

PREDICTORS OF MIDWIFE PERFORMANCE IN LOW BIRTH WEIGHT PREVENTION: A MULTI-FACTORIAL ANALYSIS IN RURAL NIAS, INDONESIA

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ABSTRACT

Low Birth Weight (LBW) remains a significant public health issue in Indonesia, contributing to high neonatal mortality rates. This study aims to analyze the influence of tenure, supervision, compensation, and training on midwives' performance in efforts to reduce the risk of LBW at Community Health Centers (Puskesmas) in Nias Regency. This study employed a cross-sectional design with an analytical approach. A total of 281 active midwives at Community Health Centers in Nias Regency were selected as the study sample through a questionnaire survey conducted from July to August 2025. Data were analyzed using the Chi-Square test and logistic regression to determine the most dominant factors. The results indicate that length of service, supervision, compensation, and training have a significant influence on midwives' performance ($p < 0.05$). Among these four variables, compensation was identified as the most dominant factor influencing midwives' performance in managing the risk of LBW. These findings underscore the importance of strengthening reward systems and managerial support to optimize the role of midwives on the front lines of maternal and child health care.

Keywords: *Midwives, Low Birth Weight, Performance, Compensation, Supervision, Nias.*

Introduction

Low Birth Weight (LBW) is defined by the World Health Organization (WHO) as a baby born weighing less than 2,500 grams, regardless of gestational age (Herwanto et al., 2024). Globally, the prevalence of LBW shows a stagnant trend, with the incidence rate decreasing only slightly from 15% in 2012 to 14.7% in 2020 (WHO, 2025). Of the total global incidence of LBW, which stands at 15.5% or approximately 20.6 million infants, the majority of cases 96.5%, occur in developing countries (Ulfianasari & Perdani, 2023). This situation poses a

serious challenge because LBW accounts for half of all neonatal deaths worldwide, with a mortality risk 20 times higher than that of infants with normal birth weight (WHO, 2025). In Indonesia, this issue is particularly critical, as approximately 79.1% of infant deaths in the country are reported to be closely linked to LBW (Lestari et al., 2023). In addition to the risk of death, infants with LBW also face a 20-fold higher risk of experiencing various short-term and long-term health complications compared to infants born with normal birth weight (Putri & Naur, 2025). Given its far-reaching impact, LBW

is now included as one of the 100 core global health indicators used to assess nutrition monitoring frameworks worldwide (Devaguru et al., 2023).

Infants born with very low birth weight or extremely premature face serious long-term consequences, including the risk of internalizing disorders that can lead to economic difficulties and social relationship problems in adulthood (Zhou et al., 2025). Clinical complications such as bronchopulmonary dysplasia (BPD) remain a major challenge in neonatal care, necessitating early risk identification (Su et al., 2025). In rural areas, factors such as maternal age, literacy levels, and socioeconomic status have been identified as critical determinants of low birth weight incidence (Sau et al., 2025). Additionally, infants with very low birth weight often experience postnatal growth failure, which requires close monitoring (Matsubara et al., 2026). The success of an infant's weight gain pattern during hospitalization depends heavily on the optimization of energy and protein intake provided (Nunes et al., 2025). On the other hand, changes in clinical practices and hygiene protocols in neonatal intensive care units have also been shown to have a significant impact on morbidity and mortality rates among preterm infants (Picans-Leis et al., 2025).

Low birth weight (LBW) remains a critical global public health challenge, with

prevalence rates in regions such as Sub-Saharan Africa reaching approximately 9.76% (Tadesse et al., 2021). The occurrence of LBW is consistently associated with a high risk of neonatal morbidity and mortality, which can adversely affect the child's future quality of life (Taha et al., 2020). Key risk factors include maternal biological and nutritional conditions, such as suboptimal nutritional status, low body mass index (BMI), and inadequate iron supplementation during pregnancy (Arabzadeh et al., 2024; C. et al., 2020). In rural areas, this problem is exacerbated by low levels of maternal education and limited access to adequate antenatal care services (Bater et al., 2020). In addition to clinical and socioeconomic factors, recent scientific evidence highlights a new threat in the form of environmental factors, where exposure to air pollution and extreme heat due to climate change has been shown to significantly increase the risk of low birth weight (Bekkar et al., 2020; Chersich et al., 2020).

