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Original Research Article

Epidemiological, clinical and therapeutic aspects of severe malaria in pregnancy: a cross-sectional study at the Initiative Plus Hospital center maternity ward in Kinshasa, Democratic Republic of the Congo

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ABSTRACT

Background: Malaria is a febrile, hemolytic, erythrocytic parasitic disease caused by the presence and multiplication of a *Plasmodium* protozoan within human erythrocytes, transmitted via the bite of a female *Anopheles* mosquito. The objective of this study is to determine the epidemiology, clinical presentation, and treatment of severe, complicated malaria in pregnant women monitored at the "Initiative Plus" Hospital Center maternity ward between January 1, 2023, and December 31, 2025.
Methods: This is a cross-sectional study of a case series involving severe, complicated malaria during pregnancy at the "Initiative Plus" Hospital Center maternity ward in Kinshasa, utilizing non-probability convenience sampling for case selection. Statistical analyses employed the chi-square test, ANOVA, and adjusted logistic regression.
Results: The prevalence of malaria during pregnancy was 44.33%. The mean age of patients was 29.01±7.7 years, and the mean parity was 1.56±1.91 deliveries, with a predominance of nulliparous and primiparous women. The mean number of antenatal care (ANC) visits was 1.88±2.29. Mean parasitemia was 49,471.74±8,778.5 trophozoites, with 28 cases (15%) showing parasitemia levels greater than or equal to 98,208 trophozoites per microscopic field. Mean hemoglobin was 9.41±2.09 g/dl, mean blood glucose was 75.94±26.58 g/dl, and mean temperature was 37.77±1.06°C. Artesunate combined with an antispasmodic was administered in 150 cases (79.4%), Manalaria in 30 cases (15.9%), and quinine combined with an antispasmodic in 8 cases (4.2%). The complication rate for severe malaria in pregnancy was 30.32%, and the rate of congenital malaria was 4.52%.
Conclusion: Malaria in pregnancy is a genuine public health issue requiring treatment that adheres to established standards. Our findings can support further research into the anatomical-pathological and biological characteristics of infected placentas in pregnant women who suffered from malaria, with the aim of improving clinical management.

Keywords: Epidemiology, Clinical presentation, Treatment, Severe malaria in pregnancy, "Initiative Plus" Hospital Center, Kinshasa, DR Congo

INTRODUCTION

Malaria is a febrile, hemolytic, erythrocytic parasitic disease caused by the presence and multiplication of a Plasmodium hematozoan within human erythrocytes, transmitted through the bite of a female Anopheles mosquito [1,2]. There are six different Plasmodium species capable of infecting humans: Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, Plasmodium knowlesi, and Plasmodium

cynomolgi [1]. The mortality rate associated with severe P. falciparum malaria is significantly higher in pregnant women than in non-pregnant women.[3]

In 2024, approximately 282 million malaria cases and 600,000 deaths attributed to the disease were recorded worldwide. Transmission occurs in nearly 80 countries, primarily in disadvantaged tropical regions of Africa, Asia, and Latin America.[2] Globally, the African region is the most heavily affected, accounting for 95% of cases (265 million) and deaths (579,000)-75% of which occur in children under the age of five.[1] In contrast, the situation differs in the Region of the Americas, where a decline in cases was observed between 2005 and 2014, followed by a resurgence starting in 2015, particularly in Colombia.[4]

The Democratic Republic of the Congo (DRC) ranks second globally in terms of the number of malaria cases (12.6%) and malaria-related deaths (11.3%), with 27.3 million cases and 24,880 malaria-related deaths reported in 2022—representing increases of 9.2% and 11.2%, respectively, compared to 2021.[5] A study conducted in Lubumbashi reported a malaria prevalence of 16%.[6]

Malaria during pregnancy poses a significant public health challenge, particularly in regions where the disease is endemic. It represents a serious risk for mothers and their unborn children.[7] Pregnant women are more vulnerable to malaria infection due to physiological and immunological changes that compromise their ability to fight the disease.[8] Parasites sequester in the placenta, disrupting nutrient and oxygen exchange and thereby compromising fetal development.[9]

The lack of epidemiological data regarding severe malaria in pregnancy prompted us to initiate this study, which aims to determine the epidemiology of severe malaria among pregnant women receiving care at the "Initiative Plus" Hospital maternity ward between January 1, 2023, and December 31, 2025.

