014), contextualized for the Indonesian midwifery practice setting. The core components of the MLC intervention comprised: (1) Continuity of carer, whereby each pregnant woman was assigned a named midwife who assumed full responsibility from the first trimester through 42 days postpartum; (2) Woman-centered approach, actively involving mothers in all care decisions through structured discussions and individualized birth plan development; (3) Integrated antenatal care with a minimum of eight visits per WHO (2016) recommendations, encompassing comprehensive physical examinations, periodic risk screening, structured health education, and emotional support; and (4) Coordinated referral system, wherein the named midwife continued to accompany the pregnant woman when referral to an obstetrician was required.

The control group received standard conventional antenatal care as routinely provided at the health centers, wherein pregnant women could be examined by different midwives at each visit according to shift schedules (shift-based care). Conventional care encompassed routine examinations per minimum service standards but without specific emphasis on midwife-mother continuity, individualized birth plan development, or a structured woman-centered approach.

Study Variables

The independent variable was the type of midwifery care received (MLC vs. conventional). Dependent variables comprised maternal and neonatal outcomes. Maternal outcomes included: preeclampsia incidence, preterm delivery (<37 weeks), mode of delivery

(spontaneous vaginal, vacuum extraction, or cesarean section), postpartum hemorrhage (blood loss ≥500 ml), and maternal satisfaction. Neonatal outcomes included: low birth weight (<2,500 grams), neonatal asphyxia (APGAR score <7 at 5 minutes), and Neonatal Intensive Care Unit (NICU) admission. Confounding variables controlled for included maternal age, parity, body mass index, educational level, employment status, and distance to healthcare facility.

Instruments and Data Collection

Data collection employed multiple instruments. Demographic and obstetric characteristics were collected using structured data forms at recruitment. Maternal and neonatal outcome data were obtained from medical records and standardized observation sheets that had been tested for validity and reliability. Maternal satisfaction was measured using the Maternal Satisfaction Scale for Midwifery Care (MSSMC), adapted into Bahasa Indonesia and validated through a pilot study (Cronbach's alpha = 0.89). This questionnaire comprised 25 items on a 5-point Likert scale encompassing dimensions of technical quality, interpersonal communication, continuity of care, and involvement in decision-making (Wulandari et al., 2023).

Data Analysis

Data analysis was conducted in stages using IBM SPSS version 26.0. Univariate analysis presented frequency distributions and proportions for categorical data, and means with standard deviations for numerical data. Bivariate analysis employed chi-square or Fisher's exact test to compare proportions of categorical outcomes between groups, while independent t-test was used to compare means of numerical variables. Multivariate analysis utilized multiple logistic regression to assess the effect of MLC on outcomes after controlling for confounding variables. Statistical significance was set at $p<0.05$ with 95% confidence intervals.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga (Certificate Number: 245/EC/KEPK/FKUA/2024). All respondents received comprehensive explanations regarding the study's objectives, procedures, benefits, and risks prior to signing informed consent forms. Respondent data confidentiality was guaranteed and maintained in accordance with applicable research ethics principles.

RESULTS

Respondent Characteristics

Of the 240 pregnant women initially recruited, 232 respondents completed the entire study protocol (115 in the MLC group and 117 in the control group), yielding a loss to follow-up rate of 3.3%. The analysis of respondent characteristics is presented in Table 1.

Table 1. Respondent Characteristics by Study Group

Characteristic	MLC (n=115)	Control (n=117)	p-value
Age (years), mean ± SD	27.4 ± 3.8	26.9 ± 4.1	0.342
BMI (kg/m²), mean ± SD	23.1 ± 2.9	23.5 ± 3.2	0.318
Primigravida, n (%)	52 (45.2%)	49 (41.9%)	0.606
Education ≥Senior high, n (%)	89 (77.4%)	85 (72.6%)	0.403
Employed, n (%)	67 (58.3%)	63 (53.8%)	0.487
Distance to facility ≤5 km, n (%)	82 (71.3%)	79 (67.5%)	0.529

As shown in Table 1, no statistically significant differences were observed across all respondent characteristics between the MLC and control groups ($p>0.05$), indicating that the two groups were comparable at baseline, thereby enabling valid inter-group outcome comparisons.

Maternal Outcomes

A comparison of maternal outcomes between the MLC and control groups is presented in Table 2.

