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Maternal-Fetal Prognosis of Obstetric Emergencies Admitted to CHU Gabriel Touré in Bamako during the Power Rationing Period from September 2023 to August 2024

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Abstract

Introduction: Power outages, known as electrical rationing, are frequent in Mali, particularly affecting healthcare facilities. The impact of these outages on maternal-fetal prognosis has not been sufficiently studied in Mali, which justifies this research conducted at CHU Gabriel Touré in Bamako. **Objectives:** The main objective of this study was to assess the impact of electrical rationing on the maternal-fetal prognosis of obstetric emergencies at CHU Gabriel Touré in Bamako, in order to formulate recommendations for improving care in a context of energy failure. **Methodology:** This was a cross-sectional case-control study conducted between September 2023 and August 2024. The sample included 224 patients evacuated due to power rationing and 448 controls evacuated for other medical reasons. Data were collected from medical records and consultation registers. Statistical analysis was performed using SPSS software, employing tests such as Chi² and Fisher's exact test. **Results:** The study revealed that 33.3% of evacuated patients were under power rationing, with more severe complications in this group. The main indications for evacuation were labor on a scarred uterus (18.3%), malpresentations (16.5%), and acute fetal distress (9.4%). Compared to controls, patients under rationing had a much higher cesarean rate (76.7% vs. 55.4%, $p < 0.001$). Pathologies requiring urgent interventions, such as acute fetal asphyxia (14.3% vs. 5.6%) and presentation disorders (9% vs. 2.7%), were also more frequent. Regarding newborns, the stillbirth rate was lower for cases under rationing (10.3% vs. 22.9%, OR = 0.39), but Apgar scores at the first minute were signif-

icantly lower in newborns exposed to power outages (32.6% with score ≤7 vs. 21.6%). Maternal complications in the postpartum period were more frequent among patients under rationing (24.7% vs. 18.1%, p = 0.046), particularly postpartum hemorrhages. **Conclusion:** This study demonstrates that electrical rationing exacerbates obstetric and neonatal complications, increasing the resort to cesareans and the rate of fetal distress. Although the stillbirth rate is lower in exposed cases, the lower Apgar scores indicate increased neonatal distress.

Keywords

Electrical Rationing, Obstetric Emergencies, Maternal-Fetal Prognosis, CHU Gabriel Touré, Bamako, Mali

1. Introduction

Electricity plays a particularly critical role in gynecology-obstetrics services, where rapid and effective management of emergencies often determines the survival of both mother and child.

Electrical rationing, defined as a temporary and planned interruption of electricity supply in a given area, affects both households and institutions [1]. These interruptions can lead to major disruptions, particularly in healthcare facilities lacking autonomous power systems (generators, solar energy, etc.).

Historically, electricity has played a key role in the development of modern medicine, both in diagnostics and treatment [2] [3]. Obstetric emergencies, characterized by their diversity and severity, require immediate therapeutic management in a secure technical environment [4].

In under-equipped health facilities, power rationing severely disrupts the management of obstetric emergencies, sometimes necessitating evacuations to better-equipped hospital centers, such as CHU Gabriel Touré in Bamako. This dynamic tends to alter the classic referral patterns, which are generally medico-surgical, by adding energy failure-related motives.

The referral and evacuation system, essential to the organization of primary healthcare, is intended to ensure continuity of care by facilitating the orientation of patients to more specialized levels of care [5] [6]. A study conducted in the state of Maharashtra in India showed that each additional power outage led to a 2.08% decrease in facility-based deliveries, with a parallel 18% increase in home births and a reduction in the likelihood of assistance by a skilled professional (OR: 0.97) [7]. In Uganda, the installation of solar panels in 30 rural maternity wards reduced nighttime care delays by 10 minutes, improved care quality by 4 points, and ensured adequate lighting in 100% of deliveries, compared to 40% previously [8].

In Togo, the solar equipping of 122 health centers resolved issues related to darkness, thereby contributing to the prevention of postpartum hemorrhages, which are often fatal [9]. Similarly, a study on the maternal-fetal prognosis of se-

vere preeclampsia cases in intensive care demonstrated that power outages, by exacerbating deficiencies in equipment and training, represent a major factor in maternal mortality in Africa [10].

