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Burden, Clinical Management, and Maternal-Neonatal Outcomes of Obstetric Emergencies at a Secondary Referral Hospital in Benin in 2020: A Retrospective Cross-Sectional Study

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Abstract

Background: Obstetric emergencies remain a major contributor to maternal and neonatal morbidity and mortality in sub-Saharan Africa. Evidence from secondary referral hospitals in Benin is limited. **Objective**: This study assessed the burden, clinical profile, management and outcomes of obstetric emergencies at Comè Zone Hospital in 2020. **Methods:** We conducted a retrospective descriptive study of women admitted with obstetric emergencies between 1 January and 31 December 2020. Obstetric admissions were screened using maternity registers, and eligible records were reviewed. Obstetric emergency prevalence was calculated using all obstetric admissions as the denominator. Maternal and neonatal outcomes were assessed using appropriate denominators. Descriptive statistics summarized sociodemographic characteristics, antenatal care, referral patterns, diagnoses, management and outcomes. **Results:** Among 1866 obstetric admissions, 372 records were identified as obstetric emergencies and six were excluded because of incomplete key information, leaving 366 women for analysis. Obstetric emergencies therefore represented 19.6% of all obstetric admissions. Hypertensive disorders were the leading emergency diagnosis (130/366, 35.5%), followed by obstetric hemorrhage (100/366, 27.3%) and acute fetal distress (92/366, 25.1%). Overall, 264 women (72.1%) had received at least one antenatal care visit, while 73 (27.7% of those attending antenatal care) had completed four or more visits. Referral from another facility

occurred in 246 women (67.2%), but pre-referral communication was documented in only 97 (39.4%). Emergency caesarean section was performed in 223 women (60.9%). Most women were discharged after clinical recovery (304/366, 83.1%); 10 (2.7%) died, 16 (4.4%) were discharged against medical advice and 36 (9.8%) absconded. Among 341 live-born infants, 23 died before hospital discharge, corresponding to an in-hospital neonatal mortality of 6.7%. **Conclusion:** Obstetric emergencies accounted for nearly one-fifth of obstetric admissions, with substantial maternal and neonatal mortality. Strengthening antenatal care quality, early recognition of complications, referral communication, emergency obstetric capacity and integrated newborn care may improve outcomes.

Keywords

Obstetric Emergencies, Maternal Mortality, Neonatal Mortality, Emergency Obstetric Care, Hypertensive Disorders of Pregnancy, Obstetric Hemorrhage, Benin

1. Introduction

Obstetric emergencies remain one of the leading causes of preventable maternal and perinatal morbidity and mortality worldwide. They encompass acute complications occurring during pregnancy, labor, delivery, or the postpartum period that require immediate recognition and timely intervention to prevent severe maternal and fetal outcomes. Despite substantial progress in maternal health over the past two decades, these emergencies continue to pose major challenges, particularly in low- and middle-income countries (LMICs), where health systems often struggle with limited resources, delayed access to care, shortages of skilled personnel, and inadequate emergency obstetric services [1]-[3].

Globally, an estimated 287,000 women died from pregnancy- or childbirth-related causes in 2020, with nearly 95% of these deaths occurring in low-resource settings, most of them considered preventable through timely access to quality emergency obstetric care [4]. Hemorrhage, hypertensive disorders of pregnancy, sepsis, obstructed labor, and complications of unsafe abortion account for the vast majority of maternal deaths worldwide [4] [5]. These conditions also contribute substantially to adverse neonatal outcomes, including birth asphyxia, prematurity, stillbirth, and early neonatal death, thereby constituting a dual burden for maternal and newborn survival [5] [6].

Sub-Saharan Africa bears a disproportionate share of this burden. Although the region accounts for only a fraction of the world's population, it contributes approximately 70% of global maternal deaths (4). Several structural and health-system factors explain this situation, including delayed recognition of obstetric complications, poor utilization of antenatal care services, inefficient referral systems, transportation barriers, shortages of blood products, and insufficient availability

of comprehensive emergency obstetric and neonatal care services [7]-[9]. Consequently, strengthening emergency obstetric care remains one of the most cost-effective interventions for reducing maternal and neonatal mortality in the region [10].

Benin continues to face similar challenges despite sustained efforts to improve maternal and child health. National strategies aimed at expanding access to skilled birth attendance and emergency obstetric and neonatal care have contributed to improvements in maternal health indicators; however, maternal mortality remains unacceptably high compared with global targets established under the Sustainable Development Goals [11] [12]. Hypertensive disorders, obstetric hemorrhage, uterine rupture, obstructed labor, and severe fetal distress remain among the principal causes of obstetric referrals and maternal deaths reported by tertiary hospitals across the country [13]-[15]. These findings highlight persistent weaknesses in the continuum of obstetric care, particularly regarding timely diagnosis, referral, and emergency management.

