

# Factors Associated with In-Hospital Mortality among Preterm Newborns in Kisangani (Democratic Republic of Congo): A Multicenter Analytical Study

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## Abstract

**Background:** Prematurity remains a major contributor to neonatal mortality worldwide, particularly in resource-limited settings. This study aimed to identify factors associated with in-hospital mortality among preterm newborns in Kisangani. **Methods:** A multicenter prospective analytical study was conducted in four hospitals in Kisangani from March 2025 to February 2026. All eligible preterm newborns (<37 weeks of gestation) were consecutively included. Data were prospectively collected using standardized forms based on medical records and clinical examination. The primary outcome was in-hospital mortality. Associations were assessed using chi-square or Fisher's exact tests, followed by multivariate logistic regression. **Results:** Among 482 admitted neonates, 120 were preterm (24.9%). The in-hospital mortality rate was 33.3% (n = 40). Independent factors associated with mortality included absence of antenatal care (aOR 22.0; 95% CI 4.28 - 144; p < 0.001), intrauterine growth restriction (aOR 6.71; 95% CI 2.78 - 18.2; p < 0.001), respiratory distress (aOR 22.1; 95% CI 6.18 - 142; p < 0.001), anemia (aOR 27.1; 95% CI 7.56 - 174; p < 0.001), apnea (aOR 25.3; 95% CI 8.86 - 92.3; p < 0.001), and hypothermia (aOR 5.73; 95% CI 2.19 - 18.0; p < 0.001). **Conclusion:** Preterm mortality remains unacceptably high in Kisangani. Strengthening antenatal care coverage and improving neonatal care quality are essential to reduce mortality.

## Keywords

Prematurity, Neonatal Mortality, Risk Factors, Kisangani, DR Congo

## 1. Introduction

Prematurity is defined as birth occurring before 37 weeks of gestation. According to the World Health Organization, approximately 15 million babies are born prematurely each year worldwide, representing nearly 11% of all live births [1].

Prematurity is currently the leading cause of neonatal mortality and one of the major causes of death among children under five years of age [2]-[4]. Complications related to prematurity account for nearly one million deaths annually.

The incidence of prematurity varies considerably between countries. In the United States, the prevalence is estimated at about 10.5%, whereas in France it is approximately 6.6% [5].

In sub-Saharan Africa, several studies have reported high rates of prematurity, including 21.4% in N'Djamena (Chad) and 9.9% in Oran (Algeria) [6] [7].

In low- and middle-income countries, limited access to neonatal intensive care, insufficient medical equipment, and a shortage of trained health professionals contribute significantly to neonatal mortality [8] [9].

In the Democratic Republic of Congo, prematurity represents a substantial proportion of neonatal deaths. However, data on the determinants of mortality among preterm newborns remain limited [10] [11].

The aim of this study was to identify factors associated with mortality among preterm newborns hospitalized in several health facilities in Kisangani.

## 2. Materials and Methods

### 2.1. Study Design and Setting

This was a multicenter prospective analytical study conducted in four hospitals in Kisangani:

- University Clinics of Kisangani.
- Cinquantenaire Hospital.
- Kabondo General Referral Hospital.
- Rekapi Polyclinic.

### 2.2. Study Population

All preterm newborns admitted during the study period were eligible.

### 2.3. Inclusion and Exclusion Criteria

Inclusion criteria:

- Gestational age <37 weeks.
- Admission to participating hospitals.

Exclusion criteria:

- Major congenital anomalies incompatible with life.
- Refusal of parental consent.

### 2.4. Data Collection

Data were prospectively collected using standardized forms based on medical rec-

ords and clinical examination. Maternal, obstetric, clinical, and laboratory variables were recorded.

## 2.5. Definitions of Variables

- Intrauterine growth restriction (IUGR): birth weight <10th percentile.
- Anemia: hemoglobin <14 g/dL at admission.
- Hypothermia: axillary temperature <36.5°C at admission.
- Respiratory distress:  $\geq 2$  signs (tachypnea, retractions, nasal flaring, grunting).
- Apnea: breathing pause  $\geq 20$  seconds or associated with cyanosis.

All variables were assessed at admission.

## 2.6. Outcome Definition

The primary outcome was in-hospital mortality, defined as death occurring during hospitalization.

## 2.7. Statistical Analysis

Data were analyzed using R software.

- Qualitative variables: frequencies and percentages.
- Bivariate analysis: chi-square or Fisher's exact test.
- Multivariate analysis: logistic regression.

Missing data were handled using complete-case analysis (<10%).

## 2.8. Ethical Considerations

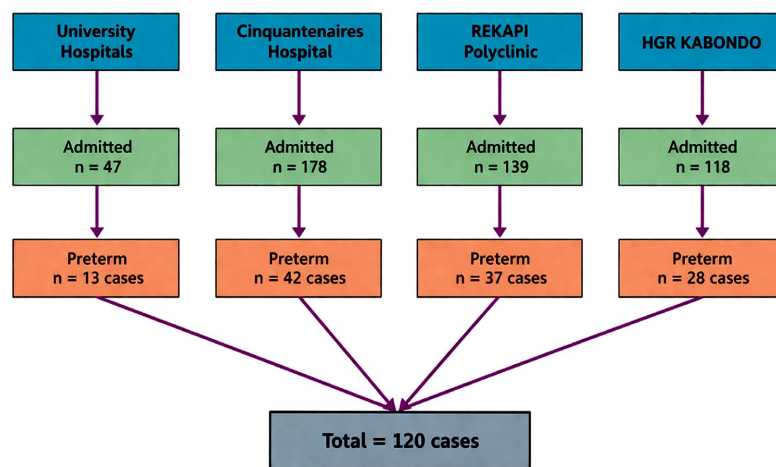
Ethical approval was obtained. Written informed consent was obtained from parents.

