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Research Article

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Immediate Postpartum Hemorrhage: Management Delays and Factors Associated with Maternal Mortality in A Referral Maternity Hospital

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Abstract

Introduction: *Immediate postpartum hemorrhage (IPPH) remains one of the leading causes of maternal mortality in low-resource countries. However, most of these deaths could be prevented through adequate obstetric care. Timeliness of management is a major determinant of maternal survival.*

Objective: *To analyze management delays and factors associated with maternal mortality during immediate postpartum hemorrhage in a referral maternity unit.*

Methods: *A retrospective analytical study was conducted on cases of IPPH recorded in a university maternity hospital. Clinical data, intervention delays, and the profile of the involved healthcare personnel were analyzed.*

Results: *A delay of more than 30 minutes before initial medical intervention significantly increased maternal lethality (OR = 5.45; p = 0.001), whereas intervention within the first 10 minutes was highly protective (OR = 0.072; p < 0.001). A delay exceeding 120 minutes before surgical management markedly increased the risk of death (OR = 120; p < 0.001). Healthcare personnel qualification was not statistically associated with maternal lethality.*

Multivariate analysis showed that maternal lethality due to postpartum hemorrhage was significantly associated with maternal age >35 years, incomplete antenatal care, admission by referral, and delivery by cesarean section.

Conclusion: *Maternal mortality due to postpartum hemorrhage is strongly influenced by delays in response. The implementation of emergency protocols, reorganization of care, and rapid availability of surgical interventions are essential.*

1. Introduction

Immediate postpartum hemorrhage (IPPH) is defined as blood loss of 500 mL or more within 24 hours following vaginal delivery or more than 1000 mL after cesarean section [1,2]. It constitutes a major obstetric emergency and is responsible for nearly 25% of maternal deaths worldwide, with more than 80% of these deaths occurring in sub-Saharan Africa and South Asia [3,4].

Maternal mortality is a key indicator of international development. Its reduction remains a longstanding challenge in low-income countries despite the availability of effective interventions [5]. It is estimated that approximately 14 million cases of postpartum hemorrhage (PPH) occur worldwide each year, with a case fatality rate close to 1%, corresponding to one maternal death every four minutes [6]. Maternal mortality related to PPH varies considerably between countries; in France, for example, the maternal mortality ratio was 10.3 deaths per 100,000 live births in 2012 [1,6]. More broadly, in 2020, about 800 women died every day from preventable causes related to pregnancy and childbirth, equivalent to one woman every two minutes [7].

In Guinea, despite efforts to strengthen the maternal health system, postpartum hemorrhage remains a major cause of maternal mortality, exacerbated by delays in management, limited availability of blood products, dysfunctions in care pathways, and the absence of systematic protocols in some health facilities [8].

Maternal survival in cases of PPH is strongly correlated with the timeliness of intervention, whether medical (uterotonic drugs, resuscitation) or surgical (suturing, uterine revision, hysterectomy). The three-delay model (delay in decision-making, delay in reaching care, and delay in receiving appropriate care) fully applies to this condition, with dramatic consequences in maternity units where responsiveness is inadequate [9,10].

Few local studies have explored actual management delays and their impact on maternal lethality related to PPH. This study therefore aims to analyze factors associated with maternal lethality due to immediate postpartum hemorrhage, with particular emphasis on critical delays in medical and surgical interventions as well as the role of the qualification of the personnel assisting childbirth.

1. Methodology

A retrospective analytical study was conducted in the Department of Gynecology and Obstetrics of Ignace Deen National Hospital, Conakry, Guinea, from January 2022 to December 2023. This national referral center, receiving referrals from across the country, records an average of 8,000 deliveries per year.

All women who presented with immediate postpartum hemorrhage were included in the study, whether they delivered in the department or were referred for its management, regardless of the mode of delivery, provided that informed consent was obtained. All maternal deaths attributable to immediate postpartum hemorrhage occurring during the study period were also included.

Deaths unrelated to childbirth or the postpartum period, as well as deaths recorded at admission when the death had occurred outside the department, were excluded.

Data were extracted from medical records, operating room registers, and monitoring charts. The dependent variable was maternal outcome (survival/death). Independent variables included: delay before first medical intervention (<15, 10–30, >30 minutes), delay before surgery (<60, 60–120, >120 minutes), maternal age, number of antenatal care visits, mode of admission, mode of delivery, and qualification of the attending personnel.