The organization and performance of referral hospitals play a pivotal role in determining maternal and neonatal outcomes during obstetric emergencies. District hospitals constitute the first referral level for many pregnant women and therefore provide valuable information regarding the epidemiology, management practices, and prognosis of obstetric emergencies. Such evidence is essential for identifying deficiencies in emergency obstetric care, optimizing resource allocation, improving referral pathways, and strengthening quality-of-care initiatives [10] [16]. Nevertheless, available evidence from Benin remains largely concentrated in tertiary referral hospitals, while data describing the burden and clinical management of obstetric emergencies in district-level hospitals remain scarce.

The Comè Zone Hospital is one of the major referral facilities serving the Mono-Couffo health region in southwestern Benin. As a referral center receiving obstetric emergencies from peripheral health facilities, it manages a broad spectrum of life-threatening maternal and fetal complications. However, little is known about the epidemiological profile of these emergencies, the therapeutic interventions implemented, and the maternal and neonatal outcomes achieved within this setting. This lack of local evidence limits the capacity of healthcare managers and policymakers to develop targeted strategies aimed at improving emergency obstetric care and reducing preventable maternal and neonatal deaths.

This study aimed to describe the epidemiological characteristics, therapeutic management, and maternal and neonatal outcomes of obstetric emergencies managed at the maternity unit of Comè Zone Hospital, Benin, during the year 2020.

2. Methods

2.1. Study Design

A retrospective descriptive cross-sectional study was conducted at the maternity unit of Comè Zone Hospital, a secondary-level referral hospital located in southwestern Benin. The hospital serves as the main referral center for the Comè health

zone and receives obstetric emergencies from public and private peripheral health facilities within the Mono-Couffo region. The maternity unit provides comprehensive emergency obstetric and neonatal care, including emergency caesarean section, blood transfusion, neonatal resuscitation, and the management of severe obstetric complications. The study covered a one-year period from 1 January to 31 December 2020.

2.2. Study Population

The study population consisted of all women admitted to the maternity unit with an obstetric emergency during the study period. Eligible women were identified through the maternity admission register, after which their corresponding medical records were retrieved from the hospital archives for detailed review. Each woman was included only once in the analysis, irrespective of the number of interventions received during hospitalization.

2.3. Eligibility Criteria

Women were eligible if they were admitted between 1 January and 31 December 2020 with an obstetric emergency requiring immediate medical and/or surgical management. Medical records were included if they contained complete information on the principal study variables, including the diagnosis, emergency management, maternal outcome, and neonatal outcome when applicable. Records with incomplete information on these key variables were excluded from the analysis.

2.4. Operational Definition of Obstetric Emergency

An obstetric emergency was defined as any acute maternal or fetal condition occurring during pregnancy, labor, delivery, or the postpartum period that required immediate medical and/or surgical intervention to prevent severe maternal or fetal morbidity or death.

The following conditions were considered obstetric emergencies: hypertensive disorders of pregnancy (severe pre-eclampsia and eclampsia); obstetric hemorrhage (including postpartum hemorrhage, placenta previa, placental abruption, uterine rupture, ectopic pregnancy, and abortion-related hemorrhage); acute fetal distress; obstructed labor and other major dystocias; severe decompensated anemia; and severe obstetric infections.

2.5. Sampling Procedure

A consecutive exhaustive sampling strategy was used. During the study period, 1866 obstetric admissions were recorded in the maternity unit. All admissions were screened using the maternity admission register to identify women presenting with an obstetric emergency. A total of 372 obstetric emergency records were initially identified. After retrieval of the corresponding medical records, six records were excluded because of incomplete information on key study variables.

Consequently, 366 women were included in the final analysis. The prevalence of obstetric emergencies was calculated using the total number of obstetric admissions (n = 1866) as the denominator. The participant selection process is summarized in Figure 1.

2.6. Data Collection

Data were extracted using a standardized data collection form specifically developed for this study. Before data collection, the instrument was pilot-tested on medical records from a different study period to assess its clarity, completeness, and feasibility. Minor revisions were made before the start of data collection. Information was obtained from maternity admission registers, individual medical records, operative reports, delivery registers, and neonatal records. Data extraction was performed by trained investigators, and all completed forms were independently reviewed for completeness and internal consistency before database entry. Any discrepancies identified during data verification were resolved through consensus after review of the original medical records.

The following variables were collected:

- Sociodemographic characteristics: maternal age, nationality, place of residence, educational level, occupation, religion, and marital status.
- Obstetric characteristics: gravidity, parity, antenatal care attendance, number of antenatal care visits, antenatal care provider, referral status, referring facility, transport modality, and communication between referring facilities and the receiving hospital.
- Clinical characteristics: type of obstetric emergency, principal diagnosis, time from hospital admission to initiation of emergency management, initial stabilization measures, medical treatment, obstetric procedures, and surgical interventions.
- Maternal outcomes: duration of hospitalization, discharge status, maternal complications occurring during hospitalization, and maternal death.
- Neonatal outcomes: mode of delivery, live birth, stillbirth, Apgar score at one minute, neonatal resuscitation, and neonatal death before hospital discharge.

