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ORIGINAL ARTICLE

Prevalence and Associated Risk Factors of Postpartum Hemorrhage in Tertiary Care Hospitals of Pakistan. A Cross-Sectional Study

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ABSTRACT

Background: Postpartum hemorrhage (PPH) still ranks as a major cause of maternal morbidity and mortality, especially in low and middle-income countries. The objective of this study was to find the prevalence of PPH and its risk factors among postpartum women in tertiary care hospitals of Pakistan.

Methods: It is a cross-sectional study done at Sandeman Provincial Hospital, Quetta, and KMC Civil Hospital, Khairpur, from January 2022 to December 2022. Systematic random sampling was used to include a total of 120 postpartum women with complete medical records. Retrospectively, data on demographic characteristics, obstetric history, clinical parameters, and biomarkers (haemoglobin levels, coagulation profiles, and C reactive protein) were obtained. SPSS version 25 statistical analyses were conducted with chi-square tests and multivariate logistic regression to determine independent predictors of PPH. Statistically significant was set at a p-value <0.05.

Results: The prevalence of PPH was 8.3%. In the absence of fetal demise, advanced maternal age (≥35 years), multiparity, prolonged labor (≥18 hours), anemia (hemoglobin <11 g/dL), and elevated C-reactive protein levels (>10 mg/L) were all significant independent risk factors for PPH. The odds of PPH were 2.5 times higher (OR = 2.5; 95% CI: 1.4–4.5; p = 0.002) with prolonged labor.

Conclusion: The findings suggest that PPH is a multifactorial disease, with both demographic and clinical factors acting to increase its occurrence. These results emphasize the importance of comprehensive antenatal screening and careful peripartum care to reduce PPH risks. Early detection and management of anemia, as well as monitoring labor duration and inflammatory status, are suggested as targeted interventions to improve maternal outcomes.

Keywords: Postpartum hemorrhage, maternal morbidity, tertiary care hospitals, Pakistan, risk factors, anemia, prolonged labor, C-reactive protein.

INTRODUCTION

Postpartum hemorrhage (PPH) is one of the leading causes of maternal morbidity and mortality in the world, and even more so in low and middle-income countries. However, maternal health challenges persist in Pakistan as a result of the lack of resources, variable quality of care, and uneven distribution of healthcare services[1]. Having a blood loss of 500 mL or more after vaginal delivery, or 1,000 mL or more after cesarean section, is still a critical public health issue that not only threatens the lives of pregnant women, but also threatens the healthcare system[2].

Several risk factors for PPH have been identified from existing literature from different geographical settings, including advanced maternal age, multiparity, prolonged labor, and antepartum anemia[3]. Nevertheless, information pertaining to tertiary care hospitals in Pakistan is scant. These hospitals are often referral centers for high-risk cases and are therefore key to understanding and managing obstetric emergencies. Investigation of PPH in these settings should highlight the unique challenges faced in these settings, which range from resource constraints to the management of complex clinical cases[4].

To fill these gaps, this study is meant to systematically evaluate the prevalence of PPH and its related risk factors among women delivering in tertiary hospitals in Pakistan. Our research is done through a cross-sectional design to identify key predictors of PPH so that healthcare providers can adopt more targeted and effective management strategies[5]. The study attempts to provide evidence-based insights regarding the possible impact of identified factors on maternal mortality by quantifying the impact of identified risk factors[6].

The aims of this study was to assist in the broader understanding of PPH in Pakistan. Study also aimed to explain the epidemiology of PPH based on a detailed analysis of patient demographics, obstetric history, and clinical parameters, to make actionable recommendations for improving maternal care. The anticipated findings are expected to have a major impact on the improvement of clinical outcomes and the design of future public health interventions in maternal health care[7].

MATERIALS AND METHODS

Study Design and Setting: From January 2022 to December 2022, a cross-sectional study was conducted at two major tertiary care hospitals in Pakistan: Sandeman Provincial Hospital in Quetta and KMC Civil Hospital in Khairpur. These institutions serve as key referral centers in their regions, managing a high volume of obstetric cases and providing advanced maternal healthcare services. The primary objective of the study was to determine the prevalence and risk factors for postpartum hemorrhage (PPH) among women who delivered at these hospitals.

Study Population and Sampling: The study population consisted of postpartum women delivering at the participating hospitals during the study period. Participants were selected through a systematic random sampling method for the sample to represent the overall patient population. Thus, a total of 120 participants were finally sampled. Women who delivered at either of the two hospitals with complete medical records containing a comprehensive obstetric history and laboratory investigation were included as inclusion criteria. The study excluded women transferred from other facilities after delivery or those with incomplete records.

