



OBSTETRIC DETERMINANTS OF POSTPARTUM COMPLICATIONS AMONG MOTHERS IN INDONESIA: EVIDENCE FROM THE 2023 INDONESIAN HEALTH SURVEY

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ABSTRACT

Postpartum complications remain a significant contributor to maternal morbidity and mortality in Indonesia, yet national data on their determinants remain limited. Understanding the role of obstetric factors in postpartum outcomes is essential for informing maternal health strategies, particularly in low- and middle-income settings where delays in risk detection and care are common. This study aims to analyze the association between obstetric factors and the occurrence of postpartum complications using data from the 2023 Indonesian Health Survey (SKI). This cross-sectional analysis utilized secondary data from the 2023 Indonesian Health Survey (SKI), involving women aged 15–54 years who delivered in the last five years. The dependent variable was postpartum complications, while independent variables included parity, place of delivery, mode of delivery, type of birth attendant, and pregnancy-related conditions. Descriptive statistics, Chi-Square tests, and multivariate logistic regression were used in the analysis. The results showed that primiparous women, those who delivered via cesarean section, gave birth in hospitals, were attended by doctors, and experienced complications during pregnancy were significantly more likely to report postpartum complications. These findings underscore the need for improved antenatal risk screening, enhanced referral systems, and targeted maternal health interventions to prevent adverse outcomes in the postpartum period in Indonesia.

Keywords: indonesia health survey; maternal health; obstetric factor; postpartum complications

How to cite (in APA style)

Safitri, M. R., & Adisasmita, A. C. (2025). Obstetric Determinants of Postpartum Complications among Mothers in Indonesia: Evidence from the 2023 Indonesian Health Survey. *Indonesian Journal of Global Health Research*, 7(5), 201-212. <https://doi.org/10.37287/ijghr.v7i5.6707>.

INTRODUCTION

Maternal mortality is a key indicator of a country's health system performance. Deaths occurring during pregnancy, childbirth, or the postpartum period reflect persistent challenges in the accessibility and quality of reproductive health services. (Ronsmans & Graham, 2006; Say dkk., 2014) These deaths often result from preventable causes and signal systemic gaps in maternal healthcare, particularly in low- and middle-income countries where resources are limited and delays in care are common. According to the 2020 Long Form Population Census, Indonesia's maternal mortality ratio (MMR) was recorded at 189 per 100,000 live births, reflecting a decline from 346 in the 2010 Census and 305 in the 2015 Intercensal Survey (SUPAS). This 45% reduction brings the figure closer to the 2020–2024 National Medium-Term Development Plan (RPJMN) target of 183 per 100,000 live births. However, it remains significantly above the Sustainable Development Goals (SDGs) target of 70 per 100,000 live births by 2030. (Alisjahbana & Murniningtyas, 2018; Badan Pusat Statistik, 2024)

The majority of maternal deaths result from complications occurring during postpartum period. The postpartum period, defined as the first six weeks (42 days) following delivery, remains a critical window when the risk of maternal complications is particularly high. (World Health Organization, 2014) A systematic analysis of 417 datasets from 115 countries identified obstetric hemorrhage (27.1%), hypertensive disorders of pregnancy (14%), and

sepsis (10.7%) as the leading causes of maternal death. Abortive outcomes accounted for 7.9%, embolism for 3.2%, and other causes for 9.6%. Notably, more than two-thirds of hemorrhagic deaths occurred during the postpartum period.(Say dkk., 2014) These findings mirror global trends, where low- and middle-income countries face a disproportionate burden of preventable maternal deaths compared to high-income settings. In developed countries, leading causes include hemorrhage (16.3%), embolism (13.8%), and hypertensive disorders (12.9%). Meanwhile, in lower-income regions, hemorrhage remains the most common cause (27.1%), followed by hypertensive disorders (14%) and sepsis (10.7%) (Say dkk., 2014)

