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Malaria Burden Among Pregnant Women in the Democratic Republic of Congo: Prevalence, Determinants, and Barriers to Prevention (Case Study of Lomami Province in 2024 and 2025)

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Abstract
Malaria during pregnancy remains a major public health problem in the Democratic Republic of Congo, particularly in areas of stable transmission such as Lomami Province. Despite national prevention strategies, the burden of the disease on pregnant women remains high. This study aimed to determine the prevalence of malaria during pregnancy, identify its determinants, and describe the barriers to prevention.
A mixed-methods study with a sequential explanatory design was conducted, combining a quantitative survey (cross-sectional descriptive study) of 1,030 pregnant women and a qualitative approach (phenomenological study) using focused interviews. Statistical analyses included bivariate tests and multivariate logistic regression to identify the determinants of malaria disease. Qualitative data explored perceptions, practices, and barriers to prevention.
The overall prevalence of malaria disease was approximately 19% (95% CI: 16.75–21.54), with a mean parasitemia of 4490 ± 3410 parasites/µL. Regular use of insecticide-treated bed nets (ITNs) was observed in 63% of pregnant women, while 56.7% received intermittent preventive treatment. ITN use (p=0.0001) and indoor and outdoor sanitation (p<0.0001) were shown to be protective factors, while proximity to mosquito breeding sites proved to be a major risk factor (p<0.0001). Qualitative data revealed a partial understanding of malaria, therapeutic pluralism, and significant structural and sociocultural barriers to malaria prevention. Malaria in pregnant women in Lomami Province results from complex multifactorial interactions. Integrated interventions focusing on environmental prevention, the correct use of ITNs, and improved access to healthcare are needed to reduce the burden of the disease.

Keywords: Malaria, pregnant women, prevalence, determinants, barriers, Lomami, DRC.

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I. Introduction

Malaria remains one of the major public health problems worldwide, despite the progress made over the past two decades. According to the World Health Organization (WHO), the number of malaria cases increased from 232 million in 2019 to 245 million in 2020, and then to 247 million in 2021, reflecting a worrying resurgence in transmission after a period of gradual decline [1]. A substantial reduction in mortality was observed between 2000 and 2019, with deaths falling from 736,000 to 409,000, a decrease of 44%. However, these gains have been largely undermined by the COVID-19 pandemic, which led to a resurgence in deaths to 625,000 in 2020 and 619,000 in 2021 [1,2]. Approximately 63,000 additional deaths and 13 million additional cases of malaria in 2020–2021 are directly attributable to disruptions in health services and malaria control programs related to the pandemic [1]. As a result, the interim target of the Global Technical Strategy (GTS) to reduce incidence by 40% by 2020 was achieved by only 3%, a gap of nearly 37%, and the 2030 target is at risk of being missed by 87% if

current trends continue [2]. The WHO African Region bears the brunt of the global malaria burden, accounting for 95% of cases (234 million) and 96% of deaths (593,000) recorded in 2021 [1]. This situation is explained by a combination of climatic factors favorable to transmission, unfavorable socioeconomic conditions, and structural weaknesses in health systems. Pregnant women and children under 5 years of age constitute the vulnerable groups. Malaria during pregnancy is associated with high morbidity and mortality, potentially leading to maternal anemia, spontaneous abortions, premature births, low birth weight, congenital malaria, and, in severe cases, maternal and/or neonatal death [3–9].

In Indonesia, Hasyim and colleagues found that people unaware of the existence of a health care facility had a higher risk of malaria, with an adjusted odds ratio (aOR) of 4.18 [10]. In India, Sohail's team reported that pregnant women from rural areas, as well as those in their first or second pregnancy, had a significantly increased risk of malaria infection [8]. In sub-Saharan Africa, malaria prevalence among pregnant women remains high: 42.6% in Burkina Faso, as well as 42.6% and 56.4% in two separate sites in Ghana, 22.4% and 22.9% in two sites in Cameroon, and 41.6% in Nigeria [11–14]. Conversely, some more recent studies report lower prevalence. Indeed, in Ghana, Fondjo and colleagues reported a prevalence of 8.9% in 2020, suggesting the potential effect of better-implemented preventive interventions [15].

