

THE RELATIONSHIP BETWEEN A HISTORY OF DIABETES MELLITUS AND ABORTUS WITH THE INCIDENCE OF POSTPARTUM HEMORRHAGE AT ANANDA MOM AND CHILD HOSPITAL OF MAKASSAR IN 2022-2024

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ABSTRACT

Background: Postpartum hemorrhage is a major cause of maternal mortality worldwide, contributing to more than one-fifth of maternal deaths. This study aimed to analyze the association between a history of diabetes mellitus and a history of abortion with the incidence of postpartum hemorrhage, and to identify the most strongly associated factor at Ananda Mother and Child Hospital of Makassar, during 2022 to 2024.

Methods: This study employed a case control design with a 1:1 ratio between case and control groups. A total of 132 patients were selected using purposive sampling. Data were obtained from medical records of patients who delivered at Ananda Mother and Child Hospital from 2022 to 2024. Data analysis was conducted using the Chi-square test for bivariate analysis and logistic regression for multivariate analysis.

Results: A history of diabetes mellitus was significantly associated with postpartum hemorrhage ($p = 0.013$; OR = 4.559; 95% CI = 1.424–14.593). Similarly, a history of abortion was also significantly associated with postpartum hemorrhage ($p = 0.012$; OR = 2.713; 95% CI = 1.303–5.647). Multivariate analysis showed that a history of diabetes mellitus was the most dominant factor associated with postpartum hemorrhage (OR = 5.742; 95% CI = 1.729–19.070; $p = 0.004$).

Conclusion: Pregnant women are advised to undergo regular antenatal care, adopt a healthy lifestyle, and adhere to healthcare providers' recommendations throughout pregnancy and delivery to reduce the risk of postpartum hemorrhage.

Keywords : Postpartum hemorrhage ; history of abortion; history of diabetes mellitus

INTRODUCTION

Postpartum hemorrhage is one of the most common obstetric complications experienced by women during childbirth and remains a leading cause of maternal morbidity and mortality worldwide. Postpartum hemorrhage is defined as blood loss ≥ 500 ml after vaginal delivery or ≥ 1000 ml after cesarean section and can rapidly progress into an emergency condition if not managed appropriately¹. It is estimated that 830 women die daily due to complications of pregnancy and childbirth². Globally, 80% of maternal deaths are caused by severe bleeding, infection, hypertension, and unsafe abortion, with postpartum hemorrhage contributing to more than 20% of maternal deaths, with a maternal mortality ratio of 223 per 100,000 live births in 2020, still exceeding the Sustainable Development Goal (SDG) 3.1 targets^{3,4}.

In Indonesia, the trend of maternal mortality remains concerning. Data from the 2023 Indonesia Health Profile show an increase in maternal mortality from 2019 to 2021, followed by fluctuations from 2021 to 2023⁵. Obstetric hemorrhage is one of

the most common causes of maternal death in Indonesia, with postpartum hemorrhage accounting for approximately 28% of maternal deaths. In South Sulawesi, maternal deaths reached 174 cases in 2022, with the highest number occurring in Makassar City, mostly due to obstetric hemorrhage⁶. In 2021, postpartum hemorrhage was reported as the most frequent cause of maternal death⁷.

Several risk factors are known to contribute to postpartum hemorrhage, including a history of diabetes mellitus (DM) (pregestational or gestational), history of abortion, and repeated curettage. Diabetes mellitus is a chronic disease with increasing global prevalence, projected to reach 578 million cases by 2030 and 700 million by 2045⁸. Meanwhile, the incidence of abortion in Indonesia is estimated at 10–15% or approximately 500,000–750,000 cases⁹. The increasing prevalence of diabetes mellitus and abortion suggests that both factors may significantly contribute to the risk of postpartum hemorrhage.

However, the relationship between diabetes mellitus, abortion, and postpartum hemorrhage may vary across populations and healthcare settings, necessitating further studies

based on local clinical data. Studies specifically evaluating these factors using hospital medical records, particularly in Makassar, remain limited. This study aimed to analyze the association between a history of diabetes mellitus and abortion with postpartum hemorrhage at Ananda Mother and Child Hospital Makassar from 2022 to 2024 and to identify the most strongly associated factor.