Although international data on this topic are abundant, no specific study has yet evaluated the impact of power rationing on the prognosis of obstetric emergencies in Mali, particularly at CHU Gabriel Touré in Bamako. This scientific gap is concerning, especially given the frequent power outages and the strong growth in obstetric demand in the country.

It is in this context that the present study was undertaken. Its objective is to investigate the impact of electrical rationing on the maternal-fetal prognosis of obstetric emergencies managed at CHU Gabriel Touré and to formulate concrete recommendations aimed at improving emergency management and strengthening the resilience of the health system against energy interruptions.

The research hypotheses are as follows: Repeated power outages in health facilities have a negative impact on maternal and neonatal mortality rates by delaying critical medical interventions during obstetric emergencies. Power outages impair the quality of obstetric emergency care (difficult deliveries, hemorrhages, cesareans, neonatal resuscitation), increasing the likelihood of severe complications and the need for emergency evacuations to other better-equipped hospital centers.

2. Patients and Methods

2.1. Study Setting

Our study was conducted in the Gynecology-Obstetrics department of the University Hospital Center Gabriel Touré. This is a tertiary referral facility within Mali's health pyramid, equipped with backup generators and solar panels to ensure the continuity of emergency care.

It was a cross-sectional case-control study conducted over a one-year period from September 2023 to August 2024.

Our population consisted of patients admitted during the gravid-puerperal period in the department during the relevant data collection period.

We conducted exhaustive sampling for cases including the files of patients evacuated during pregnancy or postpartum for reasons of electrical load shedding written on the medical evacuation form and, for the control group, the files of patients evacuated during pregnancy or postpartum for reasons other than load shedding written on the medical evacuation form.

We selected one case for every two controls, regardless of their ages or obstetric histories.

Data were collected using an investigation form from obstetric records, referral/evacuation forms, prenatal consultation booklets (CPN), the operative report register, and the register of emergency obstetric and neonatal care (SONU).

Data entry was performed using Microsoft Word and Excel Office 2019 software. Data analysis was conducted using SPSS software (version not specified), with statistical tests including Chi^2, Yates' correction, and Fisher's exact test, using

a significance threshold of $p < 0.05$.

Anonymity was guaranteed.

2.2. Operational Definitions

Maternal-fetal prognosis: The outcome of the pregnancy for the mother and fetus in terms of mortality and morbidity.

Morbid Apgar: Apgar score ≤ 7.

Risk factors: Any characteristic or circumstance attached to a person or group of people that is known to be associated with an abnormal risk of the existence or evolution of a process or special exposure to such a process.

World Health Organization (WHO) Score for General Condition:

WHO 0 = (excellent condition), **WHO 1** = (good condition, mild restrictions), **WHO 2** = (average condition, limited autonomy), **WHO 3** = (altered condition, assistance necessary),

WHO 4 = (severely altered condition).

3. Results

3.1. Frequency and Motive of Evacuations

During the data collection period, we recorded 224 obstetric emergencies evacuated to the service due to electrical rationing and 448 emergency admissions for reasons other than rationing (see Table 1). In Figure 1, we present the monthly evolution of the frequency of admissions due to electrical rationing.

Table 1. Distribution of parturients according to the motive for evacuation.

Motive for Evacuation	No.	Percentage (%)
Electrical Rationing	224	33.3
Other Motive	448	66.6
Total	**672**	**100.0**

Among the 448 evacuations for reasons other than electrical rationing, 42 (6.2%) were due to practical non-medical dysfunctions, while 406 (60.4%) were evacuated for medical reasons.

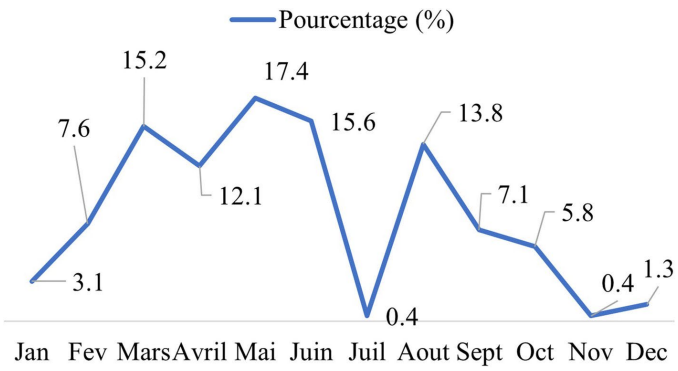

Figure 1. Monthly evolution of admissions due to electrical rationing.