The Democratic Republic of Congo (DRC) is among the African countries most affected by malaria. Committed to the Global Technical Strategy for Malaria 2016-2030, the AIM 2016-2030 initiative, and the African Malaria Strategy, the DRC aims to eliminate the disease by 2030. Nevertheless, malaria remains the leading cause of morbidity and mortality in the country: it accounted for 44% of outpatient visits and 22% of hospital deaths in 2019. In 2021, 21,345,031 malaria cases were recorded, accompanied by 22,729 deaths, while in 2022, these figures increased to 27,292,419 cases and 24,880 deaths, reflecting a continued worsening of the epidemiological situation [16].

In terms of prevention, the DRC recommends the use of insecticide-treated bed nets (ITNs), environmental sanitation, and intermittent preventive treatment with sulfadoxine-pyrimethamine (IPT-SP) for pregnant women. Although ITN ownership increased significantly, rising from 9% in 2007 to 70% in 2013–2014, it has stagnated at around 69–70% since then [17]. The 2018 MICS surveys showed that 46.2% of pregnant women had an ITN and that 48.3% had slept with an ITN the night before the survey. In contrast, only 32.5% of household members and 40% of children under five used an ITN. IPT-SP coverage remains very low: 5.6% of pregnant women received three doses and only 0.3% received four [18]. The 2024 DRC-EDS III indicates that 60% of pregnant women slept under IBD the night before the survey and that only 22% received at least two doses of SP in IPT [17].

Despite various interventions implemented by the National Malaria Control Program, malaria remains the leading cause of morbidity in Lomami Province, accounting for 39.5% of proportional morbidity in 2023. Its incidence increased from 176 per 1,000 inhabitants in 2019 to 196 per 1,000 inhabitants in 2022 [19]. This persistence contrasts with the decline observed at the global and African levels. Pregnant women, who are particularly vulnerable, continue to bear a high burden of the disease. This situation suggests the existence of determinants and bottlenecks hindering the effectiveness of prevention strategies and the achievement of malaria elimination by 2030. The following three major questions guided our painstaking scientific investigation: What is the prevalence of malaria among pregnant women in Lomami Province? What are the determinants of malaria in pregnant women? What are the barriers to malaria prevention?

To provide answers to these questions and to scientifically document this public health issue, this study aimed to assess the prevalence, determinants, and barriers to malaria prevention among pregnant women in two Health Districts of Lomami Province, Democratic Republic of Congo.

II. Methods

2.1 Study Design

A mixed-methods study was conducted: a descriptive cross-sectional study with prospective data collection carried out from March 1 to 15, 2024, and a qualitative phenomenological study carried out from March 1 to 31, 2025.

2.2 Study framework

Lomami Province is in the southeast of central DRC and covers an area of 56,426 km². It belongs to a stable and hyperendemic malaria transmission zone, with a historically estimated parasite prevalence between 31% and 55% [20]. In 2024, the provincial population was estimated at 4,806,254 inhabitants, with an average density of 85 inhabitants/km². The provincial health system comprises 16 functional Health Districts, 316 Health Centers, and 16 General Referral Hospitals (GRHs). A malaria surveillance sentinel site is operational in the Mwene-Ditu Health District [19]. The study was conducted in two Health Districts with contrasting contexts: the

urban Health District of Mwene-Ditu and the rural Health District of Kanda-Kanda (Luilu Territory). This choice aimed to compare distinct socioeconomic and health environments likely to influence malaria transmission and prevention behaviors among pregnant women.

2.3 Study population

The target population consisted of pregnant women residing in the Mwene-Ditu and Kanda-Kanda Health Districts. For the quantitative component, the source population comprised pregnant women identified at the community level in households during the data collection period. For the qualitative component, participants were selected from among pregnant women in the two Health Districts, considering the diversity of profiles in terms of age, parity, education level, and place of residence.

Inclusion and exclusion criteria

All pregnant women in their second or third trimester, residing in one of the two targeted Health Districts, who provided free and informed consent, and who underwent a rapid diagnostic test (RDT) were included. Women not meeting at least one of these criteria were excluded from this study.

