



Complications among Postpartum Mothers in Indonesia

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Abstract

The postpartum period, also known as the postpartum period, begins immediately after the birth of the neonate and placenta and ends at 6–8 weeks. Maternal mortality in Indonesia was caused by bleeding in 30.5%, infection in 22.5%, gestosis in 17.5%, and anesthesia in 2.0%. The purpose of this study is to analyze the risk factors that affect the incidence of complications in postpartum mothers in the working area of the Grobogan Health Center in 2025. This research is quantitative with a case-control study design, using data from the Grobogan Health Center in 2025. The analysis used was univariate, bivariate (chi-square test), and multivariate analysis (logistic regression). The results showed that there was a relationship between maternal education ($p=0.011$, $OR=1.83$), employment status ($p<0.0001$, $OR=2.52$), gestational age ($p<0.0001$, $OR=3.02$), parity status ($p=0.034$, $OR=1.24$), BMI ($p<0.0001$, $OR=9.09$), childbirth distance ($p<0.0001$, $OR=13.38$), hypertension ($p=0.006$, $OR=2.4$), diet ($p<0.0001$, $OR=5.797$) and exposure to cigarette smoke ($p<0.0001$, $OR=3.50$), history of psychological disorders ($p=0.007$, $OR=0.158$), and LBW ($p<0.0001$, $OR=2.443$). The results of this study are expected to increase postpartum mothers' awareness of the importance of recognizing and managing risk factors that may lead to complications, thereby encouraging healthy behaviors and informed decision-making during the postpartum period.

Introduction

Maternal health is essential for future generations, covering pregnancy, childbirth, and the 6–8 weeks postpartum period. The Maternal Mortality Rate (MMR) is a key SDG indicator, with WHO targeting <70/100,000 live births by 2030, alongside Neonatal Mortality of 12/1,000 and Infant Mortality of 25/1,000 (Paulson et al., 2021). In 2020, nearly 800 women died every two minutes, with 95% of maternal deaths occurring in developing countries. Indonesia ranks third in Southeast Asia for the highest MMR, with 190 deaths per 100,000 live births, and the number remains well below the target set by the Sustainable Development Goals (SDGs). Data in 2023 recorded an MMR of 177 per 100,000 KH. This data is still far from the reference to achieve

the MMR target by the SDGs 70/100,000 KH in 2030 and the UN target of 102/100,000 KH (Kemenkes RI, 2023). In 2022, Central Java recorded a maternal mortality rate of 88.58 per 100,000 live births, ranking third among Indonesian provinces. About 50.7% of deaths occurred during the postpartum period, with the highest incidence in women aged 20–34 years (65.4%) and 1.4% in those ≤20 years. The leading causes were pregnancy-induced hypertension (34.6%), bleeding (22.5%), other causes (23.5%), cardiovascular disorders (8.7%), infection (5.8%), Covid-19 (4.1%), cerebrovascular disease (0.4%), and autoimmune disease (0.4%).

In 2020, Grobogan Regency ranked second after Brebes in Central Java with 31 maternal mortality cases. In 2022, the main

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causes were bleeding (34.7%), pre-eclampsia (30.4%), and others (21.7%), and smaller proportions from infection, cardiovascular disorders, and Covid-19 (each 4.3%). Most maternal deaths occurred during the postpartum period (81%), while 19% happened during pregnancy (Kementrian Kesehatan, 2023). In Central Java, 62.27% of maternal deaths occurred during postpartum.

The postpartum period is highly vulnerable to complications such as bleeding, infection, hypertension, wound issues, and uterine sub-involution, which pose serious risks to maternal health and require greater attention to prevent mortality (Aimagambetova et al., 2024; Schrey-Petersen et al., 2021). Research by (Tsai et al., 2023a) stated that complications of the postpartum period were caused by the low level of education (high or lower) (OR = 1.47, 95% CI 1.26–1.71), cesarean section (OR = 1.7, 95% CI 1.51–1.94), unplanned pregnancy (OR = 1.36, 95% CI 1.2–1.54), gestational age of 24–36 weeks (OR = 1.3, 95% CI 1.07–1.54), and Apgar score at minute 5 < 7 (OR = 2.19, 95% CI 1.11–4.3) (Tsai et al., 2023). Given the great potential for mothers to experience complications during the postpartum period, we aim to find out the magnitude of the problems and factors related to the incidence of complications in postpartum mothers in the work area of the Grobogan Health Center.

