

Review Article

"Near-Miss" Maternal: Understanding to Save More Lives

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Abstract

Introduction: Maternal cardiorespiratory arrest (MCRA) represents a rare but critical obstetric emergency, frequently associated with high maternal and fetal mortality. Swift and efficient resuscitative measures are essential for a favorable outcome. Patients who survive such events are considered "near-miss" cases. This study focuses on patients who experienced MCRA and were successfully resuscitated-referred to as near-miss cases or "narrow escapes." **Methods:** This was a descriptive cross-sectional study utilizing retrospective data collection over a five-year period. Included were medical records of pregnant, laboring, or postpartum patients admitted to the CHU-MEL during the study interval who presented with a severe obstetric complication-whether or not cardiorespiratory arrest occurred-and were successfully resuscitated during hospitalization. Data were obtained from operating room and intensive care unit registries, patient medical files, and maternal mortality audit reports. **Results:** The incidence of near-miss events was 42.5%. The mean age of patients was 29.72 ± 5.78 years. Upon admission, 54.5% of patients exhibited signs of clinical distress. Cardiorespiratory arrest occurred in 80.8% of cases, compared to isolated respiratory arrest in 16.1%. In 98.9% of instances, medical personnel were the first responders to the arrest. An emergency alert was activated promptly in 93.9% of cases. External cardiac massage was administered in 90.9% of patients, while resuscitative care by the anesthesia and critical care team was rendered in 92.9%. A total of 145 patients (42.5%) regained cardiac activity following cardiopulmonary resuscitation and were categorized as near-miss survivors. **Conclusion:** This study conducted at CHU-MEL in Cotonou from 2020 to 2024 quantified the hospital frequency of near-miss maternal cardiorespiratory arrests and detailed their clinical course and management. To improve maternal outcomes, it is imperative to anticipate such emergencies and ensure immediate access to trained healthcare personnel and resuscitation equipment.

Keywords

Maternal Cardiorespiratory Arrest, Near-Miss, Cardiopulmonary Resuscitation, CHU-MEL

1. Introduction

Cardiorespiratory arrest (CRA) during pregnancy ranks among the most feared emergencies in obstetrics [2, 3]. Though uncommon, it carries substantial morbidity and mortality risks, threatening both maternal and fetal lives.

Prompt and effective resuscitative interventions are critical for a favorable outcome [1-4]. Women who survive such events constitute the group referred to as "narrow escapes."

The incidence of maternal cardiorespiratory arrest (MCRA)

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varies significantly worldwide. In the United States, it is estimated at 1 per 12,000 deliveries [5]; in France, 1 per 20,000 [6]; and in Scotland, 1 per 25,000 [7]. In Asia, although data are scarce, similar incidence rates have been observed [8].

In Africa, and particularly in Benin data on MCRA remain limited. One of the few local studies, conducted by Akodjenou et al. [9], reported an incidence of 104 per 10,000 peripartum anesthetic procedures. Most available studies focus on general obstetric complications rather than MCRA specifically leading to a near-miss event [10].

The Mother and Child University Hospital Center - Lagune (CHU-MEL) in Cotonou, Benin, is a referral institution for obstetric care. Maternal cardiorespiratory arrests occur relatively frequently at this facility, and the maternal mortality rate remains high. Confronted with this recurring challenge, our study investigates cases of MCRA in which patients were successfully resuscitated-typically referred to as “near-miss” or “narrow escape” scenarios.

2. Patients and Methods

This was a descriptive cross-sectional study with retrospective data collection spanning five years, from January 1, 2020, to December 31, 2024. The study population consisted of medical records for pregnant women, women in labor, and postpartum patients admitted to CHU-MEL during the study period. The target population included all such cases in which patients narrowly escaped death during hospitalization.

A “near-miss” event is defined as an unexpected incident that could have resulted in harm or loss but did not, either by chance or due to timely and effective intervention. In obstetrics, a near-miss refers to a situation in which a woman facing a severe complication survives-either fortuitously or through appropriate clinical management.

Included in the study were records of patients admitted to CHU-MEL who experienced serious obstetric complications and were successfully resuscitated during their hospital stay. Excluded were cases with missing records, incomplete documentation, or damaged files. Sample size calculations were performed using Open Epi version 3.01.

