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Research Article

Factors Associated with Malaria among Pregnant Women in Ngaba Health Zone, Kinshasa, Democratic Republic of the Congo, 2023

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Abstract

Introduction: Malaria during pregnancy remains a major public health concern in endemic areas, including the Democratic Republic of the Congo (DRC). This study aimed to determine the proportion of malaria-confirmed cases and identify factors associated with malaria among pregnant women hospitalized with suspected malaria in Ngaba Health Zone, Kinshasa.

Methods: An analytical cross-sectional study was conducted in April 2023 among 450 pregnant women hospitalized with suspected malaria. Data were extracted from medical records and antenatal care (ANC) registers. Associations were assessed using chi-square tests and multivariable logistic regression.

Results: Malaria was confirmed in 69.3% of participants. At the first ANC visit, 56.7% had received sulfadoxine–pyrimethamine (SP), and 50.9% had received a long-lasting insecticidal net (LLIN). In multivariable analysis, failure to attend scheduled ANC appointments was associated with higher odds of confirmed malaria (adjusted OR [aOR] = 16.87; 95% CI: 1.22–233.23; p = 0.035). Residence in the Baobab health area was associated with lower odds of confirmed malaria than residence in Mukulua (aOR = 0.24; 95% CI: 0.10–0.55; p = 0.001). Receipt of SP before the malaria episode was also associated with lower odds of confirmed malaria (aOR = 0.005; 95% CI: 0.000–0.047; p = 0.001); however, this extreme estimate warrants cautious interpretation.

Conclusion: Among pregnant women hospitalized with suspected malaria in Ngaba Health Zone, the proportion of confirmed cases was high. Strengthening ANC follow-up and malaria prevention services is important, although these findings should be interpreted in light of the study population and the observational design

Keywords: Malaria, Pregnancy, Associated factors, Ngaba Health Zone, Kinshasa.

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I. Introduction

Malaria during pregnancy remains a major public health concern because of its adverse consequences for maternal, fetal, and neonatal health, including maternal anaemia, maternal death, intrauterine growth restriction, prematurity, and low birth weight [1]. In 2023, an estimated 263 million malaria cases and 597,000 malaria-related deaths occurred worldwide [3]. The WHO African Region accounted for 94% of global malaria cases and 95% of malaria-related deaths [3]. In 2021, approximately 11.6 million pregnancies in this region were exposed to malaria, representing 34% of all pregnancies [4]. The World Health Organization (WHO) recommends intermittent preventive treatment in pregnancy with sulfadoxine–pyrimethamine (IPTp-SP), starting as early as possible in the second trimester, alongside the use of long-lasting insecticidal nets (LLINs), prompt diagnosis, and effective treatment. However, in 2023, only 44% of eligible pregnant women received at least three doses of IPTp, while LLIN use among pregnant women reached 59% [3]. These figures highlight persistent gaps in malaria prevention during pregnancy.

In the Democratic Republic of the Congo (DRC), malaria remains a major public health challenge. According to the 2017–2018 Multiple Indicator Cluster Survey, 63% of households owned at least one LLIN, 52% of pregnant women used LLINs, 31% received at least two doses of sulfadoxine–pyrimethamine, and 13% received at least three doses of IPTp [5]. National malaria control strategies implemented by the National Malaria Control Programme (NMCP) and its partners include IPTp-SP, LLIN distribution, rapid diagnostic testing, and appropriate treatment [6,7]. In Kinshasa, malaria transmission varies across communities, with administrative data indicating high incidence in some peripheral communes [8]. Fever during pregnancy requires prompt clinical assessment because malaria may lead to serious maternal and fetal complications [9,10]. According to the District Health Information Software 2 (DHIS2), Ngaba Health Zone recorded 5,376 first antenatal care (ANC) visits and 2,571 fourth ANC visits in 2023, alongside 1,746 reported malaria cases among pregnant women and 1,508 treated cases [11]. These figures emphasize the importance of strengthening malaria prevention and case management within maternal health services.

Despite ongoing interventions by the NMCP and its partners, malaria continues to affect pregnant women in Ngaba Health Zone. However, the factors associated with malaria confirmation among pregnant women receiving care in this setting remain insufficiently documented. Identifying these factors could help reveal gaps in preventive interventions and antenatal care. Therefore, this study aimed to determine the proportion of confirmed malaria cases and identify factors associated with malaria confirmation among pregnant women hospitalized with suspected malaria in Ngaba Health Zone, Kinshasa, in April 2023. The findings may inform locally appropriate strategies to strengthen malaria prevention, diagnosis, and management during pregnancy.