Sampling and Sample Size

For the quantitative component, stratified random sampling was used. Stratification was based on residence (Health Area). Within each stratum, participants were randomly selected to ensure adequate representation of both contexts. The qualitative research used purposive sampling. Participants were selected based on their ability to provide relevant and varied information on malaria prevention practices and the use of health services. Recruitment continued until data saturation was reached.

The sample size for the quantitative component was calculated using the following Schwartz formula: $N = \frac{(Z_\alpha)^2 \times p \times (1-p)}{d^2}$ where Zα = 1.96 (at the 5% significance level), p = 0.5 (in the absence of previous local data), and d = 0.05 [21]. Therefore, the minimum sample size obtained was 384 pregnant women per Health District. A 30% increase was applied to account for non-respondents, bringing the sample size to 499 participants per surveyed Health District. This was rounded up to 515 participants per Zone, for a total of 1030 pregnant women.

The sample size for the qualitative research was determined based on the principle of data saturation. A total of 48 pregnant women participated in the study, divided into eight focus groups of six participants each.

Study Variables

The dependent variable was malaria, defined as fever confirmed by a positive result on a rapid diagnostic test (RDT) and/or thick blood smear. Independent variables included sociodemographic, economic, obstetric, clinical, environmental, and behavioral characteristics.

For the qualitative component, the data were organized into themes and sub-themes related to understanding malaria, prevention practices, use of prenatal care services, sociocultural barriers, and areas for improvement.

2.4 Data Processing and Analysis

We conducted a household survey. Data were collected using a structured, pre-established, and pre-tested questionnaire, based on prenatal care records and laboratory tests. Women presenting with a fever at the time of the survey or reporting a history of fever within the previous 48 hours underwent a rapid diagnostic test at the survey site. A thick blood smear was also performed and analyzed at the General Referral Hospital laboratory by a qualified technician.

Qualitative data were collected through focus groups, constructed using a semi-structured interview guide based on the Health Belief Model (HBM). The discussions explored perceptions of susceptibility, severity, benefits, and barriers to malaria, as well as self-efficacy and cues influencing the adoption of preventive measures during pregnancy. The interviews were conducted in Tshiluba, recorded, and then transcribed and fully translated into French.

Quantitative data were initially entered using KoboCollect and ODK applications before being exported to Excel 2021 for data cleaning. Statistical analyses were performed using Epi Info 7 (version 7.2.5) and SPSS (version 28) software.

The prevalence of malaria was calculated as the ratio of the number of pregnant women with a positive thick blood smear to the total number of women surveyed. Analyses included descriptive statistics, bivariate analyses, and multivariate analyses. Associations were assessed using the chi-square test and odds ratios with 95% confidence intervals. The threshold for statistical significance was set at 5%.

Qualitative data were analyzed using QDA Miner 2025 software, employing a thematic content analysis combining vertical and horizontal discourse analysis.

Ethical Considerations

The research protocol was approved by the Medical Ethics Committee of the University of Lubumbashi by letter No. UNILU/CEM/014/2024 dated February 26, 2024.

The confidentiality and anonymity of the data collected in the field were strictly respected. All participants provided prior free and informed consent. Women diagnosed with malaria were treated according to current national guidelines.

III. Results

3.1 Quantitative Results

3.1.1 Malaria Prevalence Among Pregnant Women

Table 1: Distribution of Respondents According to Malaria Prevalence by Health district of Origin

Health district	Malaria disease		Total
	Yes (%)	No (%)	
Kanda-Kanda	106 (20,58)	409 (79,42)	515
Mwene-Ditu	90 (17,48)	425 (82,52)	515
Total	196 (19,03)	834 (80,97)	1030

ZS: Health District

The prevalence of malaria in the two targeted Health Districts was 19.03% [95% CI = 16.75–21.54], with malaria prevalence being higher in the rural Kanda-Kanda Health District than in the Mwene-Ditu urban Health District; the difference was not statistically significant (p = 0.23).