The main motives for evacuations due to electrical rationing were: labor on a multi-scarred uterus (18.3% for cases versus 1.1% for controls), malpresentations (16.5% for cases versus 0.9% for controls), and acute fetal distress and labor on a uni-scarred uterus, respectively 9.4% and 9.4% for cases versus 0.7% and 0.2% for controls (see Table 2).

Table 2. Distribution of parturients according to their motive for evacuation.

Motives for Evacuation	No.		Total (%)	*p*	OR [IC]
	Cases (%)	Controls (%)			
Severe Preeclampsia	8 (3.5)	142 (31.7)	150 (22.2)	$< 10^{-3}$	0.05 [0.02 - 0.12]
Retroplacental Hematoma	14 (6.3)	59 (13.2)	73 (10.9)	0.005	0.43 [0.24 - 0.80]
Eclampsia	0 (0)	54 (12.1)	54 (8.0)	$< 10^{-3}$	-
Multi-scarred Uterus	41 (18.3)	5 (1.1)	46 (6.8)	$< 10^{-3}$	19.9 [7.72 - 51.0]
Eclamptic Crisis	0 (0)	42 (9.4)	42 (6.3)	$< 10^{-3}$	-
Malpresentations	37 (16.5)	4 (0.9)	41 (6.1)	$< 10^{-3}$	22.0 [7.71 - 62.5]
Premature Rupture of Membranes	2 (0.9)	24 (5.4)	26 (3.9)	0.004	0.16 [0.04 - 0.68]
In-utero Transfer for Preterm Pregnancy	0 (0)	26 (5.8)	26 (3.9)	$< 10^{-3}$	-
Acute Fetal Distress	21 (9.4)	3 (0.7)	24 (3.6)	$< 10^{-3}$	14.0 [4.14 - 47.5]
Scarred Uterus	21 (9.4)	1 (0.2)	22 (3.3)	$< 10^{-3}$	42.3 [5.65 - 316.4]

3.2. Sociodemographic Characteristics

The mean age of the total sample was 26.26 ± 6.68 years, with extremes of 15 and 46 years. For the cases, the mean age was 26.54 ± 6.42 years, with extremes of 15 and 46 years, while for the controls, the mean age was 26.12 ± 6.81 years, with extremes of 15 and 46 years. More than half of the cases were uneducated (58.5%) compared to 56.5% for the controls, with an OR of 0.95 and a confidence interval [0.68 – 1.33]. These data are listed in Table 3.

Table 3. Sociodemographic characteristics.

Age Group (in years)	No.		Total (%)	*p*	OR [IC]
	Cases (%)	Controls (%)			
< 20	37 (16.5)	92 (20.5)	129 (19.2)	0.196	0.77 [0.50 - 1.17]
20 - 35	167 (74.6)	308 (68.8)	475 (70.7)	0.071	1.33 [0.93 - 1.91]
> 35	20 (8.9)	48 (10.7)	68 (10.1)	0.419	0.82 [0.47 - 1.41]
Total	**224 (33.3)**	**448 (66.7)**	**672 (100.0)**		
Education Level	**No.**		**Total (%)**	***p***	**OR [IC]**
	Cases (%)	**Controls (%)**			
No Formal Education	131 (58.5)	172 (56.5)	384 (57.1)	0.808	0.95 [0.68 - 1.33]
Primary	43 (19.2)	103 (22.99)	146 (21.7)	0.268	0.80 [0.53 - 1.19]
Secondary	30 (13.4)	58 (12.95)	88 (13.1)	0.865	1.04 [0.65 - 1.67]
Higher	20 (8.9)	34 (7.59)	54 (8.0)	0.656	1.19 [0.67 - 2.13]
Total	**224 (33.3)**	**448 (66.7)**	**672 (100.0)**		

$Khi^2 = 1.451$; df = 3; ***p* = 0.694.**

3.3. Data on Evacuations

All patients were evacuated from referral health centers (CSRéf), which are level 2 structures with limited resources. These structures do not have a backup generator that can provide a permanent supply of electricity. The average duration of stay in the CSRéf was 1.00 ± 0.082 days, with extremes of 0 and 72 hours. The patients were evacuated on board a medicalized ambulance in 82.6% of cases versus 73.9% for the controls, and they had at least one peripheral venous line in 61.2% for cases and 77% for controls (see Table 4).

