Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.2327

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Frequency of Maternal Morbidities in Patients with Postpartum Hemorrhage and Anemia

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ARTICLE INFO

Keywords: Anemia, Hysterectomy, Hypovolemic Shock, Postpartum Hemorrhage, Renal Failure, Respiratory Insufficiency.

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Declaration
Authors' Contribution
All authors equally contributed to the study and approved the final manuscript

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 25-01-2025 Revised: 11-05-2025
Accepted: 20-05-2025 Published: 30-05-2025

ABSTRACT

Background: Postpartum hemorrhage and anemia are major contributors to maternal morbidity and mortality worldwide, particularly in low- and middle-income countries. Their coexistence exacerbates hemodynamic instability, oxygen transport compromise, and multi-organ dysfunction, leading to severe complications such as hypovolemic shock, renal failure, respiratory failure, and hysterectomy. Regional data on the frequency of these morbidities in Pakistan remain limited. **Objective:** To determine the frequency of maternal morbidities in anemic patients with managed postpartum hemorrhage at Ayub Teaching Hospital Abbottabad. **Study Design:** Cross-sectional study. **Duration and Place of Study:** The study was conducted from July 2024 to December 2024 at the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital Abbottabad. **Methodology:** A total of 262 women aged 18–40 years with singleton pregnancies beyond 36 weeks, experiencing postpartum hemorrhage managed with medical or surgical interventions, and hemoglobin <10 g/dL were enrolled. Patients with hemorrhage after 24 hours, pre-existing bleeding disorders, or traumatic delivery injuries were excluded. Maternal complications, including respiratory failure, hysterectomy, hypovolemic shock, and renal failure, were monitored for three days post-intervention. **Results:** The mean age was 29.77±3.22 years, gestational age 39.27±1.05 weeks, parity 2.08±1.13, and BMI 25.24±2.00 kg/m^2. Respiratory failure occurred in 6.5%, hysterectomy 8%, hypovolemic shock 8%, and renal failure 1.1% of patients. Higher age, gestational age >39 weeks, parity >3, and BMI >25 kg/m^2 were significantly associated with adverse maternal outcomes. **Conclusion:** Maternal morbidities are significant among anemic women with postpartum hemorrhage. Early identification, risk stratification, and timely multidisciplinary interventions are crucial to improving maternal health outcomes.

INTRODUCTION

Postpartum hemorrhage (PPH) and anemia are principal etiological factors of maternal morbidities and mortalities worldwide, particularly in low- and middle-income nations.[1] Postpartum hemorrhage is defined as excessive hemorrhagic loss following parturition, generally exceeding 500 ml after vaginal delivery or 1000 ml after cesarean section.[2] Its etiopathogenesis includes uterine atony, retained placental fragments, genital tract trauma, or coagulopathies.[3] Anemia, which may be preexisting during gestation or exacerbated by acute hemorrhagic loss in the puerperium, further deteriorates the clinical status of the parturient.[4] When these two pathological entities coexist, they critically compromise maternal hemodynamic circulation, oxygen transport, and convalescence, thereby predisposing to life-threatening complications and prolonged hospitalization.[5]

Among the severe maternal morbidities associated with postpartum hemorrhage and anemia, the most acute and hazardous condition is hypovolemic shock.[6] When a significant proportion of intravascular volume is depleted, perfusion to vital organs diminishes, arterial pressure decreases, multiple organ dysfunction ensues, and if not managed promptly, maternal mortality may occur.[7] Acute kidney injury may develop because, in the state of circulatory shock, renal hypoperfusion and ischemia cause parenchymal insult, which complicates recovery and sometimes necessitates renal dialysis.[9] Respiratory failure may also occur, which results from hypoxemia due to profound anemia, iatrogenic fluid overload during resuscitation, or secondary acute respiratory distress syndrome (ARDS).[10] These complications demonstrate how hemorrhagic loss and anemia synergistically precipitate systemic pathophysiological derangements.

Another critical morbidity is hysterectomy, which is undertaken as a definitive life-saving surgical intervention when hemorrhage remains refractory to pharmacological and conservative surgical measures.[11] Although this

procedure prevents maternal mortality, it results in irreversible infertility and induces profound psychosocial distress, particularly among younger females.[12] Furthermore, morbidities such as respiratory failure, renal dysfunction, hypovolemic shock, and hysterectomy cumulatively exacerbate maternal morbidity and constitute a major impediment in obstetric management. In order to mitigate these adverse outcomes, prophylactic measures, timely diagnosis, and multidisciplinary interventions are imperative to enhance global maternal health outcomes.