MATERIALS AND METHODS

This study employed a case-control design and received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences at Alauddin State Islamic University of Makassar with number 129/KEPK/FKIK/XI/2025. Data collection was conducted from November to December 2025 at Ananda Mother and Child Hospital of Makassar. The study population included all women who delivered and were in the postpartum period at the hospital between 2022 and 2024. A total of 132 respondents were included, consisting of 66 cases and 66 controls, selected using purposive sampling based on inclusion and exclusion criteria.

Inclusion criteria included mothers giving birth, whether or not they experienced postpartum hemorrhage at Ananda Mother and Child Hospital of Makassar from 2022 to 2024, with

complete, clear, and reviewable medical records. Exclusion criteria included mothers aged <20 or >35 years, parity <4 (grandemultipara), coagulation system disorders, anemia, hypertension, and a history of previous postpartum hemorrhage.

The data used in this study were secondary data sourced from the medical records of mothers who gave birth at Ananda Mother and Child Hospital of Makassar during the study period. Univariate analysis was performed to describe the frequency distribution of respondent characteristics, including history of diabetes mellitus, history of abortion, and incidence of postpartum hemorrhage. Bivariate analysis was then performed using the Chi-Square test to assess the relationship between the independent variables and the incidence of postpartum hemorrhage. To determine the factors with the strongest association after controlling for other variables, multivariate analysis using logistic regression was performed.

RESULTS

The following table presents the frequency distribution of history of diabetes mellitus, history of abortion, and postpartum hemorrhage among mothers who delivered at Ananda Mother and Child Hospital of Makassar from 2022 to 2024.

Table 1. Distribution of mothers who delivered at Ananda Mother and Child Hospital Makassar from 2022 to 2024.

Variable	Frequency	
	n	%
History of DM		
a. Yes	19	14,4
b. No	113	85,6
History of abortion		
a. Yes	49	37,1
b. No	83	62,9
Postpartum Hemorrhage		
a. Yes	66	50
b. No	66	50
Total	132	100

Based on the results of univariate analysis, it was found that the number of mothers giving birth with a history of diabetes mellitus was 19 samples with a percentage of 14.4%, while the number of mothers giving birth without a history of diabetes mellitus was 113 samples with a percentage of 85.6%. Meanwhile, mothers

giving birth with a history of abortion were distributed as many as 49 samples with a percentage of 37.1% while mothers giving birth without a history of abortion were 83 samples with a percentage of 62.9%.

Tabel 2. The relationship between history of diabetes mellitus and the incidence of postpartum hemorrhage

History of DM	Postpartum Hemorrhage				Total		<i>p-Value</i>	OR	95% CI
	Control		Case						
	n	%	n	%	N	%			
No	62	93,9	51	77,3	113	85,6	0,013	4,559	1,424-14,593
Yes	4	6,1	15	22,7	19	14,4			
Total	66	100	66	100	132	100			

The results of bivariate analysis using the Chi-Square test showed that a history of diabetes mellitus was significantly associated with the incidence of postpartum hemorrhage, with a p-value of <0.05 (p = 0.013). In addition, mothers with a history

of diabetes mellitus had a 4.559 times greater risk of experiencing postpartum hemorrhage compared to mothers without a history of diabetes mellitus (OR = 4.559; 95% CI = 1.424-14.593).