Method

This type of research is quantitative research with a case-control research design. This research will be carried out at the Grobogan Health Center (Puskesmas), Central Java Province, in 2025. The independent variables in this study included marital status, age, education level, employment status, gestational age, parity status, BMI, childbirth distance, hypertension, diet, exposure to cigarette smoke, history of psychological disorders, family support, desired pregnancy, LBW, and type of delivery. The bound variable in this study is complications of the postpartum period. The case population in this study is postpartum mothers with complications recorded in the electronic medical record (EMR) of the Grobogan Health Center in 2025, which totals

539 cases. Meanwhile, the control population in this study is postpartum mothers without complications recorded in the electronic medical records (RME) of the Grobogan Health Center in 2025, which amounted to 2150 controls.

The sampling technique used is purposive sampling with a total of 2150 mothers as respondents. Based on the geographical area, namely by choosing one health center representing the northern, southern, and eastern regions in Grobogan Regency. This selection was carried out deliberately based on consideration of regional characteristics and data availability. The sample case of this study is that postpartum mothers experience complications with inclusion criteria, namely postpartum mothers with complications, domiciled in Grobogan, complete electronic medical record data recorded in 2025 including marital status, age, education level, employment status, gestational age, parity status, BMI, childbirth distance, hypertension, diet, exposure to cigarette smoke, history of psychological disorders, family support, desired pregnancy, LBW, and type of childbirth. Meanwhile, the exclusion criteria are patients who have died and incomplete data.

The data analysis in this study includes univariate, bivariate, and multivariate analyses. In this study, univariate analysis was conducted to identify the frequency distribution, while bivariate analysis was performed to examine the relationship between independent and dependent variables using the chi-square test. Multivariate analysis used logistic regression to find out which variables were most dominant in the incidence of postpartum complications and to determine the probability of complications in postpartum mothers. In multivariate analysis, confounding variables can be controlled. The disruptive factor is said to exist when the crude OR (unadjusted) differs from the multiple logistic regression OR (OR_{adj}). The interpretation of the data also considers statistical significance, where a p-value < 0.05 is deemed significant, and the 95% confidence interval (CI) is used to assess the precision of the estimate. If the OR_{adj} remains significant after adjustment and the confidence interval does not cross 1, the association is considered robust

and unlikely to be due to chance. If the OR difference is more than 10%, then the variable is considered to affect the relationship between independent and dependent variables, so that it can be considered a confounding variable. Research bias occurs when data is entered incorrectly, resulting in inaccurate research results. Unreasonable data can be excluded from the study to maintain the accuracy of the results.

Result and Discussion

The results of the univariate analysis of factors related to complications in postpartum mothers at the Grobogan Health Center in Table 1, included 2150 patients as a sample of this study. The characteristics of respondents related to sociodemographic factors showed that the majority of patients were 98.9% married, 84.1% of productive age, 57.5% of secondary education, 88.9% working, and 96.9% of gestational age ≥ 37 weeks. In the health and behavioral characteristics of patients, 64.2% experienced multipara, 55.3% < 2 years of childbirth interval, 98.1% did not experience hypertension, 98.8% had a regular diet, 74.6%

were not exposed to cigarette smoke, 98.2% had no history of psychological disorders, 99.1% had family support, 99.3% had desired pregnancies. Meanwhile, the normal BMI was 61.9%, 94.4% of the child's birth weight was ≥ 2500 grams, and 59.1% spontaneous (Table 1).