METHODS

Study design and setting

This is a cross-sectional study of a series of cases of severe malaria in pregnancy recorded at the maternity ward of the "Initiative Plus" Hospital Center in Kinshasa between January 1, 2022, and July 31, 2025. This hospital was selected due to its technical facilities—befitting a modern secondary-referral hospital—the presence of trained and experienced medical staff (including obstetrician-gynecologists), and the high volume of pregnant women attending for prenatal care.

Study population

The study utilized the medical records of women of all ages who had given birth and had suffered from complicated severe malaria during pregnancy, recorded at the maternity ward of the "Initiative Plus" Hospital Center in Kinshasa between January 1, 2022, and July 31, 2025. All incomplete or missing medical records were excluded. 188 cases of malaria in pregnancy were included; two cases were excluded because the records could not be found. A non-probability convenience sampling method was implemented. The sample size was determined by the study's temporal and geographical scope. The inclusion criteria applied included women who had given birth and suffered from malaria during pregnancy, received care at the "Initiative Plus" Hospital Center maternity ward during the study period, and had a complete medical record, while women with incomplete medical records and those who had been transferred were excluded.

Data collection

Data for this study were collected by reviewing the medical records of women who had given birth, as well as the registers and computerized databases of the maternity ward at the "Initiative Plus" Hospital Center in Kinshasa; these data were recorded on data collection forms. The following variables were used: year of study, maternal age, parity, gestational age, number of prenatal visits, number of doses of intermittent preventive treatment (IPTp) with sulfadoxine-pyrimethamine (SP), temperature, *Plasmodium* species, positive thick blood smear, positive thin blood smear, treatment administered, post-treatment outcome, and complications.

For data collection, we first identified the names of women who had suffered from severe, complicated malaria during pregnancy using the maternity ward's registers and computer system; we then located the physical and electronic records for the identified patients and finally transcribed the data from the medical records anonymously onto the data collection forms.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 29. Mean±standard deviation (SD) and proportions were used to present quantitative and qualitative variables, respectively.

Ethical considerations

Principles of medical ethics and guidelines for documentary studies were observed: data were collected confidentially and handled anonymously. Our study received authorization from the local Ethics Committee of the "Initiative Plus" Hospital Center (reference number N°112/MD/CHIP/2026).

RESULTS

Frequency of malaria in pregnancy

We recorded 188 pregnant women suffering from severe malaria out of a total of 424 pregnant women; the number of cases shifted from 68 (36.1%) in 2023 to 55 (29.2%) in 2025, with 65 cases (34.5%) in 2024. The frequency of severe malaria in pregnancy at the CHIP maternity ward during the study period was 44.33%. According to Figure 1, this frequency followed an inverted-V pattern, moving from 45.03% in 2023 to 41.67% in 2025, passing through 46.09% in 2024. The mean incidence of severe malaria cases in pregnancy in our setting is 62.67±0.5 cases per year.

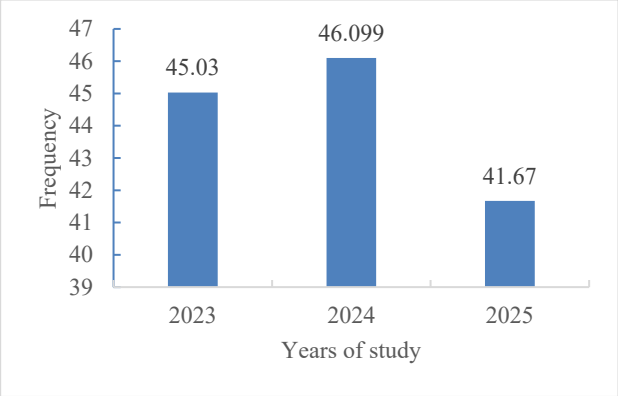


Figure 1: Trend in malaria frequency during the study period.

