

# Burden and Risk Factors of Postpartum Haemorrhage among Normal Delivery Cases at A Tertiary Care Hospital

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## ABSTRACT

**Background:** Postpartum haemorrhage (PPH) remains a significant cause of maternal mortality and morbidity globally, accounting for approximately 27% of all maternal deaths. This study aimed to determine the prevalence of PPH and its determinants among women who had delivered by normal vaginal delivery in a Bangladeshi tertiary care hospital. **Methods & Materials:** This is a cross-sectional study, conducted in Sylhet MAG Osmani Medical College Hospital from January, 2024 to December, 2024 among 200 women who had delivered by normal vaginal delivery. Data were collected by direct observation and medical record review using a standardized checklist. PPH was defined as blood loss > 500 mL in 24 hours after delivery. Data were compared using SPSS version 26, chi-square test, and binary logistic regression to identify independent predictors with adjusted odds ratios (AOR) and 95% confidence intervals (CI). **Results:** The incidence of PPH in normal deliveries was 14.0% (n=28). Independent predictors of PPH included advanced maternal age  $\geq 30$  years (AOR=2.27, 95% CI: 1.08-4.76), multiparity (AOR=2.09, 95% CI: 1.03-4.25), fewer than four antenatal visits (AOR=2.61, 95% CI: 1.25-5.45), prolonged labor  $\geq 12$  hours (AOR=2.80, 95% CI: 1.32-5.94), and perineal tear (AOR=3.35, 95% CI: 1.31-8.56). In the group with PPH, 42.9% had mild haemorrhage, 35.7% had moderate haemorrhage, and 21.4% had severe haemorrhage. Blood transfusion was required in 64.3% of PPH cases, with one maternal death recorded (3.6%). **Conclusion:** PPH was prevalent and was associated with multiparity, maternal age, poor antenatal care, prolonged delivery, and perineal tear. Identification of risks early, management of the third stage of delivery actively, and providing antenatal care universally is important to decrease mortality and morbidity among mothers.

**Keywords:** Postpartum Haemorrhage, Normal Delivery, Maternal mortality

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## INTRODUCTION

Postpartum haemorrhage (PPH) is one of the most significant obstetric emergencies, contributing to about 27% of all maternal mortality globally and remaining the principal direct cause of death in low- and middle-income nations [1]. The World Health Organization states that 14 million women experience PPH annually, and sub-Saharan Africa and Southern Asia account for about 85% of maternal deaths due to PPH [2]. Despite advances in obstetric care, PPH incidence has risen in developed countries, from 2.7% to 4.3% over the past two decades, while developing nations continue to report prevalence rates of 10-14% [3,4]. This disparity underscores the need for context-specific research to understand PPH burden and risk factors in resource-limited settings. In Bangladesh, haemorrhage is responsible for approximately 31% of maternal deaths, and the maternal mortality ratio is as high as 173 per 100,000 live births, far exceeding the under 70 per 100,000 in 2030 [5,6]. Tertiary hospitals such as Sylhet MAG Osmani Medical College Hospital are a referral point for complicated pregnancies and complicated deliveries, and therefore, they are the prime areas where obstetric

complications can be researched. However, data on PPH incidence and determinants in uncomplicated vaginal births remain scarce, hampering effective prevention efforts. PPH is defined as blood loss exceeding 500 mL after vaginal birth or 1000 mL after cesarean section within the first 24 hours post-delivery [7]. Etiologically, PPH is classified based on the "Four Ts": tone (uterine atony), trauma (injuries in the genital tract), tissue (retained products of placenta), and thrombin (coagulation defects), with uterine atony causing 70-80% of all cases [8]. Risk factors in systematic reviews include advanced maternal age, multiparity, inadequate antenatal care, prolonged or induced labor, instrumental delivery, and perineal trauma [9,10]. Awareness of these factors within individual healthcare environments is relevant for risk stratification and early intervention. Increased maternal age, particularly  $\geq 35$  years, is associated with increased risk for PPH from decreased uterine contractility, higher incidence of comorbidities, and greater obstetric intervention (OR 1.15-4.37) [11]. Parity also has a complex association; nulliparous women are at risk for prolonged labor or instrumental delivery-related PPH, whereas multiparous

women are at risk from uterine overdistension and atony [12]. Insufficient antenatal visits (<4) increase the risk of PPH threefold, most significantly by limiting early detection and management of complications such as anemia and hypertensive disorders [13]. Intrapartum conditions, including labor lasting greater than 12 hours, induced labor, and perineal trauma, contribute to PPH by mechanisms of myometrial fatigue, desensitization of oxytocin receptors, infection, and direct blood loss [14,16]. The cumulative effect of all these factors classifies PPH as a multifactorial condition. Despite evidence-based management, maternal mortality caused by PPH still happens in developing countries due to delayed detection, limited resources, and a lack of training for health workers [17]. This study aimed to assess the burden of PPH among women delivering by normal vaginal delivery and identify the maternal and intrapartum associated risk factors.