II. Methodology

Study design

An analytical cross-sectional study was conducted in April 2023 to assess malaria and its associated factors among pregnant women hospitalized for suspected malaria in the Ngaba Health Zone, Kinshasa, Democratic Republic of the Congo (DRC). Data were retrospectively extracted from existing antenatal care (ANC) and prenatal follow-up records.

Study site

The study was conducted in the Ngaba Health Zone, located in the city-province of Kinshasa, DRC. The health zone has an estimated population of 270,530 inhabitants, including 6,762 pregnant women, within an area of 4 km², corresponding to a population density of 55,017 inhabitants/km² [12]. It is accessible by road and is subdivided into six functional health areas. Its healthcare infrastructure includes a central health zone office (CBSO), a general referral hospital (GPH), 28 public and private health centers, and 10 maternity units. These facilities provide basic healthcare services, including curative care,

antenatal care (ANC), postnatal care (PNC), and maternity services.

Study population, inclusion and non-inclusion criteria

The study population consisted of pregnant women hospitalized for suspected malaria in selected healthcare facilities within the Ngaba Health Zone. The study used data retrospectively extracted from existing antenatal care (ANC) and prenatal follow-up records.

Inclusion criteria: Pregnant women were eligible if they had attended ANC at one of the selected healthcare facilities in the Ngaba Health Zone, had been hospitalized for suspected malaria, had documented results of both a rapid diagnostic test (RDT) and thick blood smear microscopy in their prenatal follow-up records, and had complete information on the study variables.

Non-inclusion criteria: Records were excluded if they lacked the results of either the RDT or thick blood smear, contained incomplete information on the variables required for the analysis, or were otherwise unusable for data extraction.

