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Article

Comparison of Maternal and Neonatal Outcome Among In-Patients and Referred Cases with Postpartum Hemorrhage Visiting Liaqat Memorial Hospital Kohat

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ABSTRACT

Background: Postpartum hemorrhage (PPH) is the leading cause of maternal mortality globally, with particularly high rates in low-resource settings like Pakistan. Despite improvements in obstetric care, delayed referrals and systemic disparities continue to worsen outcomes, necessitating localized research into maternal and neonatal morbidity and mortality patterns. **Objective**: To compare maternal and neonatal outcomes among in-patients and referred cases with primary postpartum hemorrhage at Liaqat Memorial Hospital Kohat, and to evaluate the association of parity, socioeconomic status, and mode of delivery with maternal morbidity and mortality. **Methods**: This was a cross-sectional descriptive study involving 137 women with primary PPH managed between 2023 and 2024. Women were included if they experienced blood loss >500 ml within 24 hours postpartum; those with bleeding disorders, on anticoagulants, or refusing consent were excluded. Data were collected through structured interviews and hospital records, with outcomes including maternal anemia, acute renal failure, acute respiratory distress syndrome, and mortality. Ethical approval was obtained, and the study complied with the Declaration of Helsinki. Data analysis was performed using SPSS v20 with Chi-square tests, considering p-values <0.05 as significant. **Results**: Maternal morbidity occurred in 54.8% of cases, with anemia being the most common complication (40.1%). Cesarean delivery (p = 0.02), high parity (p = 0.03), and lower socioeconomic status (p = 0.01) were significantly associated with increased morbidity. Maternal mortality was recorded at 4.4%, significantly linked to high parity and poor socioeconomic background (p = 0.04). **Conclusion**: Primary postpartum hemorrhage remains a significant contributor to maternal morbidity and mortality, especially among multiparous women, cesarean deliveries, and socioeconomically disadvantaged populations. Targeted prenatal care, anemia prevention, cautious surgical decision-making, and strengthening referral systems are critical to improving maternal outcomes in similar healthcare settings.

Keywords: Postpartum Hemorrhage, Maternal Mortality, Maternal Morbidity, Cesarean Section, Socioeconomic Factors, Referral and Consultation, Anemia

INTRODUCTION

This cross-sectional descriptive study was conducted at Liaqat Memorial Hospital Kohat, Pakistan, over a period of six months. The study included women diagnosed with primary postpartum hemorrhage (PPH) presenting to the hospital, either as in-patients or referred cases from peripheral health centers. A total of 137 participants were recruited using a consecutive non-probability sampling method. Inclusion criteria were all postpartum women experiencing primary PPH, defined as blood loss exceeding 500 ml within the first 24 hours after delivery, regardless of gravidity and parity. Exclusion criteria included women with known bleeding disorders, those on anticoagulant therapy, and individuals who declined to provide informed consent.

Participants were approached during their hospital stay in either the obstetrics ward or emergency department. After explaining the purpose and procedures of the study, informed consent was obtained from all participants, and confidentiality was ensured by anonymizing collected data. Ethical approval for the study was granted by the hospital's ethical review committee prior to commencement. The study adhered to the principles outlined in the Declaration of Helsinki for research involving human subjects.

Data collection focused on both maternal and neonatal outcomes. Maternal variables included age, distance from hospital, education level, parity, socioeconomic status, referral status, mode of delivery, and complications such as anemia, acute renal failure, acute respiratory distress syndrome (ARDS), and disseminated intravascular coagulation (DIC). Neonatal outcomes were recorded but are not reported in detail here due to the primary focus on maternal outcomes. Blood loss was measured during the third stage of labor using a gravimetric method; the sanitary pads used were weighed before and after use, and a difference of more than 500 grams was considered significant. Sociodemographic data and obstetric histories were recorded through a pre-designed structured proforma after delivery.

The primary outcomes of interest were maternal morbidity, defined as the occurrence of anemia, acute renal failure, ARDS, or DIC, and maternal mortality within the hospital stay. Secondary outcomes included the association of morbidity and mortality with sociodemographic and clinical factors such as parity, socioeconomic status, referral status, and mode of delivery. No specific laboratory investigations or imaging beyond standard clinical care were used to define outcomes.