Low Birth Weight (LBW) is a major determinant of high infant mortality rates and long-term growth impairments through various observable and unobservable factors (Jana et al., 2023). A literature review indicates that the prevalence of LBW is strongly influenced by maternal demographic characteristics and lifestyle,

with advanced maternal age (≥ 35 years), low educational attainment, and residence in urban areas identified as significant risk factors (Ruan et al., 2025). In addition to individual factors, socioeconomic vulnerability and maternal nutritional status during pregnancy have consistently been shown to be key determinants of LBW incidence in vulnerable populations (Falcão et al., 2020; Tadesse et al., 2021). The quality of primary healthcare services, particularly adherence to antenatal care (ANC) visits and the consumption of iron-folate supplements, has also been reported to play a crucial role in reducing the risk of low birth weight (Thapa et al., 2022). As a clinical intervention, the systematic implementation of *Kangaroo Mother Care* (KMC) has proven effective in reducing neonatal mortality rates, the incidence of sepsis, and hypothermia in low birth weight infants (Sivanandan & Sankar, 2023). Recent findings even confirm that initiating KMC immediately after birth provides significantly greater survival protection for low birth weight infants compared to delaying its implementation until the infant's condition stabilizes (Group, 2021).

Maternal and child health services in the community are led by midwives. If midwives are able to carry out their duties and responsibilities, the early detection of health problems in mothers and children will have a positive impact on their health.

Midwives' performance in reducing the risk of low birth weight (LBW) in the community (village) is expected to identify abnormalities or diseases, thereby reducing maternal and infant mortality rates, such as through early diagnosis of Intrauterine Growth Restriction (IUGR), which contributes to LBW. To reduce the incidence of LBW, the objective of this study is to analyze the Role of Midwives in Reducing the Risk of Low Birth Weight: A Performance Evaluation Study in the Nias Regency Work Area.

Method

This research is analytical in nature, using a cross-sectional research design, namely data that carries independent variables and dependent variables collected and observed at the same time. This study was conducted from July 10 to August 10, 2025, at health centers that had BBLR cases and those that did not have BBLR cases. Based on the 2021 report from nurses from January to December in Labuhan Batu, it is known that the number of midwives is 944 people. A sample of 281 samples was taken using the Slovin formula.

Primary data Primary data was obtained by distributing questionnaires to respondents and asking them to provide answers in accordance with the alternative choices listed in the interview form using a Likert scale for each measurement result for each variable.

This study's analysis used univariate descriptive test analysis, bivariate chi-square test analysis, and multivariate multiple linear regression test analysis with JASP 0.96.0 software analysis.

Results

Table 1. Distribution of Respondent Characteristics at Community Health Centers in the Nias Regency Working Area

Respondent Characteristics	f	%
Age		
Under 25	17	6.1
25–35	90	32
Over 35	174	61.9
Gender		
Male	110	39.1
Female	171	60.9
Education		
Bachelor's Degree	198	70.5
Master's Degree	83	29.5
Years of Service		
1–10 years	139	49.5
> 10 years	142	50.5
Supervision		
Poor	106	37.7
Good	175	62.3
Compensation		
None	102	36.3
Available	179	63.7
Training		
Never	138	49.1
Ever	143	50.9
Midwife Performance		
Poor	115	40.9
Good	166	59.1
Total	281	100

Based on Table 1 regarding the characteristics of respondents and research variables at health centers in the Nias Regency working area, it is known that, based on age, most respondents were > 35 years old, namely 174 (61.9%). Meanwhile, other respondents aged 25-35 years old numbered 90 (32.0%), and respondents aged < 25 years old numbered 17 (6.1%). Based on gender, most respondents were

female, numbering 171 (60.9%), while males numbered 110 (39.1%).

