

Management of Obstetric Emergencies in Parakou, Benin, 2023: Therapeutic Aspects

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Abstract

Introduction: Obstetric emergencies remain a leading driver of maternal and neonatal mortality in sub-Saharan Africa. In Benin, these conditions account for a substantial proportion of preventable deaths at the referral level, yet data on management quality at the tertiary level remain limited. This study examines the therapeutic management of obstetric emergencies at the University Hospital of Borgou-Alibori (CHUD/B-A) in Parakou. **Methods:** A descriptive and analytical cross-sectional study was conducted with retrospective data collection from March 1 to June 30, 2023, at the CHUD/B-A. All women admitted for obstetric emergencies, including pregnant women, women in labor, postpartum (days 1 - 41), and post-abortion cases, were included. Management was deemed adequate when at least 70% of the WHO-recommended actions were applied per diagnosis. A total of 391 cases were analyzed. Data were processed using Epi-Info 7.1.14. Prevalence ratios (PR) with 95% confidence intervals (CI) were calculated; statistical significance was set at $p < 0.05$. **Results:** Out of 1525 women admitted, 391 presented with obstetric emergencies (25.6%). The mean age was 27.8 years. The leading diagnoses were severe preeclampsia (19.7%), acute fetal distress (15.6%), and postpartum hemorrhage (8.2%). Management was adequate in 85.9% (336/391) of cases. Inadequate management was significantly associated with residence outside Parakou (PR = 2.25; 95% CI: 1.26 - 4.00; $p = 0.006$), directed admission mode (PR = 4.61; 95% CI: 1.53 - 13.92; $p = 0.007$), and compromised general condition at admission (PR = 2.94; 95% CI: 1.64 - 5.27; $p < 0.001$). Inadequate management increased the risk of maternal death 4.19-fold (PR = 4.19; 95% CI: 1.73 - 10.12; $p = 0.001$).

The maternal mortality rate was 6.1% and the perinatal mortality rate was 15.9%. **Conclusion:** Management quality at CHUD/B-A was generally satisfactory, though significant gaps persist, particularly for hypertensive disorders and ectopic pregnancy. Residence outside Parakou, inadequate referral coordination, and poor admission status are modifiable risk factors that require targeted intervention.

Keywords

Obstetric Emergencies, Management Quality, Maternal Mortality, Benin, Sub-Saharan Africa, Referral System

1. Introduction

Obstetric emergencies are among the most time-sensitive and life-threatening conditions encountered in clinical medicine [1]-[3]. They include hemorrhage, hypertensive disorders of pregnancy, sepsis, unsafe abortion complications, and obstructed labor, each requiring rapid, coordinated clinical responses. Together, these conditions account for the overwhelming majority of the estimated 800 maternal deaths that occur globally every day, with more than 94% concentrated in low- and middle-income countries [4].

Sub-Saharan Africa bears a disproportionate share of this burden. The region recorded a maternal mortality ratio of approximately 545 per 100,000 live births in 2017, a figure that masks marked within-region heterogeneity and reflects persisting structural deficits in obstetric care [5]. In West Africa, health systems routinely grapple with scarce human resources, fragmented supply chains, and referral networks that frequently fail at the moment they are needed most [4] [6].

Benin is no exception. The country's maternal mortality ratio remains among the highest on the continent, driven in large part by delays in reaching and receiving appropriate care at the facility level. While significant attention has been paid to community-level determinants of maternal death, the quality of in-facility management of obstetric emergencies has received comparatively less scrutiny. Yet the gap between diagnosis and adequate treatment is a correctable cause of preventable death.

The University Hospital of Borgou-Alibori (CHUD/B-A) in Parakou serves as the primary tertiary referral center for northern Benin, receiving patients from a wide geographic catchment area. Its capacity to manage obstetric emergencies effectively has direct implications for maternal and perinatal survival across the region. Understanding where management gaps occur, what patient and system factors predict inadequate care, and how those gaps translate into adverse outcomes is essential for designing targeted quality improvement interventions.

This study was conducted at CHUD/B-A between March and June 2023 with the objective of describing the therapeutic management of obstetric emergencies, identifying factors associated with management failure, and quantifying the im-

pact of inadequate management on maternal mortality.