3.1.2 Parasite Density

In infected pregnant women, the mean parasitemia was 4,490 ± 3,410 parasites/µL and the median was 3,250 parasites/µL, with a minimum of 640 parasites/µL and a maximum of 18,200 parasites/µL.

3.1.3 Clinical Presentation of Malaria

Table 2: Distribution of pregnant women surveyed according to malaria symptoms presented in addition to fever or a history of fever

Fever or the history of fever	Frequency	Percentage (%)
Yes	545	52.91
No	485	47.09
Total	1030	100
Malaria symptoms presented in addition to fever or a history of fever.	Frequency (n=545)	Percentage (%)
Convulsions	3	0.55
Diarrhea	8	1.47
Abdominal pain	244	44.77
Generalized aches and pains	210	38.53
Chills	49	8.99
Anorexia	45	8.26
Headache	414	75.96
Nausea	57	10.46
Dizziness	168	30.83
Vomiting	43	7.89

Most participants (52.91%) reported a current or recent fever.Among these (n = 545), the most frequent associated symptoms were headaches (75.96%), abdominal pain (44.77%), generalized aches and pains (38.53%), and dizziness (30.83%).

Severe forms were rare, with seizures reported in only 0.55% of cases.

3.1.4 Sociodemographic and Obstetric Characteristics

Table 3: Distribution of pregnant women surveyed according to age, gravidity and parity

Age (years)	**Frequency**	**Percentage (%)**
≤ 20	130	12.62
20-34	768	74.56
≥ 35	132	12.82
Total	1030	100
Number of pregnancy	**Frequency**	**Percentage (%)**
First pregnancy	192	18.64
Short pregnancy	302	29.3
Multi-pregnancy	347	33.69
Extensive multi-pregnancy	189	18.35
Total	1030	100
Parity	**Frequency**	**Percentage (%)**
Nulliparous	193	18.74
Primiparous	148	14.37
Pauciparous	284	27.57
Multiparous	302	29.32
Large multiparous	103	10.00
Total	1030	100

Nearly three-quarters of the pregnant women surveyed were between 20 and 34 years old (74.56%). Women with multiple pregnancies and those with few pregnancies represented 33.69% and 29.30% of cases, respectively. Women with multiple pregnancies accounted for nearly a third of the participants (29.32%), compared to 10% of women with very few pregnancies.

3.1.5 Socioeconomic and Environmental Conditions

Table 4: Distribution of pregnant women surveyed according to the socioeconomic level of the couple, the type of housing, the domestication of animals and the proximity of larval habitats

Socioeconomic level of the couple	Frequency	Percentage (%)
Low	879	85,34
Medium	135	13,11
High	16	1,55
Total	1030	100
Types of accommodation	Frequency	Percentage (%)
House made of durable materials	28	2,72
House made of non-durable materials with corrugated iron roofing	420	40,78
Straw bale house	582	56,50
Total	1030	100
Animal domestication	**Frequency**	**Percentage (%)**
Yes	479	46,50

No	551	53,50
Total	1030	100

Households near larval breeding sites	**Frequency**	**Percentage (%)**
Yes	349	33,88
No	681	66,12
Total	1030	100

There was a clear predominance of low socioeconomic status (85.34%), while a very small proportion (1.55%) belonged to a high socioeconomic level.
Nearly 6 out of 10 pregnant women (56.50%) lived in straw huts, and 40.78% lived in houses built from non-durable materials, while only 2.72% of households had housing considered durable. Furthermore, 46.5% of pregnant women lived in households with pets, and 33.88% of them lived near potential mosquito breeding sites.

