

ORIGINAL RESEARCH

A Comprehensive Analysis of Risk Factors and Management Strategies for Postpartum Hemorrhage: A Prospective Observational Study

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ABSTRACT

Background: Postpartum hemorrhage (PPH) remains a leading cause of maternal morbidity and mortality worldwide. This prospective observational study aims to investigate and identify the risk factors associated with postpartum hemorrhage, contributing to a deeper understanding of its etiology and the development of effective preventive strategies. **Methods:** A one year observational study was conducted at Department of Obstetrics and Gynaecology, SMGS Hospital, GMC Jammu with effect from December 2019 to November 2020. The study enrolled 60 pregnant women aged over 18, who delivered at the hospital. Inclusion criteria comprised specific blood loss thresholds, bleeding causing hemodynamic instability, or >10% decline in postpartum hemoglobin, necessitating blood transfusion. Exclusion criteria applied to women unable to provide consent or unwilling to participate. **Results:** The study cohort, primarily aged between 20-24, constituted 51.7%, with decreasing representation in subsequent age groups. Primiparous individuals dominate at 61.7%, while gestational age distribution was relatively balanced. Normal vaginal deliveries (NVD) prevailed at 68.3%, contrasting with 31.7% cesarean section (LSCS). Anemia was prominent in 31.7%, and 23.3% had a history of Previous Lower Segment Cesarean Section (LSCS). Hypertensive disorder of pregnancy was noted in 18.3%, Premature Rupture of Membranes in 13.3%, Abruption Placentae in 10.0%, and prolonged labor in 3.3%. Uterotonics were universally administered (100%), with surgical interventions and blood transfusions at 81.7% and 80.0%, respectively. Mortality incidence is notably low at 1.7%, with 98.3% demonstrating resilience. **Conclusion:** The study revealed significant risk factors for postpartum hemorrhage (PPH), including younger maternal age, primiparity, preterm birth, lower segment cesarean section, anemia, previous cesarean section, pregnancy-induced hypertension/pre-eclampsia, placental abruption, and premature rupture of membranes. Postpartum management, incorporating uterotonics and surgical interventions, proved vital in mitigating adverse outcomes.

Keywords: Risk factors, PPH, Atonic PPH, previous LSCS, Hypertensive disorders of pregnancy

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INTRODUCTION

The intricate labyrinth of maternal healthcare demands a meticulous exploration of the multifaceted challenges posed by postpartum hemorrhage (PPH). As a cardinal contributor to maternal morbidity and mortality, PPH engenders a compelling imperative for scholarly inquiry. Postpartum hemorrhage (PPH) manifests as a consequential phenomenon wherein a woman undergoes a surfeit of blood loss subsequent to parturition. This intricately intricate complication of childbirth assumes a paramount significance within the realm of maternal health, particularly in socioeconomically constrained regions where healthcare accessibility is circumscribed. The

temporal onset of PPH is noteworthy, spanning a continuum from within 24 hours post-delivery to an expansive window of 12 weeks thereafter, dichotomously categorized as primary or secondary contingent upon this temporal distinction. Primary PPH delineates an exorbitant blood loss transpiring within the inaugural 24 hours postpartum, while secondary PPH encapsulates any aberrant or excessive bleeding manifesting between the subsequent 24 hours and the subsequent 12 weeks.¹⁻³ Foremost among the precipitating factors instigating PPH is uterine atony, a condition emblematic of the uterus' incapacity to contract. This failure of the uterine contraction engenders a state of persistent

hemorrhage, precipitating 75% of PPH occurrences. Concurrently, ancillary etiologies of PPH encompass traumatic injuries to the birth canal, encompassing afflictions upon the uterus, cervix, vagina, and perineum. Additionally, the retention of placental bits and membrane and perturbations in clotting mechanisms, as typified by coagulopathies, represent contributory factors to the multifaceted etiology of postpartum hemorrhage.⁴

