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Immediate Postpartum Hemorrhage: Analysis of Factors Influencing Its Occurrence, Causes, and Management

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Abstract

Introduction and Objective: Hemorrhage is the leading cause of maternal death in under-medicalized countries, with immediate postpartum hemorrhage (HPPI) accounting for over 25% of these cases. This study aims to reduce maternal deaths due to HPPI in our department. **Patients and Methods**: This case-control study was conducted in the Department of Gynecology and Obstetrics at the University Hospital Center (CHU) of Bouaké from January 1, 2018, to December 31, 2022. We matched cases of immediate postpartum hemorrhage (HPPI) with controls (normal deliveries). The study included 188 parturients, with 94 presenting with HPPI and 94 having normal deliveries. We identified risk factors, assessed severity, documented treatments, and evaluated maternal prognosis. Data analysis was performed using SPSS software, and proportions were compared using the chi-square test with a significance threshold of 5%. **Results**: The prevalence of HPPI was 0.53% of deliveries. The parturients were predominantly uneducated housewives and married in both groups, with statistically significant differences. Additionally, 51.06% of cases were referred from peripheral maternity units. The primary causes included uterine atony (53.19%), abnormal placental insertion (28.72%), and uterine rupture (10.64%). Active management of the third stage of labor (AMTSL) was implemented in 54% of cases. Uterine revision was performed in 54.25%, and severe anemia was present in 44.18%. Hemostatic hysterectomy and uterine repair (hysterorrhaphy) were conducted in 23.3% and 30% of cases, respectively. The case-fatality rate was 9.6%. **Conclusion**: HPPI remains a significant public health issue in our practice, characterized by a high case-fatality rate.

Keywords

Immediate Postpartum Hemorrhage, Risk Factors, Prognosis, Blood Transfusion

1. Introduction

A study by the World Health Organization reports that among the 585,000 women who die each year from complications related to pregnancy and childbirth, one quarter succumb to postpartum hemorrhage [1] [2]. The mortality rate varies by region; a recent study concluded that the immediate postpartum period is critical in both the United States and developing countries, with 125,000 maternal deaths annually due to immediate postpartum hemorrhage [2] [3]. Hemorrhage remains the leading cause of maternal death in under-medicalized countries, with immediate postpartum hemorrhage accounting for over 25% of these cases [2]. An increasing number of publications have investigated the predictive factors of postpartum hemorrhage in various countries [4] [5].

Prevention and management have been the focus of recommendations established by CNGOF, ICM, and FIGO, including the active management of the third stage of labor and the identification of at-risk women [6] [7]. Despite adherence to WHO initiatives, our country reports a maternal mortality rate of 385 deaths per 100,000 live births (EDS-CI 2021), with postpartum hemorrhage as the leading cause. This rate remains high relative to the 2030 SDGs. Furthermore, limited data are available on immediate postpartum hemorrhage in our department regarding associated factors and management, highlighting the relevance of this study, which aims to contribute to the reduction of maternal mortality in Côte d'Ivoire.

2. Patients and Methods

This case-control study was conducted in the Department of Gynecology and Obstetrics at the University Hospital Center (CHU) of Bouaké from January 1, 2018, to December 31, 2022. We employed simple matching by selecting a normal delivery as the control and the immediate postpartum hemorrhage case that followed. The sampling included all deliveries in the department during the study period. We defined immediate postpartum haemorrhage as any blood loss ≥ 500 ml for vaginal deliveries and ≥ 1000 ml for caesarean deliveries, or any blood loss during delivery ≥ 300 ml with hemodynamic repercussions. Quantification was performed using a graduated jar in the operating room, but in the delivery room it was a visual estimate based on the basins used to collect blood after delivery due to a lack of suitable equipment. For the cases, we included deliveries from 28 weeks of amenorrhea onward that presented with bleeding within 24 hours; for the controls, we selected normal deliveries from 28 weeks of amenorrhea. The study involved 188 parturients, comprising 94 with immediate postpartum hemorrhage (HPPI) and 94 with normal deliveries. Schwartz's formula for calculating

sample size for cross-sectional studies enabled us to determine our sample size.

n = number of samples;

t = 1.96 when the confidence level is 95%;

m = 5%, which is the margin of error we have agreed upon;

p = expected prevalence, which is 1.22% [8];

q = probability of non-occurrence p, q = 1 − p.