## METHODS & MATERIALS

This descriptive cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Sylhet MAG Osmani Medical College Hospital from January,

2024 to December, 2024 to determine the burden and risk factors of postpartum haemorrhage (PPH) among normal vaginal delivery cases. A total of 200 women who underwent normal delivery during the study period were included using a purposive sampling technique. Women with cesarean section, retained placenta, coagulation disorders, or incomplete records were excluded. Data were collected through direct observation and review of medical records using a structured checklist that included maternal demographic details, antenatal-care history, obstetric and delivery characteristics, and occurrence of postpartum haemorrhage. PPH was defined as blood loss exceeding 500 mL within 24 hours of delivery. Severity was categorized as mild (500-1000 mL), moderate (1000-

1500 mL), or severe (>1500 mL) based on clinical estimation and need for intervention. All participants received standard obstetric management following hospital protocol. Data were compiled and analyzed using SPSS software version 27. Descriptive statistics (frequency, percentage, mean, and standard deviation) summarized baseline characteristics. Associations between categorical variables and PPH were tested by the chi-square test, and variables showing  $p < 0.05$  were entered into a binary logistic regression model to identify independent predictors. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to determine the strength of association. Ethical approval was obtained from the institutional review board of Sylhet MAG Osmani Medical

College Hospital, and informed consent was taken from all participants before data collection.

**RESULTS**

Table I presents the sociodemographic profile of the study population. The majority of participants (55.0%) were between 20-29 years old, the fertile reproductive age. 57.5% of the participants were multiparous, while 42.5% were primiparous. The majority of women (60.0%) had attended four or more antenatal care visits. 65.0% of participants were from the urban environment, due to the hospital's catchment area within the capital city and its accessibility to urban residents.

**Table I**  
Baseline Characteristics of Study Population (n = 200).

Baseline Characteristics	Category	n (%)
Age (years)	<20	40 (20.0)
	20-29	110 (55.0)
	≥30	50 (25.0)
Parity	Primipara	85 (42.5)
	Multipara	115 (57.5)
Antenatal Care (ANC) Visits	≥4 visits	120 (60.0)
	<4 visits	80 (40.0)
Residence	Urban	130 (65.0)
	Rural	70 (35.0)

Table II presents key obstetric and delivery-related factors among the study population. Seventy-five percent (75.0%) of women experienced labor that was shorter than 12 hours, while a quarter experienced

prolonged labor. Induction of labor was performed in 30.0% of instances, consistent with medical indications for expedited delivery. Spontaneous vaginal delivery was possible in 80.0% of the cases, whereas

instrumental delivery was required in 20.0%. Perineal trauma occurred in 15.0% of the deliveries (Table II)

**Table II**  
Obstetric and Delivery-Related Factors (n = 200).

Obstetric and Delivery-Related Factors	Category	n (%)
Duration of Labor	<12 hours	150 (75.0)
	≥12 hours	50 (25.0)
Induction of Labor	Yes	60 (30.0)
	No	140 (70.0)
Mode of Delivery	Spontaneous Vaginal	160 (80.0)
	Instrumental	40 (20.0)
Perineal Tear	Present	30 (15.0)
	Absent	170 (85.0)

Table III demonstrates that PPH complicated 14.0% of all normal vaginal deliveries in the study, or 28 cases out of 200

women. This is comparable with results in other developing country settings and much higher than in high-income environments.

86.0% of women without PPH represent successful management and good outcomes (Table III).

**Table III**  
Prevalence of Postpartum Haemorrhage (n = 200).

Outcome	n (%)
Postpartum Haemorrhage (PPH) Present	28 (14.0)
PPH Absent	172 (86.0)

Table IV reflects evident correlations between maternal demographic factors and the occurrence of PPH. Maternal age of less than 20 years demonstrated a highly significant correlation with PPH ( $p=0.021$ ), and 25.0% of them experienced

haemorrhage. Multiparity was significantly associated with PPH ( $p=0.041$ ), and 17.4% of multiparous women were affected. Inadequate antenatal visits (<4 visits) were significantly associated with PPH ( $p=0.033$ ), and 22.5% of women with low

visit counts were hemorrhaging. Rural residence was significantly associated with PPH ( $p=0.045$ ), affecting 20.0% of rural women (Table IV).