2.7. Outcome Measures

The primary outcome was the burden of obstetric emergencies, expressed as the proportion of obstetric admissions complicated by an obstetric emergency during the study period. Secondary outcomes included the therapeutic management of obstetric emergencies, maternal outcomes, maternal complications occurring during hospitalization, and neonatal outcomes.

Maternal outcome at hospital discharge was classified into four mutually exclusive categories: discharged after clinical recovery; maternal death during hospitalization; discharge against medical advice; absconding before formal discharge.

Maternal complications included puerperal infection, anemia, surgical site infection, thrombophlebitis, and other complications documented during hospitalization. Neonatal outcomes were assessed among women who delivered during

the index hospitalization. Neonatal mortality was defined as the proportion of live-born infants who died before hospital discharge. Stillbirths were analyzed separately and were therefore excluded from the denominator used to calculate neonatal mortality. In multiple pregnancies, each newborn was considered as an individual observation for neonatal outcome assessment.

2.8. Quality Assurance and Statistical Analysis

To ensure data quality, investigators received standardized training before data collection. The data collection tool was pilot-tested before implementation, and extracted data were independently checked for completeness, consistency, and plausibility. Any discrepancies identified during data verification were resolved through review of the original medical records before statistical analysis.

Data were entered using EpiData version 3.1 with double-entry verification to minimize transcription errors. Statistical analyses were performed using Epi Info version 7.2.2 (Centers for Disease Control and Prevention, Atlanta, GA, USA).

Quantitative variables were summarized as means with standard deviations (SD) or medians with ranges, as appropriate. Categorical variables were described using frequencies and percentages. For procedure-specific interventions, percentages were calculated using the appropriate eligible denominator whenever applicable. Numerical results were reported using a consistent rounding convention throughout the manuscript.

Given the descriptive objective of the study, no hypothesis testing or multivariable analyses were performed.

2.9. Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Ethical approval was obtained from the Local Ethics Committee for Biomedical Research of the University of Parakou (Reference No. 0404/CLERB-UP/P/SP/R/SA). Administrative authorization to access hospital records was also obtained from the management of Comè Zone Hospital before commencement of the study.

Because this was a retrospective study based exclusively on routinely collected hospital records and involved no direct contact with patients, the requirement for individual informed consent was waived by the ethics committee. All extracted data were anonymized prior to analysis, and strict confidentiality was maintained throughout the study.

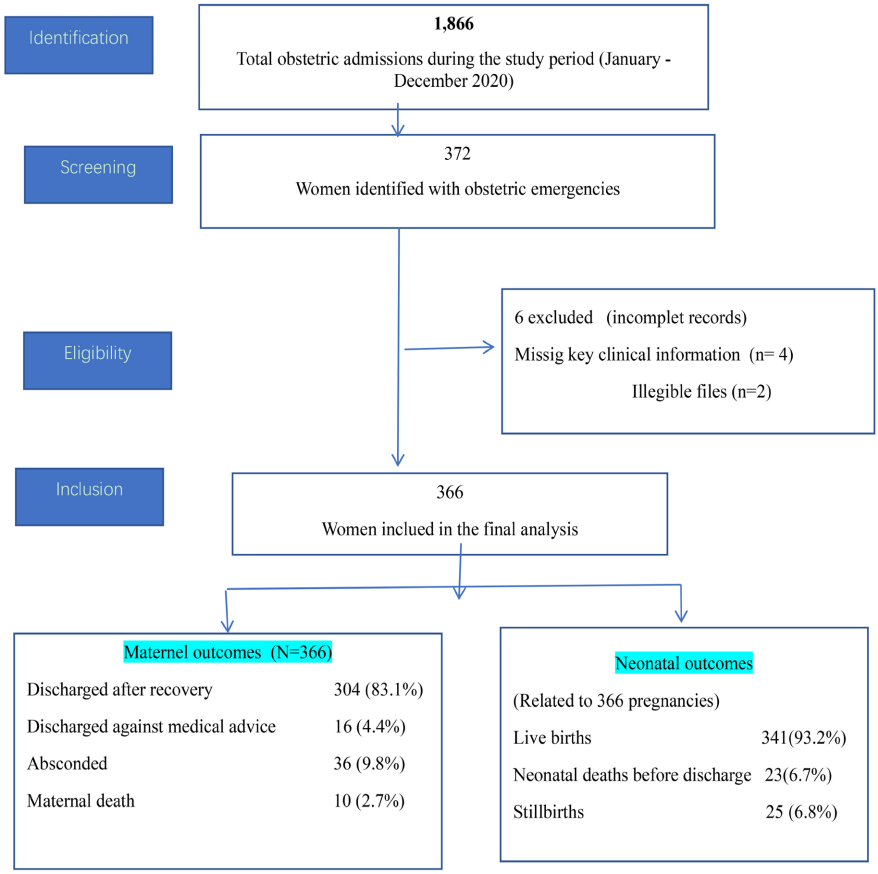
3. Results

3.1. Study Population

During the study period, 1866 obstetric admissions were recorded at the maternity unit of Comè Zone Hospital.

