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Maternal Mortality and Morbidity Associated with Primary PPH In Patients at Allied Hospital Faisalabad

Saira Majeed[1], Tasnim Tahira[2], Zirwa Younis[1], Shehreen Usman[1]

[1]Department of Gynae, Unit 1, Faisalabad Medical University/Allied Hospital Faisalabad, Pakistan.
[2]Professor of Gynecology, Faisalabad Medical University/Allied Hospital Faisalabad, Pakistan.

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Corresponding Author: Saira Majeed, Department of Gynae, Unit 1, Faisalabad Medical University/Allied Hospital Faisalabad, Pakistan.
Email: sairamajeed144@gmail.com

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ABSTRACT

Background: Postpartum hemorrhage (PPH) is a leading cause of maternal mortality, especially in developing countries like Pakistan. Uterine atony accounts for 80% of cases. Effective prevention and prompt treatment remain critical. **Objectives:** to evaluate the burden of PPH-related maternal complications and mortality in a tertiary care setting in Pakistan and to analyze risk factors, management strategies, and outcomes. **Study Setting:** The study was conducted in the Department of Obstetrics and Gynecology, Allied Hospital, Faisalabad. **Duration of Study:** The study was conducted over a specified period using a cross-sectional study design. **Data Collection:** A total of 220 patients with primary PPH were included, and data on demographic characteristics, PPH causes, interventions, maternal morbidity, and mortality were analyzed using SPSS version 25. Statistical tests were performed to identify significant associations ($p \leq 0.05$). **Results:** The majority of participants were aged 18-35 years, with a mean BMI of 26.57 ± 4.80. Uterine atony was the leading cause of PPH (44.5%), followed by retained placenta (30.0%) and genital trauma (18.6%). Oxytocin was the most frequently used uterotonic agent (40.5%), while 10.0% of cases required surgical intervention. Maternal morbidities included anemia (17.7%), sepsis (8.6%), DIC (8.2%), and acute renal failure (6.4%), with a mortality rate of 7.73%. **Conclusion:** PPH remains a significant cause of maternal morbidity and mortality in Pakistan, with uterine atony as the predominant cause. The high prevalence of anemia underscores the need for improved maternal nutrition. Strengthening institutional delivery services, timely risk assessment, and expanding access to uterotonic agents are essential for reducing PPH-related complications.

INTRODUCTION

Postpartum hemorrhage (PPH) is a major concern following labour and delivery[1-2] and its severity is calculated to be 2–4% and 6% following vaginal or cesarean-sections (C/S) deliveries. Worldwide, PPH occurs about 8.7 million times and kills 44,000 to 86,000 women annually, making it the most common cause of death during pregnancy.[3] In developing nations, PPH is the major cause of maternal mortality, with 25–43% maternal death.[4] PPH is contributory for 34% maternal deaths in Pakistan.[5-6] An estimated 25,000+ women die due to PPH annually. Nearly 14 million women experience primary postpartum hemorrhage each year and at least 128,000 of them die as a result of bleeding.[7] Pathophysiology of PPH is varied which has numerous well-documented post-delivery etiologies like retained placental tissue, trauma to the genital tract, and one of the leading causes is uterine atonia. Pathophysiology of it is divided into four broad categories such as 1) uterine atonia, 2) placental disorders like retained placenta and placental abruption, 3) trauma to the genital tract, and 4) systemic medical conditions (such as inherited and acquired defects of coagulation). The most frequent etiology of PPH is uterine atony responsible for 80% of primary PPH cases.[8]

Thus, the World Health Organization (WHO) advises prophylactic use of agents that enhance uterine contractility (uterotonics) in all deliveries.[9] Even after the use of effective uterotonic agents for prevention of PPH, PPH remains a very frequent complication, affecting as many as 15% of women delivering.[10] In case prevention is unsuccessful and PPH develops, additional use of uterotonic agents as 'first-line' therapy is advised. Various uterotonics can be applied to manage PPH, e.g., oxytocin, ergometrine, misoprostol, carbetocin, prostaglandin injectables, and combination agents. All are of varying potency and side-effects, complicating the issue of which uterotonic drug is best used for the 'first-line' treatment of PPH.[9]