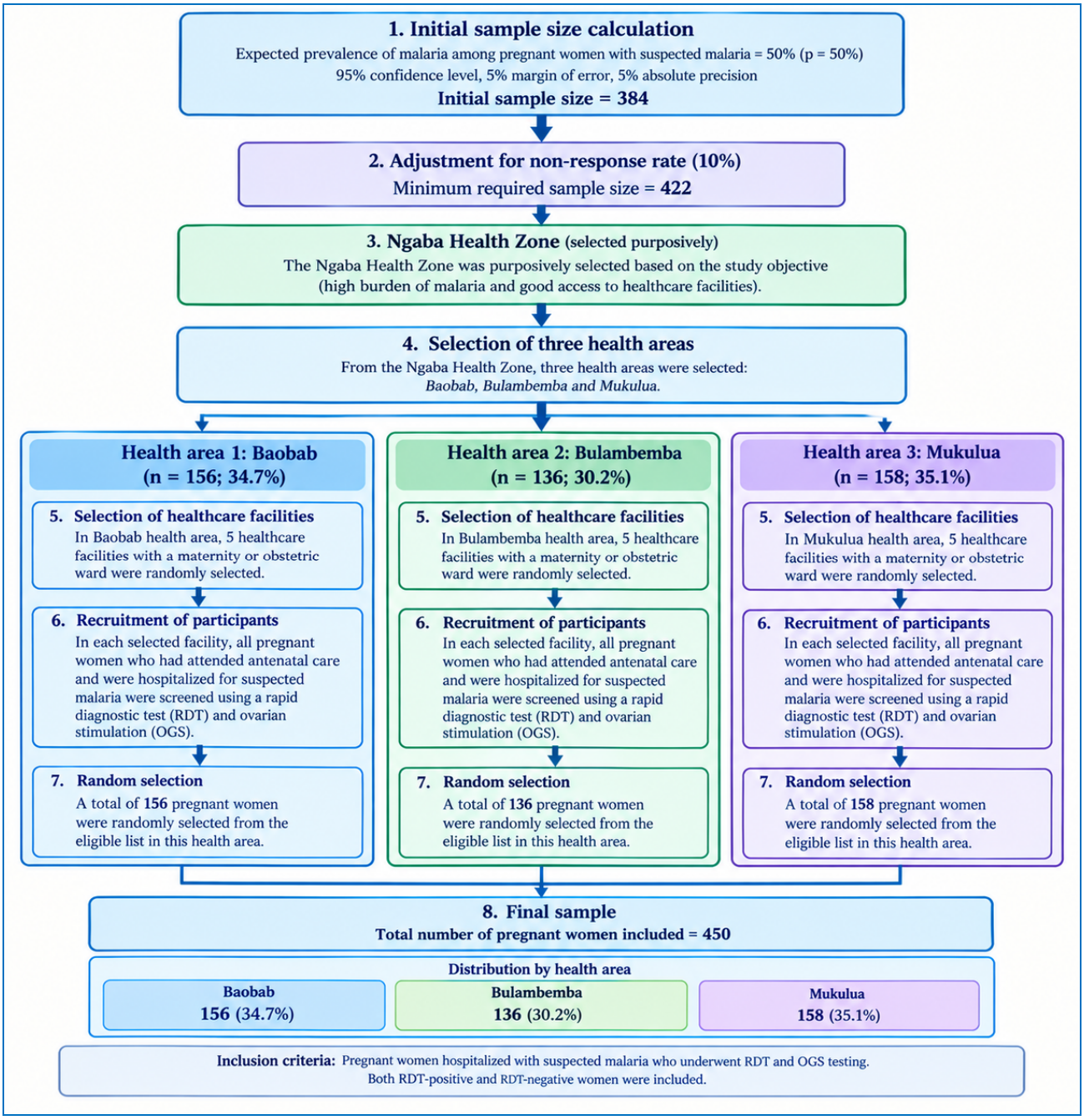


Figure 1. Sampling flow diagram

Sampling

The sample size was calculated using the formula for a proportion in a single population: $n \geq \frac{Z_{\alpha}^2}{d^2} pq$.

The minimum sample size was calculated using a single-population proportion formula, assuming an expected malaria prevalence of 50% among pregnant women hospitalized with suspected malaria in the Ngaba Health Zone. A 95% confidence level, a 5% margin of error, and an absolute precision of 5 percentage points were used, yielding an initial sample size of 384 participants. After accounting for a potential 10% non-response rate, the minimum required sample size was estimated at 422 pregnant women. For organizational and fieldwork-related reasons, the final sample was increased to 450 participants.

A multistage sampling procedure was used to select the study sites and participants. First, the Ngaba Health Zone was purposively selected based on the study objectives. Second, three health areas (Baobab, Bulambemba, and Mukulua), were selected. Third, pregnant women who met the eligibility criteria were recruited from the selected health areas through the participating healthcare facilities providing maternity or obstetric services.

The final sample of 450 pregnant women was distributed across the three health areas according to the number of participants recruited in each area: 156 (34.7%) in Baobab, 136 (30.2%) in Bulambemba, and 158 (35.1%) in Mukulua. Eligible participants were pregnant women hospitalized with suspected malaria who underwent malaria testing using a rapid diagnostic test (RDT). Selection was based on suspected malaria before the test result was known, rather than confirmed malaria, to ensure that both RDT-positive and RDT-negative women were included in the study. Women were enrolled if they met the predefined eligibility criteria and provided informed consent.

Study variables and operational definitions

The dependent variable was malaria status, defined as the presence or absence of malaria based on the results of rapid diagnostic testing (RDT) and thick blood smear microscopy documented in the antenatal care (ANC) records of pregnant women hospitalized for suspected malaria. These diagnostic tests were performed as part of routine healthcare, and their results were retrospectively extracted from the existing prenatal follow-up records. No diagnostic tests were performed specifically for this study. Malaria status was classified according to the diagnostic information available in the records.

The independent variables included maternal age, gestational age at diagnosis, occupation, educational level, gravidity, parity, number of ANC visits attended, receipt of malaria chemoprophylaxis, clinical signs and symptoms, pregnancy-related complications, and receipt of intermittent preventive treatment during pregnancy (IPTp). These variables were extracted from the prenatal follow-up records and operationally defined according to the information available in the study database. Quantitative variables were recorded using their documented values, while categorical variables were classified according to the predefined categories used for data collection and analysis. For preventive interventions, receipt was determined from the information documented in the ANC records.