Table 4. Data on evacuations to CHU Gabriel Touré.

Means of Evacuation	No.		Total (%)	p	OR [IC]
	Cases (%)	Controls (%)			
Ambulance	185 (82.6)	331 (73.9)	516 (76.8)	0.011	1.68 [1.11 - 2.51]
Taxi	1 (0.4)	16 (3.6)	17 (2.5)	0.035	0.12 [0.02 - 0.92]
Personal Car	0 (0)	11 (2.5)	11 (1.6)	0.001	-
Not Specified	38 (17)	90 (20.1)	128 (19.0)	0.312	0.81 [0.53 - 1.24]
Peripheral Venous Line	**No.**		**Total (%)**	**p**	**OR [IC]**
	Cases (%)	Controls (%)			
Yes	137 (61.2)	345 (77)	482 (71.7)	$< 10^{-3}$	0.47 [0.33 - 0.67]
No	47 (21)	75 (16.7)	122 (18.2)	0.119	1.32 [0.88 - 1.98]
Not Specified	40 (17.9)	28 (6.3)	68 (10.1)	$< 10^{-3}$	3.26 [1.95 - 5.45]

Fisher's exact test = 14.741; df = 3; $p = 0.002$.

3.4. Clinical Data on Admission

Patients had a good general condition on admission in 84.8% of cases and 74.8% of controls, with an odds ratio (OR) of 1.89 and a confidence interval (CI) of [1.24 - 2.88]. Unfortunately, we noted 1 death on admission among the cases, representing 0.4%.

The diagnoses retained on admission included labor on a scarred uterus in 25.1% of cases and 4.7% of controls, acute fetal asphyxia in 14.3% versus 5.6% of controls, and malpresentations in 9% versus 2.7% of controls, with an OR of 3.58 and CI [1.72 - 7.46] (see Table 5).

Table 5. Distribution of parturients according to general condition on admission to the CHU.

General Condition on Admission to the CHU	No.		Total (%)	*p*	OR [IC]
	Cases (%)	Controls (%)			
Good (WHO 1-2)	190 (84.8)	335 (74.8)	525 (78.1)	0.003	1.89 [1.24 - 2.88]
Altered (WHO 3-4)	33 (14.7)	113 (25.2)	147 (21.9)	0.003	0.51 [0.33 - 0.78]
Death Observed	1 (0.4)	0 (0)	1 (0.1)	0.004	-
Retained Diagnoses	**No.**		**Total (%)**	**p**	**OR [IC]**
	Cases (%)	Controls (%)			
Labor/Delivery in Progress	35 (15.7)	195 (43.5)	230 (34.3)	$< 10^{-3}$	0.24 [0.16 - 0.36]
Hypertension during Pregnancy (HTA)	8 (3.6)	93 (20.8)	101 (15.1)	$< 10^{-3}$	0.14 [0.07 - 0.30]
Scarred Uterus	56 (25.1)	21 (4.7)	77 (11.5)	$< 10^{-3}$	6.82 [4.00 - 11.61]

Continued

Retroplacental Hematoma (HRP)	16 (7.2)	57 (12.7)	73 (10.9)	0.037	0.53 [0.30 - 0.95]
Acute Fetal Asphyxia	32 (14.3)	25 (5.6)	57 (8.5)	$< 10^{-3}$	2.84 [1.63 - 4.91]
Malpresentation	20 (9)	12 (2.7)	32 (4.8)	$< 10^{-3}$	3.58 [1.72 - 7.46]
Hemorrhagic Placenta Previa	6 (2.7)	13 (2.9)	19 (2.8)	0.919	0.93 [0.35 - 2.47]
Stationary Dilation	10 (4.5)	7 (1.6)	17 (2.5)	0.014	2.96 [1.11 - 7.88]
Others*	33 (14.8)	17 (3.8)	50 (7.5)	0.001	4.40 [2.39 - 8.10]

Fisher's exact test = 177.434; df = 9; $p = 0.000$. *: *Uterine rupture. Cord prolapse. Intracranial hypertension. Pre-uterine rupture syndrome. Hydrocephalus. Immediate postpartum hemorrhage. Ruptured ectopic pregnancy. Generally narrowed pelvis in labor. Short intergenesic interval. Third-trimester pregnancy in labor. Fetal polymalformative syndrome.*

3.5. Therapeutic Data

Patients gave birth vaginally in 21.6% of cases and 44.6% of controls, with an odds ratio (OR) of 0.39 and a confidence interval (CI) of [0.27 - 0.56]. Among the vaginal deliveries, we performed 8 vacuum extractions, of which 4 were for cases and 4 for controls, and 3 forceps extractions for cases.