**Table IV**  
Association Between Maternal Factors and PPH (*n* = 200).

Variable	Category	PPH Present n (%)	PPH Absent n (%)	p-value
Age (years)	<20	10 (25.0)	30 (17.4)	0.021
Parity	Multipara	20 (17.4)	95 (55.2)	0.041
Antenatal Care	<4 visits	18 (22.5)	62 (36.0)	0.033
Residence	Rural	14 (20.0)	56 (32.6)	0.045

Table V presents intrapartum conditions and the occurrence of PPH. Increased labor time ( $\geq 12$  hours) was strongly associated with PPH ( $p=0.024$ ), with 24.0% of women being influenced by haemorrhage. Induced

labor was strongly associated ( $p=0.031$ ) with 23.3% induced women experiencing PPH. Instrumental delivery was strongly associated with PPH ( $p=0.018$ ), affecting 25.0% of women requiring instrumentation.

Perineal tear had the highest proportional association ( $p=0.012$ ), in which 26.7% of those women who experienced tears also developed PPH (Table V).

**Table V**  
Association Between Delivery Factors and PPH (*n* = 200).

Variable	Category	PPH Present n (%)	PPH Absent n (%)	p-value
Prolonged Labor ( $\geq 12$ h)	Yes	12 (24.0)	38 (22.1)	0.024
Induced Labor	Yes	14 (23.3)	46 (26.7)	0.031
Instrumental Delivery	Yes	10 (25.0)	30 (17.4)	0.018
Perineal Tear	Yes	8 (26.7)	22 (12.8)	0.012

The table shows showing multivariate logistic regression analysis results of independent predictors of PPH after controlling for confounding factors. High maternal age ( $\geq 30$  years) was a significant predictor with 2.27 times higher odds of

PPH ( $p=0.031$ ). Multiparity possessed twice the odds of PPH (AOR=2.09,  $p=0.043$ ). Inadequate antenatal care (<4 visits) was the strongest modifiable predictor with 2.61 times higher odds ( $p=0.010$ ). Prolonged labor ( $\geq 12$  hours) was also a significant

predictor (AOR=2.80,  $p=0.007$ ) and likely due to uterine atony due to myometrial fatigue. Perineal tear showed the greatest odds ratio (AOR=3.35,  $p=0.011$ ), reflecting immediate traumatic blood loss (Table VI).

**Table VI**  
Binary Logistic Regression Analysis of Predictors of PPH (*n* = 200).

Variable	$\beta$ (Coefficient)	Adjusted OR (95% CI)	p-value
Age $\geq 30$ years	0.82	2.27 (1.08-4.76)	0.031
Multiparity	0.74	2.09 (1.03-4.25)	0.043
<4 ANC visits	0.96	2.61 (1.25-5.45)	0.010
Prolonged labor $\geq 12$ h	1.03	2.80 (1.32-5.94)	0.007
Perineal tear	1.21	3.35 (1.31-8.56)	0.011
Constant	-	-	-

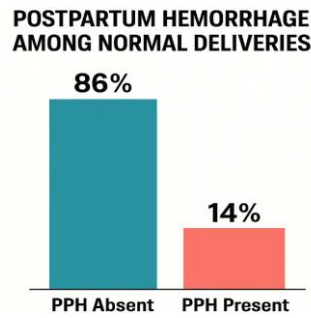
Table VII presents the distribution of severity and management outcome among the 28 women who experienced PPH. Mild haemorrhage (500-1000 mL) was most common at 42.9%, while severe haemorrhage (>1500 mL) occurred in 21.4% of instances, indicating extreme

clinical severity in one-fifth of PPH. Half of the patients (50.0%) were treated with uterotonics alone, while 28.6% were surgically treated and 21.4% were treated medically and surgically. Blood transfusion was necessary in 64.3% of instances, indicating widespread acute blood loss.

Most patients (82.1%) recovered without complications, but 14.3% developed complications, and one maternal death occurred (3.6%), highlighting the life-threatening nature of severe PPH even in tertiary care settings (Table VII).

