

Characteristics and Causes of Maternal Deaths at the Pikine National Hospital Center in the Dakar Suburbs, Senegal: A Five-Year Study (From January 1, 2019 to December 31, 2023)

Khalifa Ababacar Gueye^{ID}, Mouhamet Sene, Mouhamadou Nazir Sylla, Youssoupha Toure, Moussa Diallo, Abdoul Aziz Diouf, Alassane Diouf

National Hospital Center of Pikine (CHNP), Dakar, Senegal

Email: lifogueye@yahoo.fr, senemos10@hotmail.com, nassirsylla@gmail.com, 2re1088@gmail.com,

moussadiallo25@hotmail.com, dizezfr@yahoo.fr, dioufalassane@gmail.com

How to cite this paper: Gueye, K.A., Sene, M., Sylla, M.N., Toure, Y., Diallo, M., Diouf, A.A. and Diouf, A. (2026) Characteristics and Causes of Maternal Deaths at the Pikine National Hospital Center in the Dakar Suburbs, Senegal: A Five-Year Study (From January 1, 2019 to December 31, 2023). *Open Journal of Obstetrics and Gynecology*, 16, 1476-1485.

<https://doi.org/10.4236/ojog.2026.1610134>

Received: September 15, 2026

Accepted: October 16, 2026

Published: October 19, 2026

Copyright © 2026 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Background: Maternal mortality remains a major public health problem, particularly in resource-limited countries. Despite the progress achieved, hypertensive and hemorrhagic complications continue to account for a substantial proportion of maternal deaths. This study aimed to analyze the determinants, causes, and circumstances of maternal deaths recorded at Pikine National Hospital, a referral hospital in the suburbs of Dakar. **Methods:** We conducted a retrospective descriptive and analytical study including all maternal deaths that occurred between January 1, 2019, and December 31, 2023, in the Department of Gynecology and Obstetrics at Pikine National Hospital. Data were collected from medical records, hospital admission registers, operating room registers, and anesthesia and intensive care records. Sociodemographic, obstetric, clinical, and therapeutic variables, as well as causes of death, were analyzed using SPSS version 20. **Results:** During the study period, 125 maternal deaths were recorded among 28,197 live births, corresponding to a maternal mortality ratio of 443.3 per 100,000 live births. The mean age of the patients was 31 ± 6 years. Most were multiparous (73.6%), had been referred from another health facility (74.4%), and had attended fewer than four antenatal care visits (84.8%). The leading underlying causes were preeclampsia (38.4%) and postpartum hemorrhage (22.4%). The leading immediate causes were hemorrhagic shock (39.2%), HELLP syndrome (20.0%), and eclampsia (15.2%). Direct obstetric causes accounted for 84.0% of deaths.

Keywords

Maternal Mortality, Determinants, Preeclampsia, Postpartum Hemorrhage, Obstetric Referral, Senegal

1. Introduction

Maternal mortality remains a major public health problem and a sensitive indicator of health system quality. According to the World Health Organization (WHO), approximately 287,000 women died in 2020 from complications related to pregnancy, childbirth, or the postpartum period, and more than 95% of these deaths occurred in low- and middle-income countries [1]. Sub-Saharan Africa alone accounts for nearly 70% of this global burden, reflecting persistent barriers to accessing high-quality obstetric care [1].

The leading causes of maternal death are direct obstetric complications, particularly hemorrhage, hypertensive disorders of pregnancy, infections, and abortion-related complications. Indirect causes include pre-existing cardiac, metabolic, and infectious diseases [2]. Most maternal deaths are preventable through high-quality antenatal care, an effective referral and transfer system, and prompt management of obstetric emergencies [3].

In Senegal, despite progress in maternal health, maternal mortality remains high and poses a challenge to achieving Sustainable Development Goal 3.1, which aims to reduce the global maternal mortality ratio to fewer than 70 deaths per 100,000 live births by 2030 [1]. Studies conducted in West African referral hospitals indicate that maternal deaths occur predominantly among patients referred late with severe hypertensive or hemorrhagic complications [4]-[6].