Importantly, complications during labor not only threaten maternal survival but also pose risks to fetal and neonatal outcomes. (Bayuana dkk., 2023). Several maternal and obstetric characteristics have been associated with the risk of complications during delivery. Among them, parity has consistently been linked to adverse outcomes. Women with high parity, particularly grand multiparas, face increased risks of uterine atony, prolonged labor, and retained placenta. (Ramadhaniati dkk., 2018)(Khan dkk., 2022) This U-shaped association underscores the need for tailored clinical attention across different parity levels. Another important factor is the place of delivery and the type of birth attendant. Deliveries that occur outside health facilities or without skilled birth attendants increase the risk of delays in recognizing and managing life-threatening complications (Campbell & Graham, 2006). Mode of delivery also plays a dual role in maternal outcomes. While cesarean section can be a life-saving intervention in complicated labor, its inappropriate or delayed use may lead to increased risks of surgical site infections, hemorrhage, and other perioperative complications. (Betrán dkk., 2016a). Given the persistent burden of maternal morbidity and mortality in Indonesia and the multifaceted nature of delivery-related complications, further empirical investigation is warranted. Understanding the contribution of obstetric factors to postpartum complications is essential for informing national health strategies and designing targeted interventions to reduce maternal health risks. This study aims to examine the association between obstetric factors—namely parity, place and mode of delivery, birth attendant type, and pregnancy-related conditions—and the occurrence of postpartum complications among Indonesian mothers, based on data from the 2023 Indonesian Health Survey (SKI).

METHOD

This study using a cross-sectional design using secondary data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia, SKI). SKI is a nationally representative, household-based survey conducted across all provinces in Indonesia. Data collection was based on census block sampling frames and covered comprehensive health-related information at the individual level, including maternal health and the utilization of maternal healthcare services. The study population included women aged 15–54 years recorded in the SKI 2023 dataset. The analytical sample comprised all women in that age group who reported having been pregnant and given birth within the five years preceding the survey. Inclusion criteria were women with singleton pregnancies, while cases involving miscarriage were excluded. Pregnancy-related information was collected through two main sources: the Maternal and Child Health (MCH-Buku KIA) handbook and structured recall-based interviews with respondents. Access to the SKI dataset was obtained through a formal request submitted to the Indonesian Ministry of Health. The application included an institutional endorsement letter, a brief research proposal outlining the study objectives and required variables, and a signed Non-Disclosure Agreement (NDA) in accordance with SKI data governance policies. Upon review and approval by the SKI data management team, the researcher received a customized dataset containing the approved variables.

Data processing began with a cleaning phase in which records not meeting the inclusion criteria or with missing values on key variables were excluded from analysis. Complete data were required for respondent identification and for core variables related to antenatal care visit adequacy. The outcome variable in this study was postpartum complications, defined as a binary variable (presence or absence of complications until six week after delivery). Independent variables included maternal parity (primipara, multipara, grand multipara), place of delivery (hospital, primary health facility, non-health facility), mode of delivery (vaginal delivery, cesarean section), type of birth attendant (doctor, midwife/nurse, non-skilled provider), and pregnancy-related conditions (yes or no). Pregnancy-related conditions were defined based on the SKI 2023 questionnaire and included symptoms such as persistent vomiting or diarrhea, high fever, hypertension, decreased fetal movement, heavy vaginal bleeding, premature rupture of membranes, dysuria, prolonged cough, shortness of breath, palpitations or chest pain, leg swelling, seizures, and other complaints reported during pregnancy. Univariate analysis was performed to describe the characteristics of the respondents. The association between independent variables and postpartum complications was assessed using Chi-square tests. Bivariate analysis was conducted to estimate the prevalence ratio (PR), considering variables with p-values less than 0.25 for inclusion in the multivariate model. Logistic regression was then applied to identify factors significantly associated with postpartum complications, with statistical significance set at $p < 0.05$.

RESULT

A total of 68,695 mothers were included in the analysis. As shown in Table 1, the most frequently reported postpartum complication was obstructed labor (6.56%), followed by preeclampsia/eclampsia (5.02%), infection (4.09%), and hypertension (3.00%). Hemorrhage was reported in 2.94% of respondents, while 4.22% experienced other complications. Regarding maternal parity, the majority of mothers were multiparous (70.90%), followed by primiparous women (23.79%), and grand multiparas (5.30%). In terms of place of delivery, 46.08% gave birth at primary health facilities, 40.77% in hospitals, and 13.15% at non-health facilities. Most mothers delivered vaginally (76.00%), while 24.00% underwent cesarean section. Skilled birth attendants were present in the majority of cases, with midwives or nurses attending 59.11% of deliveries and doctors attending 36.05%. A small proportion (4.84%) delivered with unskilled providers. Furthermore, 84.38% of mothers reported experiencing pregnancy-related conditions, while 15.62% did not. These included a range of maternal complaints and clinical symptoms, such as fever, bleeding, hypertension, or fetal movement issues, as captured in the SKI 2023 survey instrument.