Digital application:

$n = 1.96^2 \times 0.012\ (1 - 0.012)/0.05^2 = 18$

The parameters studied were: the epidemiological profile of patients (age, gender, occupation, ethnicity, residence, marital status...), the clinical aspects of HPPI (condition of the conjunctiva, blood pressure, pulse, etc.), the causes of HPPI (atony, retained placenta, soft tissue tears, coagulopathy), risk factors (history, mode of admission, pregnancy monitoring, labor progression, etc.), therapeutic techniques used in the management of HPPI (medical, surgical, etc.), the prognosis for HPPI (favorable, unfavorable, etc.).. Data analysis was performed using SPSS software. Proportions were compared using the chi-square test to identify potential associations between variables. Differences were considered statistically significant for a p-value ≤ 0.05.

The parameters studied included the epidemiological profile of patients (age, sex, occupation, ethnicity, residence, marital status); clinical aspects of HPPI; causes of HPPI; risk factors (history, mode of admission, antenatal care follow-up, course of labor); therapeutic techniques for managing HPPI; and prognosis (favorable or unfavorable).

3. Results

The prevalence of immediate postpartum hemorrhage (HPPI) was 0.53% of deliveries. The mean age of cases was 36 years (range: 16 - 44), compared to 23 years (range: 15 - 43) for controls. The predominant age group was 35 - 39 years, and the difference was statistically significant (p = 0.001). Among cases, 80.85% of women were uneducated, compared to 61.70% of controls, showing a statistically significant difference (p = 0.013). Housewives represented the majority in both groups, accounting for 60.64% of cases and 44.68% of controls, which was statistically significant (p = 0.0034). Married women predominated in both groups, with 91.49% among cases and 63.83% among controls; this difference was also statistically significant (p = 0.001).

The mean gravidity was 2.3 for cases (range: 1 - 10) and 2.1 for controls (range: 1 - 8), indicating a statistically significant difference (p = 0.0004). The mean number of antenatal visits was 3.47 for cases compared to 3.38 for controls, with no statistically significant difference (see **Table 1** for epidemiological and clinical characteristics). The mean duration of labor for cases was estimated at 10 hours, compared to 9 hours for controls. Additionally, 28.72% of cases experienced labor lasting more than 12 hours, compared to 20.21% of controls. Vaginal deliveries occurred in 54.26% of cases, and hypovolemic shock was observed in 21.28% of

cases.

Table 1. Distribution according to epidemiological and clinical characteristics.

Parameters	Frequency	Percentage	Frequency	Percentage	P-value
Age (years)	**Cases**		**Controls**		
<18	4	4.3	11	11.7	P = 0.001
[19 - 24]	7	7.4	32	34.1	
[25 - 29]	23	24.5	22	23.4	
[30 - 34]	25	26.6	18	19.1	
[35 - 39]	28	29.8	7	7.4	
≥ 40	7	7.4	4	4.3	
Instruction					
None	76	80.8	58	61.7	P = 0.013
Primary	9	9.6	10	10.6	
Secondary	5	5.3	14	14.9	
Higher	4	4.3	12	12.8	
Occupation					
Housewife	57	60.6	42	44.7	P = 0.0034
Civil servant	7	7.5	11	11.7	
Trader	24	25.5	19	20.2	
Student	1	1.1	14	14.9	
Artisan	5	5.3	8	8.5	
Marital status					
Married	86	91.5	60	63.8	P = 0.001
Single	8	8.5	34	36.2	
Residence					
Bouaké	64	68.1	89	94.7	P = 0.001
Outside Bouaké	30	31.9	5	5.3	
Gravidity					
Primigravida	10	10.7	22	23.4	P = 0.0004
Paucigravida	24	25.5	41	43.6	
Multigravida	44	46.8	23	24.5	
Grand multigravida	16	17	8	8.5	
Parity					
Primiparous	21	22.4	27	28.7	P = 0.11
Pauciparous	32	34	42	44.7	
Multiparous	30	31.9	19	20.2	
Grand multiparous	11	11.7	6	6.4	