Based on education, most respondents had a bachelor's degree, namely 198 (70.5%), while those with a master's degree numbered 83 (29.5%). Based on length of service, most respondents had > 10 years of service, namely 142 (50.5%), while those with 1-10 years of service numbered 139 (49.5%). Based on supervision, most respondents

rated supervision as good, namely 175 (62.3%), while those who rated supervision as not good numbered 106 (37.7%). Based on compensation, most respondents received compensation, namely 179 (63.7%), while those who did not receive compensation numbered 102 (36.3%). Based on training, most respondents had participated in training, namely 143 (50.9%), while those who had never participated in training numbered 138 (49.1%). Based on midwife performance,

most respondents rated midwife performance in reducing the risk of LBW as good, namely 166 (59.1%), while 115 (40.9%) rated it as poor. Overall, most respondents at the Community Health Centers in the Nias Regency work area were health workers who were > 35 years old, female, highly educated, had considerable work experience, and were supported by supervision, compensation, training, and midwives' performance in reducing the risk of LBW.

Table 2 Cross Tabulation of Factors Related to Midwife Performance

Variable	Midwife Performance				Total		p-value
	Not Good		Good		n	%	
	n	%	n	%			
Years of Service							
1-10 years	67	23,8	72	25,6	139	49,5	0.020
> 10 years	48	17,1	94	33,5	142	50,5	
Supervision							
Poor	75	26,7	31	11,0	106	37,7	0.001
Good	40	14,2	135	48,1	175	62,3	
Compensation							
None	82	29,2	20	7,1	102	36,3	0.001
Yes	33	11,7	146	52,0	179	63,7	
Training							
Never	69	24,6	69	24,6	138	49,1	0.004
Ever	46	16,4	97	34,5	143	50,9	
Total	115	40,9	166	59,1	281	100,0	

Intervention strategies to improve midwife performance in Nias Regency should prioritize strengthening the supervision system and compensation scheme, given that these two variables show the most significant performance disparities in the research results. The data shows that in the group with poor supervision, 26.7% of midwives performed poorly, while good supervision enabled

48.1% of midwives to achieve optimal performance (p=0.001). Intervention in the compensation system is also crucial because 29.2% of midwives who do not receive compensation have poor performance, in stark contrast to 52.0% of midwives who receive compensation and are able to work at a good level (p=0.001).

In addition, competency strengthening through training must be

expanded and made mandatory for all staff, as midwives who have participated in training show a higher percentage of good performance (34.5%) compared to those who have never received training (24.6%; $p=0.004$). Finally, internal coaching policies need to take into account the variable of length of service, where midwives with more than 10 years of experience have a higher proportion of

good performance (33.5%) compared to midwives with 1-10 years of service (25.6%; $p=0.020$). By integrating scheduled supportive supervision, adequate incentives, and accelerated technical training, it is hoped that the quality standards of midwifery services in reducing the risk of low birth weight (LBW) can be improved evenly and sustainably across all health center working areas.

Table 3 Selection of Candidate Variables for Logistic Regression Testing

Variable	p value	Description
Employment period	0,020	Candidate
Supervision	0,001	Candidate
Compensation	0,001	Candidate
Training	0,004	Candidate

Based on Table 3 above, it can be seen that all four variables are candidates for the model in the logistic regression test

where $p\ value < 0.25$. The results of the logistic regression analysis can be seen in the following table:

Table 4 Final Results of Logistic Regression Analysis

Variable	B	Pvalue	Exp(B)OR	95%C.I.for EXP(B)
Stage 1				
Employment period	0,280	0,409	1,323	0,680-2,576
Supervision	2,104	0,001	8,097	4,097-16,404
Compensation	2,760	0,001	15,803	7,856-31,787
Training	0,719	0,035	2,053	1,052-4,003
Stage 2				
Supervision	2,125	0,001	8,373	4,182-16,765
Compensation	2,797	0,001	16,394	8,165-32,916
Training	0,744	0,028	2,,104	1,082-4,091
Final Stage				
Supervision	2,043	0,001	8,713	3,922-15,171
Compensation	2,854	0,001	17,355	8,715-34,561

The results of the logistic regression analysis in the final stage show that compensation is the most dominant factor influencing midwives' performance in Nias Regency, with an Odds Ratio (OR) of