Pikine National Hospital is one of the main obstetric referral centers in the Dakar region and receives patients transferred daily for severe complications. Analyzing the characteristics and causes of maternal deaths in this facility is essential for identifying gaps in the health care system and guiding prevention strategies. To contribute to efforts aimed at reducing maternal mortality and to provide updated data, we conducted a study to assess the characteristics and causes of maternal deaths at the Pikine National Hospital Center between January 1, 2019, and December 31, 2023.

2. Methods

2.1. Study Design and Setting

This retrospective descriptive and analytical study was conducted in the Department of Gynecology and Obstetrics at Pikine National Hospital, a tertiary-level hospital in the suburbs of Dakar. The hospital is a referral center for obstetric transfers from health facilities in the districts of Pikine and Guédiawaye and from several regions of Senegal.

2.2. Study Period

The study covered five consecutive years, from January 1, 2019, to December 31, 2023.

2.3. Study Population

The source population comprised all women admitted to Pikine National Hospital during pregnancy, childbirth, or the postpartum period. We included all maternal deaths meeting the WHO definition: the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Deaths occurring more than 42 days after the end of pregnancy and accidental or traumatic deaths unrelated to pregnancy were excluded. It should be noted that all deaths occurring during pregnancy or the puerperium were systematically reviewed by the Maternal Death Review and Response Committee of the Pikine Health District. The committee consisted of two obstetrician-gynecologists, one anesthesiologist-intensivist, two general practitioners, and four midwives. Following the review, each case was classified as either a maternal death or a non-maternal death, and the cause of death was determined. At the end of the study period, 125 maternal deaths were included in the study, including women who died during referral and were declared dead on arrival.

2.4. Study Variables

The study variables included sociodemographic characteristics; obstetric history; pregnancy characteristics; admission pathway; clinical and therapeutic data; underlying and immediate causes of death according to the WHO classification; and direct and indirect obstetric causes.

2.5. Data Collection

Data were collected from medical records, hospital admission registers, operating room registers, transfer forms, anesthesia and intensive care records, and maternal death registers.

2.6. Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS® version 20. Quantitative variables were summarized as means with standard deviations or medians with ranges, according to their distribution. Qualitative variables were reported as frequencies and percentages. Proportions were compared using Pearson's chi-square test or Fisher's exact test when expected cell counts were insufficient. Statistical significance was set at $p < 0.05$.

2.7. Operational Definitions

For the purposes of this study, the following operational definitions were used:

- Anemia in pregnancy: a hemoglobin concentration <11 g/dL during pregnancy.
- Hypertension: systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg.
- Preeclampsia: new-onset hypertension (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg) occurring after 20 weeks of gestation and associated with proteinuria ≥ 300 mg/24h.
- Postpartum hemorrhage: blood loss ≥ 500 mL within 24 hours after childbirth, regardless of the mode of delivery.
- Preterm birth: birth occurring before 37 completed weeks of gestation and, for the purposes of this study, from 22 weeks of gestation onward.

The quality of antenatal care was assessed according to the number of antenatal care visits completed in relation to gestational age, completion of the recommended antenatal laboratory investigations, and adherence to national antenatal care standards and protocols.

2.8. Ethical Considerations

Data were collected anonymously and confidentially, and patient identities were never disclosed.

3. Results

3.1. Epidemiological Characteristics

During the study period, 125 maternal deaths were recorded among 28,197 live births, yielding an overall maternal mortality ratio of 443.3 deaths per 100,000 live births. The annual ratio fluctuated, reaching its highest levels in 2020 (551.5 per 100,000 live births) and 2021 (547.9 per 100,000 live births), and its lowest level in 2022 (305.5 per 100,000 live births). The highest absolute number of deaths was recorded in 2021, with 30 cases (24.0% of all deaths) (**Table 1**). The mean age was 31 ± 6 years (range, 16 - 45 years), and the median age was 33 years. Women aged 25 - 34 years and those aged 35 years or older each accounted for 40.0% of cases. Multiparous women represented nearly three-quarters of the study population (73.6%).

Table 1. Annual maternal mortality ratios at Pikine National Hospital, 2019-2023.