The manifestation of postpartum hemorrhage (PPH) is intricately interwoven with a myriad of factors, encompassing adherent placenta, uterine atony, genital tract injury, and coagulopathy.⁵⁻⁷ Despite obstetricians implementing measures such as the administration of oxytocin during childbirth, the prevalence of PPH persists at elevated levels.⁸ Fukami et al posit that irrespective of the clinical etiology, the heightened incidence of PPH may stem from inherent characteristics within the maternal demographic.⁵ Antecedent research has unveiled that a history of PPH, multiple pregnancies, macrosomia, primiparity, multiple births, advanced maternal age, premature delivery, limited educational attainment, cesarean section, and stillbirth stand as potential factors concomitant with the occurrence of PPH.^{9,10}

For obstetric practitioners, the accurate identification of pivotal indicators influencing PPH in gravid women and a comprehensive assessment of PPH risk prove imperative for expeditious intervention and the preemptive mitigation of its occurrence. The present study is an attempt to help clinicians develop effective preventive strategies and improve management protocols for PPH, ultimately reducing maternal morbidity and mortality. Additionally, the findings of the study can inform public health policies and guide the allocation of resources for maternal health services.

METHODS

Between December 2019 to November 2020, a rigorous one year observational investigation was

RESULTS

In this section, the results of the study will be described

Parameter	Number	Percentage	
Age (Years)	20-24	31	51.7
	25-29	19	31.7
	30-34	8	13.3
	≥ 35	2	3.3
Parity	Primi	37	61.7
	Multi	23	38.3
Gestational age (Weeks)	< 37	22	36.7
	≥ 37	38	63.3
Mode of delivery	NVD	41	68.3
	LSCS	19	31.7

Table 1 presents a comprehensive overview of the general characteristics of the study participants, constituting a cohort of 60 individuals. The demographic distribution by age reveals a notable

orchestrated within the esteemed confines of the Department of and Obstetrics and Gynaecology, SMGS Hospital, GMC Jammu. An exclusive cohort of 60 gravid women, surpassing the threshold of 18 years of age, who partook in the miraculous act of childbirth within the hospital precincts, were judiciously enrolled. Inclusion criteria comprised instances wherein the quantum of estimated blood loss surpassed the 500 mL threshold following a vaginal delivery, exceeded 1000 mL subsequent to a cesarean delivery, or escalated to 1500 mL subsequent to an obstetric hysterectomy. Furthermore, inclusion criteria embraced cases wherein profuse bleeding manifested clinically through symptomatic expressions of hypovolemia or through a discernible >10% reduction in postpartum hemoglobin concentration from prepartum levels, necessitating blood transfusion. Conversely, discerning exclusion criteria were applied to women whose debilitated health condition precluded the provision of informed consent or to those who exhibited a reluctance to partake in this erudite investigation.

The expansive array of meticulously gathered data encompassed parameters of maternal age, gestational age, parity, obstetric history, concomitant pregnancy-related comorbidities, risk factors germane to postpartum hemorrhage (PPH), volumetric assessments of blood loss, modality of delivery, neonatal birth weight, etiological determinants of PPH, administered blood transfusions, strategies employed in PPH management, and the attendant spectrum of maternal morbidity. Robust statistical tools, notably SPSS software, were invoked for data analysis, deploying measures of central tendency such as mean, and standard deviation for quantitative variables while as categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and pie diagrams.

preponderance of patients within the 20-24 age bracket, comprising 51.7% of the study population. Subsequent age strata exhibit a gradual decline in representation, with 25-29-year-olds accounting for

31.7%, 30-34-year-olds at 13.3%, and those aged 35 and above constituting a modest 3.3%. Parity delineates a division between primigravidae and multigravidae, where primiparous individuals dominate the cohort at 61.7%, while multigravidae comprise the remaining 38.3%. Gestational age distribution reflects a relatively balanced representation, with 36.7% of pregnancies below 37 weeks and a majority of 63.3% attaining or surpassing

37 weeks. The mode of delivery highlights the prevalence of normal vaginal deliveries (NVD) as the predominant method, encompassing 68.3% of cases. Conversely, cesarean section (LSCS) emerges as an alternative modality, accounting for 31.7% of the study population. This tabulation provides a succinct snapshot of the demographic and obstetric attributes within the studied cohort, setting the stage for a nuanced exploration of pertinent research parameters.

