

Clinicodemographic Risk Factors and Maternal Outcomes Associated with Primary Postpartum Hemorrhage. A Prospective Observational Study

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ABSTRACT

Background: Primary postpartum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide, particularly in developing countries. Early identification of clinicodemographic risk factors is essential for prevention and improved maternal outcomes.

Objective: To assess the clinicodemographic risk factors and maternal outcomes associated with primary postpartum hemorrhage in a tertiary care hospital.

Methods: This prospective observational study included 100 women who developed primary PPH within the first 24 hours after delivery. Primary PPH was defined according to World Health Organization criteria. A structured proforma was used to document sociodemographic characteristics, obstetric risk factors, causes of PPH, and maternal outcomes. Data were analyzed using SPSS version 26. Chi-square or Fisher's exact tests were applied to evaluate associations between risk factors and adverse maternal outcomes, with a p-value <0.05 considered statistically significant.

Results: The mean maternal age was 29.4 years. Major risk factors identified were multiparity (62%), anemia (61%), and rural residence (65%). Cesarean delivery accounted for 44% of cases. Uterine atony was the most common cause of PPH, responsible for 72% of cases. Maternal outcomes included the need for blood transfusion (68%), surgical intervention (19%), ICU admission (15%), and hysterectomy (4%). Maternal mortality was reported in 2% of cases. Anemia, multiparity, cesarean delivery, and prolonged labor showed significant associations with severe maternal outcomes ($p \leq 0.05$).

Conclusion: Primary postpartum hemorrhage is strongly associated with modifiable clinicodemographic factors, particularly anemia, multiparity, and inadequate prenatal care. Early risk stratification, correction of maternal hemoglobin levels, and timely obstetric intervention are crucial to reducing severe morbidity and mortality. Strengthening antenatal care and ensuring optimal emergency obstetric preparedness remain key strategies for improving maternal health outcomes.

Keywords: Primary postpartum hemorrhage, uterine atony, mother outcome, anemia, multiparity, obstetric risk factors



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INTRODUCTION

Postpartum hemorrhage (PPH) is the cause of maternal morbidity and mortality in the world [1]. It is regarded as blood loss of 500 mL or above with delivery through the vagina and blood loss of 1000 mL or above with delivery through a cesarean section within the first 24 hours

following birth. Most of the maternal deaths associated with PPH have been ascribed to primary postpartum hemorrhage that occurs within the first 24 hours of delivery [2]. Despite such advancement in the field of obstetric care, the issue of PPH is still a major health concern of the population, particularly in the low- and middle-income countries [3].

Globally, the rate of postpartum bleeding has been estimated to be 2530 percent of the total maternal deaths, which the World Health Organization estimates [4]. It is a significant disease burden in South Asia and Sub-Saharan Africa, where maternal recognition, referral, and management delay lead to poor maternal outcomes [5]. In Pakistan and other such environments, there exists a lack of emergency obstetric services, anemia, large parity, as well as substandard antenatal services that further expose women to severe complications [6].

The most common reasons for primary PPH are uterine atony, retained placental tissue, genital tract trauma, and coagulation abnormalities. Out of these, only uterine atony is thought to be in place about 7080 percent of the cases. Nevertheless, PPH is unlikely to develop as a result of just one factor [7]. It is thus important to understand the association between the clinicodemographic variables, namely, maternal age, parity, body mass index, previous PPH history, mode of delivery, protracted labor, multiple gestation, hypertensive disorders of the pregnancy, and anemia, and the likelihood of excessive bleeding during the postpartum period [7].

Clinicodemographic determinants of primary PPH are critical in determining high-risk pregnancies at an early stage and taking measures to prevent them [8]. The maternal effects of primary PPH include mild anemia to fatal conditions, including but not limited to: hypovolemic shock, disseminated intravascular coagulation (DIC), blood transfusion, hysterectomy, intensive care unit hospitalization, and maternal mortality [9]. These greatly hinge on the promptness of diagnosis, the presence of qualified birth attendants, as well as prompt implementation of evidence-based management procedures [10].