Year	Maternal deaths, n	Live births, n	Ratio per 100,000 live births
2019	25	7523	332.3
2020	28	5077	551.5
2021	30	5475	547.9
2022	16	5238	305.5
2023	26	4884	532.4
Total	125	28,197	443.3

3.2. Obstetric Characteristics

Most pregnancies were singleton pregnancies (91.2%), while twin pregnancies accounted for 8.8% of cases. Antenatal care was inadequate for most patients: 84.8% had attended fewer than four antenatal care visits and 6.4% had received no antenatal care. Nearly half of the pregnancies were preterm (<37 weeks of gestation) (48.0%), while 46.4% were term pregnancies and 5.6% ended before 22 weeks of gestation. The main associated conditions were anemia (70.1%), hypertension (55.1%), gestational diabetes (15.9%), and a scarred uterus (12.1%). The principal obstetric characteristics are summarized in **Table 2**.

Table 2. Main obstetric characteristics of the patients.

Variable	Percentage (%)
Singleton pregnancy	91.2
Twin pregnancy	8.8
Fewer than four antenatal care visits	84.8
No antenatal care	6.4
Preterm pregnancy (<37 weeks)	48.0
Anemia	70.1
Hypertension	55.1
Gestational diabetes	15.9
Scarred uterus	12.1

3.3. Admission Pathways

Overall, 93 patients (74.4%) were referred from peripheral health facilities, whereas 32 (25.6%) were admitted directly. Among referred patients, 79.5% were transferred before delivery, 8.6% immediately after delivery, 6.4% during the first trimester of pregnancy, and 5.3% during the late postpartum period. The main reasons for referral were severe preeclampsia (18.3%), eclampsia (12.9%), postpartum hemorrhage (10.8%), and placental abruption (7.5%). At admission, the most frequent diagnoses were severe preeclampsia (38.4%), eclampsia (13.6%), postpartum hemorrhage (8.0%), and placental abruption (7.2%).

3.4. Treatment

Management comprised four complementary components: resuscitation, medical treatment, obstetric management, and surgical treatment. All patients received initial resuscitative measures, including oxygen therapy, intravenous fluid replacement, and hemodynamic monitoring. Of these, 86 patients (68.8%) required admission to the intensive care unit. The main medical treatments were blood transfusion (18.0%) and magnesium sulfate (12.8%), while 4.0% of patients received antibiotic therapy. Other treatments were used less frequently (**Table 3**).

Table 3. Treatment provided at admission.

Treatment	Frequency, n	Percentage (%)
Resuscitative measures	119	95.2
Admission to intensive care	86	68.8
Blood transfusion	20	18.0
Magnesium sulfate	16	12.8
Antibiotic therapy	4	4.0
Thrombolysis	1	0.8
Insulin therapy	1	0.8
Rehydration	1	0.8

Among the 102 patients who received obstetric treatment, cesarean delivery was the main mode of delivery (67.6%), followed by vaginal delivery (29.4%). Uterine evacuation procedures accounted for less than 3% of obstetric interventions. Additional surgery was performed in 35 patients (28.0%), mainly hemostatic hysterectomy (60.0%) or repair of a cervical tear (22.9%). Other surgical procedures were less frequent (**Table 4**).

Table 4. Obstetric and surgical treatments.

Treatment	Frequency, n	Percentage (%)
Obstetric treatment (n = 102)		
Cesarean delivery	69	67.6
Vaginal delivery	30	29.4
Manual vacuum aspiration	2	1.9
Uterine curettage	1	0.9
Surgical treatment (n = 35)		
Hemostatic hysterectomy	21	60.0
Cervical tear repair	8	22.9
Peritoneal lavage	3	8.6
Perineorrhaphy	2	5.7
Triple arterial ligation	1	2.8

3.5. Circumstances and Causes of Maternal Deaths

Maternal deaths occurred mainly in the intensive care unit (68.8%), followed by the maternity ward (20.8%), operating room (5.6%), and during transfer to the hospital (4.8%). The mean interval between admission and death was 3 ± 5 days

(range, 0 - 28 days), with a median of 1 day. One-third of deaths (33.0%) occurred within the first 24 hours after admission. Nearly half (49.6%) occurred during the immediate postpartum period, compared with 32.8% during the late postpartum period and 16.0% during pregnancy.