Table 3. The relationship between history of abortion and the incidence of postpartum hemorrhage

Riwayat abortus	Perdarahan postpartum				Total		<i>p-Value</i>	OR	95% CI
	Kontrol		Kasus						
	n	%	n	%	N	%			
Tidak	49	74,2	34	51,5	83	62,9	0,012	2,713	1,303-5,647
Ya	17	25,8	32	48,5	49	37,1			
Total	66	100.0	66	100.0	132	100.0			

Based on the results of bivariate analysis using the Chi-Square test, a history of abortion was significantly associated with the incidence of postpartum hemorrhage with a p-value <0.05 (p = 0.012). Furthermore, mothers with a history of abortion had a

2.713-fold increased risk of postpartum hemorrhage compared to those without a history of abortion (OR = 2.713; 95% CI = 1.303-5.647)

Table 4. The factor most strongly associated with the incidence of postpartum hemorrhage

Independent variables	p-value	OR	95% CI
History of diabetes mellitus	0,004	5,742	1,729-19,070
History of abortion	0,003	3,213	1,495-6,906

Based on the results of multivariate analysis using logistic regression, it was found that a history of diabetes mellitus is the factor most strongly associated with the incidence of postpartum

hemorrhage, with an OR = 5.742 (OR > 1; 95% CI = 1.729–19.070) and a p-value = 0.004.

DISCUSSION

The relationship between history of diabetes mellitus and the incidence of postpartum hemorrhage

Normal pregnancy is characterized by complex maternal metabolic adaptations, particularly in lipid metabolism to support maternal energy needs and fetal growth. In early to mid-pregnancy, there is an increase in lipogenesis and fat tissue accumulation, whereas approaching the third trimester, lipolytic activity increases in preparation for labor and lactation. This adaptation reflects the physiological homeostatic mechanisms of normal pregnancy¹⁰.

However, these mechanisms are disrupted in pregnant women with diabetes mellitus. Diabetes mellitus in pregnancy, whether pregestational (type 1 and type 2 DM) or Gestational Diabetes Mellitus (GDM), is characterized by hyperglycemia that broadly affects metabolic, vascular, and obstetric functions. Women with pregestational diabetes mellitus have a higher risk of complications compared to those with GDM due to higher and longer-lasting hyperglycemia, even since the periconceptional period, and may be accompanied by acute complications such as diabetic ketoacidosis (DKA)¹¹.

This study demonstrated a significant association between a history of diabetes mellitus and postpartum hemorrhage at Ananda Mother and Child Hospital of Makassar (p = 0.013), with a risk approximately 4.559 times higher in mothers with a history of diabetes mellitus compared to those without. This finding

strengthens the evidence that diabetes mellitus is a risk factor for postpartum hemorrhage. Pathophysiologically, chronic hyperglycemia may reduce myometrial contractility through disruption of uterine smooth muscle cell metabolism, thereby increasing the risk of uterine atony, which is the main cause of postpartum hemorrhage¹².

In addition, diabetes mellitus also contributes indirectly through an increased incidence of fetal macrosomia due to excessive maternal glucose transfer to the fetus. Macrosomia leads to uterine overdistension, labor dystocia, and increases the risk of birth canal lacerations and uterine atony. This mechanism has been demonstrated in a long-term population-based study in Norway, which showed a significant increase in the risk of postpartum hemorrhage among mothers with diabetes mellitus, particularly those accompanied by labor dystocia¹³. Similar findings were also reported by Behafarin et al. and Mooberry et al. , which emphasized the role of type 1 and type 2 DM as independent predictors of postpartum hemorrhage, although the role of GDM remains variable^{14,15}.

In addition to mechanical mechanisms, diabetes mellitus also affects placentation and the hemostatic system. Chronic hyperglycemia causes endothelial dysfunction and microangiopathy in spiral arteries, thereby disrupting the physiological remodeling of uterine blood vessels by trophoblasts. This condition increases the risk of abnormal placentation, including placenta accreta and retained placenta, which are risk factors for severe postpartum hemorrhage¹⁶. Meanwhile, mothers with poor glycemic control are more prone to complications such as diabetic nephropathy, which may also result in platelet

dysfunction and coagulation disorders due to uremia, thereby exacerbating bleeding¹⁷.

However, several studies have reported conflicting results. Studies by Hosseinzadeh et al. and a meta-analysis by Ye et al. found no significant association between diabetes mellitus and postpartum hemorrhage^{1,18}. These differences may be related to variations in population characteristics, sample size, control of confounding factors, and the clinical definitions of diabetes mellitus and postpartum hemorrhage used. This indicates that the relationship between diabetes mellitus and postpartum hemorrhage is complex and influenced by various clinical and methodological factors.