In a bivariate analysis of 16 variables in Table 2, eleven variables were found to be related to risk factors for complications in postpartum mothers at the Grobogan Health Center in 2025 ($p\text{-value} < 0.05$). The related variables were maternal education ($p=0.011$, $OR=1.83$), employment status ($p<0.0001$, $OR=2.52$), gestational age ($p<0.0001$, $OR=3.02$), parity status ($p=0.034$, $OR=1.24$), BMI ($p<0.0001$, $OR=9.09$), delivery distance ($p<0.0001$, $OR=13.38$), hypertension ($p=0.006$, $OR=2.4$), diet ($p<0.0001$, $OR=5.797$) and exposure to cigarette smoke ($p<0.0001$, $OR=3.50$), history of psychological disorders ($p=0.007$, $OR=0.158$), and Low Birth Weight ($p<0.0001$, $OR=2.443$). In contrast, the following independent variables were not related to complications in postpartum mothers, namely marital status, age, desired pregnancy, family support, and type of delivery (Table 2).

Table 1. Characteristics of Postpartum Mothers at Grobogan Health Center (n=2150)

Variables	Total (n)	Percentage (%)
Marital status		
Invalid	24	1.1
Legitimate	2126	98.9
Mother's Age		
Unproductive (<20 and >35 years)	342	15.9
Productive (20-35 years)	1808	84.1
Education		
Low (SD-SMP)	744	34.6
Middle (SMA)	1236	57.5
Height (PT)	170	7.9
Employment Status		
Work	239	11.1
Not Working	1911	88.9
Gestational Age		
<37 weeks	67	3.1
≥ 37 weeks	2083	96.9
Parity Status		

Primipara	770	35.8
Multipara	1380	64.2
BMI		
Malnutrition (<18.5 and ≥ 25)	819	38.1
Normal (18.5-24.9)	1331	61.9
Delivery Distance		
< 2 years	1189	55.3
≥ 2 years	961	44.7
Hypertension		
Yes	40	1.9
Not	2110	98.1
Diet		
Irregular	26	1.2
Orderly	2124	98.8
Exposure to Cigarette Smoke		
Yes	546	25.4
Not	1604	74.6
History of Psychological Disorders		
Yes	39	1.8
Not	2111	98.2
Family support		
Yes	2130	99.1
Not	20	0.9
Pregnancy Desired		
Not	16	0.7
Yes	2134	99.3
Low Birth Weight (LBW)		
LBW (<2500 gr)	129	6.0
Normal (≥ 2500 gr)	2021	94.0
Types of Childbirth		
Caesar	862	40.1
Spontaneous	1288	59.9
Complications of the Postpartum Period		
Yes	539	25.1
Not	1611	74.9

Source: Secondary Data by Public Health Center of Grobogan 2025

Table 2. Bivariate Analysis of Risk Factors for Postpartum Complications at Grobogan Health Center

Variables	Postpartum Complications				<i>p-value</i>	OR	(CI 95%)
	Cases		Controls				
	N	%	N	%			
Marital status							
Invalid	9	1.7	15	0.9	0.240	1.807	0.786-4.153
Legitimate	530	98.3	1596	99.1			
Mother’s Age							
Unproductive	83	15.4	259	16.1	0.761	0.950	0.726-1.243
Productive	456	84.6	1352	83.9			
Education							
Low (SD-SMP)	179	33.2	565	35.1	0.011*	1.838	1.164-2.901
Middle (SMA)	335	62.2	901	55.9	0.001*	2.156	1.385-3.357
Height (PT)	25	4.6	145	9.0	Reff		
Employment Status							
Work	30	5.6	209	13.0	<0.001**	2.529	1.702-3.758
Not Working	509	94.4	1402	87.0			
Gestational Age							
<37 weeks	33	6.1	34	2.1	<0.001**	3.025	1.854-4.934
≥37 weeks	506	93.9	1577	97.9			
Parity Status							
Primipara	214	39.7	556	34.5	0.034*	1.249	1.022-1.527
Multipara	325	60.3	1055	65.5			
BMI							
Malnutrition	485	90.0	34	2.1	<0.001**	9.093	7.251-11.405
Normal	37	6.9	1222	75.9			
Delivery Distance							
< 2 years	491	91.1	698	43.3	<0.001**	13.380	9.790-18.286
≥ 2 years	48	8.9	913	56.7			
Hypertension							
Yes	18	3.3	22	1.4	0.006*	2.495	1.328-4.689
Not	521	96.7	1589	98.6			
Diet							
Irregular	17	3.2	9	0.6	<0.001**	5.797	2.569-13.083
Orderly	522	96.8	1602	99.4			
Exposure to Cigarette Smoke							
Yes	242	44.9	304	18.9	<0.001**	3.503	2.838-4.325
Not	297	55.1	1307	81.1			
History of Psychological Disorders							
Yes	2	0.4	37	2.3	0.007*	0.158	0.038-0.660
Not	537	99.6	1574	97.7			