Worldwide primary postpartum hemorrhage contributes significant morbidity to a significant number of survivors. Some morbidities secondary to hemorrhage are anemia, acute renal failure, DIC, hysterectomy and several transfusions of blood with all the risks attached to it.[10] Sepsis, DIC, acute renal failure, anemia, and maternal mortality were recorded in 10.37%, 6.64%, 8.71%, 83.4%, and 18.26% of PPH respectively.[7]

Postpartum hemorrhage is highly common in our patient population. Onset of post-partum hemorrhage is usually unpredictable and abrupt; this complicates the prevention of PPH. The objective of the study is to evaluate the burden of consequences in terms of maternal morbidity and mortality of PPH. The information regarding primary PPH presentation and outcome of management will assist in the reduction of maternal morbidity and mortality by recognizing high-risk cases in antenatal period, counseling high-risk cases for delivery in hospital and planned immediate treatment of confirmed PPH.

METHODOLOGY

This cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Allied Hospital, Faisalabad from 30 October 2024 to 28 February 2025. The study included 220 patients, determined using the WHO sample size calculator based on a 6.64% prevalence of primary postpartum hemorrhage (PPH), with an absolute precision of 3.3% and a 95% confidence level. A non-probability consecutive sampling technique was used to select participants. The inclusion criteria consisted of females aged 18 to 35 years with singleton pregnancies at a gestational age between 37 and 41 weeks who developed primary postpartum hemorrhage, as defined in the operational definition. Women with multiple gestations, diabetes mellitus, hypertension, bleeding disorders, chronic liver disease, chronic renal failure, or cardiovascular disorders were excluded.

Following approval from the hospital's ethical committee, eligible patients were enrolled in the study after obtaining informed consent. A thorough physical and clinical examination was conducted, including a complete blood count (CBC), C-reactive protein (CRP), serum electrolytes, renal function tests (RFTs), liver function tests (LFTs), D-dimers, and serum fibrinogen levels. These investigations were processed in the hospital's pathology laboratory and interpreted by a pathologist. Blood loss was measured using the gravimetric technique, wherein the weight of blood-soaked materials was converted to volume using the equivalence of 1 g = 1 ml of blood loss. Emergency medical care was provided as per standard treatment protocols based on the patient's condition and the underlying cause of PPH.

Maternal morbidity was assessed within 72 hours of PPH onset in terms of sepsis, disseminated intravascular coagulation (DIC), acute renal failure, and anemia, as per the predefined criteria. Maternal mortality was recorded as death occurring within 72 hours of PPH. Patients remained admitted for continuous monitoring and management during this period. All clinical and laboratory information was recorded on a specially designed proforma by the principal investigator.

SPSS version 25 was used for data entry and statistical analysis. Continuous variables, including age, gestational age at delivery, parity, and BMI, were summarized using mean and standard deviation. Categorical variables, such as gestational diabetes, pregnancy-induced hypertension, mode of delivery, PPH causes, interventions, maternal morbidity, and mortality, were presented as frequencies and percentages. To minimize confounding effects, stratification was applied based on age, gestational age, BMI, parity, gestational diabetes, pregnancy-induced hypertension, and mode of delivery. Post-stratification chi-square testing was conducted, with a significance threshold of $p \leq 0.05$.