Data were analyzed using SPSS version 20. Quantitative variables such as age were assessed for normality using normal probability plots; mean and standard deviation (SD) or median and interquartile range (IQR) were calculated accordingly. Categorical variables, including parity, socioeconomic status, referral status, and presence or absence of morbidity and mortality, were summarized as frequencies and percentages. Associations between categorical variables and outcomes were evaluated using the Chi-square test, with a p-value of less than 0.05 considered statistically significant. No imputation was performed for missing data, and all analyses were based on complete case data.

MATERIALS AND METHODS

This study was a cross-sectional descriptive analysis conducted at Liaqat Memorial Hospital Kohat, Pakistan, over a six-month period. The study included women diagnosed with primary postpartum hemorrhage (PPH), defined as blood loss exceeding 500 ml within the first 24 hours following delivery. A total of 137 women were enrolled through consecutive non-probability sampling. Inclusion criteria comprised all postpartum women with primary PPH, irrespective of age, gravidity, or parity. Exclusion criteria were the presence of known bleeding disorders, current anticoagulant therapy, and refusal to provide informed consent. All participants were recruited from either the hospital's obstetrics ward or emergency department during their postpartum hospital stay. Written informed consent was obtained from each participant after explaining the study objectives and procedures, and confidentiality was ensured through anonymization of collected data.

Data collection involved recording sociodemographic characteristics such as age, distance from hospital, education level, parity, and socioeconomic status, alongside clinical factors including mode of delivery and referral status. Maternal outcomes, specifically morbidity and mortality, were systematically assessed. Morbidity outcomes included the occurrence of anemia, acute renal failure, acute respiratory distress syndrome (ARDS), and disseminated intravascular coagulation (DIC). Blood loss estimation during the third stage of labor was conducted using a gravimetric technique, whereby sanitary pads were weighed before and after use, and the difference in weight quantified the blood loss. A structured proforma designed for the study was used to record all clinical and sociodemographic data based on patient interviews and medical records. No laboratory investigations or imaging outside routine clinical care were performed for research purposes, and there were no planned follow-ups beyond the immediate postpartum hospitalization period.

The primary outcome of the study was the frequency of maternal morbidity among women with primary PPH, and the secondary outcome was the frequency of maternal mortality. Associations between sociodemographic factors, clinical characteristics, and maternal outcomes were evaluated to identify potential risk factors influencing morbidity and mortality. Particular attention was given to differences in outcomes between in-patients and referred cases.

The study protocol complied with the ethical standards of the Declaration of Helsinki (1964) and its subsequent amendments. Institutional ethical approval was obtained prior to data collection from the hospital's ethics committee. Participants were informed that their involvement was voluntary, that they could withdraw at any time without affecting their care, and that all information would be kept confidential and used solely for research purposes.

Data analysis was performed using SPSS version 20. Quantitative variables such as age were assessed for normality using normal probability plots, and summarized using means and standard deviations or medians and interquartile ranges where appropriate. Categorical variables, including parity, socioeconomic status, mode of delivery, referral status, and maternal morbidity or mortality, were summarized as frequencies and percentages. Associations between categorical variables and outcomes were tested using the Chi-square test, and a p-value of less than 0.05 was considered statistically significant. No imputation was performed for missing data, and analysis was based on complete available cases.

RESULTS

A total of 137 women diagnosed with primary postpartum hemorrhage (PPH) were included in the study. The mean age of participants was within the range of 18 to 45 years, with the highest proportion of cases (36.5%) falling in the 26–35 years age group, followed by the 36–45 years group (34.3%) and the 18–25 years group (29.2%). No statistically significant association was observed between age and morbidity ($p = 0.35$).

With respect to distance from the hospital, 52.6% of participants resided within 10 kilometers, while 47.4% lived farther than 10 kilometers; this factor was not significantly associated with maternal morbidity ($p = 0.22$). Educational attainment varied, with 41.6% of women having completed higher education, 36.5% secondary education, and 21.9% only primary education, but no statistically significant association between education level and morbidity was detected ($p = 0.45$). primigravida, 44.5% were multigravida (G2–G4), and 26.3% were grand multigravida (G5+), with higher morbidity rates observed among multigravida and

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grand multigravida women. Socioeconomic status was also significantly associated with morbidity (p = 0.01), with poorer women (<20,000 PKR income) and lower-income groups (<50,000 PKR) exhibiting higher morbidity rates compared to middle- and upper-income groups.