Variables collected included sociodemographic characteristics, underlying etiology, details surrounding the cardiorespiratory arrest, initial resuscitative efforts, and clinical management. Data were gathered using a structured collection form modeled after the standardized Utstein template for in-hospital cardiac arrests. Sources included operating room and ICU registries, patient medical records, and maternal mortality audit reports. Data entry was conducted using Kobo Toolbox and analyzed with Stata version 18.

3. Results

Incidence of Near-Miss Events

From 2020 and 2024, a total of 341 cases of severe obstetric

complications resulting in maternal cardiorespiratory arrest (MCRA) were recorded among 30,768 deliveries. Of these 341 cases, 145 patients were successfully resuscitated, yielding a near-miss incidence of 42.5%.

Sociodemographic Characteristics

The mean age of the patients was 29.72 ± 5.78 years. The majority were traders (36.4%), followed by artisans (28.3%). Married women constituted 72.7% of the cohort.

Admission Characteristics

Most patients (73.7%) were referred from other facilities. A significant proportion originated from peripheral hospitals (27.3%) and private clinics (17.8%).

Clinical Status at Admission

Upon arrival, 54.5% of patients presented with clinical signs of distress. Headache was reported in 7.1% of cases, dyspnea in 4.0%, and seizures in 7.1%.

Occurrence of MCRA

MCRA occurred in 50.5% of cases after more than seven hours of hospitalization, and in 26.3% within the first six hours. The majority of arrests occurred on weekdays (76.8%) and during daytime hours (54.6%). The events were most frequently recorded in the intensive care unit (58.6%) and operating room (19.2%). The postpartum period accounted for 83.8% of MCRA cases. Cardiorespiratory arrest was more common (80.8%) than isolated respiratory arrest (16.1%). In 98.9% of cases, medical personnel were the first responders. Emergency alerts were issued promptly in 93.9% of cases.

Basic Cardiopulmonary Resuscitation (CPR) Data

External cardiac massage (ECM) was widely performed in 90.9% of cases, with variable durations: 37.7% lasted 10 minutes, 23.3% ranged between 11 and 20 minutes, and 6.6% exceeded 20 minutes. Oxygen therapy was administered to 14.1% of patients, primarily via oxygen mask (64.3%). Airway clearance procedures were conducted in 85.8% of cases.

Advanced Cardiopulmonary Resuscitation (CPR) Data

Advanced resuscitative management by the anesthesia and critical care team was implemented in 92.9% of cases. The team arrived promptly at the site of arrest following alert activation in 55.5% of cases. Continued external cardiac massage was performed in 88.8% of cases. No patient received defibrillation.

Orotracheal intubation with assisted ventilation was executed in 79.8% of cases. Intravenous access was established in nearly all patients (96.9%), with peripheral venous lines accounting for 94.8%. Vascular volume expansion was performed in 8.1% of cases, with Ringer's lactate being the preferred solution (50.0%). Hypoglycemia correction was rarely undertaken (1.0%).

Resuscitation carts or kits were accessible in 80.8% of cases. Administration of bolus doses of adrenaline or noradrenaline occurred in 79.8% of patients. Perimortem cesarean section was performed in 3.0% of cases, with only one procedure initiated within five minutes of arrest. The overall resuscitation duration varied, with 83.8% of cases receiving CPR for less than 30 minutes.

Etiological Data of Near-Miss Events

The most frequent direct causes were respiratory distress (76.7%), circulatory shock (69.7%), and neurological complications (67.6%). Identified etiologies were primarily related to hypertensive disorders of pregnancy (57.1%), hemorrhage (41.8%), and sepsis (30.6%).

Among the hypertensive disorders, severe preeclampsia accounted for 76.8% of cases, followed by eclampsia in 46.4%. The leading causes of hemorrhage included cervical lacerations (56.1%), coagulopathy (51.2%), and uterine atony (43.9%).

Outcomes Following Cardiopulmonary Resuscitation (CPR)

A total of 145 patients-representing 42.5% of MCRA cases-regained cardiac activity post-resuscitation and were classified as near-miss survivors.