The relationship between history of abortion and the incidence of postpartum hemorrhage

A history of abortion, particularly when accompanied by repeated curettage procedures, is known to increase the risk of postpartum hemorrhage through structural and functional damage to the uterus. Endometrial trauma resulting from intrauterine procedures may lead to scar tissue formation, impaired decidualization, and abnormal placental attachment, including placenta accreta and retained placenta, which are major causes of postpartum hemorrhage¹⁹.

In this study, a history of abortion was significantly associated with postpartum hemorrhage ($p = 0.012$), with a risk approximately 2.713 times higher compared to mothers without a history of abortion. This finding is consistent with previous studies showing that abortion may affect uterine vascular remodeling, trigger chronic inflammation, oxidative stress, and post-abortion hormonal changes that influence placental development and attachment in subsequent pregnancies^{20,21}.

Induced abortion through dilation and curettage procedures has the potential to cause endometrial injury that inhibits normal trophoblast penetration, thereby increasing the risk of abnormal placentation such as placenta previa and placenta accreta. This relationship was reported by J. Zhang et al., emphasizing that suboptimal endometrial repair following abortion contributes to adverse obstetric outcomes²².

In addition to placentation disorders, a history of abortion is also associated with alterations in the hemostatic system. Endometrial injury triggers inflammatory responses and a hypercoagulable state that may persist into subsequent pregnancies. This condition increases the risk of venous thromboembolism (VTE), which often requires anticoagulant therapy. The use of anticoagulants during the peripartum period may disrupt physiological hemostatic mechanisms and increase the risk of postpartum hemorrhage^{23,24}.

However, some studies have reported inconsistent findings. Hosseinzadeh et al. (2023) and Muluye et al. (2023) did not find a significant association between a history of abortion and postpartum hemorrhage. These differences indicate that the impact of abortion on postpartum hemorrhage is highly influenced by other factors, such as the number of abortions, method of pregnancy termination, interpregnancy interval, quality of healthcare services, and the implementation of active management of the third stage of labor^{1,25}.

Multivariate Analysis and Clinical Implications

Multivariate analysis in this study demonstrated that a history of diabetes mellitus is the most dominant factor and acts as an independent predictor of postpartum hemorrhage compared to a history of abortion. After controlling for confounding variables, a history of diabetes mellitus continued to show a strong association ($OR = 5.742$), whereas a history of abortion exhibited a lower strength of association ($OR = 3.213$). These findings are consistent with a national-scale study by Gorsch et al. (2023), which emphasized the role of metabolic and vascular disorders in diabetes mellitus as major determinants of severe obstetric complications, including postpartum hemorrhage²⁶.

The difference in the strength of these associations can be explained by the nature of the pathophysiological mechanisms of both variables. Diabetes mellitus, as a chronic metabolic disease, exerts a continuous systemic impact on the myometrium, uterine vascularization, placenta, and the hemostatic system. In contrast, a history of abortion tends to produce more localized effects on the uterus, with its impact highly dependent on the frequency of abortions, the method of pregnancy termination, and other obstetric factors¹⁴.

Thus, the findings of this study emphasize that a history of diabetes mellitus is a more dominant risk factor for postpartum hemorrhage compared to a history of abortion. These findings have important clinical implications, particularly in risk screening through antenatal care services, closer pregnancy monitoring, and optimal delivery planning for pregnant women with a history of diabetes mellitus and abortion.

CONCLUSION AND RECOMMENDATION

This study found a significant association between a history of diabetes mellitus and abortion with the incidence of postpartum hemorrhage at Ananda Mother and Child Hospital of Makassar from 2022 to 2024. Furthermore, among the factors of diabetes mellitus and abortion history, the most significant association with postpartum hemorrhage, based on multivariate analysis, was a history of diabetes mellitus.

Meanwhile, future researchers are expected to develop and add other variables and use other research designs to broaden understanding of the various factors associated with postpartum hemorrhage.

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