Clinical characteristics of patients

The mean age of the patients was 29.01±7.7 years; mean parity was 1.56±1.91 deliveries, with 36.70% being nulliparous; and the mean number of antenatal care (ANC) visits was 1.88±2.29, with 45% of patients having received no ANC. The mean gestational age was 22.39±10.04 weeks of amenorrhea, with 43% of pregnant women at or beyond 24 weeks; the mean number of IPTp-SP doses was 0.62±0.85, with 57.97% receiving no IPTp-SP; mean parasitemia was 49,471.74±8,778.5 trophozoites, with 28 cases (15%) showing parasitemia≥98,208 trophozoites per microscopic field; mean hemoglobin was 9.41±2.09 g/dl, mean blood glucose was 75.94±26.58 g/dl, and mean temperature was 37.77±1.06°C, with fever present in 71.80% of cases (Table 1).

Treatment initiated and post-treatment course

Artesunate plus an antispasmodic was administered in 150 cases (79.4%), Manalaria in 30 cases (15.9%), and quinine combined with an antispasmodic in 8 cases (4.2%). The complication rate for severe malaria in pregnancy was 30.32%; maternal complications included anemia (70% of cases) and cerebral malaria (14%), while fetal/neonatal outcomes included prematurity associated with intrauterine growth restriction (IUGR) and intrauterine fetal death (IUFD) (26.63% of cases), congenital malaria (4.52%), and spontaneous abortion (28%) (Table 1).

Table 1: Clinical and therapeutic characteristics of pregnant women who suffered from malaria during pregnancy.

Variables	Total
	Mean±SD or n=180 (%)
Patient age	29.02±7.74 years
Patient parity	1.56±1.91 deliveries
Grouped parity	
Nulliparity	69 (36.70%)
Primiparity	53 (28.19%)
Number of ANC visits	1.88±2.29
No ANC follow-up	84 (44.68%)
Non-use of impregnated mosquito nets	93 (49.68%)
Gestational age	22.39±10.04 weeks
Gestational age ≥24 weeks	81 (43.08%)
Number of IPT doses	0.62±0.85 doses
Absence of IPT	109 (57.97%)
Temperature in °C	37.77±10.6°C
Presence of fever	135 (71.80%)
Positive blood smear	183 (97.34%)
Thin smear	22 (38.59%)
Plasmodium falciparum	188 (100%)
Parasitemia	49,471.74±8,778.5 trophozoites per field
Parasitemia ≥98,208 trophozoites per microscopic field	28 (14.89%)
Hemoglobin	9.41±2.096 g/dl
Blood glucose	75.94±26.58 mg/dl

Continued.

Variables	Total
Maternal anemia	51 (27.12%)
Cerebral malaria	9 (4.78%)
Prematurity	20 (10.63%)
IUGR and Stillbirth	49 (26.63%)
Spontaneous abortion	18 (9.57%)
Treatment initiated	
Artesunate-based combination + papaverine	150 (79.1%)
Antimalarial + antispasmodic	30 (15.9%)
Quinine + antispasmodic	8 (4.2%)
Post-treatment outcome	
Complications	57 (30.32%)
Congenital malaria	8 (4.25%)
Parasitemia	49,471.74±8,778.5 trophozoites per field

N: total effective;%: percentage

DISCUSSION

The aim of our study was to determine the epidemiological, clinical, and therapeutic characteristics of severe malaria in pregnant women monitored at the "Initiative Plus" Hospital Center maternity ward between January 1, 2023, and December 31, 2025. The prevalence of malaria during pregnancy was 44.33%; the mean age was 29.01±7.7 years; the mean parity was 1.56±1.91 deliveries, with a predominance of nulliparous and primiparous women; the mean number of antenatal care (ANC) visits was 1.88±2.29 ; the mean parasitemia was 49,471.74±8,778.5 trophozoites (with 28 cases—representing 15% of the total—showing parasitemia levels greater than or equal to 98,208 trophozoites per microscopic field); the mean hemoglobin level was 9.41±2.09 g/dl; the mean blood glucose level was 75.94±26.58 g/dl; the mean temperature was 37.77±1.06°C; and the complication rate was 30.32%.