Neurological assessment post-CPR remained limited; in 83.33% of cases, the Glasgow Coma Scale score ranged between 10 and 14. Among documented cases, pupillary examination revealed resolution of mydriasis in 85.7% within the first 10 minutes following resuscitation.

Regarding post-resuscitation care, the majority of patients (76.2%) received assisted ventilation, and 85.7% were administered vasopressor agents.

4. Discussion

Incidence of Near-Miss Events

At CHU-MEL, the incidence of near-miss cases during the study period was 145, representing 42.5%. This proportion is significantly higher than the 1.04% reported by Akodjenou et al. in 2019 [9]. This notable discrepancy may be attributed to the proximity of the delivery ward, operating theater, and obstetric resuscitation unit at CHU-MEL, as well as the continuous availability of a trained resuscitation team prepared to respond promptly to maternal cardiorespiratory arrests.

Etiologies of Near-Miss Events at CHU-MEL

In our study, hypertensive disorders of pregnancy (57.1%) were the most commonly implicated causes of arrest, followed by hemorrhage (41.8%), sepsis (30.6%), anesthetic-related complications (12.2%), and cardiac conditions (10.2%). These etiologies closely align with those reported in maternal mortality audits [11-14], and show similarities-though in varied proportions-to findings published by American researchers.

Management Modalities

Basic Cardiopulmonary Resuscitation (CPR)

In our cohort, a call for emergency assistance was issued in 95.7% of cases, mobilizing anesthesiologists and resuscitation specialists (91.0%), obstetric trainees (22.2%), and midwives (16.2%). External cardiac massage (ECM) was performed in 90.9% of cases, with variable durations. Ventilation and upper airway clearance were achieved in 85.5% of cases, while oxygen therapy via face mask was administered in 64.3%.

Manual left uterine displacement was not performed in any

case. Ideally, perimortem cesarean delivery (PMCD) should be initiated within the first 4-5 minutes following maternal arrest. In our study, PMCD was performed in only 3.0% of cases, and within the recommended timeframe in a single instance. This rate is substantially lower than those reported by Dijkman et al. (21.8%) in the Netherlands [14], Einav et al. (87.2%) in the United States [15], and Beckett et al. (62.1%) in the United Kingdom [16]. This variation likely reflects disparities in health system infrastructure and emergency response protocols between high-income and resource-limited settings.

Advanced Cardiopulmonary Resuscitation (CPR)

Rapid orotracheal intubation-often technically challenging-should be performed promptly. In our study, it was conducted in 79.8% of cases, accompanied by artificial ventilation. This high frequency is likely attributable to the fact that 58.6% of patients were managed in the resuscitation room and 19.2% in the operating theater, where anesthesiologists and resuscitation specialists were present and resuscitation equipment was immediately accessible in 80.8% of cases.

Early vascular access is also recommended and was nearly universal in this cohort (96.9%), with a clear predominance of peripheral venous access (94.8%). Administration of adrenaline or noradrenaline was carried out in 79.8% of patients.

In cases of maternal cardiorespiratory arrest, perimortem cesarean delivery (PMCD) is ideally performed within the first 4 to 5 minutes. In our study, PMCD was conducted in only 3.0% of cases, with a procedure initiated within 5 minutes in just one instance. This rate is markedly lower than those reported by Dijkman et al. in the Netherlands (21.8%) [14], Einav et al. in the United States (87.2%) [15], and Beckett et al. in the United Kingdom (62.1%) [16]. This substantial difference can be attributed to the fact that these studies were conducted in high-income countries with well-established and functional healthcare systems.

5. Conclusion

Maternal cardiorespiratory arrest (MCRA) represents an extreme obstetric emergency, with unfavorable outcomes in most cases. The small subset of patients who survive these events are considered “near-miss” cases.

This study, conducted at CHU-MEL in Cotonou from 2020 to 2024, established the hospital incidence of MCRA, and clarified its circumstances and management approaches. To improve survival, it is essential to anticipate such emergencies and ensure immediate availability of skilled personnel and resuscitation equipment.

Abbreviations

MCRA	Maternal Cardiorespiratory Arrest
CRA	Cardiorespiratory Arrest

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Conflicts of Interest

The authors declare no conflicts of interest.

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