Table 1.
Distribution of Postpartum Complications and Obstetric Factors Among Mothers in Indonesia
Based on the 2023 Indonesian Health Survey (SKI)

Variable	f	%
Complication		
Hemorrhage	2,018	2.94
Preeclampsia/Eclampsia	3,448	5.02
Hypertension	2,060	3.00
Infection	2,807	4.09
Obstructed Labor	4,505	6.56
Others	2,901	4.22
Maternal Parity		
Primipara	16,345	23.79
Multipara	48,707	70.90
Grand multipara	3,643	5.30
Place of delivery		
Hospital	28,005	40.77

Variable	f	%
Primary health facility	31,657	46.08
Non health facility	9,033	13.15
Mode of delivery		
Vaginal delivery	52,209	76.00
Caesarean Section	16,486	24.00
Birth Attendant		
Doctor	24,764	36.05
Midwife/nurse	40,608	59.11
Non Skilled provider	3,323	4.84
Pregnancy-related conditions		
Yes	57,968	84.38
No	10,727	15.62

Based on Table 2, all obstetric variables were significantly associated with postpartum complications ($p < 0.0001$). In terms of maternal parity, multiparous women had a lower prevalence of complications compared to primiparas (PR = 0.833; 95% CI: 0.808–0.859), while grand multiparas showed a further reduction (PR = 0.778; 95% CI: 0.722–0.838). For place of delivery, mothers who delivered at primary health facilities (PR = 0.332; 95% CI: 0.320–0.344) and non-health facilities (PR = 0.331; 95% CI: 0.308–0.357) had lower complication prevalence compared to those delivering in hospitals. Mode of delivery showed a strong association, with mothers who underwent cesarean section having a higher prevalence of complications (PR = 3.834; 95% CI: 3.730–3.941) compared to vaginal delivery. Regarding birth attendants, mothers assisted by midwives or nurses had a lower prevalence of complications (PR = 0.293; 95% CI: 0.284–0.303), as did those assisted by non-skilled providers (PR = 0.367; 95% CI: 0.327–0.412), compared to those assisted by doctors. Pregnancy-related conditions were also associated with postpartum complications. Mothers who experienced complications during pregnancy had a higher prevalence of postpartum complications (PR = 3.548; 95% CI: 3.457–3.642) than those who did not.

Table 2.
Association Between Obstetric Factors and Postpartum Complications Among Mothers in Indonesia: Analysis of the 2023 Indonesian Health Survey (SKI)

Indonesia: Analysis of the 2025 Indonesian Health Survey (SIKI)							
Variable	Postpartum Complication status				PR	95% Confidence Interval	p-value
	Yes		No				
	f	%	f	%			
Maternal Parity							
Primipara	4,193	25.65	12,152	74.35		Ref	
Multipara	9,755	20.03	38,952	79.97	0.833	0.808-0.859	<0,0001
Grand multipara	608	16.69	3,035	83.31	0.778	0.722-0.838	
Place of delivery							
Hospital	10,640	37.99	17,365	62.01		Ref	
Primary health facility	3,219	10.17	28,438	89.83	0.332	0.320-0.344	<0,0001
Non health facility	697	7.72	8,336	92.28	0.331	0.308-0.357	
Mode of delivery							
Vaginal delivery	6,584	12.61	45,625	87.39		Ref	
Caesarean Section	7,972	48.36	8,514	51.64	3.834	3.730-3.941	<0,0001
Birth Attendant							
Doctor	9,953	40.19	14,811	59.81		Ref	
Midwife/nurse	4,336	10.68	36,272	89.32	0.293	0.284-0.303	<0,0001
Non Skilled provider	267	8.03	3,056	91.97	0.367	0.327-0.412	
Pregnancy-related conditions							
Yes	5,770	53.79	4,957	46.21		Ref	
No	8,786	15.16	49,182	84.84	3.548	3.457-3.642	<0,0001

The multivariate analysis in this study employed a determinant modeling approach to identify the optimal set of independent variables that significantly influence the outcome variable. The modeling process began with variable selection, in which only variables with a p-value < 0.25 in the bivariate analysis were included in the multivariate model. As shown in Table 2, all independent variables met this criterion and were therefore retained for inclusion in the final multivariate analysis.