Data collection

The data were collected using a pre-tested data collection form including the characteristics of the pregnant woman, and other variables mentioned above by 10 investigators trained for two days on the objectives of the study, the survey questionnaire and its completion, the rules of ethics, and the quality of the data to be collected.

Statistical analysis

Data were collected using KoboCollect, stored on the KoboToolbox server, and exported to Microsoft Excel for data processing, consistency checks, and cleaning before analysis. Statistical analyses were performed using IBM SPSS Statistics, version 27. Categorical variables were summarized as frequencies and percentages, whereas continuous variables were described

using means and standard deviations for normally distributed data or medians and interquartile ranges for non-normally distributed data.

Bivariate analyses were conducted to examine associations between the independent variables and malaria status during pregnancy. Associations between categorical variables were assessed using the chi-square test; Fisher's exact test was used when expected cell counts were too small for the chi-square test assumptions to be met. Binary logistic regression was used to estimate crude odds ratios (ORs) and their 95% confidence intervals (CIs). Where a multivariable logistic regression model was fitted, adjusted odds ratios (aORs) and their 95% CIs were calculated to assess the associations between the explanatory variables and malaria status while accounting for the other variables included in the model. Statistical significance was set at a two-sided p-value of less than 0.05.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Kinshasa School of Public Health (approval No. ESP/CE/244/2024, dated 24 December 2024). Administrative authorization was also obtained from the managers of the participating healthcare facilities before data collection. Data were collected retrospectively from existing medical records and antenatal care (ANC) registers using a data extraction form; no direct interviews with pregnant women were conducted. Confidentiality and anonymity were maintained throughout data extraction, management, and analysis. Personal identifying information was not included in the analytical dataset, and the data were used exclusively for research purposes.

III. Results

Socio-demographic characteristics of the women:

The study included 450 pregnant women hospitalized for suspected malaria in the Ngaba Health Zone. Participants were almost equally distributed across the three health areas, with 35.1% residing in Mukulua, 34.7% in Baobab, and 30.2% in Bulambemba. Women aged 25 to 49 years represented nearly two-thirds of the study population (63.8%). Most participants were married (67.8%) and had attained secondary education (56.0%). Regarding occupation, self-employed women were the largest group (56.0%), while a substantial proportion of partners were unemployed (37.1%) or self-employed (30.0%) (**Table I**).

Table I. Sociodemographic characteristics of pregnant women hospitalized for suspected malaria in Ngaba Health Zone, Kinshasa, DRC, 2023 (N = 450)

Variable	Frequency, n	Percentage (%)
Health area		
Baobab	156	34.7
Bulambemba	136	30.2
Mukulua	158	35.1
Age group (years)		
15–24	162	36.0
25–49	287	63.8
≥50	1	0.2
Marital status		
Single	100	22.2
Married	305	67.8
Cohabiting	45	10.0
Educational level		
No formal education	26	5.8
Primary	83	18.4
Secondary	252	56.0
Higher education	89	19.8
Main occupation		
Other occupations	26	5.8
Civil servant	83	18.4

Self-employed	252	56.0
Informal-sector worker	89	19.8
Unemployed/housewife	26	5.8
Partner's occupation		
Other occupations	11	2.4
Trader/small business owner	34	7.6
Civil servant	103	22.9
Self-employed	135	30.0
Unemployed	167	37.1

Antenatal care, malaria prevention and treatment among pregnant women:

Coverage of antenatal care services was high, with 95.3% of patient records documenting ANC visits and 97.3% of women reporting adherence to scheduled ANC appointments. Most women (96.4%) attended their first ANC visit before 16 weeks of gestation. Concerning malaria prevention, 56.7% received sulfadoxine-pyrimethamine (SP) during the first ANC visit, and 51.6% had received SP before the documented malaria episode. Nearly half of the participants received a long-lasting insecticidal net (LLIN) during the first ANC visit (50.9%), while 46.7% reported having received an LLIN before the malaria episode. Artemether-lumefantrine was the most frequently prescribed treatment for the first malaria episode (64.2%), followed by artesunate-amodiaquine (26.7%) (**Table II**).