Family support

Yes	537	99.6	1593	98.9	0.193	0.330	0..076-1.425
Not	2	0.4	18	1.1			

Pregnancy Desired

Not	4	0.7	12	0.7	1.000	0.996	0.320-3.102
Yes	535	99.3	1599	99.3			

Low Birth Weight (LBW)

LBW (<2500 gr)	56	10.4	73	4.5	<0.001**	2.443	1.699-3.511
Normal (≥2500 gr)	483	89.6	1538	95.5			

Types of Childbirth

Caesar	235	43.6	627	38.9	0.062	1.213	0.996-1.478
Spontaneous	304	56.4	984	61.1			

Source: Data primer (2025)

** = Significant at p-value < 0,001 ;

* = Significant at p-value < 0,05

Based on educational variables, primary education (SD-SMP) has a p<value of 0.011 (p<0.05), which shows a significant relationship between low education (SD-SMP) and the occurrence of complications in postpartum mothers. The odds ratio (OR) for low education is 1.83, indicating that mothers with lower education levels are 1.83 times more likely to experience complications than those with higher education levels. Secondary education has a p<0.05 value, which indicates a significant relationship between secondary education (SMA) and the incidence of complications in postpartum mothers. The OR (odds ratio) value of this low education is 2.15, which means that mothers who are less educated are 2.15 times more likely to experience complications compared to mothers who are highly educated. Low education is a key risk factor for postpartum depression (PPD), with mothers of lower educational levels being 1.47 times more likely to develop PPD (Tsai et al., 2023). Similar findings by Matsumura et al. (2019) showed a strong link between education and postpartum complications (p<0.0001). Higher education improves women's health management, while lower education hinders access to care and early detection of complications, resulting in poorer outcomes (Aprillia et al., 2024; Mokhtaryan-Gilani et al., 2022). A high level of education will assist someone in receiving information, so more knowledge can be obtained (Mindarsih et

al., 2018; Zuhana et al., 2018).

The findings of this study align with those of Matsumura et al. (2019), who reported a significant association between education level and postpartum complications, as evidenced by a p-value<0.0001 (Matsumura et al., 2019). Education improves women's ability to manage health more effectively (Mokhtaryan-Gilani et al., 2022). This is significant because women with lower educational attainment often lack the knowledge and ability to effectively access healthcare services or identify warning signs of complications, potentially resulting in delayed treatment and deteriorating health outcomes (Floyd et al., 2023; Sarkar et al., 2021).

Based on the gestational age variable, it has a p<0.0001 (p<0.05), which shows a significant relationship between gestational age and the incidence of complications in postpartum mothers. The OR (odds ratio) value of gestational age is 3.02, which means that mothers with a gestational age of <37 weeks have a 3.02 times greater chance of experiencing complications compared to mothers with a gestational age of ≥37 weeks. The findings of this study are consistent with those of a study conducted by (Hacker et al., 2022), which identified a significant association between gestational age and postpartum complications, as indicated by a p-value of 0.004 (p < 0.05) (Hacker et al., 2022). Research shows that pregnancies with a gestational age of less than

37 weeks, which is classified as premature, are associated with a much higher risk of complications compared to pregnancies at 37 weeks or more. Pregnancy with a gestational age of <37 weeks significantly increases the risk of neonatal morbidity and mortality, as well as obstetric complications (Andersson et al., 2022; Nurafifah & Kusbiantoro, 2019).