Data Collection and Demographic Information: Retrospective data collection from hospital records using a structured data collection form was done. Age, residence, educational level, occupation, and socioeconomic status were obtained from detailed demographic information. Obstetric history, including parity, gravidity, previous history of postpartum hemorrhage, method of delivery, and duration of labor, was noted. Pre-delivery hemoglobin levels, blood pressure, and presence of comorbid conditions were noted.

Biomarker Assessment: To investigate potential biochemical indicators for PPH, the study included a review of many of the biomarkers from routine laboratory investigations. Standard antenatal and peripartum blood tests included measurements of hemoglobin and hematocrit. Also, when available, coagulation profiles (including prothrombin time and activated partial thromboplastin time, PT and aPTT) were documented to assess

clotting function. If available, inflammatory markers (such as C-reactive protein or CRP) were recorded to evaluate systemic inflammatory status, which may interfere with obstetric complications. Both hospitals had standardized methods for sample collection and analysis, so they were consistent across the study sites.

Definitions and Measurements: Blood loss of more than 500 mL after a vaginal delivery or more than 1,000 mL after a cesarean section within 24 hours postpartum was defined as postpartum hemorrhage. Hemoglobin was below 11 g/dL during the third trimester were defined as anemia. To achieve a consistent measurement and interpretation, these standardized definitions were applied uniformly across both study sites.

Power Analysis and Sample Size Calculation: We performed a power analysis prior to data collection to make sure that 120 participants would have 80% power to detect statistically significant associations between PPH and its potential risk factors at the 0.05 significance level. Specifically, this calculation relied on estimated prevalence rates and expected effect sizes derived from previous studies to ensure that the sample size was sufficient for achieving the study's objectives.

Statistical Analysis: SPSS (Statistical Package for the Social Sciences) version 25 was used to enter data into and to analyse. Demographic characteristics, clinical parameters, and biomarker values were computed to summarize the descriptive statistics. The prevalence of PPH was determined, and the initial association between possible risk factors and PPH was first assessed through chi-square tests for categorical variables. In the bivariate analysis, variables with a p-value < 0.05 were included in a multivariate logistic regression model to identify the independent predictors of PPH. The data were described as odds ratios (OR) with 95% confidence intervals (CI), and a p-value less than 0.05 was considered statistically significant.

Ethical Considerations: The institutional review boards of Sandeman Provincial Hospital and KMC Civil Hospital had approved the study. The study was performed according to the ethical rules of research involving human subjects, and all patient data were anonymized to maintain confidentiality.

RESULTS

120 postpartum women were included in the study. In our cohort, there were 10 women with postpartum hemorrhage (PPH) prevalence of 8.3% (10/120). The demographic, clinical, and biomarker profiles of the study participants are described here and associated with PPH statistically.

Demographic and Obstetric Characteristics: Demographic and obstetric characteristics of the study population are summarized in Table 1. Most women (50 percent) were 25–34 years of age, 25 percent were less than 25 years, and 25 percent were 35 years or older. The participants were multiparous in 62.5% of them, and 75% were primiparous. 20.8% of the cases had a prolonged labor (≥18 hours).

Table 1: Demographic and Obstetric Characteristics (n = 120)

Characteristic	n (%)
Age (years)	
<25	30 (25.0%)
25–34	60 (50.0%)
≥35	30 (25.0%)
Parity	
Primiparous	45 (37.5%)
Multiparous	75 (62.5%)
Mode of Delivery	
Vaginal	90 (75.0%)
Cesarean	30 (25.0%)
Duration of Labor (hrs)	
<18	95 (79.2%)
≥18	25 (20.8%)

Biomarker and Clinical Parameter Profiles: Key clinical parameters and biomarkers assessed in the study are shown in Table 2 in the mean values. The pre-delivery hemoglobin level was 11.2 ± 1.5 g/dL. CRP was used to assess inflammatory status, which had a mean value of 8.5 ± 3.2 mg/L, and coagulation profiles (prothrombin time, PT; and activated partial thromboplastin time, aPTT) were within normal ranges (mean 12.5 ± 1.2 seconds, and 32.0 ± 3.8 seconds, respectively). In addition, these measurements gave us further insights into the hemostatic and inflammatory status of the participants and helped us to assess whether they might act as risk factors for PPH.