Table II. Antenatal care and malaria prevention and treatment among pregnant women hospitalized for suspected malaria in Ngaba Health Zone, 2023 (N = 450)

Variable	Frequency, n	Percentage (%)
Antenatal care (ANC)		
ANC appointments recorded in the patient's file		
No	21	4.7
Yes	429	95.3
ANC appointments attended as scheduled		
No	12	2.7
Yes	438	97.3
First ANC visit before 16 weeks of gestation		
No	16	3.6
Yes	434	96.4
Malaria prevention		
Received sulfadoxine–pyrimethamine (SP) at the first ANC visit		
No	195	43.3
Yes	255	56.7
Received SP before the documented malaria episode		
No	218	48.4
Yes	232	51.6
Received an insecticide-treated mosquito net at the first ANC visit		
No	221	49.1
Yes	229	50.9
Received a long-lasting insecticidal net before the malaria episode		
No	240	53.3
Yes	210	46.7
Treatment received during the first malaria episode		
Artemether–lumefantrine	289	64.2
Injectable artesunate	38	8.4
Artesunate–amodiaquine (ASAQ)	120	26.7
Other treatment	1	0.2
Quinine	2	0.4

Factors associated with malaria occurrence among pregnant women:

Bivariate analysis identified several factors significantly associated with malaria occurrence among pregnant women (**Tables III and IV**). Among sociodemographic characteristics, educational level and partner's occupation showed statistically significant associations with malaria confirmation. With regard to obstetric and antenatal care factors, gravidity, gestational age, number of ANC visits attended, number of malaria episodes, compliance with ANC appointments, SP uptake at ANC1, receipt of intermittent preventive treatment before the malaria episode, and receipt of LLINs either during ANC1 or before the malaria episode were significantly associated with malaria occurrence.

Table III. Sociodemographic factors associated with malaria confirmation among pregnant women hospitalized for suspected malaria in Ngaba Health Zone, 2023

Variable	Malaria not confirmed, n	Malaria confirmed, n	Total, n	p-value
Health area				0.050
Baobab	38	118	156	
Bulambemba	51	85	136	
Mukulua	49	109	158	
Age group (years)				0.570
15–24	46	116	162	
25–49	92	195	287	
≥50	0	1	1	
Educational level				0.001
No formal education	2	24	26	
Primary	36	47	83	
Secondary	89	163	252	
Higher education	11	78	89	
Main occupation				0.420
Other occupations	3	7	10	
Civil servant	31	64	95	
Self-employed	28	88	116	
Informal-sector worker	6	8	14	
Unemployed/housewife	70	145	215	
Partner's occupation				0.001
Other occupations	4	7	11	
Trader/small business owner	5	29	34	
Civil servant	32	71	103	
Self-employed	27	108	135	
Unemployed	70	97	167	

Table IV. Obstetric factors associated with the occurrence of malaria among pregnant women hospitalized for suspected malaria in Ngaba Health Zone, 2023 (N = 450)

Variable	Malaria confirmed No n (%)	Malaria confirmed Yes n (%)	Total n (%)	p-value
Gravidity				0.010
< 5	136 (31.9)	291 (68.1)	427 (94.9)	
≥ 5	2 (8.7)	21 (91.3)	23 (5.1)	
Parity				0.500
< 5	137 (30.6)	311 (69.4)	448 (99.6)	
≥ 5	1 (50.0)	1 (50.0)	2 (0.4)	
Gestational age (weeks				0.001
< 16	137 (30.8)	308 (69.2)	445 (98.9)	
≥ 16	1 (20.0)	4 (80.0)	5 (1.1)	
Number of ANC visits attended				0.001
< 4	138 (32.5)	287 (67.5)	425 (94.4)	
≥ 4	0 (0.0)	25 (100.0)	25 (5.6)	
Number of malaria episodes				0.001

< 2	127 (29.2)	308 (70.8)	435 (96.7)	
≥ 2	11 (73.3)	4 (26.7)	15 (3.3)	
failure to attend scheduled antenatal care appointments				0.010
No	8 (66.7)	4 (33.3)	12 (2.7)	
Yes	130 (29.7)	308 (70.3)	438 (97.3)	
ANC1 before 16 weeks of a				0.100
No	2 (12.5)	14 (87.5)	16 (3.6)	
Yes	136 (31.3)	298 (68.7)	434 (96.4)	
Received SP at ANC1				0.001
No	6 (3.1)	189 (96.9)	195 (43.3)	
Yes	132 (51.8)	123 (48.2)	255 (56.7)	
IPTp before malaria episode				0.001
No	2 (0.9)	216 (99.1)	218 (48.4)	
Yes	136 (58.6)	96 (41.4)	232 (51.6)	
LLIN received at ANC1				0.001
No	14 (6.3)	207 (93.7)	221 (49.1)	
Yes	124 (54.1)	105 (45.9)	229 (50.9)	
LLIN received before malaria episode				0.001
No	13 (5.4)	227 (94.6)	240 (53.3)	
Yes	125 (59.5)	85 (40.5)	210 (46.7)	