Multivariate logistic regression analysis was performed to identify factors associated with maternal lethality. Results were expressed as odds ratios (ORs) with 95% confidence intervals, and statistical significance was set at $p < 0.05$.

2. Results

2.1. Frequency

Out of a total of 6,750 deliveries, 187 cases of immediate postpartum hemorrhage were recorded, corresponding to a frequency of 2.7%. During the study period, 27 maternal deaths related to this complication were reported, representing a case fatality rate of 14.4%.

2.2. Sociodemographic and obstetric factors

Maternal age was significantly associated with maternal death. Women aged 35 years and above had a significantly higher odds of maternal mortality (OR = 3.69, 95% CI: 1.48–9.21, p = 0.003). No statistically significant association was observed among women aged less than 20 years (OR = 0.85, 95% CI: 0.19–3.73, p = 0.827), 20–24 years (OR = 0.44, 95% CI: 0.13–1.50, p = 0.178), 25–29 years (OR = 1.32, 95% CI: 0.52–3.34, p = 0.553), or 30–34 years (OR = 0.21, 95% CI: 0.03–1.54, p = 0.083).

Parity was not significantly associated with maternal mortality. The odds ratios were 0.91 (95% CI: 0.36–2.30, p = 0.844) for primiparous women, 1.58 (95% CI: 0.66–3.78, p = 0.304) for pauciparous women, 0.38 (95% CI: 0.09–1.65, p = 0.180) for multiparous women, and 1.57 (95% CI: 0.94–2.62, p > 0.05) for grand multiparous women.

Antenatal care attendance showed a significant association with maternal mortality. Women who attended fewer than four antenatal care visits had a significantly higher risk of maternal death (OR = 4.08, 95% CI: 1.35–12.28, p = 0.007). Conversely, attending four or more antenatal care visits was associated with a significantly reduced risk of maternal mortality (OR = 0.25, 95% CI: 0.08–0.74, p = 0.007).

Maternal Age (years)	Maternal deaths	Survivors	OR (95% CI)	p-value
<20	2	58	0.848 (0.192–3.732)	0.827
20–24	3	145	0.437 (0.127–1.505)	0.178
25–29	7	144	1.323 (0.523–3.344)	0.553

30–34	1	103	0.205 (0.027–1.544)	0.083
≥35	8	75	3.692 (1.480–9.210)	0.003
Parity				
Primiparous	7	186	0.911 (0.36–2.30)	0.844
Pauciparous	10	192	1.577 (0.66–3.78)	0.304
Multiparous	2	114	0.380 (0.09–1.65)	0.180
Grand multiparous	2	33	1.569 (0.94–2.62)	
ANC visits				
<4 ANC	17	268	4.08 (1.35–12.28)	0.007
≥4 ANC	4	257	0.25 (0.08–0.74)	0.007

Table 1: Sociodemographic and obstetric factors associated with maternal lethality among patients with immediate postpartum hemorrhage

2.3. Diagnostic delays and initial access to care

A total of 187 cases of immediate postpartum hemorrhage were included in the analysis. The diagnostic delay was documented for all patients. The diagnosis was established within less than one hour in 103 patients (55.1%). A delay of 1 to 2 hours was observed in 46 patients (24.6%), 2 to 3 hours in 16 patients (8.6%), and 3 to 4 hours in 19 patients (10.2%). In three patients (1.6%), the exact time of diagnosis could not be determined. Overall, 44.9% of patients had a diagnostic delay of one hour or more. In addition, 68.89% of patients were admitted by referral to the referral maternity unit, while 31.11% presented directly on their own.

2.4. Delay in management intervention

Intervention delay was strongly associated with maternal mortality. A first intervention performed within 10 minutes was significantly protective against maternal death (OR = 0.07, 95% CI: 0.01–0.55, $p < 0.001$). In contrast, a delay of more than 30 minutes before the first intervention was associated with a significantly increased risk of maternal mortality (OR = 5.45, 95% CI: 1.77–16.84, $p = 0.001$).

Prolonged delay before surgical intervention also showed a very strong association with maternal death. A surgical intervention performed more than 120 minutes after indication was associated with a markedly increased risk of maternal mortality (OR = 120.0, 95% CI: 14.01–1027.77, $p < 0.001$).