The indications for cesarean section were: labor on a multi-scarred uterus (21.6% vs. 6.5%), acute fetal asphyxia (19.3% vs. 10.1% for controls), with an OR of 2.23 [1.27 - 3.90]. These results are presented in Table 6.

Table 6. Data on the mode of delivery and indications for cesareans.

Mode of Delivery	No.		Total (%)	*p*	OR [IC]
	Cases (%)	Controls (%)			
Vaginal Delivery	47 (21.6)	200 (44.6)	247 (37.6)	$< 10^{-3}$	0.39 [0.27 - 0.56]
Cesarean Delivery	171 (76.7)	248 (55.4)	419 (62.4)	$< 10^{-3}$	2.55 [1.78 - 3.66]
Indications for Cesarean Section	**No.**		**Total (%)**	***p***	**OR [IC]**
	Cases (%)	**Controls (%)**			
Severe Preeclampsia	7 (4.1)	57 (23)	64 (15.3)	$< 10^{-3}$	0.15 [0.07 - 0.34]
Acute Fetal Asphyxia	33 (19.3)	25 (10.1)	58 (13.8)	0.004	2.23 [1.27 - 3.90]
Multi-scarred Uterus	37 (21.6)	16 (6.5)	53 (12.6)	$< 10^{-3}$	4.17 [2.24 - 7.79]
Malpresentation	14 (8.2)	10 (4)	24 (5.7)	0.058	2.21 [0.96 - 5.10]
Sherman's Grade II Retroplacental Hematoma	6 (3.5)	13 (5.2)	19 (4.5)	0.381	0.69 [0.26 - 1.84]
Hemorrhagic Placenta Previa	6 (3.5)	13 (5.2)	19 (4.5)	0.381	0.69 [0.26 - 1.84]
Scarred Uterus	14 (8.2)	3 (1.2)	17 (4.1)	0.002	7.58 [2.14 - 26.79]
Pre-uterine Rupture Syndrome	11 (6.4)	3 (1.2)	14 (3.3)	0.003	5.84 [1.61 - 21.27]

3.6. Therapeutic Data

We also performed a laparotomy for uterine rupture in 68.8% of cases versus 75.0% of controls, with an odds ratio (OR) of 0.73 and a confidence interval (CI) of [0.06 - 8.92]. A transfusion of red blood cell packs or fresh frozen plasma (CGR or PFC) was administered in 12.6% of cases with severe anemia and 14.7% of con-

trols, with an OR of 0.83 and CI [0.52 - 1.34]. The Nicardipine protocol as an antihypertensive and the magnesium sulfate protocol for neuroprotection were used in 3.1% versus 18.1% for controls and 4% versus 47.1% for controls, respectively.

3.7. Newborn Data

We recorded 10.3% stillbirths among cases versus 22.9% among controls, with an OR of 0.39 and CI [0.24 - 0.62]. Newborns had an Apgar score ≤7 in 32.6% of cases versus 21.6% of controls. These data are presented in Table 7.

Table 7. Distribution of parturients according to newborn apgar scores.

Apgar Score	No.		Total (%)	p	OR [IC]
	Cases (%)	Controls (%)			
1st minute					
8 - 10	138 (57)	261 (55.4)	399 (56.0)	0.733	1.07 [0.78 - 1.46]
4 - 7	69 (28.5)	91 (19.3)	160 (22.4)	0.003	1.67 [1.16 - 2.39]
1 - 3	10 (4.1)	11 (2.3)	21 (2.9)	0.211	1.80 [0.75 - 4.30]
0	25 (10.3)	108 (22.9)	133 (18.7)	0.001	0.39 [0.24 - 0.62]
Total	**242 (33.9)**	**471 (66.1)**	**713 (100.0)**		

Fisher's exact test = 21.45; df = 3; $p = 0.000$.