2. Methods

2.1. Study Design and Setting

This was a descriptive and analytical cross-sectional study with retrospective data collection, carried out at the Department of Obstetrics and Gynecology of the CHUD/B-A in Parakou, Benin. The study period ran from March 1 to June 30, 2023, covering four months of consecutive admissions. CHUD/B-A is the referral hospital for a catchment population spanning several northern Beninese departments.

2.2. Population and Eligibility Criteria

The study population comprised all women admitted for an obstetric emergency during the study period: pregnant women (gestantes), women in active labor (parturientes), postpartum women (days 1 - 41), and post-abortion cases. Women were included regardless of gestational age and regardless of fetal viability status at presentation. Women found dead on arrival and cases with incomplete or missing medical records were excluded.

2.3. Sampling

An exhaustive census of all eligible obstetric emergency cases was performed; no sampling technique was applied. All cases meeting inclusion criteria during the four-month period were enrolled.

2.4. Data Collection

Data were collected prospectively from the moment of admission through discharge, using a standardized data collection form. Information sources included referral sheets, admission records, medical files, surgical reports, and the ward admission register. The principal variables collected covered sociodemographic characteristics, clinical status at admission, mode of referral, pre-referral treatments, diagnostic categories, therapeutic interventions, and clinical outcomes for both mother and neonate.

2.5. Definition of Adequate Management

Management was defined as adequate when at least 70% of the clinical actions recommended by the WHO for each specific obstetric emergency were documented as performed. A binary outcome variable was created: “Yes” (adequate) when this threshold was met, and “No” (inadequate) otherwise. This threshold was applied uniformly across all diagnostic categories.

2.6. Statistical Analysis

Data were entered and analyzed using Epi-Info 7.1.14. Categorical variables were expressed as frequencies and percentages. Quantitative variables were described using means and standard deviations. Bivariate analysis used the Chi-square test

to assess associations between potential predictor variables and inadequate management. For each significant association, the prevalence ratio (PR) with its 95% confidence interval (CI) was calculated. A p-value below 0.05 was considered statistically significant. Variables significant at the bivariate level were entered into a multivariate Poisson regression model with robust variance to identify independent predictors of management failure.

2.7. Ethical Considerations

Ethical clearance was obtained from the competent institutional review committee prior to data collection. Patient confidentiality was maintained throughout the study. All data were anonymized and used exclusively for research purposes.

3. Results

3.1. Frequency of Obstetric Emergencies among Admitted Women

During the four-month study period, 1525 women were admitted to the maternity ward of CHUD/B-A, of whom 1293 were admitted for obstetric conditions and 232 for gynecological ones. Among the obstetric admissions, 391 cases met the criteria for obstetric emergency, representing a frequency of 30.2% of obstetric admissions and 25.6% of all admissions. Of these 391 women, 318 (81.3%) were pregnant (gestantes) and 73 (18.7%) were in the postpartum period.

3.2. Distribution of Women by Sociodemographic Characteristics, Parakou, 2023 (n = 391)

The mean age of the study population was 27.8 years (SD: 6.4), with the 20 - 29 year age group being the most represented (53.9%). The majority resided in Parakou (62.4%). Most women were homemakers (42.5%) and lived in common-law unions (60.4%). Primigravidas accounted for 32.5% of the sample. **Table 1** presents the detailed sociodemographic and obstetric characteristics.

Table 1. Distribution of women by sociodemographic and obstetric characteristics, at CHUD/B-A, Parakou, 2023 (n = 391).

Characteristic	n	%
Residence		
<i>Parakou</i>	244	62.40
<i>Outside Parakou</i>	147	37.60
Occupation (women)		
<i>Homemaker</i>	166	42.46
<i>Trader/ vendor</i>	93	23.79
<i>Artisan</i>	86	21.99
<i>Civil servant</i>	22	5.63

Continued

Marital status		
<i>Common-law union</i>	236	60.36
<i>Married</i>	150	38.36
<i>Single</i>	2	0.51
Gravidity		
<i>Primigravida</i>	127	32.48
<i>Paucigravida (2 - 3)</i>	119	30.43
<i>Multigravida (4 - 5)</i>	80	20.46
<i>Grand multigravida (>5)</i>	62	15.86

3.3. Distribution of Women by Mode of Admission and Care Delays, Parakou, 2023 (n = 391)

The majority of women (70.1%) were referred or evacuated from peripheral facilities, while 23.3% came on their own initiative. Among referred patients, a pre-referral phone call was made in only 16.4% of cases. Regarding care delays, 67.3% of women waited between 16 and 30 minutes before being examined by a physician or midwife after admission. Once examined, however, 97.9% received their first therapeutic intervention within 15 minutes of the clinical exam. **Table 2** summarizes these findings.