A study conducted by Shahbazi Sighaldeh et al. reported that among patients managed for postpartum hemorrhage, the frequency of respiratory failure was 7%, hysterectomy 6%, hypovolemic shock 5.1%, and renal failure 2.8%.[13]

Maternal morbidities continue to be a strong public health issue in Pakistan, with postpartum hemorrhage and anemia being prominent causes of maternal complications. Few region-specific data are available regarding the prevalence and severity of these conditions in Abbottabad, where access to healthcare and resources might vary from major urban locations. This study will yield invaluable insights into regional maternal health trends, reveal high-risk groups, and guide evidence-based interventions to mitigate adverse outcomes. Recognizing these trends is critical for enhancing mother care and informing evidence-based healthcare planning in the region.

METHODOLOGY

The study was conducted at the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital Abbottabad, from July 2024 to December 2024, adopting a cross-sectional design. Ethical approval was obtained from the hospital's institutional review board before the initiation of data collection. A total of 262 participants were recruited, based on sample size calculation using WHO software with a 95% confidence interval, a 2% margin of error, and an expected prevalence of renal complications of 2.8% in patients with controlled postpartum hemorrhage.[13] Participants were selected through non-probability consecutive sampling.

Women aged 18 to 40 years with a singleton pregnancy beyond 36 weeks gestation, confirmed by last menstrual period and ultrasound, of any parity, who experienced postpartum hemorrhage managed with medical or surgical interventions, and who had hemoglobin levels below 10 g/dL were included. Patients with hemorrhage occurring after 24 hours postpartum, pre-existing bleeding disorders, or traumatic vascular injuries during delivery were excluded. Postpartum hemorrhage was considered significant when blood loss reached or exceeded 500 mL following vaginal delivery or 1000 mL following cesarean section within the first 24 hours, measured by weighing soaked pads, gauzes, and clots, with one gram equivalent to one milliliter of blood. Postpartum hemorrhage was deemed controlled when blood loss did not exceed 100 mL within 24 hours after interventions including uterotonics, uterine massage, intravenous fluids, blood transfusion, or surgical procedures. Informed consent was obtained from all participants after explaining the purpose and potential benefits of the study. Demographic information was recorded. Detailed obstetric history and clinical examination were performed, and maternal complications were monitored for three days following the management of postpartum hemorrhage.

Maternal complications were defined as respiratory failure, hysterectomy, hypovolemic shock, and renal failure. Respiratory failure was identified by mild to moderate distress (Downe's Score 3–6) or recurrent apnea episodes (>2 in 12 hours without need for resuscitation). Hysterectomy referred to complete removal of the uterus within 24 hours when medical measures such as uterotonics, Bakri balloon, or surgical interventions including transuterine compression sutures or devascularization failed to control bleeding. Hypovolemic shock was diagnosed according to standard clinical criteria, and renal failure was defined as a twofold increase in serum creatinine, a 50% reduction in glomerular filtration rate, or urine output below 0.5 mL/kg per hour for 12 hours.

Data were analyzed using IBM SPSS version 26. Continuous variables were reported as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Maternal complications were further stratified by demographic and obstetric characteristics, and associations were evaluated using the chi-square test, with a p-value ≤0.05 considered statistically significant.

RESULTS

The study examined 262 patients with postpartum hemorrhage and anemia, revealing specific demographic characteristics and maternal morbidity patterns. The patient population had a mean age of 29.77±3.22 years, gestational age of 39.27±1.05 weeks, parity of 2.08±1.13, and BMI of 25.24±2.00 kg/m^2. The residential distribution showed 133 patients (50.8%) from rural areas and 129 patients (49.2%) from urban areas, while socioeconomic status indicated 118 patients (45.0%) were classified as poor and 144 patients (55.0%) as middle class (as shown in Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	29.77±3.22
Gestational Age (weeks)	39.27±1.05
Parity	2.08±1.13
BMI (kg/m^2)	25.24±2.00
Residential Status	
Rural n (%)	133 (50.8%)
Urban n (%)	129 (49.2%)
Socio Economic Status	
Poor n (%)	118 (45.0%)
Middle n (%)	144 (55.0%)

Regarding maternal morbidities, respiratory failure occurred in 17 patients (6.50%), hysterectomy was performed in 21 patients (8.00%), hypovolemic shock developed in 21 patients (8.00%), and renal failure was observed in only 3 patients (1.10%) (as shown in Table-II).