3.8. Prognosis

We recorded a complication in the postpartum period in 24.7% of cases and 18.1% of controls, with an odds ratio (OR) of 1.55 [1.05 - 2.27] and p = 0.046. The main complications were postpartum hemorrhages (49.1% vs. 48.1% for controls) and postpartum eclampsia (1.8% vs. 6.2% for controls, OR: 0.31, CI [0.04 - 2.73]). These data are listed in Table 8. We transferred 22 patients to the intensive care unit, including 3 cases and 19 controls. There were 16 deaths, of which 5 were cases and 11 were controls.

Table 8. Distribution of parturients according to maternal complications in the postpartum period.

Maternal Complications in the Postpartum Period Postpartum Hemorrhage	No.		Total (%)	p	OR [IC]
	Cases (%)	Controls (%)			
Hypovolemic Shock	27 (49.1)	39 (48.1)	66 (48.5)	0.911	1.91 [0.92 - 3.96]
Cardiac Arrest	14 (25.3)	23 (28.4)	37 (27.2)	0.019	0.31 [0.12 - 0.81]
Anemia	5 (9.1)	12 (14.8)	17 (12.5)	0.410	0.71 [0.23 - 2.17]
Eclampsia	7 (12.7)	2 (2.5)	9 (6.6)	0.028	1.10 [0.45 - 2.65]
Coagulation Disorder	1 (1.8)	5 (6.2)	6 (4.4)	0.283	0.31 [0.04 - 2.73]
Maternal Complications in the Postpartum Period	1 (1.8)	0 (0)	1 (0.7)	0.404	-
Causes of Maternal Deaths	No.		**Total %**	**p**	**OR [IC]**
	Cases (%)	Controls (%)			
Hypovolemic Shock	2 (40.0)	6 (54.5)	8 (50.0)	0.537	0.56 [0.06 - 4.76]
Coagulation Disorder	1 (20.0)	2 (18.2)	3 (18.8)	1.000	1.13 [0.8 - 16.31]
Postpartum Hemorrhage	**1 (20.0)**	**1 (9.1)**	**2 (12.5)**	**0.467**	**2.50 [0.12 - 50.4]**

Continued

Hypertension and its Complications	1 (20.0)	2 (18.2)	3 (18.8)	1.000	1.13 [0.8 - 16.31]

4. Discussion

4.1. Methodological Approaches and Limitations of the Study

This study, conducted in the Gynecology-Obstetrics department of the University Hospital Center Gabriel Touré, analyzed 224 cases and 448 controls, at a ratio of 1 case to 2 controls, with the aim of better understanding the impact of electrical rationing on maternal-fetal prognosis in cases of obstetric emergencies. The data collection period spanned from September 2023 to August 2024, covering a sample of parturients who were referred or evacuated specifically in connection with power outages.

However, this study presents several important methodological limitations. Identifying the direct impact of power outages on obstetric complications proved complex, particularly due to the absence of an automated system for tracking outages in delivery rooms. As a result, while data on the occurrence of rationing were collected from caregivers' testimonies and medical records, this information was often imprecise, which may have introduced bias in assessing the exact impact of outages on obstetric complications.

Another major limitation lies in the availability of complete data in some medical records. Indeed, certain documents were incomplete or difficult to access due to partial information management. Additionally, the subjectivity of some testimonies, particularly regarding evacuation reports, may have influenced the interpretation of the results. Finally, equipment failures in certain units—such as the lack of continuously operational generators and functional monitoring systems—constituted an aggravating factor that was difficult to quantify objectively. The impact of these failures, although notable, was not always measured precisely, making the analysis more complex.

4.2. Sociodemographic Characteristics

The sociodemographic characteristics of parturients exposed to electrical rationing were carefully analyzed. The age group of 20 to 35 years represented 74.6% of cases and 68.8% of controls. Although this difference was not statistically significant (OR: 1.33 [0.93 - 1.91], p: 0.382), it suggests that this age group may be more vulnerable to complications due to power interruptions. This demographic profile is consistent with national data, where a large proportion of women give birth between 20 and 35 years of age. The low representation of adolescents in the sample may be due to their referral to peripheral health facilities or cultural practices, as noted in other studies conducted in West Africa, particularly those by Tall *et al.* [11].