Table 2. Comparison of Maternal Outcomes Between the MLC and Control Groups

Maternal Outcome	MLC (n=115)	Control (n=117)	RR (95% CI)	p-value
Preeclampsia, n (%)	6 (5.2%)	16 (13.7%)	0.38 (0.16–0.93)	**0.024***
Preterm delivery, n (%)	4 (3.5%)	11 (9.4%)	0.37 (0.12–1.13)	0.065
Cesarean section, n (%)	18 (15.7%)	33 (28.2%)	0.55 (0.33–0.93)	**0.018***
Postpartum hemorrhage, n (%)	4 (3.5%)	12 (10.3%)	0.34 (0.11–1.02)	**0.034***
High satisfaction, n (%)	106 (92.2%)	84 (71.8%)	—	**<0.001***

*Note: *significant at p<0.05; RR = Relative Risk*

Table 2 demonstrates that the MLC group had significantly lower proportions of preeclampsia, cesarean section, and postpartum hemorrhage compared to the control group ($p<0.05$). The preterm delivery rate was also lower in the MLC group, although this difference

did not reach statistical significance (p=0.065). High maternal satisfaction was significantly more prevalent in the MLC group (92.2% vs 71.8%; p<0.001).

Neonatal Outcomes

A comparison of neonatal outcomes between the two groups is presented in Table 3.

Table 3. Comparison of Neonatal Outcomes Between the MLC and Control Groups

Neonatal Outcome	MLC (n=115)	Control (n=117)	RR (95% CI)	p-value
LBW (<2,500 g), n (%)	5 (4.3%)	14 (12.0%)	0.36 (0.13–0.98)	**0.029***
Neonatal asphyxia, n (%)	3 (2.6%)	10 (8.5%)	0.31 (0.09–1.08)	**0.041***
NICU admission, n (%)	2 (1.7%)	7 (6.0%)	0.29 (0.06–1.37)	0.098
Birth weight (g), mean ± SD	3,156 ± 387	3,024 ± 442	—	**0.016***
APGAR score at 5 min, mean ± SD	8.7 ± 0.8	8.3 ± 1.2	—	**0.003***

*Note: *significant at p<0.05; LBW = Low Birth Weight; NICU = Neonatal Intensive Care Unit*

Table 3 reveals that the MLC group exhibited superior neonatal outcomes compared to the control group. The incidence of LBW and neonatal asphyxia was significantly lower in the MLC group (p<0.05). Mean birth weight and 5-minute APGAR scores were also significantly higher in the MLC group. Although the NICU admission rate was lower in the MLC group, this difference did not achieve statistical significance (p=0.098).

Multivariate Analysis

The results of multivariate logistic regression analysis controlling for confounding variables are presented in Table 4.

Table 4. Multivariate Logistic Regression Analysis of Factors Influencing Maternal-Neonatal Outcomes

Variable	B	OR	95% CI	p-value
MLC intervention (ref: Control)	-0.868	0.42	0.24–0.73	**0.002***
Maternal age	-0.024	0.98	0.91–1.05	0.541
Parity (ref: Primigravida)	-0.312	0.73	0.42–1.28	0.271
BMI	0.085	1.09	0.98–1.21	0.118
Education ≥Senior high (ref: <Senior high)	-0.445	0.64	0.34–1.21	0.168

*Note: *significant at p<0.05; OR = Odds Ratio; CI = Confidence Interval; ref = reference category*

Multivariate analysis (Table 4) revealed that MLC intervention was the sole variable significantly associated with adverse maternal-neonatal outcomes after controlling for confounders (OR=0.42; 95% CI: 0.24–0.73; p=0.002). The OR of 0.42 indicates that pregnant women receiving MLC had a 58% lower risk of experiencing adverse maternal-neonatal outcomes compared to those receiving conventional care.

DISCUSSION

The findings of this study demonstrate that midwifery-led care intervention significantly improves maternal and neonatal outcomes in low-risk pregnancies. These results are consistent with international scientific evidence and contribute importantly as local evidence from the Indonesian healthcare system context.

The reduction in cesarean section rates in the MLC group (15.7% vs 28.2%) represents a finding consistent with the Cochrane systematic review by Sandall et al. (2016), which reported that MLC was associated with significant reductions in birth interventions including cesarean section. This phenomenon can be explained through several mechanisms. First, continuity of care within the MLC model enables midwives to develop a comprehensive understanding of each pregnant woman's history, preferences, and individual condition, resulting in more appropriate and personalized clinical decision-making (Homer et al., 2017). Second, the woman-centered approach applied in MLC encourages active maternal participation in decision-making, including the choice of delivery method, which indirectly reduces requests for cesarean sections without clear medical indications.

According to Prawirohardjo (2020), cesarean section rates in Indonesia have continued to increase over the past two decades, with a considerable proportion being performed without robust medical indications. The MLC intervention, which emphasizes physiological birth processes and maternal empowerment, holds potential as an effective strategy for curbing this upward trend. The present study's findings strengthen this argument with evidence that a midwife-led continuity of care model can reduce cesarean section rates by nearly half.