PPH risk factors have been assessed in different studies, but prospective data in context-specific situations, particularly in tertiary-level care in developing countries, are quite scarce [1,5]. A potential observational model will facilitate proper recording of the clinical variables, objective assessment of blood loss, and systematic evaluation of maternal outcomes. This evidence would be critical to develop specific interventions, enhance obstetric readiness, and minimize preventable maternal morbidity and mortality [6,9]. Thus, the present study will identify the clinicodemographic risk factors and maternal outcomes of primary postpartum bleeding based on a prospective observational study, which will ultimately help in a better stratification of risks and maternal healthcare planning [11].

MATERIALS AND METHODS

The observational research was carried out between January 2025 and July 2025 at the following two clinical sites: the Department of Obstetrics and Gynaecology, Dr. Faisal Masood Teaching Hospital, Sargodha, Pakistan, and an associated tertiary-care hospital in Dubai, United Arab Emirates, where supplementary information was also gathered. This research was supposed to assess

clinicodemographic risk factors and maternal outcomes related to primary postpartum hemorrhage (PPH). One hundred women with primary PPH that occurred during the first 24 hours following delivery were used. Primary PPH was determined based on the World Health Organization's criteria of 500 mL loss of blood in a vaginal birth or 1000 mL in a cesarean section in 24 hours.

The sample included women aged 18-45 years of age who had primary PPH following vaginal or cesarean section and had written informed consent. Disqualifier criteria included secondary PPH (within 24 hours to 6 weeks of childbirth) and common hereditary bleeding disorders, incomplete medical history, or the unwillingness to take part. The eligible patients were recruited through a non-probability consecutive sampling approach to the target sample size.

A structured proforma was used to gather the data. Sociodemographic data, including the age of the mother, place of residence (urban or rural), education, and socioeconomic status, were registered. The obstetric variables were gravidity, parity, booking status, frequency of antenatal visits, previous experience of PPH, delivery gestational age, and mode. Multiple gestation, lengthy labor, labor induction and augmentation, hypertensive disorders of pregnancy, anemia (according to the level of antenatal hemoglobin), and placental abnormalities were the clinical risk factors evaluated. Each case was found to have the primary clinical cause of PPH by uterine atony, retained placenta, genital tract trauma, or coagulation disorders.

The amount of blood loss was estimated through visual evaluation and weighing of pads/drapes that were soaked, taking into consideration the difference in weight of 1 gram of pads/drapes as 1 mL of blood. Maternal outcomes, such as post-delivery hemoglobin levels, blood transfusion, additional uterotonics, surgical procedures (uterine artery ligation, B-Lynch suture, and hysterectomy), and displacement, intensive care unit (ICU) hospitalisation, complication incidents (hypovolemic shock, disseminated intravascular coagulation (DIC), or maternal death) were recorded. Every patient was treated as per the usual obstetric practice in PPH, such as active management of the third stage of labor, early administration of uterotonics, intravenous fluid replacement, blood component therapy, and surgical intervention for refractory hemorrhage.

SPSS version 26 was used in data analysis. Continuous data were presented in the form of mean and standard deviation, whereas categorical data were in terms of frequencies and percentages. Chi-square or Fisher's exact tests were used to determine associations between clinicodemographic factors and adverse maternal outcomes, with a p-value of less than 0.05 being taken as statistically significant.

The study received ethical approval through the Institutional Review Board (ERC/2025-042). Written informed consent was obtained from all participants. The confidentiality of the patient information and anonymity were ensured, and all actions were performed according to institutional ethical policies and principles of the Declaration of Helsinki.

RESULTS

There were 100 primary postpartum hemorrhage (PPH) patients who were involved in this prospective observational research. The average maternal age was 29.4 years with nine minor deviations (minimum: 18 years old, maximum: 42 years old). The majority of patients (48 years) were aged 26-30. Sixty-five percent of the women were rural dwellers, with 58 percent having a low socioeconomic level. In terms of the status of education, 46% were found to have primary-level education or less, 24% did not have any formal education, as shown in Table 1.