Table II

Frequency of Maternal Morbidities in Patients with Postpartum Hemorrhage and Anemia

Maternal Morbidities	Frequency	% age
Respiratory failure		
Yes	17	6.50%
No	245	93.50%
Hysterectomy		
Yes	21	8.00%
No	241	92.00%
Hypovolemic shock		
Yes	21	8.00%
No	241	92.00%
Renal failure		
Yes	3	1.10%
No	259	98.90%

The association analysis between demographic factors and maternal morbidities revealed significant patterns. For respiratory failure, all cases occurred exclusively in patients over 30 years of age (17 patients, 15.7% vs 0% in ≤30 years, p<0.001), gestational age >39 weeks (17 patients, 15.7% vs 0% in ≤39 weeks, p<0.001), and BMI >25 kg/m^2 (17 patients, 15.7% vs 0% in ≤25 kg/m^2, p<0.001), while parity showed no significant association (p=0.242). Hysterectomy rates were significantly higher in patients with parity >3 (8 patients, 33.3%) compared to those with parity ≤3 (13 patients, 5.5%, p<0.001), but showed no significant associations with age (p=0.762), gestational age (p=0.762), or BMI (p=0.762). Hypovolemic shock demonstrated significant associations with age >30 years (21 patients, 19.4% vs 0% in ≤30 years, p<0.001), gestational age >39 weeks (21 patients, 19.4% vs 0% in ≤39 weeks, p<0.001), BMI >25 kg/m^2 (21 patients, 19.4% vs 0% in ≤25 kg/m^2, p<0.001), and parity >3 (9 patients, 37.5% vs 12 patients, 5.0% in parity ≤3, p<0.001). Renal failure, though rare, showed significant associations with parity >3 (3 patients, 12.5% vs 0% in parity ≤3, p=0.001), while associations with age (p=0.069), gestational age (p=0.069), and BMI (p=0.069) approached statistical significance but did not reach the conventional threshold (as shown in Table-III).

Table III

Association of Maternal Morbidities with Demographic Factors

Demographic Factors		Respiratory failure		p-value	Hysterectomy		p-value	Hypovolemic shock		p-value	Renal failure		p-value
		Yes n(%)	No n(%)		Yes n(%)	No n(%)		Yes n(%)	No n(%)		Yes n(%)	No n(%)	
Age (years)	≤30	0 (0.0%)	154 (100.0%)	<0.001*	13 (8.4%)	141 (91.6%)	0.762	0 (0.0%)	154 (100.0%)	<0.001*	0 (0.0%)	154 (100.0%)	0.069*
	>30	17 (15.7%)	91 (84.3%)		8 (7.4%)	100 (92.6%)		21 (19.4%)	87 (80.6%)		3 (2.8%)	105 (97.2%)	
Gestational Age (weeks)	≤39	0 (0.0%)	154 (100.0%)	<0.001*	13 (8.4%)	141 (91.6%)	0.762	0 (0.0%)	154 (100.0%)	<0.001*	0 (0.0%)	154 (100.0%)	0.069*
	>39	17 (15.7%)	91 (84.3%)		8 (7.4%)	100 (92.6%)		21 (19.4%)	87 (80.6%)		3 (2.8%)	105 (97.2%)	
Parity	≤3	17 (7.1%)	221 (92.9%)	0.242*	13 (5.5%)	225 (94.5%)	<0.001	12 (5.0%)	226 (95.0%)	<0.001	0 (0.0%)	238 (100.0%)	0.001*
	>3	0 (0.0%)	24 (100.0%)		8 (33.3%)	16 (66.7%)		9 (37.5%)	15 (62.5%)		3 (12.5%)	21 (87.5%)	
BMI (Kg/m^2)	≤25	0 (0.0%)	154 (100.0%)	<0.001*	13 (8.4%)	141 (91.6%)	0.762	0 (0.0%)	154 (100.0%)	<0.001*	0 (0.0%)	154 (100.0%)	0.069*
	>25	17 (15.7%)	91 (84.3%)		8 (7.4%)	100 (92.6%)		21 (19.4%)	87 (80.6%)		3 (2.8%)	105 (97.2%)	