Table 3.
Full Model of Obstetric Factors Associated with Postpartum Complications Among Mothers in Indonesia: Analysis of the 2023 Indonesian Health Survey (SKI)

Variable	PR		p value
Maternal Parity			
Primipara		Ref	
Multipara	0.7506	0.715-0.787	<0,001
Grand multipara	0.709	0.637-0.790	<0,001
Place of delivery			
Hospital	Ref		
Primary health facility	0.497	0.465-0.532	<0,001
Non health facility	0.403	0.362-0.450	<0,001
Mode of delivery			
Vaginal delivery		Ref	
Caesarean Sected	2.735	2.580-2.900	<0,001
Birth Attendant			
Doctor		Ref	
Midwife/nurse	0.666	0.620-0.715	<0,001
Non Skilled provider	0.678	0.576-0.798	<0,001
Pregnancy-related conditions			
Yes		Ref	
No	5.379	5.123-5.648	<0,001

As shown in Table 3, all included variables remained statistically significant in the final multivariate model. Compared to primiparous women, multiparas and grand multiparas had a lower prevalence of postpartum complications (PR = 0.751; 95% CI: 0.715–0.787 and PR = 0.709; 95% CI: 0.637–0.790, respectively; $p < 0.001$) Women who delivered at primary health facilities (PR = 0.497; 95% CI: 0.465–0.532) or non-health facilities (PR = 0.403; 95% CI: 0.362–0.450) had significantly lower complication prevalence than those delivering in hospitals ($p < 0.001$). Cesarean delivery was associated with a higher prevalence of complications compared to vaginal delivery (PR = 2.735; $p < 0.001$). In terms of birth attendants, deliveries attended by midwives or nurses (PR = 0.666; 95% CI: 0.620–0.717) and by non-skilled providers (PR = 0.678; 95% CI: 0.576–0.799) were associated with lower prevalence compared to those assisted by doctors ($p < 0.001$). Mothers who reported complications during pregnancy had a significantly higher prevalence of postpartum complications (PR = 5.379; 95% CI: 5.123–5.648; $p < 0.001$).

DISCUSSION

This study identified several obstetric factors significantly associated with postpartum complications among Indonesian mothers. Based on the 2023 Indonesian Health Survey (SKI), the proportion of mothers reporting postpartum complications remains substantial, despite improvements in maternal health indicators over the past decade. While previous national reports such as the 2017 Indonesia Demographic and Health Survey (SDKI) and earlier Riskesdas surveys primarily focused on pregnancy-related complications, limited national data have addressed complications occurring in the postpartum period. The current findings thus provide updated and focused insight into the burden and predictors of maternal morbidity following delivery. (Kemenkes RI, 2024; National Population and Family Planning Board (BKKBN) dkk., 2018) These findings highlight gaps not only in the clinical

management of obstetric risk factors but also in the broader health system's ability to provide timely and appropriate care. Although ANC coverage is relatively high in Indonesia, the persistence of postpartum complications suggests potential shortcomings in screening, referral pathways, or intrapartum management, especially in non-hospital settings.

Maternal Parity

Parity was identified as a significant protective factor against postpartum complications in this study. Compared to primiparous women, both multiparas (PR = 0.751) and grand multiparas (PR = 0.709) had a lower risk of experiencing postpartum complications. This inverse relationship may reflect a combination of increased physiological readiness and previous childbirth experience among higher-parity women, which could contribute to smoother labor processes and better maternal outcomes. Primiparas, on the other hand, may face higher risks due to longer labor duration, greater anxiety, and limited awareness of obstetric warning signs. (World Health Organization, 2018; Yaya dkk., 2018) Interestingly, while grand multiparity is often associated with higher obstetric risk in low-resource settings—such as uterine atony and postpartum hemorrhage.—our findings suggest otherwise. (Başkiran dkk., 2023; Khan dkk., 2022) The protective pattern observed in this study may be influenced by improved maternal health services, particularly among multiparous women who are more familiar with healthcare systems and more likely to seek timely care. It is also possible that high-parity women in this dataset represent a ‘survivor group’ with inherently better reproductive health profiles, as they have successfully completed multiple deliveries without major complications.