Screening of the maternity admission register identified 372 women presenting

with an obstetric emergency. After retrieval and review of the corresponding medical records, six records were excluded because of incomplete information on key study variables. Consequently, 366 women were included in the final analysis, corresponding to an overall prevalence of 19.6% of obstetric emergencies among all obstetric admissions (Figure 1). No duplicate medical records were identified during data cleaning and verification.



Pourcentage are calculated based on the total number of women included (N = 366) unless otherwise specified. Neonatal mortality rate = neoanatal deaths among live births/total live births (6.7%).

Figure 1. Flow diagram of participant selection and inclusion in the study conducted at Comè Zone Hospital, Benin, January-December 2020.

3.2. Sociodemographic Characteristics

The mean maternal age was 26.6 ± 6.5 years (range: 15 - 47 years). Women aged 20 - 29 years represented the largest age group (54.6%), while adolescents (<20 years) accounted for 12.6% of the study population. Most participants were Beninese (98.6%) and resided in urban areas (57.4%). Regarding educational attainment, 38.0% had completed secondary education, 35.0% primary education, and 3.6% tertiary education. The most frequent occupations were trading (31.2%), artisanal work (26.5%), and housekeeping (24.0%). Overall, 81.7% of women were living in common law union (Table 1).

Table 1. Sociodemographic characteristics of women admitted with obstetric emergencies at Comè Zone Hospital, Benin, January-December 2020 (N = 366).

	n	%
Age group (years)		
<20	46	12.6
20 - 29	200	54.6
30 - 39	99	27.0
≥40	21	5.7
Mean age ± SD (years)	**26.6 ± 6.5**	
Nationality		
Beninese	361	98.6
Other	5	1.4
Place of residence		
Urban	210	57.4
Rural	156	42.6
Educational level		
No formal education	52	14.2
Primary	128	35.0
Secondary	139	38.0
Tertiary	13	3.6
Quranic/Other	34	9.3
Occupation		
Trader	114	31.2
Artisan	97	26.5
Housewife	88	24.0
Civil servant	34	9.3
Student	20	5.5
Other	13	3.6
Marital status		
Married/In common law	299	81.7
Single	53	14.5
Divorced/Widowed	14	3.8
Religion		
Christian	201	54.9
Muslim	141	38.5
Traditional/Other	24	6.6

3.3. Obstetric Characteristics and Referral Patterns

Primigravidae accounted for 36.3% of participants, while 40.9% were nulliparous. Overall, 264 women (72.1%) attended at least one antenatal care (ANC) visit, whereas 102 (27.9%) had received no antenatal care during the index pregnancy. Among women who attended ANC (n = 264), 191 (72.3%) completed one to three visits and 73 (27.7%) attended four or more visits. ANC was mainly provided by midwives (67.4%), followed by obstetricians (16.7%) and general practitioners (9.5%). A total of 246 women (67.2%) were referred from another health facility. Most referrals originated from public health facilities (92.7%), and 68.3% of women were transported by ambulance. However, prior communication with the receiving hospital was documented for only 39.4% of referrals (Table 2).

Table 2. Obstetric history, antenatal care utilization, and referral characteristics of women admitted with obstetric emergencies at Comè Zone Hospital, Benin, January-December 2020 (N = 366).

	n	%
Gravidity		
Primigravida	133	36.3
Paucigravida	115	31.4
Multigravida	82	22.4
Grand multigravida	17	4.6
Other	19	5.2
Parity		
Nulliparous	150	40.9
Primiparous	80	21.9
Pauciparous	68	18.6
Multiparous	34	9.3
Grand multiparous	34	9.3
Antenatal care attendance		
No antenatal care	102	27.9
At least one antenatal visit	264	72.1
Number of antenatal visits (n = 264)		
1 - 3 visits	191	72.3
≥4 visits	73	27.7
Main antenatal care provider (n = 264)		
Midwife	178	67.4
Obstetrician	44	16.7
General practitioner	25	9.5
Nurse	12	4.5
Auxiliary nurse	5	1.9

Continued

Referral status		
Referred	246	67.2
Self-referred	120	32.8
Origin of referral (n = 246)		
Public health facility	228	92.7
Private health facility	18	7.3
Transport to referral hospital (n = 246)		
Ambulance	168	68.3
Private/public transport	78	31.7
Receiving hospital notified before transfer (n = 246)		
Yes	97	39.4
No	149	60.6