17.355 and a very strong significance level ($p=0.001$). This finding shows that midwives who receive adequate compensation are 17.3 times more likely to perform well than those who do not,

confirming that financial and non-financial incentives are the main drivers of work motivation in the field. In addition to compensation, the supervision variable also emerged as a strong predictor in the final model, with an OR of 8.713 ($p=0.001$), indicating that midwives with a strong supervision system are 8.7 times more likely to work optimally in midwifery services. Although training was shown to increase the likelihood of good performance by 2.1 times in the previous analysis stage (OR 2.104; $p=0.028$), the length-of-service variable did not show a statistically significant effect ($p=0.409$) when tested simultaneously in the multivariate model.

Discussion

The Effect of Supervision on Midwives' Performance in Reducing the Risk of Low Birth Weight at Community Health Centers in the Nias Regency Working Area

Based on the results of statistical tests using the Chi Square test, a p-value of 0.001 (< 0.05) was obtained. Thus, it can be concluded that supervision has a significant effect on midwives' performance in reducing the risk of LBW at health centers in the Nias Regency working area. Routine supervision from superiors has been proven to improve midwives' understanding of LBW risk factors, their skills in conducting routine pregnancy checkups (ANC), their

accuracy in monitoring fetal and maternal growth, and their ability to provide nutrition education and health counseling. Midwives who received good supervision tended to be more confident in making clinical decisions, more thorough in recording and reporting data, and more effective in guiding pregnant women to comply with routine check-up schedules.

The results of this study indicate that supervision has a significant impact on midwives' performance in reducing the risk of low birth weight (LBW) in Nias Regency. These findings are consistent with research by Ulita et al., (2023), who reported that the variables of supervision and training yielded satisfactory results in influencing midwives' performance in the early detection of LBW. The positive impact of these managerial aspects is further supported by research by Oktapiani & Sumanti, (2024), which states that training and work experience are strongly correlated with midwives' effectiveness in managing health services. Furthermore, the importance of midwives' role as service leaders in Midwife-Led Continuity Care has been causally proven to reduce the incidence of LBW in developing countries (Moges et al., 2025). However, this study found that compensation is a dominant factor in determining midwives' performance, a finding that differs from the study by Ulita et al., (2023), which

identified leadership factors as the primary determinants of clinical performance.

The consistency of findings regarding the importance of supervision and competency development stems from the similar nature of midwives' duties, which require ongoing technical guidance in primary healthcare facilities (Oktapiani & Sumanti, 2024). On the other hand, differences regarding the dominant factor between compensation and leadership may stem from variations in economic well-being and infrastructure support across the respective study regions (Ulita et al., 2023). Another factor contributing to variations in the findings is the challenge of maintaining midwives' knowledge and skills, which tend to decline one year after training if not accompanied by routine clinical supervision (Sendo et al., 2025). Therefore, synergy between effective supervision and motivation through compensation is key to ensuring the quality of antenatal care services to prevent low birth weight (Sari & Setiyadi, 2024). The use of medical data-based predictive models is also recommended to help midwives reduce the risk of LBW more accurately and preventively (Ranjbar et al., 2023).

The Effect of Compensation on Midwives' Performance in Reducing the Risk of Low Birth Weight at Community Health Centers in the Nias Regency Working Area

Based on the results of statistical tests using the Chi Square test, a p-value of 0.001 (<0.05) was obtained. It can therefore be concluded that compensation has a significant effect on midwives' performance in reducing the risk of LBW at health centers in the Nias Regency working area. The questionnaire results show that compensation plays an important role in influencing midwives' performance at health centers in the Nias Regency working area, particularly in efforts to reduce the risk of LBW.