RESULTS

The study population comprised 220 participants with an average age of 25.8 years (SD = 5.22). The age distribution revealed that 51.4% were between 18-25 years, while 48.6% were in the 26-35 years category. This indicates a relatively young study group, with a balanced proportion of participants in both age groups. Regarding BMI, the mean BMI was 26.57 (SD = 4.80), indicating that a significant portion of the participants fell within the overweight range. The frequency distribution showed that 42.3% of participants had a BMI between 18-25, while a higher proportion (57.7%) fell within the 26-35 BMI category. This suggests that a majority of the study population had a BMI above the normal weight range. In terms of gestational age, the participants had a mean gestational age of 39.03 weeks (SD = 1.47). The majority, 76.8% of women, delivered between 37-40 weeks, which falls within the full-term pregnancy range. However, 23.2% had pregnancies extending beyond 40 weeks, indicating a subset of prolonged pregnancies. The study also analyzed parity, with a mean parity of 1.99 (SD = 1.45). Most participants, 78.2%, had between 0-3 previous deliveries, whereas 21.8% had more than 3 deliveries. This suggests that the majority of participants had relatively low parity. Regarding the mode of delivery, vaginal delivery was more common (65.5%), whereas 34.5% of participants underwent cesarean sections. This indicates that while the majority had spontaneous vaginal deliveries, a significant proportion required surgical intervention. (Table & Fig. 1)

The table presents the distribution of various causes of postpartum hemorrhage (PPH) among 220 patients. Uterine atony was identified as the most common cause, accounting for 44.5% (n=98) of cases. This highlights the significance of inadequate uterine contraction as a

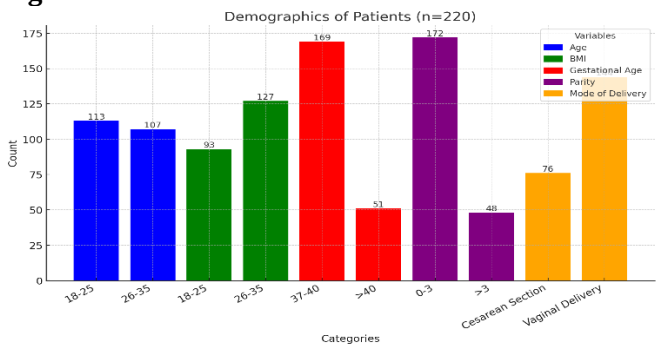
primary contributor to excessive postpartum bleeding. Retained placenta was the second most frequent cause, observed in 30.0% (n=66) of patients, indicating that incomplete expulsion of placental tissue played a crucial role in PPH occurrence. Genital trauma, including lacerations and tears, contributed to 18.6% (n=41) of cases, while coagulation disorders were the least common cause, reported in 6.8% (n=15) of the study population. The table further summarizes the various treatment modalities employed to manage PPH among 220 patients. Oxytocin was the most commonly administered uterotonic agent, used in 40.5% (n=89) of cases, underlining its role as the first-line treatment for promoting uterine contractions and reducing blood loss. Ergometrine was given to 19.5% (n=43) of patients, while misoprostol was used in 16.4% (n=36) of cases, both serving as additional uterotonic agents to control bleeding. Carbetocin, a long-acting oxytocic drug, was administered in 13.6% (n=30) of cases, offering a sustained effect in preventing atony. Despite medical management, 10.0% (n=22) of patients required surgical intervention, reflecting the severity of hemorrhage in certain cases that could not be controlled with pharmacological methods alone (Table 2).

Table 1

Demographics of the Patients(n=220)

Variable	Group	Count	Percent
Age	18-25	113	51.4
	26-35	107	48.6
BMI	18-25	93	42.3
	26-35	127	57.7
Gestational Age	37-40	169	76.8
	>40	51	23.2
Parity	0-3	172	78.2
	>3	48	21.8
Mode of Delivery	Cesarean Section	76	34.5
	Vaginal Delivery	144	65.5