Intervention delay	OR (95% CI)	p-value
First intervention <10 min	0.072 (0.009–0.550)	<0.001
First intervention >30 min	5.45 (1.77–16.84)	0.001
Surgical intervention >120 min	120 (14.01–1027.77)	<0.001

Table 2: Association between intervention delays and maternal mortality

2.5. Etiologies of immediate postpartum hemorrhage

Hemorrhage related to the third stage of labor was predominantly due to uterine atony (125 cases, 66.8%), followed by retained placenta (41 cases, 21.9%) and coagulation disorders (6 cases, 3.2%). Hemorrhage occurring contemporaneously with delivery was mainly related to soft tissue lacerations (47 cases, 25.1%).

2.6. Factors associated with maternal mortality

Several obstetric conditions were significantly associated with maternal mortality. Severe preeclampsia/eclampsia markedly increased the risk of maternal death (OR = 8.59, 95% CI: 2.56–28.85, $p < 0.001$), as did prolonged labor (OR = 7.49, 95% CI: 2.26–24.29, $p < 0.001$). Intrauterine fetal death was also associated with an increased risk of maternal mortality (OR = 4.50, 95% CI: 0.94–21.53, $p = 0.041$), while placental abruption showed a borderline association (OR = 4.15, 95% CI: 0.87–19.68, $p = 0.053$). Premature rupture of membranes and immediate postpartum status were not significantly associated with maternal death.

Among comorbidities, diabetes was strongly associated with maternal mortality (OR = 17.33, 95% CI: 3.84–78.19, $p < 0.001$), whereas obesity did not reach statistical significance.

Mode of admission showed a strong association with maternal outcome. Referred women had a significantly higher risk of maternal death (OR = 18.52, 95% CI: 4.27–80.40, $p < 0.001$), while self-referral was significantly protective (OR = 0.05, 95% CI: 0.01–0.29, $p < 0.001$).

Regarding mode of delivery, cesarean section was associated with an increased risk of maternal mortality (OR = 2.81, 95% CI: 1.29–4.26, $p = 0.012$), whereas vaginal delivery was not significantly associated with maternal death.

Condition	Deaths	Survivors	OR (95% CI)	p-value
Severe preeclampsia/Eclampsia	4	14	8.59 (2.56–28.85)	<0.001
Intrauterine fetal death	2	12	4.50 (0.94–21.53)	0.041
Immediate postpartum	0	11	—	0.503
Premature rupture of membranes	1	24	1.04 (0.13–8.11)	0.967
Prolonged labor	4	16	7.49 (2.26–24.29)	<0.001
Placental abruption	2	13	4.15 (0.87–19.68)	0.053
Comorbidities				
Condition				
Obesity	1	5	5.20 (0.58–46.50)	0.101
Diabetes	3	5	17.33 (3.84–78.19)	<0.001
Mode of admission				
Self-referral	2	347	0.054 (0.012–0.294)	<0.001
Referred	19	178	18.52 (4.27–80.40)	<0.001
Mode of delivery				
Mode delivery				
Vaginal delivery	12	337	0.74 (0.31–1.80)	0.510
Cesarean section	9	146	2.81 (1.29–4.26)	0.012

Table 3: Clinical and organizational factors associated with maternal lethality during immediate postpartum hemorrhage

2.7. Management and maternal outcomes

Oxytocin was administered to all patients (100%). Misoprostol was used in 61.58% of cases, while blood transfusion was required in 65.57% of patients. Surgical interventions included soft tissue suturing (24%), B-Lynch suturing (3.06%), and hemostatic hysterectomy (1.62%).

Maternal prognosis among patients with immediate postpartum hemorrhage was marked by high morbidity. The main complications observed were anemia, reported in 86 patients (46.0%), and shock in 74 patients (39.6%). Disseminated intravascular coagulation (DIC) was diagnosed in 5 patients (2.7%), and acute renal failure in 11 patients (5.9%). The maternal case fatality rate related to immediate postpartum hemorrhage was 14.4%.

3. Discussion

The analysis of factors associated with maternal lethality during immediate postpartum hemorrhage highlights the combined influence of maternal characteristics, the timeliness of management, and initial clinical severity, underscoring the multifactorial nature of this major obstetric complication. Our findings are fully consistent with the conceptual framework of the three delays model proposed by Thaddeus and Maine, particularly emphasizing deficiencies related to functional access to emergency obstetric and neonatal care (EmONC) services [9].