4.3. Data on Referrals

The analysis of parturient referrals reveals that 100% of cases and 89% of controls

were evacuated from a referral health center (CSRéf), with a significant difference (p: 0.000). In Mali, the referral and evacuation system requires adherence to the health pyramid. Thus, the first level of contact between the population and health services is the Community Health Center (CS Com), the second level of contact or first referral level is the Referral Health Center (CS Réf), and the third level of contact is regional and national hospitals or the second referral level of health care.

CSRéf centers are often weakened by a shortage of equipment and functional generators. Recent reports and surveys have documented the frequency of power outages in these centers, which severely affect the quality of care, particularly in maternity and neonatology services [12]-[14].

The management of transfers during periods of rationing is particularly challenging, as these outages often delay emergency care procedures and complicate interventions during periods of extreme heat. Indeed, the management of obstetric emergencies is already compromised during these times, increasing the vulnerability of parturients.

The use of various means of evacuation to CHU Gabriel Touré was an essential component of this study. The ambulance was the primary means of evacuation, with more frequent use among cases (82.6%) than controls (73.9%) (OR = 1.68). This statistically significant difference (p = 0.002) may indicate that cases under rationing were perceived as more severe and required medicalized transport. The use of taxis was marginal, with only 0.4% of cases using this means of evacuation, compared to 3.6% in the control group. This difference suggests that, in obstetric emergencies, the ambulance remains the preferred means to ensure patient safety and adequate care, especially in a rationing context where rapid intervention is crucial.

Venous access, crucial for rapid management in obstetric emergencies, was present in 77% of control patients, compared to only 61.2% in cases exposed to rationing (OR = 0.47). This statistically significant difference (p < 0.0001) highlights the impact of power outages on the ability of medical teams to provide pre-hospital care under optimal conditions. Shortages of equipment and difficulties in accessing continuous care—particularly due to frequent power failures—have led to suboptimal management of urgent cases. This finding confirms the hypothesis that rationing disrupts patient care from the moment of hospital arrival, limiting the implementation of adequate stabilization measures.

4.4. Clinical Data

In our study, 84.8% of parturients referred during electrical rationing presented with a general condition deemed "good" upon admission, compared to 74.8% in the control group. This difference is statistically significant (OR = 1.89 [1.24 - 2.88], p = 0.001), though it may seem counterintuitive at first glance. It is indeed unexpected to find that patients exposed to power outages appeared to be in better overall condition than those not exposed. However, this could be explained by several factors: parturients under rationing may have been referred earlier for in-

tensive care, given the heightened awareness of their vulnerability due to frequent power outages. Medical teams, anticipating additional challenges from electricity failures, likely took more proactive measures to stabilize these patients before their condition deteriorated further.

Conversely, control patients, who were referred without such urgent or immediate management, showed a higher rate of altered general conditions (25.2%). This phenomenon may reflect later referrals outside the rationing context, with less structured care and delays in admission, leading to a deterioration in their overall condition before reaching the hospital.

The diagnoses among parturients referred during rationing periods reveal a high-risk obstetric population, with a higher prevalence of severe pathologies requiring rapid surgical intervention. Among cases under rationing, 25.1% of patients had a scarred uterus, compared to only 4.7% in controls, and 14.3% of exposed parturients presented with acute fetal asphyxia, versus 5.6% in the control group. These conditions, often associated with an increased risk of puerperal complications, necessitate close monitoring and urgent interventions to avoid fatal outcomes. Thus, parturients exposed to rationing were more likely to suffer severe complications, leading to more intensive and invasive management of their deliveries.

In contrast, among controls, the most common diagnoses were spontaneous labor (43.5%) and gestational hypertension (20.8%), which do not require immediate interventions and are generally associated with more planned management. These findings suggest that non-exposed patients benefited from more stable and better-organized follow-up, allowing for less urgent handling of their obstetric complications. These observations are consistent with the work of Martins *et al*. (2019), who demonstrated that pregnancies with unfavorable outcomes, such as fetal deaths, are often more exposed to delays in obstetric care—these delays being frequently linked to late referrals, inadequate prenatal follow-up, or lack of information on available facilities for managing complications [15].