**Table VII**  
Distribution of Patients by Severity and Management Outcome of Postpartum Haemorrhage (*n* = 28).

Severity and Management Outcome	Category	n (%)
Severity of PPH	Mild (500-1000 mL)	12 (42.9)
	Moderate (1000-1500 mL)	10 (35.7)
	Severe (>1500 mL)	6 (21.4)
Type of Management	Medical (Uterotonics only)	14 (50.0)
	Surgical (Repair, evacuation, hysterectomy)	8 (28.6)
	Combined (Medical + Surgical)	6 (21.4)
Blood Transfusion Required	Yes	18 (64.3)
	No	10 (35.7)
Maternal Outcome	Recovered without complication	23 (82.1)
	Developed complication	4 (14.3)
	Maternal death	1 (3.6)

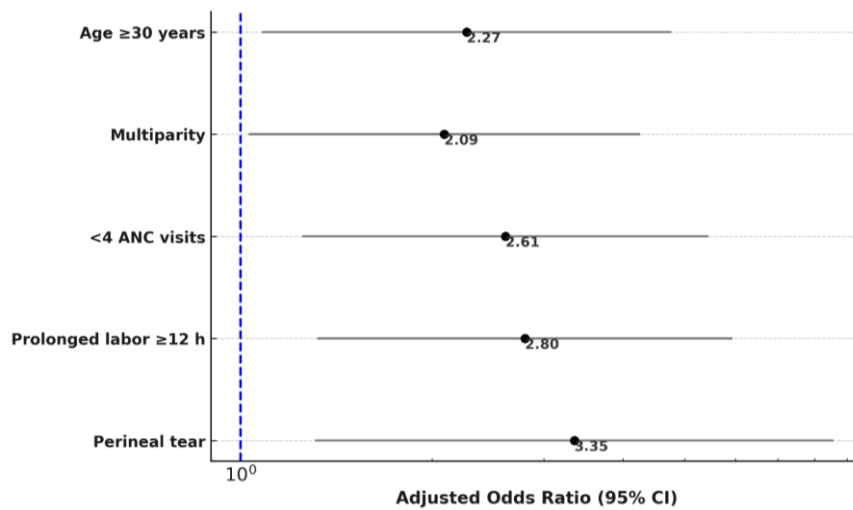


**Figure 1** Prevalence of Postpartum Haemorrhage among Normal Deliveries.

Figure 1 illustrates the prevalence of Postpartum Haemorrhage (PPH) among normal deliveries. PPH was absent in the

vast majority (86%) of cases. Conversely, postpartum haemorrhage was present in a

smaller subset, representing 14% of the recorded normal deliveries.

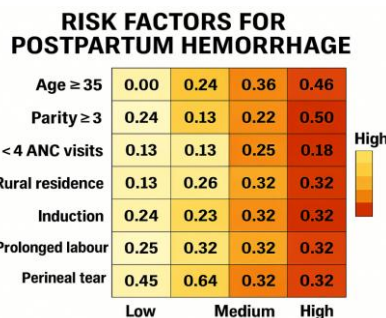


**Figure 2** Forest Plot Showing Independent Predictors of Postpartum Haemorrhage.

The forest plot in Figure 2 illustrates the independent predictors of postpartum haemorrhage (PPH) identified through logistic regression analysis. Women aged  $\geq 30$  years, multiparous mothers, those with fewer than four antenatal visits, prolonged labor ( $\geq 12$  hours), and perineal tear were significantly associated with increased PPH

risk. Among these, prolonged labor and perineal tear showed the strongest effects, indicating that both uterine atony and traumatic bleeding contribute to overall blood loss. The findings highlight that advanced maternal age, high parity, and inadequate antenatal care increase physiological vulnerability, while

intrapartum complications further aggravate risk. Early identification and close monitoring of these predictors can help reduce PPH-related morbidity through timely preventive and management interventions (Figure 2).



**Figure 3** Correlation Heatmap of Maternal and Delivery-Related Risk Factors.

The correlation heatmap in Figure 3 shows the interrelationship among maternal and delivery-related risk factors for PPH. Moderate positive correlations were found

between parity and prolonged labor, prolonged labor and perineal tear, and multiparity with poor antenatal attendance, suggesting overlapping high-risk clusters.

Maternal age was mildly correlated with parity and perineal injury, indicating shared biological and obstetric pathways.