In our study, advanced maternal age emerged as an important determinant of mortality. Women aged 35 years and older had a significantly increased risk of maternal death, in line with data from the international literature [1-3]. Several authors report that advanced maternal age is associated with a higher prevalence of comorbidities and a reduced physiological capacity to cope with hemorrhagic shock, thereby contributing to poorer outcomes in cases of severe hemorrhage. These findings suggest that older parturients should benefit from closer monitoring and systematic anticipation of hemorrhagic risk starting in the antenatal period.

In contrast, parity was not significantly associated with maternal lethality in our series. Although grand multiparity is classically described as a risk factor for the occurrence of postpartum hemorrhage, its impact on mortality appears to depend more on the quality and rapidity of management than on obstetric status alone [4,5]. The absence of an observed association may also be explained by the limited number of deaths, reducing the statistical power of the analysis.

In addition, inadequate antenatal care was strongly associated with maternal lethality. Women who had attended fewer than four antenatal visits had a markedly higher risk of death, whereas adequate antenatal follow-up exerted a significant protective effect. These findings are consistent with World Health Organization recommendations, which emphasize the central role of antenatal care in the early detection of obstetric risk factors, birth preparedness, and timely referral to appropriate levels of care [6,7]. In our context, inadequate antenatal follow-up may also reflect barriers to healthcare access and contribute to delays in seeking care at referral facilities.

Beyond these baseline factors, the timeliness of management emerged as a key determinant of maternal survival. Our study shows that a delay of more than 30 minutes before the first medical intervention significantly increased the risk of maternal death, whereas management initiated within the first 10 minutes was highly protective. These results are consistent with numerous African and

international studies identifying delays in response as one of the main determinants of maternal mortality related to postpartum hemorrhage [1-3]. The literature emphasizes that the first minutes following the onset of hemorrhage are critical to interrupt the hemorrhagic cascade and prevent progression to irreversible hypovolemic shock, supporting WHO recommendations to initiate resuscitation and administer uterotonics without delay once postpartum hemorrhage is diagnosed [3,4].

In our study, a delay of more than two hours before access to appropriate surgical management was associated with an extremely high risk of maternal death. This finding reflects a major failure in access to comprehensive EmONC services, a situation frequently described in low-resource settings. Limited availability of operating theaters, shortages of qualified staff on a continuous basis, and difficulties in rapid access to blood products constitute major barriers to effective management of severe hemorrhage [5-7]. The absence of a significant association between the qualification of the birth attendant and maternal lethality suggests that organization of care and system responsiveness outweigh individual provider competence, as reported in several multicenter African studies [8].

The mode of admission was also a major determinant of prognosis. Referred or evacuated patients had a substantially higher risk of death compared with those who presented directly, illustrating both delays in access to care and deficiencies in management after arrival at the facility. This strong dependence on the referral–evacuation system reflects an insufficiency of functional EmONC services at the peripheral level and exposes patients to cumulative delays before accessing definitive obstetric care [4,6].

Finally, maternal lethality was influenced by clinical severity at admission and by certain associated obstetric conditions. Patients admitted with severe preeclampsia or eclampsia had a significantly increased risk of death, consistent with international data identifying hypertensive disorders of pregnancy as a major cause of maternal mortality, particularly when associated with hemorrhagic complications and coagulation disorders [1-3]. Prolonged labor was also strongly associated with maternal lethality, probably related to uterine atony, maternal exhaustion, and prolonged exposure to obstetric interventions [3,4].

Among maternal comorbidities, diabetes appeared as a factor strongly associated with maternal death, in agreement with literature showing that metabolic diseases worsen the prognosis of obstetric emergencies by increasing the risk of hemorrhagic, infectious, and surgical complications [2,5]. Obesity, although associated with a high odds ratio, was not significantly related to lethality, likely due to the small number of cases. The observed association between cesarean delivery and maternal lethality most likely reflects the severity of clinical situations requiring emergency surgical intervention rather than a direct causal effect of the mode of delivery itself [3,4].

Overall, these findings confirm that reducing maternal lethality related to immediate postpartum hemorrhage requires a comprehensive approach integrating early identification of high-risk women, strengthening of antenatal care, improvement in the organization and accessibility of EmONC services, and reduction of delays in diagnosis, referral, and therapeutic management, in line with international recommendations [3,4,6,7].

4. Conclusion

Maternal mortality due to postpartum hemorrhage is strongly influenced by delays in response. The implementation of emergency protocols, reorganization of care, and rapid availability of surgical interventions are essential.

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