3.4. Clinical Profile of Obstetric Emergencies

Hypertensive disorders of pregnancy were the leading obstetric emergencies, affecting 130 women (35.5%). Severe pre-eclampsia accounted for 108 cases (83.1%) within this category, whereas 22 women (16.9%) presented with eclampsia. Obstetric hemorrhage was the second most frequent emergency, occurring in 100 women (27.3%). Among hemorrhagic emergencies, postpartum hemorrhage represented 45.0%, placenta previa 35.0%, and placental abruption 15.0%. Acute fetal distress accounted for 92 cases (25.1%), followed by dystocia (6.3%), severe anemia (4.6%), and obstetric infection (1.1%) (Table 3).

Table 3. Clinical profile and distribution of obstetric emergencies among women admitted to Comè Zone Hospital, Benin, January-December 2020 (N = 366).

	n	%
Hypertensive disorders of pregnancy	130	35.5
• Severe pre-eclampsia	108	83.1*
• Eclampsia	22	16.9*
Obstetric hemorrhage	100	27.3
• Postpartum hemorrhage	45	45.0*
• Placenta previa	35	35.0*
• Placental abruption	15	15.0*
• Other hemorrhagic conditions	5	5.0*
Acute fetal distress	92	25.1
Dystocia	23	6.3
Severe anemia	17	4.6
Obstetric infection	4	1.1

* Percentages were calculated within each diagnostic category.

3.5. Emergency Stabilization and Therapeutic Management

Initial stabilization measures were initiated in 270 women (73.8%). The mean interval between hospital admission and initiation of emergency management was 10.5 ± 4.5 minutes. The most frequently implemented stabilization procedures included placement of two peripheral intravenous lines (65.0%), left lateral positioning (48.1%), oxygen therapy (20.8%), intravenous fluid resuscitation (16.9%), insertion of an oropharyngeal airway (5.7%), and oropharyngeal suction (2.7%). Medical treatment consisted mainly of oxytocin administration (73.8%), antibiotic therapy (52.5%), antihypertensive medication (35.5%), magnesium sulphate or other anticonvulsant therapy (21.3%), and blood transfusion (8.5%). Emergency caesarean section was performed in 223 women (60.9%), while 143 women (39.1%) delivered vaginally. Among vaginal deliveries (n = 143), 51 (35.7%) required vacuum-assisted delivery. Artificial rupture of membranes and uterine exploration were performed in 41 (28.7%) and 38 (26.6%) women with vaginal deliveries, respectively. Other procedures included speculum examination under anesthesia (36.6%), hysterectomy (3.8%), and salpingectomy or salpingotomy (3.3%) (Table 4).

Table 4. Initial stabilization measures and therapeutic management of obstetric emergencies at Comè Zone Hospital, Benin, January-December 2020 (N = 366).

		n	%
Initial stabilization (N = 366)			
Initial emergency stabilization	Yes	270	73.8
	No	96	26.2
Two peripheral intravenous lines	Yes	238	65.0
	No	128	35.0
Left lateral positioning	Yes	176	48.1
	No	190	51.9
Oxygen therapy	Yes	76	20.8
	No	290	79.2
Intravenous fluid resuscitation	Yes	62	16.9
	No	304	83.1
Oropharyngeal airway	Yes	21	5.7
	No	345	94.3
Oropharyngeal suction	Yes	10	2.7
	No	356	97.3
Medical treatment (N = 366)			
Oxytocin	Yes	270	73.8
	No	96	26.2
Antibiotic therapy	Yes	192	52.5
	No	174	47.5

Continued

Antihypertensive treatment	Yes	130	35.5
	No	236	64.5
Magnesium sulphate/anticonvulsant therapy	Yes	78	21.3
	No	288	78.7
Blood transfusion	Yes	31	8.5
	No	335	91.5
Mode of delivery (N = 366)			
Mode of delivery	Caesarean section	223	60.9
	Vaginal delivery	143	39.1
Type of vaginal delivery (n = 143)			
Vaginal delivery	Spontaneous	92	64.3
	Vacuum-assisted	51	35.7
Procedures during vaginal delivery (n = 143)			
Artificial rupture of membranes	Yes	41	28.7
	No	102	71.3
Uterine exploration/revision	Yes	38	26.6
	No	105	73.4
Other obstetric procedures (N = 366)			
Speculum examination under anesthesia	Yes	134	36.6
	No	232	63.4
Hysterectomy	Yes	14	3.8
	No	352	96.2
Salpingectomy/salpingotomy	Yes	12	3.3
	No	354	96.7