## 3. Results

### 3.1. Flow of Participants

**Figure 1** shows the flow of participants included in the study.

Among 482 neonates admitted, 120 were preterm (24.9%).



**Figure 1.** Flow diagram of study population selection.

### 3.2. Baseline Characteristics

The baseline maternal and neonatal characteristics of the study population.

Most mothers were aged 18 - 35 years (64.2%), married (68.3%), and had inadequate antenatal care (<3 visits in 69.2%).

Among preterm newborns, 67.5% were male, 42.5% had a gestational age of 34–36 weeks, 57.5% had a birth weight of 1000–1500 g, and 55% had intrauterine growth restriction.

### 3.3. Neonatal Complications

- Hypothermia: 65.8%.
- Respiratory distress: 62.5%.
- Anemia: 59.2%.
- Jaundice: 10%.

### 3.4. Outcome

A total of 40 deaths and 80 survivors were recorded. The in-hospital mortality rate was 33.3%.

### 3.5. Bivariate Analysis

Mortality was significantly associated with:

- Absence of antenatal care.
- Intrauterine growth restriction.
- Hypothermia.
- Respiratory distress.
- Anemia.

### 3.6. Multivariate Analysis (Table 1)

**Table 1.** Presents the results of the multivariate logistic regression analysis of factors associated with in-hospital mortality.

Factor	Adjusted OR	95% CI	p-value
Absence of antenatal care	22.0	4.28 - 144	<0.001
Intrauterine growth restriction	6.71	2.78 - 18.2	<0.001
Respiratory distress	22.1	6.18 - 142	<0.001
Anemia	27.1	7.56 - 174	<0.001
Apnea	25.3	8.86 - 92.3	<0.001
Hypothermia	5.73	2.19 - 18.0	<0.001

All variables remained significantly associated with mortality ( $p < 0.001$ ). Abbreviations: OR: Odds Ratio; CI: Confidence Interval.

## 4. Discussion

This study highlights a high in-hospital mortality rate among preterm neonates in Kisangani (33.3%), underscoring the persistent burden of prematurity in low-re-

source settings. Similar mortality rates ranging from 25% to 40% have been reported in sub-Saharan Africa [6] [7].

The absence of antenatal care was strongly associated with mortality, which is consistent with findings from low- and middle-income countries where inadequate prenatal follow-up contributes significantly to adverse neonatal outcomes [8] [12].

Apnea and respiratory immaturity are well-recognized complications of prematurity and major contributors to neonatal mortality [13] [14] [15].

Neonatal complications such as respiratory distress, apnea, anemia, and hypothermia were major contributors to mortality. These findings are consistent with previous studies highlighting the critical role of respiratory immaturity and thermal instability in preterm deaths [11] [16].

In contrast, significantly lower mortality rates—generally below 10%—are reported in high-income countries, largely due to advanced neonatal care, including mechanical ventilation, surfactant therapy, and well-established perinatal systems [10] [17].

Our findings are also consistent with studies conducted in the Democratic Republic of Congo and other African settings, which emphasize the role of limited healthcare resources and inadequate neonatal care infrastructure [5] [6] [17].

Global estimates further confirm the substantial burden of prematurity and neonatal mortality worldwide [4] [12] [18].

Studies from Ethiopia and Tanzania report comparable mortality rates, reflecting similar constraints in neonatal care capacity [15] [20].

Overall, preterm mortality in Kisangani appears to be driven by both biological vulnerability and systemic healthcare limitations, consistent with findings reported in other African contexts [7] [11] [18].

## 5. Strengths

- Multicenter design.
- Prospective data collection.
- Robust statistical analysis.

## 6. Limitations

This hospital-based study may be subject to selection and referral bias. Residual confounding cannot be excluded. Follow-up was limited to hospitalization.

## 7. Conclusion

Preterm mortality remains high in Kisangani and is associated with both maternal factors and neonatal complications. Strengthening antenatal care and improving neonatal care quality are critical priorities.

## Funding

None.

## Authors' Contributions

Jean Hubert Tshishimbi Kalala contributed to the study design and clinical assessment of preterm newborns. Data collection was performed by Jean Hubert Tshishimbi Kalala, Scapin Kabongo Mudipanu, and Véronique Muyobela Kampunzu. Data analysis was conducted by Alphonse Lufuluabu Mpemba. Manuscript revision was performed by Gaspard Mande Bukaka, Dadi Falay Sadiki, Emmanuel Tebandite Kasai, and Jean Pierre Alworong'a Opara. All authors read and approved the final version.

## Conflicts of Interest

The authors declare no conflicts of interest.

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