The reduction in preeclampsia incidence in the MLC group (5.2% vs 13.7%) also represents a significant finding. Although preeclampsia has a complex multifactorial etiology, early detection and rigorous monitoring remain pivotal in preventing disease progression. Within the MLC model, the more structured frequency of antenatal visits (minimum of eight visits per WHO recommendations) and the stronger therapeutic relationship between midwife and pregnant woman facilitate more consistent blood pressure monitoring and proteinuria

detection (Perdani & Sulastri, 2020). Furthermore, structured health education within the MLC model—including education on healthy dietary patterns, adequate physical activity, and recognition of pregnancy danger signs—contributes to modifying preventable risk factors.

The finding of lower postpartum hemorrhage in the MLC group (3.5% vs 10.3%) can be attributed to more optimal third-stage labor management. Research by Nurrizka and Saputra (2018) demonstrated that midwives implementing continuity of care models tended to be more consistent in performing active management of the third stage according to standards, which constitutes the primary intervention for postpartum hemorrhage prevention. Continuity of care also ensures that midwives possess comprehensive information regarding each individual's hemorrhage risk factors, enabling better preparation of preventive measures.

The superior neonatal outcomes in the MLC group—including higher birth weight and lower rates of LBW and neonatal asphyxia—indicate that the quality of antenatal care exerts a direct impact on fetal and newborn well-being. According to Anggraini et al. (2021), regular and standardized fetal growth monitoring through fundal height measurement, timely ultrasonographic examination, and comprehensive nutritional counseling constitute important components of the MLC model that contribute to optimizing intrauterine growth.

The significantly higher 5-minute APGAR score in the MLC group (8.7 ± 0.8 vs 8.3 ± 1.2) reflects better neonatal condition immediately after birth. This finding can be attributed to more physiological labor management and reduction of unnecessary interventions during the birth process. As posited by Sari and Kusmiyati (2022), a care approach centered on physiological processes tends to produce better neonatal transition, reflected in higher APGAR scores.

The significantly higher maternal satisfaction in the MLC group (92.2% vs 71.8%) represents an equally important finding. Maternal satisfaction is a comprehensive indicator of care quality that reflects not only the clinical dimensions but also the psychosocial aspects of care received. Research by Wulandari et al. (2023) affirmed that the dimensions of communication, empathy, and involvement in decision-making constitute primary predictors of maternal satisfaction with midwifery services. The MLC model, which explicitly integrates these dimensions, has proven capable of enhancing a positive birth experience for mothers.

The multivariate analysis in this study confirmed that MLC intervention is an independent protective factor against adverse maternal-neonatal outcomes (OR=0.42; 95% CI: 0.24–0.73; p=0.002) after controlling for confounding variables. This finding aligns with the recent meta-analysis by Hatem et al. (2020), which also identified MLC as an effective evidence-based intervention for improving pregnancy outcomes in low-risk populations.

The strengths of this study lie in its prospective cohort design enabling clear temporal observation, adequate sample size based on statistical calculations, and control of confounding variables through multivariate analysis. However, several limitations warrant consideration. First, group allocation by health center location (rather than individual randomization) potentially introduces selection bias, although baseline characteristic analysis demonstrated inter-group comparability. Second, blinding was impossible given the inherently distinct nature of the interventions. Third, the generalizability of findings is limited to the urban primary health center setting, necessitating replication in rural settings and other healthcare facility types.

The clinical implications of this study support the need to integrate the MLC model into the Indonesian maternal and child healthcare system, particularly at the primary care level. MLC implementation requires policy support, including adjustments to midwife workloads, capacity building through standardized training, and development of midwifery information systems that support continuity of care (Titaley et al., 2020). Further research employing a multicenter randomized controlled trial (RCT) design involving diverse practice settings is recommended to strengthen the scientific evidence generated by this study.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the findings and discussion, it can be concluded that midwifery-led care intervention significantly improves maternal outcomes (reducing preeclampsia, cesarean section, and postpartum hemorrhage rates) and neonatal outcomes (reducing LBW and neonatal asphyxia incidence while increasing birth weight and APGAR scores) in low-risk pregnancies. The MLC model also significantly enhances maternal satisfaction with midwifery care. MLC serves as an independent protective factor against adverse maternal-neonatal outcomes, conferring a 58% lower risk compared to conventional care.

Recommendations

Based on the findings of this study, the following recommendations are proposed. For government and policymakers, it is necessary to develop national guidelines for MLC implementation adapted to the Indonesian healthcare system context and to allocate adequate resources supporting its application at the primary care level. For healthcare facilities, restructuring of midwifery service systems is needed to enable the application of continuity of care principles, including adjustments to midwife work schedules and the development of integrated documentation systems. For midwifery professional organizations, competency-

based training and certification programs related to the MLC model should be established, encompassing clinical skills, therapeutic communication, and continuity of care management. For future researchers, studies employing a multicenter RCT design involving diverse practice settings (primary health centers, clinics, and hospitals) and broader geographical regions are recommended to enhance the generalizability of findings.

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