Table 2: Biomarker and Clinical Parameter Profiles

Parameter	Mean ± SD
Pre-delivery Hemoglobin (g/dL)	11.2 ± 1.5
C-reactive Protein (mg/L)	8.5 ± 3.2
Prothrombin Time (sec)	12.5 ± 1.2
Activated Partial Thromboplastin Time (sec)	32.0 ± 3.8

Logistic Regression Analysis of Risk Factors for PPH: Several factors were significantly associated with an increased risk of PPH using bivariate analyses. The multivariate logistic regression model included variables that had a $p < 0.05$ in bivariate analysis. Table 3 shows that independent significant predictors of PPH were age ≥35 years, multiparity, prolonged labor (≥18 hours), anemia (hemoglobin <11 g/dL), and elevated CRP level (>10 mg/L). For example, prolonged labor increased the odds of PPH by 2.5 times (OR = 2.5, 95% CI: 1.4–4.5, p = 0.002).

Table 3: Logistic Regression Analysis of Risk Factors for PPH

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age ≥35 years	1.8	1.1 – 3.2	0.04
Multiparity	2.1	1.2 – 3.7	0.01
Prolonged labor (≥18 hrs)	2.5	1.4 – 4.5	0.002
Anemia (Hb < 11 g/dL)	2.2	1.3 – 3.8	0.003
Elevated CRP (>10 mg/L)	1.7	1.0 – 2.9	0.05

Consistent with previous studies that have also reported advanced maternal age, multiparity, prolonged labor, and anemia as significant risk factors for PPH (World Health Organization, 2012; Khan & Ahmed, 2020), these findings are consistent. Although there is no direct relationship, elevated inflammatory markers such as CRP may reflect an underlying inflammatory state that predisposes patients to coagulation disturbances and thereby increase the risk of hemorrhage. Our regression model is robust, and the statistical significance in this model for these factors indicates that they are highly significant in predicting the risk of PPH.

Our study's prevalence of PPH (8.3%) is within the range reported by other low and middle-income studies. The high prevalence in multiparous women and women having prolonged labor emphasizes the need for vigilant monitoring and early intervention in these high-risk groups. In addition, the link between anemia and PPH indicates the importance of good antenatal care in identifying and treating maternal anemia and thus, potentially reducing the risk of hemorrhagic complications. Although this relationship between elevated CRP and PPH was marginally significant, this might indicate that systemic inflammation is a factor in obstetric adverse outcomes and warrants further investigation.

In brief, our results help provide insights into the complex nature of PPH, combining demographic, clinical, and biochemical data. The results can be used to inform targeted interventions to reduce PPH and improve maternal outcomes in tertiary care settings.

DISCUSSION

The present study investigated the prevalence and associated risk factors of postpartum hemorrhage (PPH) among 120 postpartum women in two tertiary care hospitals in Pakistan[8]. Our findings are within the range of reported prevalence in comparable settings in

low and middle-income countries, with a prevalence of 8.3%. It was shown that advanced maternal age (≥ 35 years), multiparity, prolonged labor (≥ 18 hours), anemia (hemoglobin <11 g/dL), and elevated C-reactive protein (CRP > 10 mg/L) were independently associated with increased risk of PPH. These results underscore that PPH is a multifactorial disease with a combination of demographic and clinical factors involved[9].

Prolonged labor (a 2.5 increased risk) could be explained through uterine fatigue, poor contractility, and inadequate hemostasis. As anemia and PPH have been found to have a significant link, the role of adequate Antenatal care and early intervention in preventing PPH adds importance[10]. In addition to impacting the overall health of the mother, anemia also predisposes the mother to complications from delivery and subsequent delivery because the oxygen-carrying capacity is reduced and tissue healing is impaired[11].

In addition, multiparity was found to be a major risk factor. The cumulated obstetric trauma and possibly the decrease in uterine contractility after multiple pregnancies could also explain this[12]. The modest association with CRP above 0.5 mg/dL is marginally significant and may indicate systemic inflammation that participates in the breakdown of normal coagulation pathways and the elevation of bleeding risk. These findings are in line with previous studies and reinforce the need for integration of clinical strategies aiming at both modifiable and nonmodifiable risk factors[13, 14].

The study offers useful information but there are limitations. The limitations of the cross-sectional design do not allow for the inference of causality[15, 16]. In addition, the sample size of 120, which was powered for the analysis performed, may not represent all the risk factors in more diverse populations. Future research using longitudinal designs and bigger, more heterogeneous samples could shed further light on these relationships to help identify targeted interventions[17, 18].

CONCLUSION

It was found that there is a high prevalence of postpartum hemorrhage in women attending tertiary care in Pakistan and that advanced maternal age, multiparity, protracted labor, anemia, and systemic inflammation are significant risk factors. These findings suggest a need for close observation of at-risk populations and the establishment of comprehensive antenatal and peripartum care protocols. Timely management of anemia and proactive monitoring during labour could reduce the incidence of PPH and improve maternal outcomes. These associations warrant further research to confirm and determine the underlying mechanisms that could help develop more effective prevention strategies in other healthcare settings.

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