## DISCUSSION

This cross-sectional study demonstrated a prevalence of primary postpartum haemorrhage (PPH) to be 14% among normal vaginal deliveries, higher than the 3-8% observed in high-income countries but consistent with the estimates from other low and middle-income countries (LMICs), ranging from 10-14% [18,19]. This added burden is responsible for delayed presentation for management, inadequate antenatal care of risk factors, limited intrapartum monitoring services, and delays in diagnosis and treatment of haemorrhage, and thus, PPH is a persistent public health concern in Bangladesh and a major cause of maternal mortality. Advanced maternal age ( $\geq 30$  years) was, in turn, a sole predictor of PPH (AOR=2.27), as has also been reported by Mooberry et al. and Wang et al., where it has been shown that advanced maternal age is associated with 1.15-4.37 times higher odds of PPH [20,21]. Physiological alterations related to age, including decreased myometrial contractility, altered hormonal response, increased prevalence of comorbidities such as hypertension and diabetes, and more obstetric interventions, all contribute towards increased risk. A 2024 study conducted by Palmsten et al. revealed that women older than 40 years had 2.25 times higher odds of PPH, in agreement with the findings of this study [22]. As maternal age advances and reproductive policies change in the majority of Asian countries, focused surveillance and prophylactic interventions for older mothers are increasingly important. Multiparity was a separate predictor (AOR=2.09), according to evidence linking higher parity with uterine atony [23]. The cumulative effect of past pregnancies, including fibrosis and diminished uterine contractility, increases susceptibility to atonic PPH. Another study by Bestman et al. reported enhanced overall PPH incidence in nulliparous women through traumatic mechanisms [24]. The results of our research reinforce the fact that grand multiparas are more susceptible to atony-induced PPH, rendering monitoring of the uterus in grand multiparas essential. Inadequate antenatal care (<4 visits) also had a significant association with PPH (AOR=2.61), which is a preventable risk factor. This is supported by evidence from Nigussie et al. and Muluye et al., where poor attendance for ANC increased the chances of PPH by 3.43 and 2.76 times, respectively [25,26]. ANC enables early detection and management of anemia, hypertensive disorders, and abnormal placentation, as well as birth preparedness and facility delivery. The 40% of women with less than four ANC visits reflect intrinsic barriers like geographic distance, financial constraint, and cultural factors, which must be addressed by community-based interventions and quality delivery of

services. Prolonged labor ( $\geq 12$  hours) was the strongest intrapartum predictor (AOR=2.80). Prolonged labor physiologically leads to fatigue of the myometrium, ATP depletion, lactic acid buildup, and potential infection or inflammation, all of which decrease uterine contractility [27]. Oxytocin administration over a prolonged duration can also lead to receptor desensitization. Liu et al. revealed that prolonged labor increased the likelihood of severe PPH by 5.24 times [28]. Monitoring using partograms, early dystocia of labor intervention, and judicious oxytocin administration are important to offset this risk. Perineal tear has the highest AOR (3.35), which indicates traumatic haemorrhage independent of atonic PPH [29]. Risk factors include instrumental delivery, precipitous labor, a hard perineum, and poor tissue elasticity. Perineal massage, regulated fetal head delivery, selective episiotomy, and appropriate second-stage labor care are preventive measures. Severity analysis found 42.9% to be mild (500-1000 mL) and 21.4% severe ( $>1500$  mL), and 64.3% required blood transfusion and one maternal death (3.6% case fatality). 28.6% required surgical intervention, which is in line with Fenn et al. [30]. Correlation analysis revealed overlapping high-risk clusters, emphasizing that cumulative risk factors rather than individual predictors should be considered.

## LIMITATIONS

This study was limited by a single-center design in a single tertiary care center and thus may not generalize to the primary and secondary healthcare centers. Estimation of blood loss was based on clinical estimation and not objective gravimetric measurement, which may lead to underestimation.

## CONCLUSION

Postpartum haemorrhage is a significant problem in normal delivery, with a prevalence of 14% among women, according to the findings of the study. Multiparity, older maternal age, inadequate antenatal care, prolonged labor, and perineal laceration are significant independent predictors. Identification of high-risk women early through systematic screening, optimization of coverage of antenatal care, cautious intrapartum surveillance, and prompt use of evidence-based management protocols are vital in preventing PPH-related maternal morbidity and mortality in low-resource environments.

## RECOMMENDATIONS

Future studies need to be prospective multicenter studies with objective measurement of blood loss using gravimetric methods or blood collection devices to increase diagnostic precision. Research in implementation science will be

needed to evaluate evidence-based scaling strategies for interventions like risk screening tools, standardized bundles of management, and regular drills for emergency obstetric care.

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## CONFLICT OF INTEREST

None declared

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