This observation also underscores the importance of timing in obstetric care management: delays in access to care and difficulties encountered in referring patients to specialized facilities in the context of electrical rationing are aggravating factors for adverse maternal-fetal outcomes.

4.5. Therapeutic Management

The results regarding clinical and therapeutic management show that patients exposed to electrical rationing were more frequently subjected to major invasive interventions, particularly emergency cesareans (76.7% versus 55.4% in controls, $p < 0.001$). This more interventionist approach can be explained by the need for rapid decision-making in the face of urgency and the instability of the electrical system, which complicates the continuity of care. Additionally, invasive procedures such as laparotomy (OR = 7.70) and surgical hemostasis (OR = 10.25) were also more frequent among patients exposed to rationing, confirming that compli-

cations requiring urgent interventions were exacerbated by power interruptions. These results align with studies by Koroglu *et al*. (2019), which observed that frequent power outages have a direct impact on access to care and the use of health facilities [7]. The instability of the power supply undermines the continuity of care and forces teams to adopt more invasive strategies in an environment where traditional patient monitoring is difficult to achieve due to electrical interruptions [12] [14] [16].

The administration of antibiotics was also more frequent among cases (80.7% versus 58% in controls), reflecting an increased response to potential infections in the context of delayed management. In contrast, treatments such as magnesium sulfate (4% versus 47.1%) and nicardipine (3.1% versus 18.1%) were administered significantly less often to parturients under rationing.

The analysis of delivery modes shows a significant difference between parturients exposed to rationing and those in the control group. Vaginal deliveries were less frequent among cases (21.6%) than among controls (44.6%), which is a protective factor for non-exposed patients (OR = 0.39). Conversely, cesarean deliveries were more common in the case group (76.7%) than in the control group (55.4%) (OR = 2.55), reflecting greater reliance on surgical interventions during rationing. This phenomenon is likely linked to the faster and more interventionist management of cases under rationing, where decision-making must be immediate to avoid severe complications. These results confirm that rationing exacerbates the need for rapid decisions in obstetric management, particularly for complicated deliveries [17].

4.6. Maternal-Fetal Prognosis

Regarding newborn status, the results are paradoxical. Parturients under rationing had a higher rate of live births (89.5%) compared to controls (76.8%) (OR = 2.58). This outcome may reflect heightened vigilance and additional precautionary measures taken by the medical team during rationing periods, although underestimation of fetal deaths in cases may also play a role. First-minute Apgar scores were generally lower among exposed parturients, indicating more frequent or severe neonatal distress (OR = 1.73). However, by the fifth minute, differences faded, suggesting that resuscitation efforts helped mitigate the effects of perinatal stress induced by rationing.

Complicated postpartum periods were significantly more frequent among cases exposed to rationing (26% versus 18.5% in controls, p = 0.025). These severe maternal complications, such as uterine rupture (OR = 12.89) and postpartum hemorrhages (OR = 9.48), are indicators of the fragility of care under rationing conditions. Patients exposed to power outages indeed faced an unstable technical environment, making optimal management of obstetric emergencies more difficult.

Severe maternal complications in the postpartum period were also more frequent among parturients under rationing, particularly postpartum hemorrhages and hypovolemic shock, with ORs of 1.91 and 0.31, respectively. This result sug-

gests that the impact of rationing on obstetric emergency management led to more severe complications, exacerbated by disruptions in the care chain. However, it should be noted that the analysis of causes of maternal deaths showed no significant difference between cases and controls ($p = 1.000$), which may be attributed to biases in data management or the diversity of contributing factors to maternal deaths.

5. Conclusion

This study highlights the significant consequences of electrical rationing on obstetric and neonatal care in a resource-limited hospital setting. The results show that power outages have a considerable impact on the quality of care, thereby increasing the frequency of maternal and fetal complications. More specifically, parturients exposed to rationing exhibited a higher incidence of severe complications, such as postpartum hemorrhages and complicated postpartum periods. Furthermore, newborn management was also affected, with lower Apgar scores indicating increased neonatal distress, although resuscitation measures helped mitigate the long-term effects. It is imperative to implement reliable solutions to ensure a constant energy supply, such as high-performance generators, solar panels or backup batteries in referral health centres to limit medical evacuations due to power shortages.

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Conflicts of Interest

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

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