Table 1: Sociodemographic and Clinical Characteristics and Their Association with Maternal Morbidity and Mortality

Variable	Category	Frequency (n)	Percentage (%)	p-Value
Age	18–25 years	40	29.2%	0.35
	26–35 years	50	36.5%	
	36–45 years	47	34.3%	
Distance from Hospital	<10 km	72	52.6%	0.22
	>10 km	65	47.4%	
Education	Primary	30	21.9%	0.45
	Secondary	50	36.5%	
	Higher	57	41.6%	
Parity	Primigravida	40	29.2%	0.03*
	Multigravida (G2–G4)	61	44.5%	
	Grand Multigravida (G5+)	36	26.3%	
Socioeconomic Status	Poor (<20k)	48	35.0%	0.01*
	Lower (<50k)	49	35.8%	
	Middle (<80k)	28	20.4%	
	Upper (>100k)	12	8.8%	
Referral Status	Inpatients	80	58.4%	0.09
	Referred	57	41.6%	
Instrumental Delivery	Yes	38	27.7%	0.12
	No	99	72.3%	
Cesarean Delivery	Yes	65	47.4%	0.02*
	No	72	52.6%	
Maternal Morbidity	Yes	75	54.8%	0.03*
	No	62	45.2%	
Acute Renal Failure	Yes	7	5.1%	0.15
	No	130	94.9%	
Acute Respiratory Distress Syndrome	Yes	12	8.8%	0.25
	No	125	91.2%	
Disseminated Intravascular Coagulation (DIC)	Yes	9	6.6%	0.40
	No	128	93.4%	
Anemia	Yes	55	40.1%	0.12
	No	82	59.9%	
Mortality	Yes	6	4.4%	0.04*
	No	131	95.6%	

*Statistically significant at p < 0.05.

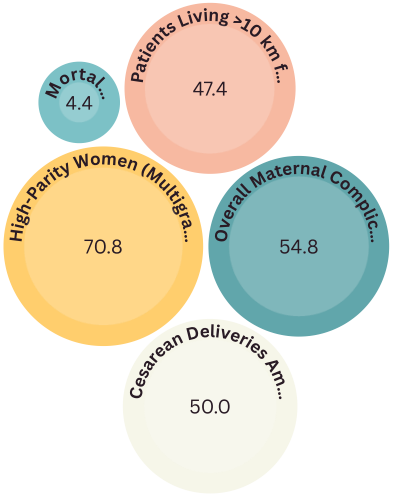

Figure Clinical Features and Key Findings

Regarding referral status, 58.4% of participants were in-patients, while 41.6% were referred from peripheral centers. Although referred patients exhibited a trend toward worse outcomes, this association did not reach statistical significance (p = 0.09). The mode of delivery revealed a significant association with morbidity (p = 0.02); women who underwent cesarean section (47.4% of total participants) had higher rates of morbidity compared to those who delivered vaginally. Instrumental deliveries were recorded in 27.7% of cases but were not significantly associated with morbidity (p = 0.12). Parity showed a statistically significant relationship with maternal morbidity (p = 0.03). Among the participants, 29.2% were Overall, 54.8% of participants experienced maternal morbidity. Anemia was the most frequent complication, affecting 40.1% of women, followed by acute respiratory distress syndrome (8.8%), disseminated intravascular coagulation (6.6%), and acute renal failure (5.1%). Mortality was recorded in 4.4% of participants, with a statistically significant association between mortality and lower socioeconomic status and high parity (p = 0.04).