3.6. Maternal Outcomes

Among the 366 women included in the study, 304 (83.1%) were discharged after complete clinical recovery. Sixteen women (4.4%) were discharged against medical advice, 36 (9.8%) left the hospital before formal discharge (absconded), and 10 women (2.7%) died during hospitalization (Table 5). The mean duration of hospital stay was 7 ± 3 days. Maternal complications were documented in 36 women (9.8%), irrespective of discharge status. Puerperal infection was the most frequent complication (14/36; 38.9%), followed by anemia (10/36; 27.8%), surgical site infection (8/36; 22.2%), and thrombophlebitis (4/36; 11.1%). The maternal case fatality rate was 2.7% (10/366). Obstetric hemorrhage was responsible for five deaths (50.0%), while hypertensive disorders of pregnancy accounted for four deaths (40.0%). One death (10.0%) resulted from severe sepsis.

3.7. Neonatal Outcomes

Among the 366 pregnancies, 341 (93.2%) resulted in live births and 25 (6.8%) in stillbirths (Table 5). Among live-born infants (n = 341), 259 (75.9%) had an Apgar score of ≥7 at one minute, whereas 60 (17.6%) required neonatal resuscitation immediately after birth. A total of 23 neonatal deaths occurred before hospital discharge among the 341 live-born infants, corresponding to an in-hospital neonatal mortality rate of 6.7%. Stillbirths were analyzed separately and were therefore not included in the calculation of neonatal mortality.

Table 5. Maternal and neonatal outcomes following the management of obstetric emergencies at Comè Zone Hospital, Benin, January-December 2020 (N = 366).

	n	%
Maternal outcomes		
Discharged after clinical recovery	304	83.1
Maternal death	10	2.7
Discharge against medical advice	16	4.4
Absconded	36	9.8
Mean hospital stay (days ± SD)	**7 ± 3**	
Maternal complications (n = 36)		
Puerperal infection	14	38.9
Anemia	10	27.8
Surgical site infection	8	22.2
Thrombophlebitis	4	11.1
Neonatal outcomes		
Total deliveries	366	
Live births	341	93.2
Stillbirths	25	6.8
Apgar score ≥ 7 at 1 minute (n = 341)	259	75.9
Neonatal resuscitation (n = 341)	60	17.6
Neonatal deaths before hospital discharge (n = 341)	23	6.7

4. Discussion

This study provides a comprehensive description of the epidemiological profile, clinical management, and maternal and neonatal outcomes of obstetric emergencies managed at Comè Zone Hospital, a secondary referral facility in southwestern Benin. Obstetric emergencies accounted for 19.6% of all obstetric admissions during the study period. Hypertensive disorders of pregnancy, obstetric hemorrhage, and acute fetal distress were the most frequent emergency conditions. Most women required urgent obstetric intervention, with caesarean section performed in 60.9% of cases. Although 83.1% of women were discharged after clinical recov-

ery, maternal mortality remained 2.7%, while in-hospital neonatal mortality was 6.7% among live-born infants. The findings also identified important gaps in antenatal care utilization and inter-facility referral communication.

4.1. Burden and Epidemiological Profile of Obstetric Emergencies

The prevalence of obstetric emergencies observed in this study (19.6%) confirms that these conditions represent a substantial component of obstetric activity in secondary referral hospitals. Similar frequencies have been reported in other hospitals in Benin, where obstetric emergencies account for approximately one-fifth to one-third of obstetric admissions [13]-[15]. Comparable findings have been described in other West African settings, although estimates vary according to the level of the health facility, referral patterns and the operational definition used for obstetric emergencies [16]-[18].

The relatively high burden observed at Comè Zone Hospital should therefore be interpreted in the context of its role as a referral facility. Women with uncomplicated pregnancies are more likely to be managed at peripheral facilities, whereas women with severe or potentially life-threatening complications are preferentially referred to hospitals with surgical, transfusion and neonatal care capacity. The proportion observed in this study consequently reflects both the underlying burden of obstetric complications and the organization of the referral system.

Women presenting with obstetric emergencies were predominantly young adults, with a mean age of 26.6 years. This finding is broadly consistent with reports from Benin and neighboring West African countries [14] [15] [18]. The predominance of women in this age group probably reflects the age distribution of pregnancy and childbirth in the population rather than an intrinsically greater biological susceptibility to obstetric emergencies.

Nevertheless, the proportion of adolescents in the study population warrants attention. Adolescence may be associated with increased risks of hypertensive disorders, obstructed labor, anemia and adverse perinatal outcomes. This finding supports the importance of accessible reproductive health information, adolescent-friendly services and effective family planning interventions aimed at preventing unintended and very early pregnancies.