The prevalence of severe malaria in pregnancy in our setting is 44.33%. Thefindings are significantly higher than those reported by Diallo et al in Rotama, Guinea-Conakry (2021), Fenomanana et al in Toamasina, Madagascar (2014), and Munan et al in Lubumbashi, DR Congo (2020), who reported rates of 7.00%, 6.23%, and 39.00%, respectively.[10,11,7] Conversely, the rate in the current study is substantially lower than those reported by Bouyou-Akotet et al in Libreville, Gabon and Nwagha et al in Nigeria, who reported 57.00% and 58.40%, respectively.[12,13] The higher prevalence observed in our study may be attributed to Kinshasa's location in a tropical zone where malaria is endemic, leading to severe complications in patients with pregnancy-associated immune alterations.

The mean age of our patients was 29.01±7.7 years, with a mean parity of 1.56±1.91 deliveries; nulliparous and primiparous women predominated in our cohort. The results align with those of Fenomanana et al in Madagascar, Bouyou-Akotet et al in Libreville, Gabon, and Nwagha et al in Nigeria all of whom reported a predominance of malaria among young women and nulliparous or primiparous women.[11-13] Pregnancy is associated with a certain decline in acquired immunity—particularly in nulliparous and primiparous women—thereby leading to an increase in the frequency and intensity of parasitemia. Consistent with observations by Fenomanana et al and Saute et al, first pregnancies are more prone to malaria than subsequent ones, and the disease is more frequent and severe in primiparous women and their newborns.[11,14] This was also the case in the current study.

Regarding WHO guidelines on the number of antenatal care (ANC) visits, at least eight visits are now recommended during pregnancy to ensure maternal-fetal monitoring and safeguard maternal health.[15] In this study, the mean number of ANC visits was 1.88±2.29, with 45% of patients having received no ANC, demonstrating low utilization of this service in our setting.

The mean gestational age of our patients was 22.39±10.04 weeks of amenorrhea (WA), with 43% of pregnant women at a gestational age of 24 WA or greater. Our results align with those of Fenomanana et al in Madagascar, where malaria occurred primarily during the second (47.5%) and third (37.5%) trimesters of pregnancy.[11]

Several studies indicate that placental infestation most commonly occurs during the middle and final trimesters of pregnancy; however, early infections-occurring before the 20th week of gestation or even prior to the first dose of intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp-SP)-can also lead to infestation 14,16-18. This is consistent with our findings.

The mean number of IPTp-SP doses was 0.62±0.85, with no IPTp-SP administered in 57.97% of cases, reflecting low uptake of this treatment. The current study results corroborate those of Fenomanana et al in Madagascar, which reported low TPI/SP uptake—with only 22.5% of malaria-affected patients receiving at least one dose—despite several Malagasy studies demonstrating that *Plasmodium falciparum* in Madagascar still retained

good sensitivity to sulfadoxine-pyrimethamine in 2008.[11,19,20,21]

The mean temperature was 37.77±1.06°C; fever was present in 71.80% of cases, maternal anemia in 27.12%, and cerebral malaria in 4.78% of our patients. This may be attributed to the low use of prophylactic treatment in our setting. The current study results align with those of Pineros et al in Colombia (2013), who found that malaria manifested in various clinical forms within the population.[22] In their study of clinical malaria manifestations, these authors also reported that *Plasmodium vivax* infections in pregnant women presented with hepatic dysfunction as the most frequent complication.[22] Bhandari et al. in India (2021) demonstrated that malaria-associated hepatic dysfunction in pregnant women exacerbates the severity of the disease.[23] This was not the case in our study, where all cases of malaria in pregnancy were caused by *Plasmodium falciparum*.