Continued

Gestational age					
Preterm	12	12.8	0	0	P = 0.0003
Term	82	87.2	94	94	
Number of ANC visits					
1 - 2	23	24.5	11	11.7	P = 0.075
3 - 4	44	46.8	52	55.3	
>4	27	28.7	31	33	
Fundal height					
<32					P = 0.134
32 - 33					
≥ 34					
TOTAL	**94**	**100**	**94**	**100**	

Among newborns, 64.89% of cases had normal weight, while 26.6% had low birth weight, compared to 93.62% normal weight and 6.38% low birth weight in controls. Macrosomia was observed in 8.51% of cases (see Table 2 for delivery parameters).

Table 2. Delivery parameters.

Parameters	Frequency	Percentage	Frequency	Percentage	P-value
Duration of labor (hours)	**Cases**		**Controls**		
<06	22	23.4	27	28.7	
[06 - 12]	45	47.9	48	51.1	P = 0.27
>12	27	28.7	19	20.2	
Qualification of birth attendant					
Obstetrician	51	54.3	28	29.8	P = 0.002
Midwife	41	43.6	60	63.8	
Not specified	2	2.1	6	6.4	
Birth weight (g)					
<2500	25	26.6	6	6.4	P = 0.001
2500 - 3999	61	64.9	88	93.4	
≥4000	8	8.5	0	0	
TOTAL	94	100	94	100	

The etiologies of HPPI were primarily uterine atony (53.19%), abnormal placental insertion (28.72%), and uterine rupture (10.64%) (Table 3). Blood loss was estimated to be between 1000 - 1500 mL in 33.3% of cases, with ≥1500 mL in

22.7%. Biologically, 55.82% of cases had hemoglobin levels between 7 and 10.9 g/dL.

Active management of the third stage of labor (AMTSL) was the most frequently performed procedure, used in 54% of cases. Uterine revision was conducted in all vaginal deliveries among cases, and all received uterotonics. Blood transfusions were performed in 59 of the 70 parturients who required them, representing 84.29% of cases. Hemostatic hysterectomy and hysterorrhaphy were performed in 23.3% and 30% of cases, respectively (Table 3).

Table 3. Distribution of parturients according to the etiology of HPPI.

Etiologies	Frequency	Percentage (%)
Uterine atony	**50**	**53.19**
Retained placenta	9	9.57
Abnormal placental insertion	**27**	**28.72**
Uterine rupture	**10**	**10.64**
Cervical tear	8	8.51
Perineal tear	1	1.06
Coagulation disorders	3	3.19

Note: associations of etiologies were observed.

In our series, we recorded 9 deaths, resulting in a case-fatality rate of 9.6%. The causes included 5 cases of uterine atony, 3 cases of uterine rupture, and 1 case of cervical tear.

4. Discussion

The hospital frequency in our series was 0.53%, lower than the 2.16% reported by Oumar S. in Mali in 2020 for postpartum hemorrhage (PPH) [9]. Our lower rate may be due to focusing solely on immediate postpartum hemorrhage (HPPI). The predominant age group was 35 - 39 years, with a mean age of 36 among cases compared to 23 among controls, showing a statistically significant difference. Bazirete *et al*. in Rwanda in 2022 [4] reported a similar age group with a higher proportion of 68.75%. In contrast, McLelland *et al*. in 2018 in Australia [10] reported a mean age of 29.1 years. This discrepancy could be attributed to aging uterine muscle fibers or endometrial changes from multiple deliveries, which may increase the risk of immediate postpartum hemorrhage.