DISCUSSION

The findings of this study demonstrate a significant burden of maternal morbidity among women with primary postpartum hemorrhage (PPH) managed at Liaqat Memorial Hospital Kohat, particularly among multigravida and grand multigravida women, those from lower socioeconomic backgrounds, and those undergoing cesarean delivery. The overall morbidity rate of 54.8% and mortality rate of 4.4% highlight the continuing threat of PPH to maternal health despite institutional care availability. These results align with previous reports from both national and international studies, emphasizing the persistent challenges in managing postpartum hemorrhage effectively. The association between high parity and increased morbidity is consistent with the findings of Tunc et al. in Turkey, who reported that women aged 30–35 years with higher parity were at increased risk for PPH-related complications (8). Similarly, Naz et al. in Pakistan observed a direct correlation between increasing parity and adverse maternal outcomes in PPH, suggesting that repeated pregnancies predispose women to uterine atony and other obstetric complications (4). However, the present study also found a considerable proportion of primigravida women experiencing morbidity, which diverges from the patterns reported by Patel et al. in India, who suggested a relatively lower risk of PPH-related complications among primigravida women (5). This discrepancy may reflect differences in antenatal care quality, obstetric practices, or underlying nutritional status across study populations. Socioeconomic status emerged as a critical determinant of maternal outcomes, with poorer women exhibiting significantly higher morbidity and mortality. This observation mirrors findings by Moran et al. in the United Kingdom, where women from disadvantaged backgrounds experienced increased obstetric complications due to delayed access to healthcare, poor nutritional status, and inadequate prenatal interventions (2). In the local context, Syed et al. reported similar trends in Karachi, where low-income women had disproportionately worse maternal outcomes, often exacerbated by inadequate emergency obstetric services at peripheral facilities (6). These findings reinforce the need for targeted healthcare interventions addressing the structural inequities that heighten maternal vulnerability.

The significant association between cesarean delivery and morbidity observed in this study corroborates evidence from Rouse et al., who documented higher risks of hemorrhage, infection, and uterine rupture following cesarean section compared to vaginal delivery (6). It is important to note that cesarean sections are often performed in emergency settings for women with anticipated complications, thus inherently associating cesarean delivery with higher morbidity. Nonetheless, the findings underscore the importance of judicious decision-making regarding cesarean deliveries, prioritizing careful intraoperative management and vigilant postoperative monitoring to mitigate risks.

Referral status, while not statistically significant in this study, showed a clear trend toward worse outcomes among referred cases, reflecting patterns reported by Mwangi et al. in Kenya, where delayed referral and inadequate stabilization at lower-level facilities contributed to heightened maternal mortality (3). Although the association did not reach statistical significance in the present analysis, likely due to sample size limitations, the clinical relevance remains substantial, emphasizing the need for improving timely referral mechanisms and capacity-building at primary healthcare levels. Anemia was the most prevalent morbidity observed, affecting 40.1% of women, consistent with findings by Patel et al. and WHO reports, which have repeatedly emphasized the critical role of antenatal anemia in exacerbating postpartum complications (5,9). Anemia limits a woman's capacity to compensate for blood loss, thereby increasing susceptibility to hypovolemic shock and organ dysfunction during PPH events. Addressing antenatal anemia through nutritional interventions and iron supplementation remains a key strategy for reducing maternal morbidity.

This study has several strengths, including the systematic assessment of both sociodemographic and clinical risk factors in a referral hospital setting and the real-world relevance of the findings for regions with similar healthcare dynamics. However, certain limitations must be acknowledged. The study's cross-sectional design precludes causal inference, and the single-center nature limits generalizability to other settings. Additionally, the relatively modest sample size may have reduced the power to detect certain associations, such as those related to referral status or less frequent complications like DIC. Lack of follow-up beyond hospital discharge may have led to underestimation of late morbidity or mortality events. Furthermore, while standardized methods were used to estimate blood loss, subjective factors inherent in clinical measurement techniques may introduce bias. Future research should focus on multicenter, prospective cohort studies with larger sample sizes to validate these findings and explore longitudinal outcomes. Investigations into the effectiveness of community-level interventions, such as strengthening peripheral healthcare systems, enhancing referral pathways, and implementing anemia control programs during pregnancy, are warranted. Studies examining the impact of institutional protocols for PPH management, including active management of the third stage of labor and rapid response teams, would also be valuable.

CONCLUSION

This study comparing maternal and neonatal outcomes among in-patients and referred cases with postpartum hemorrhage at Liaqat Memorial Hospital Kohat highlights a significant burden of maternal morbidity and mortality, particularly among women with higher parity, lower socioeconomic status, and those undergoing cesarean deliveries. The findings emphasize the urgent need for strengthening antenatal care services, improving nutritional interventions to address maternal anemia, and optimizing delivery practices to reduce preventable risks associated with postpartum hemorrhage. Clinically, the results support the implementation of early risk identification protocols, enhanced management strategies for high-risk pregnancies, and streamlined referral systems to ensure timely access to comprehensive obstetric care. From a research perspective, the study underlines the necessity for larger, multicenter investigations focusing on intervention-based models to reduce the impact of postpartum hemorrhage in resource-limited settings, ultimately contributing to the global efforts in lowering maternal morbidity and mortality.

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