The mean parasitemia is 49,471.74±8,778.5 trophozoites, with 15% of cases showing parasitemia levels greater than or equal to 98,208 trophozoites per microscopic field. The current study results reveal *Plasmodium* *hyperparasitemia* in the pregnant patients. Several studies in the literature have demonstrated that *Plasmodium* *hyperparasitemia* underlies malaria-related complications during pregnancy.[24-28] In this case series, malaria-related complications during pregnancy were present in 30.32% of cases, manifesting as maternal anemia, cerebral malaria, preterm delivery, spontaneous abortion, intrauterine growth restriction (IUGR), and intrauterine fetal death (IUFD). The results of this study align with those of several authors in the literature.[24-40] Various studies have shown that malaria during pregnancy can also be complicated by severe pre-eclampsia and severe acute respiratory distress syndrome.[41-43] However, this was not observed in this case series.

Several available articles indicate that pregnant women suffering from *P.falciparum* or *P.vivax* malaria exhibit higher levels of pro-inflammatory cytokines compared to uninfected women.[45,46] Conversely, other studies demonstrate a positive association between anti-inflammatory cytokines and malaria.[46] Still others have reported that the histopathological characteristics and CD+ lymphocyte profiles of *Plasmodium*-infected placentas show statistically significant differences compared to uninfected placentas.[47–50] Unfortunately, these biological and anatomopathological aspects were not addressed in the current study. Artesunate is used in 79.4% of cases after 15 weeks of gestation; Manalaria is used in 30 cases (15.9%); and quinine combined with an antispasmodic is used in 8 cases (4.2%) during the first trimester. According to several studies, artemisinin-based combination therapies are the recommended treatment for uncomplicated malaria during the second and third trimesters of pregnancy, whereas quinine and clindamycin are often used during the first trimester.[51-53] This largely mirrors our own practice, which includes the use of Manalaria—a locally used antimalarial drug that has proven effective across all three trimesters of pregnancy without teratogenic effects.

Preventive measures are essential to reduce the incidence and consequences of malaria during pregnancy, particularly congenital malaria.[51-53] The rate of congenital malaria in our case series is 4.52%; this is similar to the 4.7% rate reported by Unger et al. in Papua New Guinea but slightly higher than the 3.40% rate reported by Feleke et al. in Ethiopia (2020).[54] All these figures are consistent with those observed in tropical regions where malaria is endemic.

The limitations of our study include its single-center design and the failure to account for the anatomopathological and biological characteristics of placentas infected with *Plasmodium* in pregnant women who suffered from malaria. Its strengths lie in being the first study to address the epidemiology, clinical presentation, and treatment of malaria during pregnancy in this setting; its findings can inform further research into the pathological and biological characteristics of infected placentas in pregnant women who have suffered from malaria, with the aim of improving their clinical management.

CONCLUSION

Severe malaria during pregnancy is a significant public health issue in our setting. The condition presents with a prevalence of 44.33% among women (mean age: 29.01±7.7 years); a mean parity of 1.56±1.91 deliveries (predominantly nulliparous and primiparous women); a mean of 1.88±2.29 antenatal care (ANC) visits; microscopic hyperparasitemia; mean hemoglobin of 9.41±2.09 g/dl; mean blood glucose of 75.94±26.58 g/dl; mean temperature of 37.77±1.06°C; and a complication rate of 30.32%. These findings can inform further research into the anatomopathological and biological characteristics of infected placentas in pregnant women who suffered from malaria, with the aim of improving clinical management.

What is known about this topic?

Malaria is a febrile, hemolytic erythrocyte disease caused by a *Plasmodium* parasite, transmitted through the bite of a female *Anopheles* mosquito. Malaria infection during pregnancy is a major public health problem in the DRC, posing significant risks to the mother, fetus, and newborn. The lack of epidemiological data on severe malaria in pregnancy within hospitals in Kinshasa, DR Congo

What this study adds to existing knowledge

The prevalence is 44.33% among women with a mean age of 29.01±7.7 years and a mean parity of 1.56±1.91

deliveries, with a predominance of nulliparous and primiparous women. The current findings include hyperparasitemia detected via microscopy, a mean hemoglobin level of 9.41±2.09 g/dl, a mean blood glucose level of 75.94±26.58 g/dl, a mean temperature of 37.77±1.06°C, and a complication rate of 30.32%. These results can support further research into the anatomopathological and biological characteristics of infected placentas in pregnant women who suffered from malaria, with the aim of improving clinical management.

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