Findings from the 2017 Indonesia Demographic and Health Survey (SDKI) support this trend, reporting that first-time mothers were more likely to report complications compared to women with previous births. In the Indonesian context, primiparous women—especially younger or unmarried mothers—often face limited access to skilled birth care and experience greater dependency on family decision-making during labor. (National Population and Family Planning Board (BKKBN) dkk., 2018) These results highlight the need for enhanced surveillance and support during labor and postpartum care for primiparous women, including strengthening antenatal counseling and ensuring skilled attendance at birth.

Place of Delivery

Place of delivery was significantly associated with the likelihood of postpartum complications. In this study, mothers who gave birth at primary health facilities (PR = 0.497; 95% CI: 0.465–0.532) and non-health facilities (PR = 0.403; 95% CI: 0.362–0.450) had a substantially lower prevalence of postpartum complications compared to those who delivered in hospitals. While this finding appears counterintuitive, it may reflect the higher-risk profile of women who are referred to hospitals due to obstetric complications, rather than an inherent protective effect of lower-level facilities. Referral bias is a well-documented phenomenon in maternal health research, particularly in cross-sectional datasets, where hospitals often serve as the endpoint of a cascade of delays in obstetric emergency management. (Ahmed dkk., 2024; Campbell & Graham, 2006) In Indonesia, the national referral system designates hospitals for managing high-risk and emergency cases, while routine deliveries are handled at the primary level. Thus, the higher complication rates observed in hospital deliveries may not reflect lower quality of care, but rather the concentration of complex cases requiring advanced interventions.

This pattern has also been reported in recent studies, such as the analysis by Bayuana et al. (2023), which emphasized that complications during labor and postpartum are more likely to be documented in hospital settings due to the referral of severe cases. This finding highlights the importance of improving early detection of obstetric risk at the community and primary

care levels to prevent delays in referral and to optimize care continuity. Strengthening birth preparedness counseling during antenatal visits and ensuring timely access to emergency obstetric care are essential strategies to reduce preventable postpartum complications. Future longitudinal or facility-based research is needed to better disentangle the relationship between delivery location and postpartum outcomes.

Mode of Delivery

Mode of delivery was strongly associated with the risk of postpartum complications in this study. Mothers who underwent cesarean section had a significantly higher prevalence of complications compared to those who delivered vaginally (PR = 2.735; 95% CI: 2.580-2.900 $p < 0.001$). This result is consistent with a large body of literature reporting increased maternal morbidity following surgical delivery, particularly when performed under emergency circumstances. (Ahmed dkk., 2024; Betrán dkk., 2016b) Cesarean sections carry inherent surgical risks, including infection, hemorrhage, and delayed postpartum recovery, which can directly contribute to the development of complications in the postpartum period. The World Health Organization recommends that cesarean delivery should be performed only when medically indicated, as unnecessary use can increase the burden of preventable maternal complications. (World Health Organization, 2015) In Indonesia, the national cesarean rate has risen steadily over the past decade, with substantial disparities across socioeconomic and regional groups. According to the 2017 Indonesia Demographic and Health Survey (SDKI), cesarean delivery was more common among urban, wealthier, and more educated women—raising concerns about the overuse of cesarean sections in non-emergency situations. (National Population and Family Planning Board (BKKBN) dkk., 2018) The association observed in this study may thus reflect both medical and non-medical drivers of cesarean use in the Indonesian health system.