Based on parity status, it has a p -value=0.034, which indicates a significant relationship between parity status and the incidence of complications in postpartum mothers. The OR (odds ratio) value of this parity status is 1.24, which means that mothers with primipara status have a 1.24 times greater chance of experiencing complications compared to mothers with multiple parities. Primiparas will experience pain more easily than multiparas. Multiparous mothers have experienced pain in multiparas, so multiparas already have mechanisms to deal with pain in contrast to primiparas, mothers who have never had the first experience, which causes emotional tension, anxiety, and fear, which can exacerbate the pain (Purwati & Kustiningsih, 2018; Zakaria et al., 2024). Based on the BMI, it has a $p < 0.001$, which shows a significant relationship between BMI and the incidence of complications in postpartum mothers. The OR (odds ratio) BMI value is 9.09, which means that mothers who experience malnutrition are 9.09 times more likely to experience complications compared to normal mothers. The results of this study are in accordance with a study (Hacker et al., 2022) that found a significant relationship between BMI and postpartum complications, shown by a p -value of < 0.0001 (Hacker et al., 2022). Underweight mothers face nutrient deficiencies that increase the risk of premature birth, low birth weight, and anemia during pregnancy (Burnie et al., 2022).

The delivery distance had a $p < 0.0001$ ($p < 0.05$), which showed a significant relationship between the delivery distance and the incidence of complications in postpartum mothers. The OR (odds ratio) value of the delivery distance is 13.38, which means that the pregnancy gap of <2 years has a 13.38 times greater chance of experiencing complications compared to the distance of delivery ≥ 2 years. Based on the hypertension variable, it has a p -value of 0.006

($p < 0.05$), which shows a significant relationship between hypertension and the incidence of complications in postpartum mothers. The OR (odds ratio) value of hypertension is 2.49, which means that mothers who suffer from hypertension are 2.49 times more likely to experience complications compared to mothers who do not have hypertension.

Based on the dietary variable, it has a $p < 0.0001$ ($p < 0.05$), which shows a significant relationship between diet and the incidence of complications in postpartum mothers. The OR (odds ratio) value of delivery distance is 5.79, which means that mothers with an unnutritious diet are 5.79 times more likely to experience complications compared to mothers with a nutritious diet. Exposure to cigarette smoke showed a p -value < 0.0001 ($p < 0.05$), indicating a significant association between cigarette smoke exposure and the occurrence of complications in postpartum mothers. The odds ratio (OR) for cigarette smoke exposure is 3.5, indicating that mothers exposed to cigarette smoke are 3.5 times more likely to experience complications compared to those who are not exposed. These findings are consistent with a study by (Robbins et al., 2023), which also reported a significant association between cigarette smoke exposure and postpartum complications, with a p -value of < 0.0001 and a prevalence ratio (PR) of 2.67 (Robbins et al., 2023). Based on the Low Birth Weight (LBW) variable, it has a $p < 0.0001$ ($p < 0.05$), which shows a significant relationship between LBW and the incidence of complications in postpartum mothers. The OR (odds ratio) value of LBW is 2.44, which means that mothers who give birth to children with LBW are 2.49 times more likely to experience complications compared to mothers who give birth to children with normal birth weight (Astuti et al., 2025; Nurlaily et al., 2025).

The findings of this study are in accordance with the results of a study published by (Ayalew et al., 2024) which found a significant relationship between LBW and complications in postpartum mothers, shown by a p -value of < 0.0001 with OR=3.9 (Ayalew et al., 2024). Mothers who give birth to LBW babies often face a higher incidence of pregnancy-related complications such as preeclampsia, anemia, and infections (Helle et al., 2015; Wulandari

et al., 2021). Research shows that maternal complications during pregnancy are strongly associated with the occurrence of LBW births, highlighting the interaction between maternal health and baby outcomes (Nuzuliana & Wijhati, 2025; Siramaneerat et al., 2018).