Fig 1



The table presents the distribution of maternal morbidities and mortalities among the 220 study participants. Sepsis was observed in 8.6% (n=19) of cases, indicating a subset of patients experiencing postpartum infections, while 91.4% (n=201) did not develop sepsis. Disseminated intravascular coagulation (DIC) occurred in 8.2% (n=18) of patients, reflecting cases of severe coagulopathy, whereas 91.8% (n=202) remained unaffected. Acute renal failure was diagnosed in 6.4% (n=14) of cases, suggesting a relatively low incidence of kidney dysfunction post-delivery. Anemia was more prevalent, affecting 17.7% (n=39) of the study population, which may be attributed to peripartum blood loss and nutritional deficiencies. Regarding maternal mortality, 7.73% (n=17) of patients did not survive, while 92.27% (n=203) recovered. This highlights the critical nature of postpartum complications that, in some cases, can lead to fatal outcomes. Among pregnancy-associated conditions, gestational diabetes mellitus (GDM) was diagnosed in 10.9% (n=24) of patients, while the majority, 89.1% (n=196), did not develop GDM. Pregnancy-induced hypertension (PIH) was reported in 15.0% (n=33) of cases, underlining the significance of hypertensive disorders as a major pregnancy-related complication (Table 3 & Fig. 2)

Table 2

Causes and Management of Postpartum Hemorrhage (PPH)(n=220)

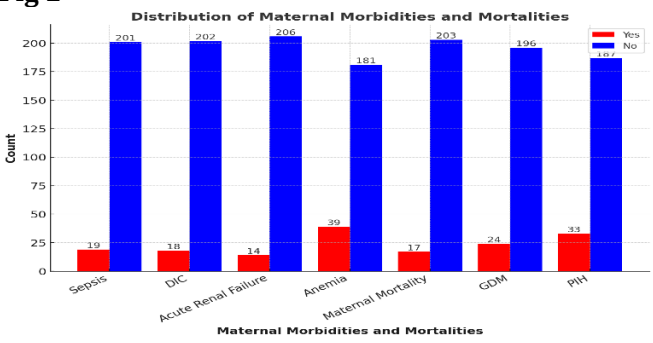
Variable	Group	Count	Percent
Causes of PPH	Coagulation Disorder	15	6.8
	Genital Trauma	41	18.6
	Retained Placenta	66	30.0
	Uterine Atony	98	44.5
	Total	220	100.0
Treatment Given	Carbetocin	30	13.6
	Ergometrine	43	19.5
	Misoprostol	36	16.4
	Oxytocin	89	40.5
	Surgical Intervention	22	10.0
	Total	220	100.0

Table 3

Maternal Morbidities and Mortalities Observed in the Study Population(n=220)

Variable	Group	Count	Percent
Sepsis	Yes	19	8.6
	No	201	91.4
DIC	Yes	18	8.2
	No	202	91.8
Acute Renal Failure	Yes	14	6.4
	No	206	93.6
Anemia	Yes	39	17.7
	No	181	82.3
Maternal Mortality	Yes	17	7.73
	No	203	92.27
Gestational Diabetes Mellitus	Yes	24	10.9
	No	196	89.1
Pregnancy Induced Hypertension	Yes	33	15.0
	No	187	85.0

Fig 2



DISCUSSION

Postpartum hemorrhage (PPH) remains a major global cause of maternal morbidity and mortality, with significant variations in incidence and outcomes across different healthcare settings. Our study aimed to evaluate the burden of PPH-related maternal complications and mortality in a tertiary care setting in Pakistan. By analyzing demographic characteristics, causes, interventions, and outcomes, this study provides insight into the effectiveness of PPH management strategies and highlights areas requiring improvement in the local healthcare system.

The study population comprised 220 participants, with an average age of 25.8 years (SD = 5.22), where 51.4% were aged 18-25 years, and 48.6% were aged 26-35 years. The majority had a BMI above the normal range (57.7% with BMI between 26-35). In terms of gestational age, 76.8% of deliveries occurred between 37-40 weeks, while 23.2% exceeded 40 weeks. The mean parity was 1.99 (SD = 1.45), with 78.2% having 0-3 previous deliveries, indicating a predominance of low-parity participants. Vaginal deliveries were more common (65.5%), while 34.5% underwent cesarean sections. These demographic characteristics are aligned with local obstetric trends in Pakistan, where early marriage and early childbearing contribute to a younger maternal age group with relatively low parity.