Table 2: Various risk factors associated with PPH among study patients

Risk factors	Number	Percentage
Anemia	19	31.7
Previous LSCS	14	23.3
PIH/ Preclampsia	11	18.3
Premature rupture of membranes	8	13.3
Abruptio placentae	6	10.0
Prolonged labor	2	3.3
Total	60	80

A substantial 31.7% of the participants exhibited anemia, establishing it as a prominent risk factor for PPH. Furthermore, 23.3% had a history of Previous Lower Segment Cesarean Section (LSCS), linking this obstetric background to an elevated risk of PPH. Pregnancy-Induced Hypertension (PIH) or Preclampsia was identified in 18.3% of the participants, suggesting a significant correlation between hypertensive disorders of pregnancy and the likelihood of PPH. Premature Rupture of Membranes

was observed in 13.3% of cases, signifying its role as a distinctive risk factor for PPH within the cohort. Additionally, Abruptio Placentae, a complication characterized by the separation of the placenta from the uterine wall, was present in 10.0% of participants, indicating its role as a discernible risk factor for postpartum hemorrhagic events. Prolonged labor, while a minor factor, was observed in 3.3% of participants, adding to the spectrum of risk factors predisposing individuals to PPH.

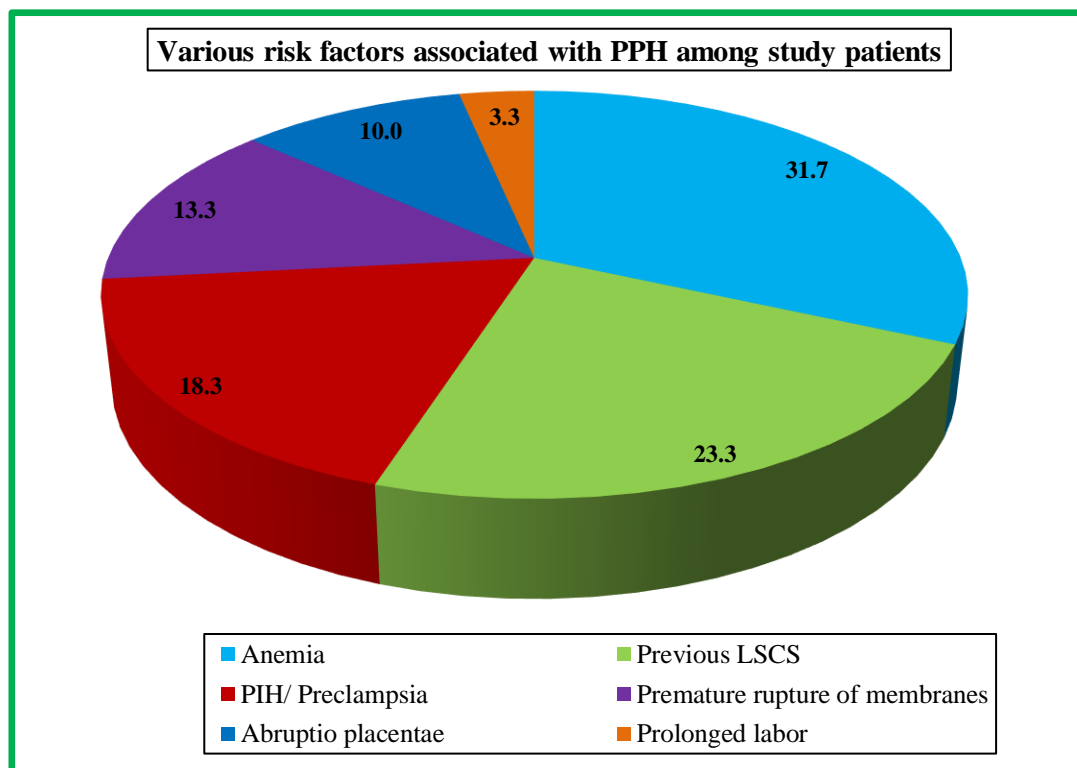


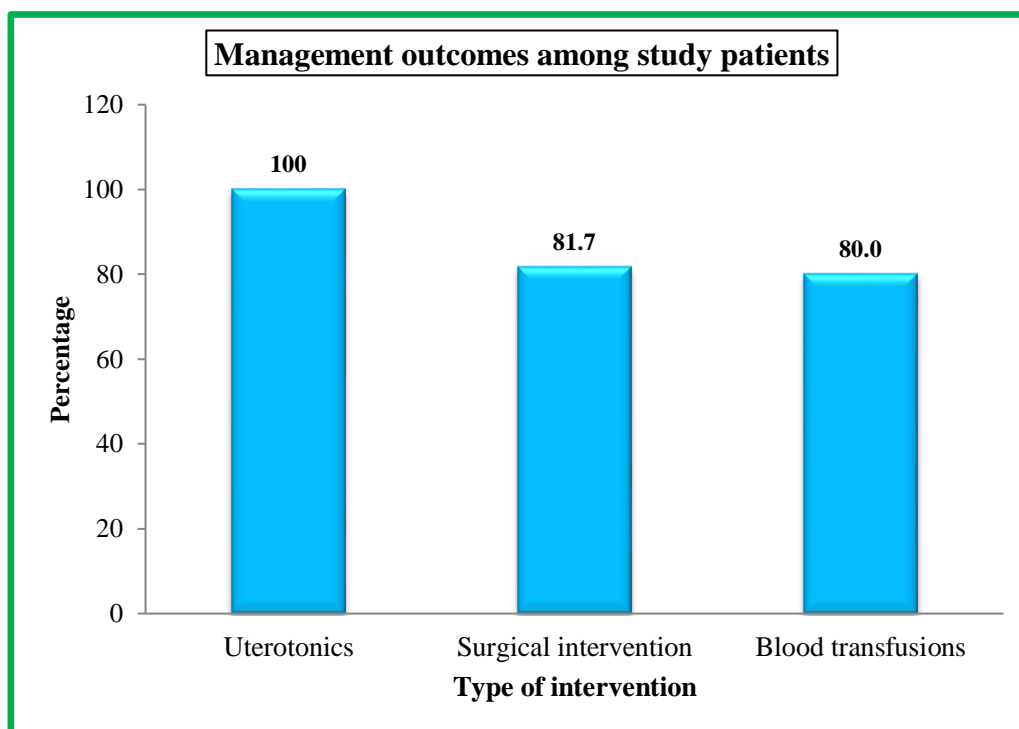
Table 3: Management outcomes of study patients [n=60]

Type of intervention	Number	Percentage
Uterotonics	60	100

Surgical intervention	49	81.7
Blood transfusions	48	80.0

Table 3 outlines the management outcomes for the 60 participants in the study, expressing data in percentages relative to the total study population. The results reveal that 100% of the study participants received uterotonics, underscoring the pervasive use of these pharmacological agents in postpartum management. Surgical interventions were deemed

necessary for 81.7% of the study population, emphasizing the crucial role of operative measures in addressing postpartum complications. Blood transfusions were administered to 80.0% of participants, highlighting the vital role of hematological support in managing postpartum hemorrhagic events.



Mortality	Number	Percentage
Yes	1	1.7
No	59	98.3
Total	60	100

Table 4 provides a concise overview of the mortality outcomes within the study cohort of 60 participants. Out of the total, only 1.7% experienced mortality, reflecting a notably low incidence. The majority, 98.3%, demonstrated resilience and did not succumb to mortality.