4.2. Antenatal Care and Opportunities for Prevention

A major finding was the inadequate utilization of antenatal care. More than one-quarter of women had received no antenatal care during the index pregnancy, and among those who had attended at least one consultation, only 27.7% had completed four or more visits. Although antenatal care cannot prevent all obstetric emergencies, it provides an important opportunity to identify and manage conditions associated with severe maternal and neonatal morbidity. Blood pressure measurement, assessment for proteinuria, detection and treatment of anemia, identification of other maternal risk factors, birth preparedness and timely referral are central components of this preventive approach [4] [19].

However, the findings should not be interpreted as indicating that the number of antenatal consultations alone determines the occurrence or severity of obstetric emergencies. The content and quality of care provided during each contact are also important. A woman may attend several consultations without receiving adequate screening, counselling or risk assessment. Strengthening the quality and continuity of antenatal care at primary and community levels may therefore be more important than focusing exclusively on attendance targets. The proportion of women without antenatal care also suggests that opportunities for early detection of hypertensive disorders and other potentially preventable complications are being missed. Strengthening links between community-based services, primary healthcare facilities and referral hospitals could facilitate earlier identification of high-risk pregnancies and timelier referral.

4.3. Referral Pathways and Health-System Factors

Referral pathways represented another important finding. Two-thirds of the women included in the study were referred from another health facility, confirming the central role of Comè Zone Hospital within the local obstetric referral network. However, only 39.4% of referring facilities had documented communication with the receiving hospital before transfer. This gap is particularly important in emergency obstetric care. Effective communication before transfer can allow the receiving team to anticipate the woman's clinical needs, mobilize appropriate personnel, prepare the operating theatre, arrange blood products and ensure the availability of neonatal resuscitation capacity. WHO standards for quality maternal and newborn care emphasize the importance of effective referral and communication mechanisms within health systems [20].

The relatively high use of ambulance transport (68.3%) suggests that physical transportation capacity is available for a substantial proportion of referred women. However, transportation alone does not ensure a safe referral. Delays may occur before departure, during transport, or after arrival if the receiving facility has not been adequately prepared. In addition, the present retrospective design did not allow us to assess the quality of pre-referral stabilization or the exact duration of each component of the referral process. Previous reports from West Africa have similarly highlighted weaknesses in referral organization despite the availability of emergency obstetric services [10] [16].

These findings suggest that strengthening the referral system should extend beyond increasing ambulance availability. Standardized referral protocols, direct communication between facilities, clear documentation of clinical status and treatment before transfer, and feedback from receiving to referring facilities may improve continuity of emergency care.

4.4. Clinical Profile of Obstetric Emergencies

Hypertensive disorders of pregnancy were the most frequent obstetric emergencies in this study, accounting for 35.5% of cases, followed by obstetric hemorrhage

(27.3%) and acute fetal distress (25.1%). This distribution highlights the importance of both maternal and fetal indications in the emergency obstetric workload. The predominance of hypertensive disorders differs from some African studies in which hemorrhage remains the leading emergency condition, but is consistent with evidence indicating a substantial burden of hypertensive disorders of pregnancy across sub-Saharan Africa [21]. Severe pre-eclampsia accounted for the majority of hypertensive emergencies in our population, while eclampsia represented a smaller but clinically important proportion.

The high frequency of hypertensive emergencies reinforces the importance of early detection and appropriate management at primary healthcare level. Because hypertension can be identified through relatively simple clinical assessment, strengthening routine blood pressure measurement, recognition of warning signs and appropriate referral may reduce progression to severe disease. However, the retrospective design does not allow us to determine whether these conditions developed despite adequate antenatal surveillance or remained undiagnosed because women had limited access to care.

Obstetric hemorrhage remained the second leading emergency and was responsible for 50% of maternal deaths in this study. Severe hemorrhage can progress rapidly to hypovolemic shock and death without timely treatment (4, 22). Effective management therefore depends on rapid recognition, availability of uterotonic agents, intravenous access, blood transfusion, surgical capacity and coordinated multidisciplinary care.

The contribution of hemorrhage to maternal deaths also supports the importance of maintaining functional blood transfusion systems and ensuring that emergency obstetric teams are able to implement standardized hemorrhage management protocols without delay. Simulation-based training and emergency drills may contribute to improving team performance during such time-critical events [22].

4.5. Emergency Intervention and Caesarean Delivery

Emergency caesarean section was performed in 60.9% of women. This high proportion should be interpreted in relation to the case mix of a referral hospital rather than considered in isolation as an indicator of excessive surgical intervention. Acute fetal distress and hypertensive disorders were among the principal emergency conditions requiring urgent delivery.

At the same time, emergency caesarean section carries important risks, particularly in settings where blood products, anesthesia, postoperative monitoring and infection prevention resources may be constrained. The objective should therefore be to ensure that caesarean delivery is undertaken when clinically indicated while simultaneously improving the safety and timeliness of emergency surgery.