Married women comprised 91.49% of cases and 63.83% of controls. This contrasts with Ambouda NL in Libreville in 2021 [11], who reported only 7.3% married women. We believe the politico-military crisis from 2002 to 2011 led to early marriages due to poverty. The mean gravidity was 2.3 among cases and 2.1 among controls, showing a statistically significant link between HPPI occurrence and gravidity. However, there was no significant link regarding parity. Repeated pregnancies can weaken the uterine wall, potentially leading to postpartum hemorrhage

due to uterine atony [9].

In our series, 75.53% of cases had at least three antenatal consultations (ANCs) compared to 88.3% among controls, with no link found between ANC attendance and HPPI occurrence. According to Magan *et al*. in 2005 [12], 20% of PPH cases occur without risk factors. Vaginal deliveries accounted for 54.26%, unlike Onyema *et al*. in Nigeria in 2015 [13], who reported 23.8%. This difference may be due to variations in labor monitoring resources.

The mean duration of labor in cases was 10 hours versus 9 hours, with 28.72% of cases experiencing labor longer than 12 hours compared to 20.21% of controls. We did not find a statistical link between labor duration and HPPI occurrence, even though the literature identifies prolonged labor as a risk factor for HPPI [14]-[16]. This may be due to challenges for our parturients in specifying the exact onset of labor or inadequate questioning by healthcare personnel.

Macrosomia was observed in 8.51% of cases and none of the controls, with a statistically significant association between birth weight and HPPI occurrence ($p = 0.002$). This aligns with literature confirming that uterine overdistension is a risk factor for HPPI [15] [16]. The primary causes of HPPI were uterine atony (53.19%), abnormal placental insertion (28.72%), and uterine rupture (10.64%), consistent with literature that identifies uterine atony as the main cause of HPPI [14] [17].

Blood loss was estimated at 1000 - 1500 mL in 33.3% of cases and ≥1500 mL in 22.7%. Our findings differ from Tort *et al*. in 2015 [18], who reported a mean blood loss of 660 ± 362 mL. This discrepancy may be due to subjective methods of quantifying blood loss in our department (In our structure, quantification is visual, so there is a risk of bias). Biologically, 55.82% had hemoglobin levels between 7 and 10.9 g/dL, and 44.18% had hemoglobin ≤ 6.9 g/dL. Our study reveals a higher incidence of severe HPPI than that reported by Deneux-Tharaux *et al*. [14].

Active management of the third stage of labor (AMTSL) was performed in 54% of cases at delivery, compared to 46% in artificial delivery. Uterine revision and the use of uterotonics were observed in all cases, and transfusion needs were met in 84.29% of cases. We noted insufficient medical and obstetric management of HPPI compared to the guidelines established by Melanie B. *et al*. in 2022 in Canada [19]. In the 2016 series by Sitti in Togo [20], AMTSL was performed in 95% of cases. This discrepancy may be due to a lack of knowledge, inadequate training of health personnel, and unavailability of blood products.

The surgical procedures performed in our study included suturing of soft tissues, vascular ligation, hemostatic hysterectomy, hysterorrhaphy, and uterine compression sutures, conducted in 23.3%, 20%, 23.3%, 30%, and 3.4% of cases, respectively. These procedures are recommended in the literature [19] [21]-[23]. The difference lies in the hierarchy of procedures: in well-equipped facilities, arterial embolization is the first-line advanced technique. The care provided in our hospital did not comply with all FIGO recommendations, which emphasize

AMTSL, the use of uterotonics, prostaglandins, and haemostatics, as well as various surgical techniques, including arterial embolization, in a well-established chronological order [24].

The case-fatality rate was 9.6%. This high rate could be explained by the fact that HPPI remains the leading cause of mortality in developing countries [14] [22].

5. Conclusion

Postpartum hemorrhage was relatively frequent in our department. Identified risk factors included age, education level, occupation, marital status, gravidity, and high birth weight. The main etiologies were uterine atony, abnormal placental insertion, and uterine rupture, resulting in definitive sterility in a significant proportion of cases due to hysterectomy. Management of postpartum hemorrhage showed shortcomings attributed to limited technical capacity, inadequate practitioner competence, and unavailability of blood and blood products. Consequently, the case-fatality rate was high.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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