In terms of obstetric features, 62 percent of the patients were multiparous, with 38 percent of them being primiparous. This number was 54 percent of the cases that had not been booked and had less than four antenatal visits. Sixty-one percent of patients had anemia (hemoglobin <11 g/dL). Forty-four percent of cases experienced cesarean section as compared to 56 percent of vaginal birth, as shown in Table 2. Uterine atony caused the most frequent primary cause of PPH, as in 72 percent of patients, and was succeeded by genital tract trauma (14 percent), placental atony (10 percent), and coagulation disorders (4 percent), as shown in

Table 3. Maternal outcome- 68 per cent of patients needed blood transfusion, with a mean of 2.32 standard deviation units of transfusion being 1.1. There was a 19 percent need for surgical intervention. The procedures done were uterine artery ligation in 9%, B-Lynch suture in 6 as well as hysterectomy in 4 percent of cases. In 15% of the cases, an ICU admission was needed. Hypovolemic shock was found in 12 percent of the patients, and disseminated intravascular coagulation (DIC) was found in 5 percent of the patients. The deaths were also 2 maternal deaths, which led to a mortality rate of 2, as shown in Table 4.

Statistical results revealed significant correlations between anemia, multiparity, the duration of labor, and cesarean birth with the high risk of severe maternal outcomes ($p \leq 0.05$). The pre-existing anemia increased the possibility of patients needing blood transfusions and ICU hospitalization. Likewise, multiparous women were more likely to have uterine atony and surgical interventions than the primiparous women. In general, the primary postpartum hemorrhage was closely linked with avoidable clinicodemographic risk factors, and timely intervention is one of the key factors that resulted in the minimization of severe maternal morbidity and mortality.

Table 1: Sociodemographic Characteristics (n = 100)

Variable	Frequency	Percentage (%)
Age Group (years)		
18–25	28	28%
26–30	48	48%
31–35	16	16%
>35	8	8%
Residence		
Rural	65	65%
Urban	35	35%
Socioeconomic Status		
Low	58	58%
Middle	32	32%
High	10	10%

Table 2: Obstetric and Clinical Risk Factors (n = 100)

Risk Factor	Frequency	Percentage (%)
Multiparity	62	62%
Previous history of PPH	18	18%
Anemia	61	61%
Prolonged labor	27	27%
Induction/Augmentation	33	33%
Hypertensive disorders	21	21%
Multiple pregnancy	9	9%
Cesarean delivery	44	44%

Table 3: Causes of Primary Postpartum Hemorrhage

Cause	Frequency	Percentage (%)
Uterine atony	72	72%
Genital tract trauma	14	14%
Retained placenta	10	10%
Coagulation disorder	4	4%

Table 4: Maternal Outcomes Following Primary PPH

Outcome	Frequency	Percentage (%)
Blood transfusion required	68	68%
Surgical intervention	19	19%
ICU admission	15	15%
Hypovolemic shock	12	12%
DIC	5	5%
Hysterectomy	4	4%
Maternal mortality	2	2%

DISCUSSION

Primary postpartum hemorrhage (PPH) is considered to be one of the greatest birth complications and, nevertheless, one of the leading causes of maternal illness and mortality, particularly in low- and middle-income countries. In this prospective observational case study of 100 patients, a multitude of significant clinicodemographic risk factors with adverse maternal outcomes were discovered, meaning that most complications of PPH are avoidable. The age of most of the patients in this study ranged from 2630, and a large proportion of patients belonged to the countryside and low socioeconomic status [11]. This is congruent with universal maternal health records reported by the World Health Organization that show that women living in resource-strained settings are more susceptible to obstetric complications as a result of lack of antenatal care, late referral, and poor emergency obstetric facilities. What is even more alarming is the contribution of the lack of adequate antenatal monitoring as a risk factor that may be modified to PPH, which in our research was a contributing factor in nearly 54 percent of unbooked incidents [12].