Table V. Multivariate analysis of factors associated with the occurrence of malaria among pregnant women hospitalized for suspected malaria in Ngaba Health Zone, 2023

Variable	Adjusted OR	95% CI	p-value
Health area			
Baobab	0.24	0.10-0.55	0.001
Bulambemba	0.81	0.40-1.65	0.559
Mukulua	1 (Ref.)	-	-
Age of pregnant woman (years)			
15-24	1.06	0.50-2.27	0.881
≥25	1 (Ref.)	-	-
Educational level			
None	0.47	0.08-2.86	0.410
Primary	0.43	0.07-2.48	0.342
Secondary	0.84	0.12-6.01	0.864
Higher education	1 (Ref.)	-	-
Gestational age (weeks of amenorrhea)			
<16	0.11	0.00-13.74	0.371
≥16	1 (Ref.)	-	-
Number of ANC visits attended			
<4	1 (Ref.)	-	-
≥4	0.86	0.10-7.37	0.890
Number of malaria episodes			
<2	0.23	0.04-1.15	0.074
≥2	1 (Ref.)	-	-
Compliance with ANC appointments			
No	0.21	0.06-0.72	0.013
Yes	1 (Ref.)	-	-
ANC1 initiated before 16 weeks of amenorrhea			
No	1.03	0.07-15.07	0.981
Yes	1 (Ref.)	-	-
Received IPTp-SP at ANC1			
No	1.35	0.21-8.56	0.751
Yes	1 (Ref.)	-	-
Received IPTp-SP before malaria episode			
No	1 (Ref.)	-	-

Yes	0.005	0.000-0.047	0.001
Received LLIN at ANC1			
No	5.24	0.28-98.53	0.269
Yes	1 (Ref.)	-	-
Received LLIN before malaria episode			
No	0.11	0.006-1.96	0.132
Yes	1 (Ref.)	-	-

Multivariate logistic regression analysis retained only a limited number of independent factors associated with malaria occurrence (**Table V**). Residence in the Baobab health area remained significantly associated with malaria occurrence compared with Mukulua (aOR=0.24; 95% CI: 0.10-0.55; p=0.001). Compliance with ANC appointments was also independently associated with malaria occurrence (aOR=0.21; 95% CI: 0.06-0.72; p=0.013). Furthermore, receipt of intermittent preventive treatment with sulfadoxine-pyrimethamine before the malaria episode remained strongly associated with malaria occurrence after adjustment for potential confounding factors (aOR=0.005; 95% CI: 0.000-0.047; p=0.001).