These findings are consistent with research conducted by Amalia et al., (2021), who, through path analysis, found that perceptions of financial compensation directly improve the performance of midwives at community health centers. Similar results were also found in a study conducted by Hakim et al., (2025), which confirmed that salaries and allowances have a strong positive influence on the quality of services provided by health workers. Support for these findings is reinforced by Margie et al., (2023), who state that appropriate compensation is a key determinant in optimizing the performance of health workers at the sub-district level. Additionally, Aningsih & Kusumastuti, (2020) revealed that the effectiveness of health services is highly dependent on the compensation system received by field staff. Furthermore, research by Andriani &

Suryani (2025) emphasizes that financial and non-financial compensation play a crucial role as mediators in enhancing job satisfaction, which ultimately leads to higher performance outcomes. Although Jung & Kim (2020) reported that income sometimes has the lowest satisfaction score among other sub-factors, this element remains an inseparable foundation of midwives' work motivation.

The significant or strong influence of compensation on midwives' performance in Nias Regency is shaped by several key interrelated supporting factors. Compensation acts as an extrinsic motivational stimulus that allows midwives to focus more on essential clinical tasks, such as the early detection and management of low birth weight (LBW) risks, without being burdened by issues related to meeting basic economic needs (Mokodompit et al., 2021). Welfare benefits provide a sense of financial security, which, according to Amalia et al., (2021), directly contributes to reduced work-related stress levels and increased midwives' dedication to antenatal care. Additionally, the provision of fair allowances and incentives fosters a perception of organizational justice, which encourages midwives to improve work discipline and effectiveness in accordance with established standard operating procedures Aningsih & Kusumastuti, (2020). Psychologically, adequate

compensation strengthens midwives' emotional bonds with the institutions where they work, thereby motivating them to work harder in providing health education to pregnant women to prevent preterm births or low birth weight infants Andriani & Suryani (2025). Therefore, in areas with geographical challenges such as Nias Regency, competitive compensation policies serve as a strategic tool to ensure midwives remain productive and competent in carrying out their vital roles on the front lines of maternal and child health services (Hakim et al., 2025).

Limitations

The limitations of this study include sample size and data collection focus. This study was only conducted on midwives working in health centers in Nias Regency, so the results may not fully represent the conditions of midwives in other regions or in different regencies/cities. In addition, this study used questionnaires as the main tool to assess midwives' performance and their perceptions of training, supervision, compensation, and length of service. This has the potential to cause subjective bias because midwives' performance is assessed based on their own perceptions, rather than on objective measurements such as medical record audits or direct observation.

Another limitation is the study's focus on formal training organized by community health centers, without

assessing non-formal training, independent learning, or field experience, which can also affect midwives' competence. The frequency and quality of training, which vary between community health centers, were not analyzed in depth, so the implications of differences in training quality on midwives' performance cannot be comprehensively ascertained.

Implications

The implication of this limitation is that the research findings must be interpreted with caution. Results showing that training improves midwives' performance may be a strong indication, but do not fully confirm a causal relationship because other external factors, such as work experience, supervision, intrinsic motivation, or health facility conditions, may also affect performance. These limitations emphasize the need for further research using mixed-method designs or longitudinal evaluations that combine subjective, objective, and field observation data to obtain a more holistic picture.

Furthermore, the practical implications for community health centers are the importance of improving the quality, frequency, and sustainability of midwife training, as well as complementing it with a comprehensive supervision and performance evaluation system. This can help reduce the impact of training limitations on midwife performance and the

effectiveness of BBLR risk prevention in the field.

Conclusions

Based on the research findings, it can be concluded that midwives' performance in reducing the risk of low birth weight (LBW) in Nias Regency is significantly influenced by factors such as length of service, supervision, compensation, and training. Compensation was found to be the strongest determinant influencing midwives' clinical performance, indicating that financial well-being and professional recognition serve as key motivators for midwives to provide high-quality antenatal care. Additionally, consistent supervision and ongoing training programs have proven effective in strengthening midwives' technical competencies in the early detection of pregnancy risks.

As a recommendation, local governments and Puskesmas management need to prioritize improvements to the compensation and incentive systems for health workers to maintain work motivation in areas with geographical challenges. Strengthening the educational aspects of clinical supervision and providing training in neonatal emergency management should also be enhanced on a regular basis. For future researchers, it is recommended to explore other organizational variables such as workload and social support, as well as

to use qualitative research designs to gain a deeper understanding of the psychosocial barriers midwives face in reducing the prevalence of low birth weight (LBW) at the community level.

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