Table 2. Distribution of women by mode of admission and care delays, at CHUD/B-A, Parakou, 2023 (n = 391).

Variable	n	%
Mode of admission		
<i>Self-referred</i>	91	23.27
<i>Referred/evacuated</i>	274	70.08
<i>Directed</i>	26	6.65
Referral call made prior to arrival		
<i>Yes</i>	45	16.42
<i>No</i>	225	82.12
Delay between arrival and first clinical exam (min)		
<i>1 - 15 min</i>	55	14.07
<i>16 - 30 min</i>	263	67.26
<i>31 - 60 min</i>	23	5.88
<i>>60 min</i>	44	11.25
Delay between clinical exam and first care (min)		
<i>1 - 15 min</i>	383	97.95
<i>>15 min</i>	8	2.05

3.4. Distribution of Women by Diagnosis, Parakou, 2023 (n = 391)

The three leading diagnoses were severe preeclampsia (19.7%; n = 77), acute fetal distress (15.6%; n = 61), and immediate postpartum hemorrhage (8.2%; n = 32). Collectively, hypertensive disorders of pregnancy (severe preeclampsia, eclampsia, postpartum eclampsia, and postpartum severe preeclampsia) represented 30.2% of all emergencies. Hemorrhagic conditions (postpartum hemorrhage, abruptio placentae, placenta previa, ruptured ectopic pregnancy, and hemorrhagic abortion) accounted for 27.4% of cases. **Table 3** presents the full diagnostic distribution.

Table 3. Distribution of women by diagnosis, at CHUD/B-A, Parakou, 2023 (n = 391).

Diagnosis	n	%
Severe preeclampsia	77	19.69
Acute fetal distress (AFD)	61	15.60
Immediate postpartum hemorrhage (PPH)	32	8.18
Hemorrhagic incomplete abortion	29	7.42
Eclampsia	20	5.12
Severe anemia in pregnancy	17	4.35
Abruptio placentae (HRP)	17	4.35
Placenta previa (PP)	17	4.35
Malpresentation/dystocia	17	4.35
Dynamic dystocia	15	3.84
Ruptured ectopic pregnancy	14	3.58
Postpartum eclampsia	12	3.07
Threatened uterine rupture	10	2.56
Postpartum septicemia	10	2.56
Uterine rupture	5	1.28
Other diagnoses	18	4.60
Total	391	100.00

3.5. Distribution of Women by Adequacy of Management per Diagnosis, Parakou, 2023 (n = 391)

Overall, management was adequate in 85.9% (336/391) of cases. Complete adherence to WHO protocols (100%) was observed for abruptio placentae, placenta previa, dynamic dystocia, threatened uterine rupture, pelvic anomalies, cord prolapse, and severe malaria. The lowest rates of adequate management were recorded for urinary tract infection in pregnancy (0%), ruptured ectopic pregnancy

(64.3%), and postpartum severe preeclampsia (66.7%). Severe preeclampsia itself had an adequate management rate of 74.0%, largely explained by incomplete magnesium sulfate protocols. The main reasons for inadequate management are detailed in **Table 4**. Delays in initiating treatment (30.9%), inadequate shock management (16.4%), and failure to perform coagulation testing (14.5%) were the most frequent deficiencies.

Table 4. Distribution of women by adequacy of management per diagnosis, at CHUD/B-A, Parakou, 2023 (n = 391).