Agreement with Existing Literature Findings from our study correspond with various international studies on postpartum hemorrhage (PPH). The high incidence of uterine atony as the primary cause (44.5%) aligns with findings from Alberto Alonso-Burgos[11] who reported uterine atony as responsible for approximately 70% of PPH cases, emphasizing its role as the leading contributor. Similarly, Shirin Shahbazi Sighaldeh et al[12] found uterine atony to be the major cause of PPH in Afghanistan, accounting for 65.6% of cases. The high prevalence of uterine atony in our study further supports global trends while highlighting the importance of timely administration of uterotonics.

Our study also supports the global recommendation for uterotonic agents in PPH management. The predominant use of oxytocin (40.5%), followed by ergometrine (19.5%), misoprostol (16.4%), and carbetocin (13.6%), reflects international guidelines for first-line PPH management. This aligns with recommendations by the World Health Organization (WHO), advocating for prophylactic uterotonics to reduce the risk of PPH.[11] The use of multiple uterotonic agents in cases of refractory hemorrhage was also observed in the studies by Bewket Tiruneh et al[13] where oxytocin was administered in 81% of cases.

Although our study reported maternal mortality at 7.73%, which is high, it remains lower than some studies conducted in resource-limited settings. For instance, the study by Jennifer Riches et al[14] in Malawi found that PPH accounted for 20.4% of maternal deaths. This discrepancy may be attributed to differences in healthcare infrastructure and emergency obstetric care availability. The relatively lower mortality in our study may reflect the benefit of hospital-based deliveries in tertiary care settings in Pakistan, where emergency interventions are readily available.

The reported incidence of maternal morbidity, including sepsis (8.6%), DIC (8.2%), and acute renal failure (6.4%), is comparable to findings from Sagni Girma et al[15] who documented similar complications associated with PPH. However, anemia was significantly higher in our study (17.7%) than in other reports, suggesting that pre-existing nutritional deficiencies, common in the Pakistani population, may contribute to increased susceptibility to postpartum anemia. This is consistent with findings from Ethiopia, where maternal anemia was found to be an independent risk factor for adverse maternal outcomes.[16]

PPH remains a significant cause of maternal morbidity and mortality in Pakistan, with an estimated 34% of maternal deaths attributed to hemorrhage.[17] The high burden of PPH-related complications in Pakistan can be attributed to multiple factors, including inadequate antenatal screening for high-risk cases, limited access to blood transfusion services, and delayed decision-making in seeking emergency care. Our findings reinforce the importance of strengthening obstetric care services, ensuring timely intervention, and promoting institutional deliveries to improve maternal outcomes.

Prevention of PPH is challenging due its unpredictability, however, recognition of high-risk cases during the antenatal period and ensuring access to comprehensive obstetric care may significantly reduce adverse outcomes. The findings of our study provide remarkable findings into the burden and management of PPH in Pakistan and highlighted the need for targeted interventions to improve maternal outcomes.

However, like other studies, this study also has certain limitations. Being a single-center study, its findings may not be generalizable to the broader population, especially rural settings where access to healthcare is limited. Moreover, we did not include long-term follow-up of maternal morbidity, limiting the ability to assess chronic complications arising from PPH. Additionally, the reliance on hospital-based data may have led to an underestimation of PPH incidence in home deliveries, where maternal deaths are more likely to go unreported. Future studies should incorporate multicenter data and include community-based surveillance to provide a more comprehensive picture of PPH in Pakistan.

CONCLUSION

PPH remains a significant contributor to maternal morbidity and mortality in Pakistan, with uterine atony as the leading cause. Despite the widespread use of

uterotonics, maternal complications remain prevalent, emphasizing the need for early identification of high-risk cases. Strengthening institutional delivery services, improving maternal nutrition, and enhancing emergency obstetric care are crucial in reducing PPH-related complications and mortality.

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