DISCUSSION

Postpartum hemorrhage (PPH) manifests as a consequential sequelae subsequent to parturition, wielding considerable influence over maternal health outcomes. The current investigation scrutinized an array of determinants associated with PPH, encompassing the intricacies of maternal age, parity, gestational age, and mode of delivery. The age distribution prominently featured a majority of patients in the 20-24 age group, comprising 51.7% of the study population. Successive age categories showed a gradual decrease in representation, with 25-29-year-olds accounting for 31.7%, 30-34-year-olds at

13.3%, and individuals aged 35 and above constituting a modest 3.3%. This harmonious correlation harmonizes seamlessly with antecedent research positing a positive correlation between youthful maternal age and the augmented susceptibility to postpartum hemorrhage (PPH).¹¹⁻¹³ Advanced maternal age leads to a higher risk of PPH which can be caused by the decrease in elasticity of the soft birth canal and worsening of uterine contraction with the increase of maternal age. In congruence with the seminal study by Uthapa et al., who scrutinized a cohort of 50 cases, our findings resonate, underscoring the predilection of PPH towards the age brackets of 20-24 and 25-29 years.¹⁴ Furthermore, the scholarly discourse is enriched by the corroborative insights from Kramer MS et al and Lao et al., whose investigations postulate a significant escalation in the incidence of PPH among women aged ≥ 35 years. In the present study, primiparous individuals dominate the cohort at 61.7%, while

multigravidae comprise the remaining 38.3%.^{15,16} This alignment with antecedent research corroborates the assertion that primiparous women are predisposed to a heightened susceptibility to PPH relative to their multiparous counterparts.^{17,18} The underpinnings of this vulnerability emanate from physiological considerations, encompassing factors such as the inherent weakness of uterine musculature and protracted labor. Rajeshwari et al. conducted a comprehensive investigation involving 142 women afflicted by postpartum hemorrhage (PPH), wherein the predominant demographic comprised primiparous individuals.¹⁹ In contrast, Li et al.'s research posits a divergent perspective, identifying multiparity as a discernible risk factor for the incidence of PPH.²⁰ The prevalence of multiparous women in Li's study among patients experiencing postpartum hemorrhage (PPH) may be attributed to divergent methodologies and heterogeneous environmental conditions.

In the present study, we discern that the gestational age distribution manifests a relatively equitable representation, with 36.7% of pregnancies occurring below 37 weeks, and a majority of 63.3% attaining or surpassing the 37-week threshold, which is compatible with the study of Haugh et al.²¹ In the present study, the substantial prevalence of normal vaginal deliveries (NVD), accounted for 68.3% of cases, juxtaposed against the 31.7% representation of cesarean section (LSCS), raising intriguing considerations. The prominence of NVD as the predominant mode of delivery prompts an exploration of its potential association with postpartum hemorrhage (PPH). While it is essential to acknowledge that NVD is a natural and physiologically normal process, the increased frequency of PPH in this subset of deliveries in the current study suggests that NVD may indeed be a pertinent risk factor for postpartum hemorrhage.

Among the participants, a noteworthy 31.7% presented with anemia, establishing it as a prominent risk factor for postpartum hemorrhage (PPH). Additionally, 23.3% had a history of Previous Lower Segment Cesarean Section (LSCS), correlating with an elevated risk of PPH. Pregnancy-Induced Hypertension (PIH) or Preeclampsia was identified in 18.3% of cases, indicating a significant association between hypertensive disorders of pregnancy and the likelihood of PPH. Premature Rupture of Membranes was observed in 13.3% of cases, signifying its role as a distinctive risk factor for PPH within the cohort. Abruptio Placentae, characterized by placental separation, was present in 10.0% of participants, indicating its discernible role as a risk factor for postpartum hemorrhagic events. Prolonged labor, albeit a minor factor, was noted in 3.3% of participants, contributing to the spectrum of risk factors predisposing individuals to PPH. Consistent with prior research, women with anemia, previous cesarean, and PIH/pre-eclampsia are at an increased risk of experiencing postpartum hemorrhage (PPH).