It is also important to consider that cesarean sections are often a response to emerging complications during labor. In many cases, women may have already developed serious intrapartum events—such as fetal distress, prolonged labor, or active hemorrhage—prior to undergoing cesarean delivery. For example, a mother experiencing postpartum hemorrhage or uterine atony during delivery may be rushed into surgery as a life-saving measure. In such contexts, cesarean section does not represent the initial cause of postpartum complications but rather a clinical consequence of acute obstetric emergencies. This aligns with the concept of reverse causation, which is commonly encountered in cross-sectional maternal health data. Nonetheless, evidence suggests that even in the absence of complications, elective cesarean sections are associated with higher maternal morbidity compared to vaginal birth, particularly in settings where surgical safety and postnatal care quality are inconsistent. (Boerma dkk., 2018; Doctor dkk., 2018; Macones dkk., 2019) The findings of this study reinforce the importance of strengthening decision-making processes around mode of delivery at both the clinical and health system levels. Antenatal counseling should include a balanced discussion of the risks and benefits of cesarean section, and health facilities must be equipped to provide high-quality surgical obstetric care with appropriate infection prevention, skilled personnel, and adequate postnatal monitoring. Reducing unnecessary cesarean deliveries is not only a matter of resource efficiency but also a public health priority to minimize preventable maternal morbidity in the postpartum period.

Birth Attendant

The type of birth attendant emerged as a significant factor associated with postpartum complications in this study. Compared to deliveries assisted by doctors, those assisted by midwives or nurses (PR = 0.666; 95% CI: 0.620-0.715) and by non-skilled attendants (PR = 0.678; 95% CI: 0.576-0.798) showed a lower prevalence of complications. At first glance, this finding appears counterintuitive, as deliveries attended by formally trained providers are

generally expected to yield better outcomes. However, such patterns have been observed in previous cross-sectional analyses and may be influenced by underlying case severity and referral dynamics within health systems. (Campbell & Graham, 2006; Negero dkk., 2018) In many settings, doctors—particularly obstetricians—are often involved only when complications arise or when lower-tier providers are unable to manage a case independently. This creates a concentration of high-risk deliveries within doctor-assisted cases, while routine, uncomplicated births are commonly handled by midwives or nurses at the primary care level. Moreover, in the Indonesian context, mothers in rural or underserved areas may first attempt to deliver with the assistance of non-skilled providers or midwives. If complications develop—such as obstructed labor, retained placenta, or excessive bleeding—the case may then be referred to a doctor at a higher-level facility. This referral pattern likely explains the higher complication rate observed in doctor-attended deliveries in this study.

This phenomenon is supported by findings from the 2017 Indonesia Demographic and Health Survey (SDKI), which documented that referrals to higher-level care frequently occurred only after prolonged labor or signs of fetal distress had emerged. A similar trend was also observed in studies from Ethiopia and Nepal, where complications tended to cluster in deliveries handled by physicians, largely due to the late arrival of referred cases from lower cadres. (Nakayuki dkk., 2021; Sharma dkk., 2014) This underscores the concept of confounding by indication, in which the presence of complications—not the provider type itself—may drive the decision to involve more specialized care. Nonetheless, the findings do not negate the importance of skilled attendance at birth. On the contrary, they highlight the need for improved early detection and referral systems that enable timely escalation of care before complications become life-threatening. Strengthening the clinical decision-making capacity of midwives and enhancing integration between levels of care are essential components of maternal health system resilience. Skilled providers across all levels must be empowered not only to provide delivery care but also to recognize early warning signs and initiate rapid referral.

Ultimately, improving maternal outcomes requires a well-coordinated continuum of care in which all types of birth attendants—from community-based workers to obstetric specialists—play a complementary role. Investments in midwifery education, emergency obstetric training, and referral infrastructure are critical for reducing postpartum complications, particularly in settings where facility-based deliveries continue to rise but care fragmentation persists. As documented in both global and Indonesian studies, ensuring the availability of competent and appropriately deployed birth attendants is a cornerstone of maternal health strategies. (Koblinsky dkk., 2016; National Population and Family Planning Board (BKKBN) dkk., 2018) This may reflect the health-seeking behavior of mothers, where referral to physicians typically occurs after complications emerge, highlighting the critical role of timely decision-making and structured referral systems.