The findings also highlight the importance of strengthening the continuum of care between primary facilities and referral hospitals. Earlier recognition and referral of women with evolving complications may allow intervention before severe maternal or fetal compromise develops and may, in selected cases, reduce the need

for more complex emergency interventions.

4.6. Maternal and Neonatal Outcomes

Most women in the study (83.1%) were discharged after clinical recovery. However, 10 maternal deaths occurred among the 366 women included, corresponding to a maternal case fatality rate of 2.7%. This finding demonstrates that, despite the availability of emergency obstetric services, a proportion of women presenting with severe complications remain at substantial risk of death. Obstetric hemorrhage accounted for half of the maternal deaths, while hypertensive disorders accounted for a further 40%. This distribution reinforces the need to prioritize rapid recognition and treatment of these two major causes of severe maternal morbidity.

The study also documented 16 discharges against medical advice and 36 episodes of absconding. These outcomes are clinically important because leaving hospital before formal completion of care may expose women to preventable complications after an emergency intervention. However, the retrospective design did not allow us to determine the reasons for leaving hospital, and no assumptions should therefore be made regarding the causes of these events. Future studies should explore the socioeconomic, cultural, communication and health-system factors associated with premature departure from hospital. Neonatal outcomes similarly indicate a substantial burden. Of the 341 live-born infants, 23 died before hospital discharge, corresponding to an in-hospital neonatal mortality rate of 6.7%. The denominator is important because stillbirths were analyzed separately and were not included in the calculation of neonatal mortality.

The occurrence of neonatal deaths in the context of obstetric emergencies illustrates the close interdependence between timely maternal and newborn care. Acute fetal distress, severe maternal hypertension and obstetric hemorrhage can all compromise fetal and neonatal survival. Improving outcomes therefore requires integrated emergency obstetric and neonatal care, including timely delivery, appropriate fetal surveillance and effective neonatal resuscitation.

4.7. Implications for Clinical Practice and Health Policy

Improving the quality of antenatal care should remain a priority, particularly at primary healthcare level. Beyond increasing attendance, emphasis should be placed on effective screening for hypertension and anemia, identification of high-risk pregnancies, counselling regarding warning signs and birth preparedness, and timely referral.

Second, the referral system requires strengthening. The low proportion of documented pre-transfer communication indicates a potentially modifiable health-system gap. Establishing standardized referral communication procedures, including direct communication between referring and receiving teams, may improve preparedness and reduce avoidable delays.

Third, referral hospitals should maintain reliable access to essential medicines,

blood products, emergency surgical capacity and neonatal resuscitation equipment. These resources are particularly important for the management of hemorrhage and severe hypertensive disorders, which accounted for most maternal deaths in this study.

Finally, regular simulation-based emergency training and clinical audits could support continuous quality improvement. Simulation has been proposed as a useful strategy for improving preparedness and team performance in obstetric emergencies [23], while systematic review of severe maternal outcomes and maternal deaths can help identify potentially avoidable factors and guide corrective interventions.

4.8. Study Limitations

This study included all eligible obstetric emergencies managed during a complete one-year period, providing a comprehensive description of the emergency obstetric workload of a secondary referral hospital. Second, information was obtained from multiple routine clinical sources, including admission registers, medical records, operative reports and delivery records. Third, the study considered both maternal and neonatal outcomes, allowing a more integrated assessment of emergency obstetric care.

Several limitations should nevertheless be considered. First, the retrospective design depended on the quality and completeness of routinely collected medical records. Although six records with insufficient information on key study variables were excluded, some clinical details may have been incompletely documented in the included records. Second, the study was descriptive and therefore cannot establish causal relationships or identify independent predictors of maternal or neonatal adverse outcomes. Third, the study was conducted in a single secondary referral hospital, which limits the generalizability of the findings to other facilities or regions of Benin. Finally, outcomes were assessed only during the index hospitalization; maternal and neonatal outcomes after discharge could therefore not be evaluated.

5. Conclusions

Obstetric emergencies accounted for nearly one-fifth of obstetric admissions at Comè Zone Hospital and represented a substantial component of the workload of this secondary referral facility. Hypertensive disorders, obstetric hemorrhage and acute fetal distress were the leading emergency conditions, while maternal and neonatal deaths remained important despite generally favorable maternal outcomes.

The findings point to opportunities for improvement across the continuum of care, particularly through better-quality antenatal care, earlier recognition of complications, stronger referral coordination and reliable availability of essential emergency obstetric and neonatal resources. Prospective multicenter studies are warranted to identify predictors of adverse outcomes and evaluate interventions

aimed at improving the quality and timeliness of emergency obstetric care in Benin.

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Author Contributions

ATADE and VODOUHE produced the manuscript. TOGBENON DOHA and BAKARY worked on the variables. ALIHO and SIPOTY conducted the fieldwork. SALIFOU read and approved the final version.

Conflicts of Interest

The authors declare that they have no competing interests.

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