Diagnosis	Total (n)	Adequate management n (%)	Inadequate management n (%)
Severe preeclampsia	77	57 (74.0)	20 (26.0)
Acute fetal distress	61	60 (98.4)	1 (1.6)
Postpartum hemorrhage	32	27 (84.4)	5 (15.6)
Hemorrhagic abortion	29	25 (86.2)	4 (13.8)
Eclampsia	20	15 (75.0)	5 (25.0)
Abruptio placentae	17	17 (100.0)	0 (0.0)
Placenta previa	17	17 (100.0)	0 (0.0)
Ruptured ectopic pregnancy	14	9 (64.3)	5 (35.7)
Postpartum eclampsia	12	9 (75.0)	3 (25.0)
Postpartum severe preeclampsia	9	6 (66.7)	3 (33.3)
Uterine rupture	5	4 (80.0)	1 (20.0)
UTI in pregnancy	5	0 (0.0)	5 (100.0)
Puerperal septicemia	10	9 (90.0)	1 (10.0)
Other diagnoses	31	28 (90.3)	3 (9.7)
Total	391	336 (85.9)	55 (14.1)

3.6. Factors Associated with Inadequate Management, Parakou, 2023

Among the 391 women, inadequate management was recorded in 55 (14.1%). Bivariate analysis identified three statistically significant predictors. Women residing outside Parakou had more than twice the risk of experiencing inadequate management compared with residents of Parakou (PR = 2.25; 95% CI: 1.26 - 4.00; $p = 0.006$). Women admitted through a directed referral pathway faced the highest risk (PR = 4.61; 95% CI: 1.53 - 13.92; $p = 0.007$), significantly greater than those who came voluntarily. Women admitted with a compromised general condition had nearly three times the risk of receiving inadequate management compared with women in good condition at admission (PR = 2.94; 95% CI: 1.64 - 5.27; $p <$

0.001). Neither age, occupation, gravidity, nor number of antenatal visits showed a significant association. **Table 5** presents the full bivariate analysis.

Table 5. Factors associated with inadequate management among women admitted for obstetric emergencies, at CHUD/B-A, Parakou, 2023 (n = 391).

Variable	Total	Failure n (%)	No failure n (%)	PR [95% CI]	p-value
Residence					
<i>Parakou (ref)</i>	244	25 (10.2)	219 (89.8)	1	-
<i>Outside Parakou</i>	147	30 (20.4)	117 (79.6)	2.25 [1.26 - 4.00]	0.006*
Mode of admission					
<i>Self-referred (ref)</i>	91	8 (8.8)	83 (91.2)	1	-
<i>Referred/evacuated</i>	274	39 (14.2)	235 (85.8)	1.72 [0.77 - 3.84]	0.184
<i>Directed</i>	26	8 (30.8)	18 (69.2)	4.61 [1.53 - 13.92]	0.007*
Admission clinical status					
<i>Good general condition (ref)</i>	281	28 (10.0)	253 (90.0)	1	-
<i>Compromised general condition</i>	110	27 (24.5)	83 (75.5)	2.94 [1.64 - 5.27]	0.000*
Age group (years)					
<20 (<i>ref</i>)	53	6 (11.3)	47 (88.7)	1	-
20 - 29	211	36 (17.1)	175 (82.9)	1.61 [0.64 - 4.05]	0.311
30 - 39	112	9 (8.0)	103 (92.0)	0.68 [0.23 - 2.03]	0.495
≥40	15	4 (26.7)	11 (73.3)	2.85 [0.68 - 11.85]	0.150

PR: Prevalence Ratio; CI: Confidence Interval; *statistically significant ($p < 0.05$); ref: reference category.

3.7. Impact of Management Quality on Maternal Mortality, Parakou, 2023

The overall maternal mortality rate was 6.1% (24/391). When management was deemed adequate, the mortality rate was 4.5% (15/336). Among women with inadequate management, mortality reached 16.4% (9/55). Inadequate management was associated with a 4.19-fold increase in the risk of maternal death (PR = 4.19; 95% CI: 1.73 - 10.12; $p = 0.001$). On the fetal side, 45 deaths were recorded among 283 deliveries, yielding a perinatal mortality rate of 15.9%. **Table 6** presents the relationship between management quality and maternal death.

Table 6. Relationship between management quality and maternal mortality, at CHUD/B-A, Parakou, 2023 (n = 391).