Anemia during pregnancy, a frequently encountered condition, is significantly associated with PPH due to uterine atony. Kaima et al. demonstrated that anemic women undergoing cesarean delivery have a 29.1% risk of developing PPH due to uterine atony, with the severity of anemia directly proportional to the risk of adverse outcomes.²² Additionally, moderate to severe anemia can impair myometrial contractility by hindering hemoglobin and oxygen transport to the uterus, leading to tissue enzyme and cellular dysfunction, as indicated by previous research. Kavle et al.'s study further revealed a noteworthy association between moderate-to-severe anemia at 28 weeks gestation and an increased severity of blood loss during delivery and postpartum, aligning with the findings of our study.²³ Magann et al.'s research unveiled a higher PPH rate in non-elective caesarean deliveries (6.75%) compared to elective caesarean deliveries (4.84%), echoing the observed patterns in our study.²⁴ Notably, our study demonstrated a PPH rate of 21.3% in patients with a history of previous lower segment cesarean section (LSCS), aligning with the findings of Kramer et al., who identified a history of LSCS as a robust risk factor for PPH.¹⁵ Consistent with our study, previous research has reported a higher risk of placenta previa and placental abruption with advanced maternal age, contributing to an increased possibility of postpartum hemorrhage (PPH).²⁵ Moreover, in prior studies, preeclampsia was identified as an independent risk factor for severe PPH, and it was associated with an elevated likelihood of requiring transfusion after the delivery of twins, aligning with the findings of our study.^{26,27} Given the heightened uterine pressure in twin pregnancies, the probability of PROM ranges from 7% to 88%.^{26,28} Our results indicate that premature rupture of membranes (PROM) emerged as an independent risk factor for PPH after an elective cesarean delivery for a twin pregnancy.

The principal intervention within the postpartum management package to prevent postpartum hemorrhage (PPH) is the administration of uterotonic drugs, capable of preventing two-thirds of PPH cases.^{26,28} In alignment with this approach, the results of the present study underscore the extensive utilization of uterotonics, with 100% of study participants receiving these pharmacological agents as part of postpartum management. Notably, surgical interventions were deemed necessary for 81.7% of the study population, emphasizing the pivotal role of operative measures in addressing postpartum complications. Additionally, blood transfusions were administered to 80.0% of participants, underscoring the indispensable role of hematological support in managing postpartum hemorrhagic events. This aligns with the findings of Rajeshwari et al., where 69% of postpartum hemorrhage (PPH) cases were successfully managed using uterotonics, while 27% necessitated surgical interventions, such as B-Lynch sutures or Hayman sutures.¹⁹ In four cases,

hysterectomy was deemed necessary, and 26 cases (18%) required blood transfusions.¹⁹ Postpartum hemorrhage (PPH) stands as a significant contributor to maternal morbidity and mortality, persisting as a formidable challenge despite notable advancements in biomedicine and reproductive health services.^{29,30} Recent studies have underscored the significant impact of postpartum hemorrhage (PPH), contributing to 26.7% of severe adverse maternal outcomes and accounting for 29.3% of maternal deaths globally.³¹⁻³³ It holds a prominent position among the leading causes of maternal death worldwide, including China.³⁴ However, in the present study, out of the total participants, only 1.7% experienced mortality, reflecting a notably low incidence. The vast majority, comprising 98.3%, demonstrated resilience and did not succumb to mortality. This highlights the effectiveness of timely postpartum management interventions in mitigating adverse outcomes and underscores the overall positive survival outcomes within the studied population.

CONCLUSION

The present study systematically examined various determinants of postpartum hemorrhage (PPH) and provided valuable insights into the associated risk factors. The findings underscored the significance of maternal age, parity, mode of delivery, and various obstetric factors in influencing the occurrence of PPH. Notably, the study identified several risk factors, including anemia, previous cesarean section, hypertensive disorders of pregnancy, and other obstetric complications. Furthermore, the study highlighted the pivotal role of postpartum management strategies, emphasizing the widespread use of uterotonics, surgical interventions, and blood transfusions. These interventions proved essential in mitigating adverse outcomes and ensuring positive survival rates. Enhanced prenatal care and vigilant monitoring during labor are crucial to identifying and managing potential risk factors early on.

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