It was established that 62 percent of the cases were multiparous cases, and this had a significant relation with severe cases of the maternal outcome. The recurrent distension of the uterus in multiparous women exposes them to uterine atony, which was found to be the leading factor of PPH in 72% of the patients [13]. This is in line with existing literature on obstetrics, which always has uterine atony as the most prevalent etiology, which causes almost 7080 percent of primary PPH events. The high correlation between multiparity and uterine atony observed in our study adds credence to the necessity of risk stratification in the antenatal care period and preparedness in the delivery room [14]. Sixty-one-percent of patients reported anemia, which was significantly related to the necessity of blood transfusion and ICU admission. In developing countries, maternal anemia is very common because of the lack of nutrients and poor supplementation [15]. Despite the fact that anemia does not directly lead to blood loss, it significantly contributes to it being a clinically adverse condition due to the decrease in body tolerance to blood

loss. Thus, it is essential to screen and manage antenatal anemia early and with rigor to minimize morbidity in PPH [16].

Cesarean section took 44 percent of the cases and was related to higher levels of hemorrhage and surgical intervention. The very process of cesarean birth predisposes healthcare to excessive bleeding through the operative trauma, placental abnormalities, and issues regarding the incision into the uterus. Long labor and induction or augmentation of labor were also a significant risk factor, which is probably a cause of uterine fatigue and consequent atony. Regarding maternal outcomes, 68 of the patients had to receive blood transfusions, which indicates the high level of blood loss among the population of the study [17]. 19 percent of cases needed surgical intervention, and 4 percent of patients underwent a hysterectomy. Even though a hysterectomy can save life, it carries immense physical, psychological, and reproductive effects, particularly to young women. In 15 percent, ICU hospitalization was determined, and 12 percent had a hypovolemic shock, which indicates the urgency and the severity of delayed or uncontrolled bleeding [18]. The 2 percent rate of maternal mortality was not very high compared to some of the earlier rates, but it is still not acceptable and demonstrates that better obstetric care is needed.

The advantage of this study is that it was prospective in nature and thus it allowed the systematic documentation of clinical variables and maternal outcome. Nonetheless, some limitations have to be admitted. The article is based on a single tertiary care facility, which could create a weakness in the overall generalizability of the results. Moreover, 100 patients are not enough to encompass both rare risk factors and rare complications [19]. In general, the findings indicate that the primary PPH is closely correlated with clinicodemographic factors that can be identified and frequently avoided, such as anemia, multiparity, insufficient prenatal care, and operative delivery. Risk identification in early pregnancies, optimal maintenance of the maternal hemoglobin, proactive management of the third stage of labour and timely provision of escalation of care are some of the most

important steps that should be used to reduce severe maternal morbidity and death [20]. Improvement of the primary care and the availability of competent birth attendants, particularly in rural areas are among the essential steps to a better maternal health outcome [11].

CONCLUSION

Primary postpartum bleeding remains one of the most significant causes of maternal morbidity and mortality, especially in the conditions of resource shortage. It is revealed that multiparity, anemia, a cesarean section, extended labor, and poor antenatal care are acute clinicodemographic risks, and they relate to severe events in the maternity. The most common cause of hemorrhage is uterine atony. Most of them were treated by means of medical treatment and blood transfusion, but a significant percentage of the cases were subjected to surgery and intensive care, in a large part of the cases. The study shows that early detection of high-risk pregnancies, optimizing the antenatal hemoglobin, active third stage of Labor, and scramble of care are important. The issue of the enhancement of maternal health services and the provision of quality obstetric care can contribute greatly to the reduction of the complications and maternal deaths due to the primary postpartum bleeding.

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Authors' Contributions:

T.H. designed the study, supervised data collection, and drafted the manuscript.

F.S. contributed to clinical oversight, data interpretation, and manuscript revision. Both authors reviewed and approved the final version of the manuscript.

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Data Availability: The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

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