The leading underlying causes of maternal death were preeclampsia (38.4%), postpartum hemorrhage (22.4%), and placental abruption (9.6%). Together, these three conditions accounted for more than two-thirds of maternal deaths (**Table 5**). The leading immediate causes were shock (39.2%), HELLP syndrome (20.0%), and eclampsia (15.2%). Direct obstetric causes accounted for 84.0% of deaths, compared with 16.0% due to indirect causes.

Table 5. Main causes of maternal deaths.

Cause	Frequency, n	Percentage (%)
Underlying causes		
Preeclampsia	48	38.4
Postpartum hemorrhage	28	22.4
Placental abruption	12	9.6
Abortion	5	4.0
Pulmonary embolism	4	3.2
Other causes	28	22.4
Immediate causes		
Shock	49	39.2
HELLP syndrome	25	20.0
Eclampsia	19	15.2
Pulmonary embolism	4	3.2
Other causes	28	22.4

3.6. Analytical Results

Bivariate analysis found no statistically significant association between the causes of maternal death and age ($p = 0.30$), parity ($p = 0.50$), number of antenatal care visits ($p = 0.30$), or direct versus indirect obstetric causes ($p > 0.05$). However, mode of delivery was significantly associated with the type of maternal death ($p = 0.01$). Hemorrhage-related deaths were more frequent after vaginal delivery, whereas deaths due to hypertensive complications were more frequent after cesarean delivery (**Table 6**).

4. Discussion

4.1. Maternal Mortality in a Referral Hospital

Our study found a maternal mortality ratio of 443.3 deaths per 100,000 live births,

which is higher than national estimates for Senegal. This finding is explained mainly by the tertiary referral status of Pikine National Hospital, which receives patients with the most severe obstetric complications after referral from peripheral facilities. This situation is comparable to that reported in other referral hospitals in sub-Saharan Africa, where hospital-based maternal mortality ratios remain substantially higher than national estimates [1] [4]-[6].

Table 6. Factors associated with the main causes of maternal death.

Variable	Hypertensive complications	Hemorrhage	p-value
Age	NS	NS	0.30
Parity	NS	NS	0.50
Number of antenatal care visits	NS	NS	0.30
Direct vs. indirect causes	NS	NS	>0.05
Mode of delivery	Association	Association	0.01

4.2. Epidemiological and Obstetric Profile

The women who died were young, predominantly multiparous, inadequately monitored during pregnancy, and frequently transferred from another health facility. These characteristics are consistent with observations from Senegal, Cameroon, and Gabon [4]-[6]. Inadequate antenatal care remains a major determinant of maternal mortality because it limits early detection of hypertensive disorders, anemia, and other complications that could be prevented or treated before progressing to severe disease [3].

4.3. Predominance of Hypertensive Complications

A major finding of our study was the predominance of hypertensive complications as the leading underlying cause of maternal death. When preeclampsia, placental abruption, eclampsia, and HELLP syndrome were considered together, hypertensive disorders constituted the leading cause of maternal mortality in our hospital, ahead of postpartum hemorrhage. This pattern may reflect an epidemiological transition already reported in several African hospitals [5] [6]. Although hemorrhage remains the leading cause of maternal death worldwide, hypertensive disorders are increasingly prominent in referral maternity units, where patients are often admitted at advanced stages of disease [1] [2].

4.4. Severity at Admission and Hospital Care

The leading immediate causes of death were shock, HELLP syndrome, and eclampsia, reflecting the severity of patients' clinical condition at admission. The frequent need for intensive care, blood transfusion, and major surgery, particularly hemostatic hysterectomy, underscores the severity of the complications man-

aged in our hospital. These findings highlight the importance of continuous access to a multidisciplinary team, obstetric intensive care, and blood products, in accordance with WHO recommendations [3].

4.5. Challenges in the Referral and Transfer System

The high proportion of referred patients confirms persistent weaknesses in the referral and transfer system. Although our study did not specifically assess delays in care, the findings suggest that the second and third delays described by Thaddeus and Maine continue to contribute substantially to maternal deaths [7]. Stronger coordination between peripheral facilities and referral hospitals, together with improved access to medical transport, could help reduce these delays.