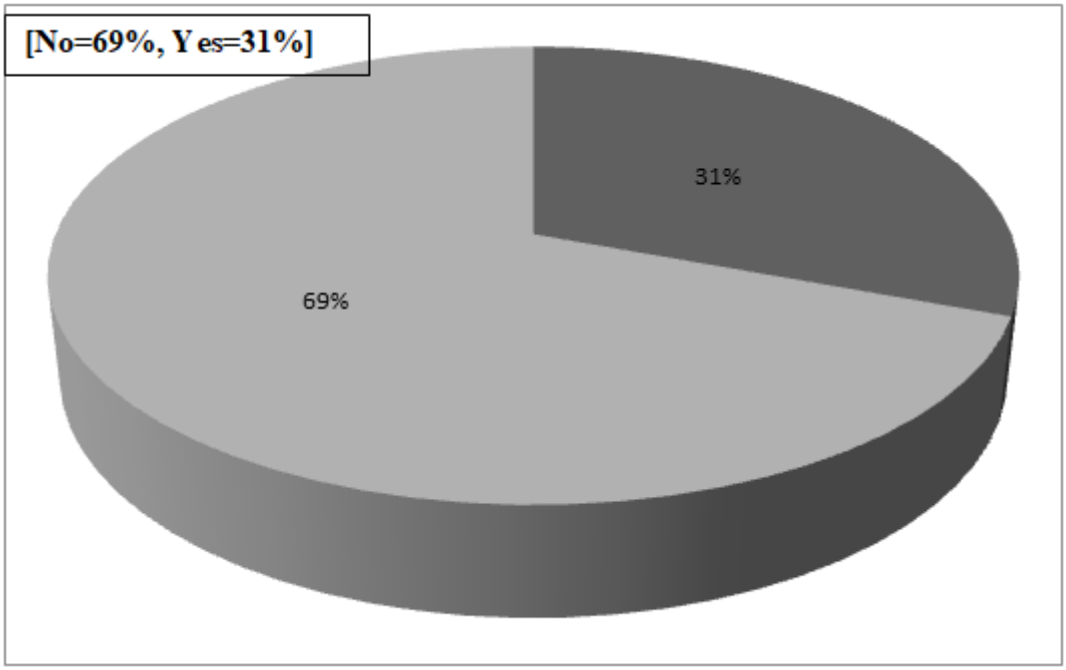


Figure 1. Confirmation of malaria in pregnant women hospitalized for suspected malaria in the Ngaba Health Zone , 2023

IV. Discussion

4.1. Proportion of malaria-confirmed cases among pregnant women

This study found that 69.3% of pregnant women hospitalized with suspected malaria in Ngaba Health Zone had a positive malaria test result documented in their antenatal care (ANC) records. This proportion reflects a substantial burden of confirmed malaria among the selected participants; it should not be interpreted as the prevalence among all pregnant women in Ngaba, because the study included hospitalized women with suspected malaria.

Malaria remains a major public health concern in the Democratic Republic of the Congo (DRC) and sub-Saharan Africa [3,4]. Studies conducted in Tanzania, Uganda, and Cameroon have also documented malaria infection during pregnancy, although estimates vary according to transmission intensity, diagnostic methods, and study populations [12,13,15]. Studies in other African settings, including Niger, further highlight the importance of malaria during pregnancy [16,17]. However, direct comparisons should be made cautiously because the present

study focused specifically on hospitalized women with suspected malaria.

4.2. Sociodemographic factors associated with malaria confirmation

Bivariate analysis identified associations between malaria confirmation, health area, maternal education, and the partner's occupation. Differences between health areas may reflect variations in malaria transmission, healthcare access, referral patterns, or preventive-intervention coverage. However, these explanations were not directly assessed.

Education may influence malaria-related knowledge, healthcare-seeking behaviour, and uptake of preventive interventions. Nevertheless, educational level was not significantly associated with malaria confirmation after adjustment, suggesting that the crude association may have been influenced by other variables. Similarly, the association with the partner's occupation may reflect differences in household resources or living conditions, although these mechanisms cannot be established from this study. Previous studies have examined maternal characteristics and malaria during pregnancy in different African settings [12,15–17], underscoring the importance of interpreting these associations within their local context.

4.3. Obstetric characteristics and antenatal care utilization

Bivariate analysis identified associations between malaria confirmation and gravidity, gestational age, number of ANC visits, previous malaria episodes, adherence to scheduled ANC appointments, and receipt of preventive interventions. ANC provides opportunities for health education, early identification of illness, and delivery of malaria prevention measures.

Research in Cameroon has examined the relationship between ANC attendance and malaria infection during pregnancy [13], while evidence from Ghana highlights the importance of ANC utilization for uptake of intermittent preventive treatment in pregnancy with sulfadoxine–pyrimethamine (IPTp-SP) [18]. However, ANC attendance alone does not guarantee receipt of recommended interventions. The observed associations also require cautious interpretation because more frequent visits may reflect either access to preventive services or illness-related healthcare use. The cross-sectional design limits conclusions about the temporal relationships between these variables and malaria confirmation.

4.4. Malaria prevention during pregnancy

Receipt of IPTp-SP and insecticide-treated nets was associated with malaria confirmation in the bivariate analysis. Both interventions are important components of malaria prevention during pregnancy [1,3]. Previous research has investigated malaria infection among pregnant women and the role of long-lasting insecticidal nets (LLINs) in prevention [12,14].