Management quality	Total	Maternal death n (%)	Survived n (%)	PR [95% CI]	P-value
Adequate	336	15 (4.5)	321 (95.5)	1 (ref)	0.001
Inadequate	55	9 (16.4)	46 (83.6)	4.19 [1.73 - 10.12]	

4. Discussion

4.1. Frequency of Obstetric Emergencies

The frequency of obstetric emergencies in our series (25.6% of all admissions) reflects the role of CHUD/B-A as a tertiary referral center for an extensive geographic catchment area. Comparable figures have been documented across sub-Saharan Africa: Lawrence *et al.* 2022 [4] note that referral hospitals in low- and middle-income countries routinely absorb a disproportionate volume of high-acuity obstetric cases, as district facilities often lack the capacity to manage complex emergencies locally. In Madagascar, a similar pattern was documented in a recent national study where tertiary facilities concentrated the most critical cases [7] [8].

4.2. Sociodemographic Profile

The mean age of 27.8 years and the predominance of the 20 - 29 age group align with the reproductive demography of northern Benin and are consistent with patterns reported elsewhere in West Africa. The high proportion of women in common-law unions (60.4%) and the predominance of homemakers (42.5%) mirror findings from Burkina Faso, where similar socioeconomic profiles were associated with delayed care-seeking [8]-[10]. The fact that 37.6% of women came from outside Parakou underscores the geographic reach of the CHUD/B-A catchment area and the structural pressures this places on the facility.

4.3. Spectrum of Obstetric Emergencies

The diagnostic profile in this series is consistent with the global epidemiology of obstetric emergencies in the sub-Saharan African context. Severe preeclampsia (19.7%), acute fetal distress (15.6%), and postpartum hemorrhage (8.2%) together dominated the case mix, a finding that aligns closely with published data. Lawrence *et al.* 2022 [4] identify hemorrhage, hypertensive disorders, and sepsis as the three leading causes of direct maternal mortality globally. The 30.2% burden attributable to hypertensive disorders in our cohort is consistent with the preeclampsia-eclampsia continuum that disproportionately affects women in sub-Saharan Africa, where antenatal care quality and early detection remain suboptimal [5].

Postpartum hemorrhage accounted for 8.2% of emergencies in our series. In sub-Saharan Africa and southern Asia, PPH and PPH-related deaths account for approximately 85% of the global burden (Makwe *et al.* 2024), reinforcing the need for strong first-line management protocols. The presence of ruptured ectopic pregnancy in 3.6% of cases highlights a condition where delayed intervention is consistently linked to poor outcomes, a problem compounded in our setting by limited pre-hospital ultrasound access.

4.4. Quality of Obstetric Emergency Management

The overall adequate management rate of 85.9% is an encouraging result for a public tertiary center operating in a resource-constrained environment. Several

diagnoses achieved complete protocol adherence, including abruptio placentae, placenta previa, cord prolapse, and dynamic dystocia, reflecting well-internalized clinical protocols for these conditions. However, the management gaps identified for severe preeclampsia (26.0% inadequate), ruptured ectopic pregnancy (35.7% inadequate), and postpartum severe preeclampsia (33.3% inadequate) point to persistent vulnerabilities.

The leading reasons for management failure in this series were delays in initiating care (30.9%), inadequate shock management (16.4%), and failure to perform coagulation testing (14.5%). These findings parallel observations from the broader literature. Harsono *et al.* 2024 [6] identified structural and procedural barriers, including supply shortages and communication failures between referring and receiving facilities, as dominant contributors to suboptimal emergency management in Cameroon. In our context, the delay problem is compounded by the fact that 67.3% of patients waited 16 - 30 minutes before being examined after arrival, a window that is clinically significant for hemorrhagic and hypertensive emergencies.

The incomplete application of magnesium sulfate protocols for severe preeclampsia (10.9% of inadequate management cases) and the simultaneous administration of magnesium sulfate and diazepam in one case are particularly notable. WHO-recommended magnesium sulfate protocols are well-established and effective; their inconsistent implementation likely reflects knowledge gaps or medication availability constraints rather than technical complexity [4]. Simulation-based training has been shown to close precisely these protocol adherence gaps, as demonstrated in the Malawian context by Kabondo *et al.* [11] [12].