After other variables were controlled, there were 8 dominant variables related to the incidence of complications in postpartum mothers, namely employment status, BMI, childbirth distance, history of hypertension, and death. exposure to cigarette smoke, history of psychological disorders, and the type of delivery that had a p-value of < 0.05. The eight variables have a significant relationship with the incidence of complications in postpartum mothers. The most dominant variables were BMI <18.5 and ≥25 (Malnutrition) with a p-value of < 0.0001 and a Wald value of 309.998. The OR value is 13.93, which means that mothers with BMI <18.5 and ≥25 (malnutrition) have a 13.93 times risk of experiencing complications in postpartum mothers. Based on the results of multivariate analysis in Table 3, the regression equation is $y = -7,101 + 1,643 \text{ (Malnutrition BMI)} + 1,643 \text{ (Not working)} + 3,395 \text{ (2-year < childbirth interval)} + 1,952 \text{ (Have a history of hypertension)} + 6,000 \text{ (Irregular diet)} + 1,554 \text{ (Exposed to cigarette smoke)} + -6,932 \text{ (Have a history of psychological disorders)} + 0.819 \text{ (LBW)} + 0.515 \text{ (Primary)}$.

Confounders or confounding factors are other independent variables that need to be controlled in this study. Confounding assessment on multivariate analysis was carried out on the covariate variables selected as models, namely BMI, employment status, childbirth distance, history of hypertension, diet, exposure to cigarette smoke, history of psychological disorders, LBW, and parity status. The confounder assessment is by looking at the difference in OR in multivariate analysis using a double logistic regression test and comparing the OR value. If it is > 10%, then the variable can be declared as a confounder and maintained in the model. The results of the calculation obtained were that the change in the POR value > 10% was the variable of work (12%), diet (18%), and LBW (18%), meaning as a confounding variable. Meanwhile, the variables of childbirth distance (7%), history of hypertension (7%), exposure to secondhand smoke (2%), and parity status (8%) were not confounding variables because they had a change in the POR value of < 10%.

Conclusion

BMI in postpartum mothers is the most dominant factor related to complications in postpartum mothers. The regression equation model in the multivariate analysis of the risk of the occurrence of diabetic retinopathy is $y = 5$.

Table 3. Results of Multivariate Logistic Regression Analysis

Variables	B	Wald	p-value	OR	(95% CI)	
					Lower	Upper
BMI	2.634	309.998	<0.001	13.930	10.390	18.676
Employment Status	1.643	32.737	<0.001	5.168	2.944	9.072
Delivery Distance	3.395	269.801	<0.001	29.806	19.879	44.691
History of Hypertension	1.952	19.598	<0.001	7.041	2.967	16.706
Diet	6.000	14.692	<0.001	403.516	18.766	8676.530
Exposure to Cigarette Smoke	1.554	95.300	<0.001	4.730	3.462	6.461
History of Psychological Disorders	-6.932	12.931	<0.001	.001	.000	.043
LBW	.819	8.207	0.004	2.268	1.295	3.972
Parity Status	.515	11.662	0.001	1.674	1.245	2.250
Constant	-7.101	330.034	<0.001	0.001		

Source: Data primer (2025)

-7,101 + 1,643 (malnutrition BMI) + 1,643 (not working) + 3,395 (2-year < delivery interval) + 1,952 (have a history of hypertension) + 6,000 (irregular diet) + 1,554 (exposed to cigarette smoke) + -6,932 (have a history of psychological disorders) + 0.819 (LBW) + 0.515 (primipara). This research offers insights into the factors associated with the occurrence of complications in postpartum mothers, so that pregnant women can carry out screening and early control (routine treatment) through health checks to find out and monitor BMI, control the distance of delivery, history of hypertension, diet, exposure to cigarette smoke, history of psychological disorders, especially in mothers who do not work with primipara status to prevent complications in postpartum mothers.

The recommendation of this study for policymakers at the Grobogan Health Center is to prioritize postpartum mothers who are malnourished and who work with primipara status with a gestational interval of <2 years by making follow-up efforts in management and treatment through BMI monitoring, dietary improvement, control of exposure to cigarette smoke, psychological disorders and monitoring and control of patient blood pressure to reduce the incidence of complications in postpartum mothers. The limitation of this study is that it only examined 16 variables due to the limited data available at the Grobogan Health Center. The data in this study cannot be representative of the entire population of Central Java Province, so the results of the study do not reflect the health conditions of all of Central Java Province.

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