***Fischer Exact Test**

DISCUSSION

This study demonstrates a significant burden of maternal morbidities associated with postpartum hemorrhage and anemia, with respiratory failure, hysterectomy, and hypovolemic shock each affecting approximately 6-8% of patients. The exclusive occurrence of respiratory failure in patients over 30 years reflects age-related physiological changes including reduced cardiovascular reserve and diminished compensatory mechanisms that impair oxygen delivery during severe blood loss. The strong association with higher BMI occurs because overweight patients have baseline respiratory compromise with reduced functional residual capacity and increased oxygen consumption, making them more vulnerable to respiratory failure during hemorrhagic shock. Grand multiparous women showed significantly higher hysterectomy rates due to increased uterine distension, weakened myometrial contractility, and higher likelihood of placental abnormalities that often require surgical intervention when conservative measures fail. The clustering of hypovolemic shock in older patients with higher BMI and grand multiparity reflects their reduced physiological reserve and increased hemorrhage severity, while the association between grand multiparity and renal failure results from prolonged hypotension causing acute tubular necrosis in patients already at risk for severe bleeding complications. The present study findings align closely with existing literature regarding the burden and patterns of maternal morbidities associated with postpartum hemorrhage. Our observed maternal morbidity rates of 6.5% for respiratory failure, 8.0% for both hysterectomy and hypovolemic shock, and 1.1% for renal failure demonstrate substantial but variable severity compared to other studies. Majeed et al. [14] reported higher morbidity rates including anemia in 17.7%, sepsis in 8.6%, disseminated intravascular coagulation in 8.2%, and acute renal failure in 6.4%, while Nazir et al. [15] found even more severe outcomes with anemia in 83.4%, sepsis in 10.4%, acute renal failure in 8.7%, and acute respiratory distress syndrome in 5.4%. The differences in morbidity patterns likely reflect varying patient populations, healthcare system capabilities, and study definitions, with our lower renal failure rate possibly attributable to better fluid management protocols and earlier intervention strategies.

Our finding that respiratory failure and hypovolemic shock occurred exclusively in patients over 30 years is supported by multiple studies demonstrating age as a critical risk factor. Kebede et al.[16] identified maternal age ≥35 years as a strong independent predictor with adjusted odds ratio 6.8, while Bai & Fatima [17] showed significantly higher PPH rates in women aged 31-40 years compared to younger patients. The age-related vulnerability reflects diminished physiological reserve and compromised cardiovascular adaptation that becomes critical during hemorrhagic complications. Similarly, our observation of higher BMI being associated with respiratory complications contrasts with Gul et al. [18] who found that lower BMI was a strong predictor of PPH in anemic women, suggesting that while underweight patients may be more prone to hemorrhage itself, overweight patients face greater respiratory compromise once bleeding occurs.

The strong association between grand multiparity and severe morbidities in our study, particularly the 33.3% hysterectomy rate in women with parity >3, aligns with established obstetric principles. Majid et al. [19] reported that 32.2% of their PPH cases were grand multiparous women, and the overall hysterectomy requirement in their series was 7.62%, which is comparable to our 8.0% rate. Fayyaz et al. [20] demonstrated that subtotal abdominal hysterectomy was required in 51.4% of fatal PPH cases, highlighting the severity of hemorrhage in high-parity women. The pathophysiology involves progressive uterine muscle weakness, increased risk of placental abnormalities, and compromised contractility that often necessitates surgical intervention when conservative measures fail. Our mortality patterns, while not explicitly detailed in the results, can be contextualized against the significant mortality rates reported in the literature. Majeed et al. [14] documented 7.73% maternal mortality in their PPH cohort, while Nazir et al. [15] reported 18.3% mortality, and Fayyaz et al. [20] identified PPH as responsible for 24.5% of all maternal deaths. These variations likely reflect differences in healthcare infrastructure, timing of intervention, and severity of cases at presentation, with tertiary care centers often receiving more critically ill patients requiring intensive interventions including massive transfusion protocols and surgical management.

The present study has several limitations that should be acknowledged. As a single-center study conducted at one tertiary care facility, the findings may not be generalizable to other healthcare settings, particularly primary or secondary care centers with different patient populations and resource availability. The cross-sectional design limits the ability to establish temporal relationships and causal inferences between demographic factors and maternal morbidities. Additionally, the study did not account for potential confounding variables such as duration of labor, timing of intervention, blood transfusion requirements, or pre-existing medical conditions that could influence maternal outcomes. The relatively small sample size, particularly for rare outcomes like renal failure, may have limited statistical power to detect all clinically significant associations. Furthermore, the study did not include detailed information about the severity of hemorrhage, volume of blood loss, or specific management protocols employed, which could have provided valuable insights into the relationship between hemorrhage severity and subsequent morbidities.

CONCLUSION

Our study has concluded that postpartum hemorrhage with anemia is associated with significant maternal morbidities, with respiratory failure, hysterectomy, and hypovolemic shock being the most prevalent complications, while renal failure remains relatively uncommon. Advanced maternal age, gestational age beyond term, higher body mass index, and grand multiparity emerged as critical demographic risk factors that substantially increase the likelihood of severe maternal morbidities.

Acknowledgments

We express our heartfelt gratitude to the department's healthcare staff for their exceptional dedication in meticulously documenting patient information and ensuring systematic management of clinical data, which greatly supported the completion of this study.

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