4.5. Factors Associated with Inadequate Management

Three independent factors predicted inadequate management in this study: residence outside Parakou, directed admission mode, and compromised general condition at admission. The geographic factor is not surprising. Women who travel significant distances to reach CHUD/B-A typically arrive after longer pre-hospital delays, with more advanced clinical deterioration, and after receiving variable pre-referral care of uncertain quality. In Chad, Krause *et al.* 2025 [13] documented that geographic remoteness from referral facilities consistently amplifies management deficiencies by the time a patient reaches tertiary care. The directed admission pathway carried the highest risk (PR = 4.61), likely because women directed from community health workers or non-specialist providers arrive without prior clinical stabilization and without a referral call that would allow the receiving team to prepare.

Compromised general condition at admission (PR = 2.94) reflects a form of clinical severity that inherently strains available resources: these patients require simultaneous stabilization and treatment, demand more personnel, more equipment, and faster decision-making. When any of these elements are suboptimal, the probability of incomplete protocol adherence increases substantially. This finding echoes data from the South African district specialist team experience de-

scribed [6], where patient acuity on arrival was a consistent predictor of care quality gaps.

The absence of significant associations with age, occupation, gravidity, or antenatal visit count suggests that management failures at this tertiary center are driven primarily by facility-level and referral-system factors rather than individual patient characteristics. This is both reassuring and actionable: it shifts the responsibility for improvement toward health system actors rather than placing the burden on patients.

4.6. Maternal and Perinatal Mortality

The maternal mortality rate of 6.1% and the perinatal mortality rate of 15.9% reflect the high clinical acuity of the patient population managed at CHUD/B-A. These figures are consistent with published data from comparable referral settings in West Africa, where tertiary hospital-based maternal mortality rates typically range between 4% and 10% of admitted emergency cases. The 4.19-fold increase in maternal mortality risk associated with inadequate management provides a quantitative anchor for the clinical and policy relevance of improving protocol adherence.

These results reinforce the centrality of management quality as a proximal determinant of survival, independent of disease severity. Kinney *et al.* [14] [15] demonstrated that structured maternal and perinatal death surveillance and response (MPDSR) systems can systematically identify and address the clinical and systemic causes of preventable deaths at the facility level. Implementing such a system at CHUD/B-A could provide the institutional feedback mechanism needed to sustain quality improvement beyond individual training initiatives.

5. Study Limitations

Several limitations should be noted. First, the retrospective nature of part of the data collection introduces the risk of incomplete documentation, which may have led to underestimation of the adequate management rate for some cases. Second, the four-month study period, while covering consecutive cases, may not fully capture seasonal variations in case load and case mix. Third, the adequacy threshold of 70% protocol adherence, while commonly used in similar studies, remains a methodological convention; different thresholds might yield different proportions of adequate versus inadequate management. Fourth, the study was conducted at a single tertiary center, limiting the generalizability of these findings to district-level facilities or to the private sector. Finally, multivariate analysis was limited by the small number of management failure events relative to the number of variables analyzed, which may have reduced statistical power.

6. Conclusions

Management of obstetric emergencies at the CHUD/B-A in Parakou was adequate in 85.9% of cases during the study period. Hypertensive disorders, ruptured ec-

topic pregnancy, and urinary tract infections in pregnancy showed the highest management failure rates. Residence outside Parakou, directed admission mode, and compromised general condition at arrival were significant and modifiable predictors of inadequate care. Inadequate management increased the risk of maternal death more than fourfold.

Targeted interventions are needed on two fronts. At the clinical level, simulation-based training on magnesium sulfate protocols, shock management algorithms, and coagulation assessment should be prioritized. At the system level, strengthening pre-referral communication protocols, improving the quality of transfer from peripheral facilities, and implementing structured mortality review processes at CHUD/B-A are essential steps toward closing the management gap and reducing preventable maternal and perinatal deaths in northern Benin.

Ethical Approval

Ethical clearance was obtained from the relevant institutional review authority prior to data collection. Patient data were anonymized and used exclusively for research purposes.

Authors' Contributions

RK and IS conceived and designed the study. IO and BJDE contributed to data analysis. YAA, NDNK, and EA contributed to data collection and field supervision. RA, MV, AO, NFMH, and KS critically revised the manuscript for intellectual content. All authors approved the final version.

Data Availability

The dataset supporting the conclusions of this article is available from the corresponding author upon reasonable request.

Conflicts of Interest

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

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