In the adjusted analysis, reported receipt of SP before the malaria episode was associated with substantially lower odds of malaria confirmation (adjusted odds ratio [aOR], 0.005; 95% confidence interval [CI], 0.000–0.047; p = 0.001). This unusually extreme estimate requires verification against the original statistical output because sparse data, coding errors, or model instability may have influenced the result. It should not be interpreted as proof of a causal protective effect.

Furthermore, recording receipt of an LLIN does not establish consistent or correct use. Strengthening ANC counseling, documenting SP doses and dates, and monitoring access to and use of LLINs remain important programmatic priorities [1,6,14,18].

4.5. Factors associated with malaria confirmation in multivariable analysis

After adjustment, women from Baobab Health Area had lower odds of malaria confirmation than those from Mukulua (aOR, 0.238; 95% CI, 0.103–0.548; p = 0.001). No statistically significant difference was observed between Bulambemba and Mukulua (aOR, 0.809; 95% CI, 0.396–1.650; p = 0.559). This finding suggests geographical variation among the hospitalized participants, although the factors underlying this difference remain unclear.

Maternal age, educational level, gestational age, number of ANC visits, timing of the first ANC visit, and receipt of an LLIN at the first ANC

visit were not significantly associated with malaria confirmation after adjustment.

Failure to attend scheduled ANC appointments was associated with higher adjusted odds of malaria confirmation (aOR, 16.874; 95% CI, 1.221–233.230; p = 0.035). However, the wide confidence interval indicates substantial uncertainty, potentially related to the small number of women who did not attend scheduled appointments. The outcome coding, reference category, and regression output should be verified before publication. Evidence concerning ANC attendance and IPTp uptake provides relevant context but does not independently validate this estimate [18].

4.6. Public health implications

These findings highlight the importance of strengthening malaria diagnosis, treatment, and prevention among pregnant women attending healthcare facilities. ANC services should provide appropriate IPTp-SP, access to LLINs, and counseling on malaria prevention [1,3,6]. Differences between health areas also support the use of local surveillance data to identify gaps in service coverage. Improving ANC documentation, particularly diagnostic results, SP doses and dates, and LLIN distribution, could strengthen clinical follow-up and the quality of future epidemiological analyses

Strengths and Limitations of the Study

This study provides useful information on malaria confirmation and associated factors among pregnant women hospitalized with suspected malaria in Ngaba Health Zone. By examining sociodemographic, obstetric, antenatal care, and malaria-prevention characteristics, it contributes to understanding the distribution of confirmed malaria in this specific clinical population.

However, several limitations should be considered. First, the cross-sectional design allowed the assessment of associations between malaria confirmation and the variables studied but did not establish temporal relationships or causal effects. Second, participants were recruited from healthcare facilities and were limited to pregnant women hospitalized with suspected malaria. Therefore, the findings may not be representative of all pregnant women in Ngaba Health Zone, particularly those who do not attend healthcare facilities or whose malaria status was not suspected or investigated. Third, information on antenatal care attendance and preventive measures may have been affected by recall bias and social desirability bias where self-reported responses were used. In addition, reliance on routine clinical records may have introduced information bias because of incomplete or inconsistent documentation. Finally, the study was conducted in a single health zone, limiting the generalizability of the findings to other areas of the Democratic Republic of the Congo, where epidemiological, environmental, and socioeconomic conditions may differ.

Conclusion

This study provides important information on malaria during pregnancy. The high prevalence of the disease, coupled with the presence of varied symptoms and severe forms, underscores the need for early diagnosis and prompt management. Although adherence to antenatal care at ANC is high, gaps persist in the implementation of preventive measures, including IPTp and the distribution of LLINs. The findings also suggest that local factors, such as place of residence, may influence disease prevalence, highlighting the need to improve coverage of key interventions and implement rigorous antenatal care.

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Conflicts of Interest: The authors declare no conflicts of interest.

Author Contributions: Papy BAPAKA WELE led the study and manuscript preparation. Paul Samson LUSAMBA DIKASSA supervised the study. Daddy BOPILA MORENZA contributed to data analysis, interpretation, and manuscript

writing. All authors approved the final manuscript.

Ethical Considerations: Ethical approval was obtained from the Kinshasa School of Public Health Ethics Committee (ESP/CE/244/2024; 24 December 2024). Administrative authorization was obtained from participating healthcare facility managers. Data were extracted retrospectively from medical records and ANC registers. Confidentiality and anonymity were maintained.

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