Pregnancy-related conditions

Pregnancy-related conditions were strongly associated with the occurrence of postpartum complications in this study. Mothers who reported experiencing at least one complication during pregnancy had a significantly higher prevalence of postpartum complications (PR = 5.379; 95% CI: 5.123–5.648). The pregnancy-related conditions assessed in the 2023 Indonesian Health Survey (SKI) ranged from minor symptoms, such as persistent vomiting or dysuria, to severe obstetric emergencies including antepartum hemorrhage, seizures, and reduced fetal movement. This broad definition likely captures both early warning signs and clinically significant conditions, thereby enhancing sensitivity but potentially reducing specificity. Nonetheless, the strength of association observed in this analysis suggests that the presence of any complication during pregnancy may serve as a critical indicator of elevated

risk during the postpartum period. Previous studies have consistently shown that complications arising during the antenatal phase—such as gestational hypertension, preeclampsia, or intrauterine infection—substantially increase the risk of labor-related and postpartum adverse outcomes. (Allotey dkk., 2020; Say dkk., 2014) A multicenter WHO study reported that maternal morbidities are often cumulative, where unmanaged or suboptimally managed antenatal conditions predispose women to emergency events during childbirth. In Indonesia, risk factors like anemia, undiagnosed preeclampsia, and lack of timely referral remain prevalent, especially in rural and resource-limited areas. These findings underscore the importance of early detection and integrated management of pregnancy-related conditions, not only to improve birth outcomes but also to reduce maternal morbidity in the immediate postpartum period.

However, one challenge in interpreting these results lies in the reliance on self-reported complications, which may be subject to recall bias or misclassification. Women may overreport common discomforts (e.g., fatigue, swelling) as complications or underreport medically significant symptoms due to lack of understanding or normalization of pain during pregnancy. Moreover, the decision to seek care often depends on symptom interpretation, cultural beliefs, and health literacy, which may vary significantly across regions and influence reporting patterns. (Filippi dkk., 2006; Yaya dkk., 2018) Despite these limitations, population-based surveys like SKI remain valuable for identifying broad patterns and highlighting the need for structured surveillance systems that document maternal morbidity more systematically. From a public health perspective, pregnancy-related conditions represent a critical window of opportunity for intervention. Strengthening antenatal care (ANC) services to include comprehensive screening, risk stratification, and patient education may help reduce progression to severe postpartum outcomes. Additionally, linking high-risk pregnancies to delivery planning and emergency preparedness can mitigate the escalation of complications during labor. In line with the Indonesian Ministry of Health's maternal health roadmap, a stronger emphasis on risk-based ANC and community-based follow-up is essential to break the continuum of unaddressed maternal morbidity. (Kemenkes RI, 2024; National Population and Family Planning Board (BKKBN) dkk., 2018). It should be noted that pregnancy-related conditions were self-reported and may be subject to recall bias, especially for symptoms experienced earlier in pregnancy. However, the inclusion of data from maternal and child health books (KIA) partially mitigates this limitation. From a policy perspective, the findings underscore the need for improving not only ANC coverage but also the quality of intrapartum and postpartum monitoring, including ensuring that women with identifiable risk factors such as high parity or pregnancy-related conditions receive higher-level surveillance and facility-based delivery.

CONCLUSION

This study found that maternal parity, place of delivery, mode of delivery, birth attendant, and pregnancy-related conditions were significantly associated with postpartum complications among mothers in Indonesia. First-time mothers, women who underwent cesarean delivery, and those who experienced complications during pregnancy were at elevated risk. While higher complication rates among hospital deliveries and doctor-assisted births may reflect referral bias, the findings reinforce the importance of early risk identification and timely care escalation. These results are consistent with national and global evidence and emphasize the need for strengthened antenatal risk screening, improved midwife capacity, and streamlined referral pathways within the maternal health system (Say et al., 2014; Gabrysch & Campbell, 2009; BPS et al., 2018). (Campbell & Graham, 2006; National Population and Family Planning Board (BKKBN) dkk., 2018; Say dkk., 2014) From a public health perspective, addressing postpartum morbidity requires not only clinical vigilance but also system-wide coordination. Policymakers should prioritize targeted interventions for high-risk groups,

invest in midwifery and emergency obstetric care, and enhance surveillance for maternal complications across all facility levels. This study's strengths include its large, nationally representative sample and multivariable approach. However, its cross-sectional design, reliance on self-reported data, and potential reverse causation limit causal inference. Further longitudinal and facility-based studies are recommended to validate these findings and inform more precise intervention strategies aimed at reducing preventable postpartum complications.

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