4.6. Factors Associated with Maternal Deaths

Statistical analysis found no significant association between the main causes of death and age, parity, or number of antenatal care visits. However, mode of delivery was significantly associated with the type of complication leading to death. This association should be interpreted cautiously because cesarean delivery is likely a marker of disease severity rather than a causal factor in maternal mortality.

4.7. Strengths Limitations and Implications

This study has limitations inherent to its retrospective design, including incomplete data in some medical records and the absence of autopsy for deaths of undetermined cause. Referral delays and the precise circumstances of transfers could not be assessed comprehensively. Nevertheless, the exhaustive inclusion of cases over five years, the substantial number of cases, and the quality of data collection in a national referral hospital are strengths that provide a useful representation of maternal deaths occurring in tertiary facilities.

From a public health perspective, our findings emphasize the need to strengthen early detection of hypertensive disorders of pregnancy, improve the quality of antenatal care, and optimize the referral and transfer system. Continuous availability of blood products, access to obstetric intensive care, and systematic maternal death reviews are essential measures for sustainably reducing maternal mortality in Senegal, in accordance with WHO recommendations [3].

5. Conclusion

This study found a high maternal mortality ratio at Pikine National Hospital, consistent with its role as a referral hospital caring for patients with severe obstetric complications. Maternal deaths occurred mainly among multiparous women who had received inadequate antenatal care and had been referred from peripheral facilities. Hypertensive disorders of pregnancy were the leading causes of maternal death, ahead of postpartum hemorrhage. Reducing maternal mortality requires stronger antenatal care, early detection and treatment of hypertensive disorders, an improved referral and transfer system, and continuous availability of blood

products and emergency obstetric care. Regular maternal death reviews are also essential for improving quality of care and supporting progress toward maternal mortality reduction targets in Senegal.

Conflicts of Interest

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

References

- [1] World Health Organization, UNICEF, UNFPA, World Bank Group, United Nations Department of Economic and Social Affairs (2023) Trends in Maternal Mortality 2000 to 2020: Estimates by WHO, UNICEF, UNFPA, World Bank Group and UN-DESA. World Health Organization.
- [2] Say, L., Chou, D., Gemmill, A., Tunçalp, Ö., Moller, A., Daniels, J., *et al.* (2014) Global Causes of Maternal Death: A WHO Systematic Analysis. *The Lancet Global Health*, **2**, e323-e333. [https://doi.org/10.1016/s2214-109x\(14\)70227-x](https://doi.org/10.1016/s2214-109x(14)70227-x)
- [3] World Health Organization (2015) Strategies toward Ending Preventable Maternal Mortality. World Health Organization.
- [4] Biaye, B., Diallo, M., Guéye, M., Gassama, O., Niassy Diallo, A.C., Toure, Y., *et al.* (2019) Maternal Mortality in a Maternity Ward at a Regional Hospital Center in Southern Senegal. *International Research Journal of Obstetrics and Gynaecology*, **2**, 10.
- [5] Foumane, P., Dohbit, J.S., Ngo Um Meka, E., Nkada, M.N., Ze Minkande, J. and Mboudou, E.T. (2015) Etiologies of Maternal Mortality in the Yaounde Gynaeco-Obstetric and Pediatric Hospital: A Series of 58 Deaths. *Health Sciences and Diseases*, **16**, 1-5.
- [6] Mayi-Tsonga, S., Ndombi, I., Oksana, L., Methogo, M., Diallo, T., Mendome, G., *et al.* (2008) Mortalité maternelle à Libreville (Gabon): État des lieux et défis à relever en 2006. *Cahiers de Santé*, **18**, 193-197. <https://doi.org/10.1684/san.2008.0133>
- [7] Thaddeus, S. and Maine, D. (1994) Too Far to Walk: Maternal Mortality in Context. *Social Science & Medicine*, **38**, 1091-1110. [https://doi.org/10.1016/0277-9536\(94\)90226-7](https://doi.org/10.1016/0277-9536(94)90226-7)