Table 5: Distribution of pregnant women surveyed according to prenatal care follow-up. reasons for non-attendance at prenatal care. and gestational age at the start of Antenatal care

ANC follow-up	Frequency	Percentage (%)
Yes	612	59.42
No	418	40.58
Total	1030	100

Reasons for not following up on prenatal care	**Frequency (n=418)**	**Percentage (%)**
Lack of money	87	20.81
Lack of marital consent	49	11.72
Lack of essential generic medications	6	1.44
Religious beliefs	9	2.15
Failure to keep appointments due to Residence in rural settlements	129	30.86
Irregular antenatal care (ANC) sessions	7	1.67
Locality of distance from healthcare facilities	85	20.33
Neglect	68	16.26

Pregnancy age at the first ANC	Frequency	Percentage (%)
First trimester of pregnancy	44	7.19
Second trimester of pregnancy	510	83.33
Third trimester of pregnancy	58	9.48
Total	612	100

Prenatal care was attended by 59.42% of the pregnant women surveyed. The main reasons for not attending regular prenatal care were living in agricultural settlements (30.86%), lack of financial resources (20.81%), distance from health facilities (20.33%). and neglect or lack of awareness of the importance of prenatal care (16.26%).
More than 8 out of 10 pregnant women (83.33%) began prenatal care during the second trimester of pregnancy.

3.1.7 Malaria Prevention During Pregnancy

Table 6: Distribution of surveyed pregnant women who received ANC care according to their Health District of origin

ANC follow-up	**Health District**				**Total**	
	Kandakanda		**Mwene-Ditu**			
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Yes	264	51.26	348	67.57	612	59.42

No	251	48.74	167	32.43	418	40.58
Total	515	100.00	446	100.00	1030	100

The proportion of CPN was higher in the urban Health District of Mwene-Ditu (67.57%) than in the rural Health District of Kanda-Kanda (51.26%), the difference being statistically very significant ($p < 0.001$).

Table 7: Distribution of pregnant women surveyed according to IPT use, reasons for not using IPT, use of IBD, and reasons for not using IBD

Traitement préventif intermittent	Frequency	Percentage (%)
Yes	584	56.7
No	446	43.3
Total	1030	100
Reasons for non-receipt of the sulfadoxine-pyrimethamine for intermittent preventive treatment	Frequency	Percentage (%)
Stockout of sulfadoxine-pyrimethamine	28	6
Non-monitoring of the ANC	418	94
Stockout of sulfadoxine-pyrimethamine	446	100
Total	**Frequency**	**Percentage (%)**
Proper use of IBD every night	649	63.01
Yes	381	36.99
No	1030	100
Total	**Frequency (n=381)**	**Percentage (%)**
Reasons for not using IBD during pregnancy	6	1.57
Reasons for not using IBD during pregnancy	230	60.37
IBD allergy	77	20.21
IDB unavailability	5	1.31
Heat caused by IBD	54	14.17
Itching	2	0.52
Suffocation	5	1.31
Use of IBD as a mattress	19	4.99
Use of IBD as a vegetable garden fence		
No opinion		

Intermittent preventive treatment for malaria with sulfadoxine-pyrimethamine (IPT-SP) was received by 56.70% of the pregnant women surveyed. Non-receipt of IPT-SP was almost exclusively due to a lack of prenatal care in 94% of cases.

Proper use of insecticide-treated bed nets was reported by 63.01% of pregnant women. The main reasons for non-use of ITNs were unavailability of bed nets (60.37%), excessive heat (20.21%), and a feeling of suffocation under the net (14.1

3.1.8 . Factors associated with malaria disease

Table 2: Association between sociodemographic and obstetric characteristics and malaria disease

Gesture	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
Primigravida	48(25.00)	144(75.00)	192	1.55	[1.07 ; 2.25]	5.46	0.01

Paucigevis	148(17.66)	690(82.34)	838	1	Reference		
Multigestation and grand multigestation							
Total	196(19.03)	834(80.97)	1030				
(Overall) parity	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
Nulliparous	48(24.87)	145(75.13)	193	1.54	[1.06 ; 2.23]	5.25	0.01
Primiparous pauciparous multiparous and grand multiparous	148(17.68)	689(82.32)	837	1	Reference		
Total	196(19.03)	834(80.97)	1030				
Education level	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
No formal education and primary school level	174(20.02)	695(79.98)	869	1.58	[0.97 ; 2.55]	3.56	0.059
Secondary school level and university level	22(13.66)	139(86.34)	161	1	Reference		
Total	196(19.03)	834(80.97)	1030				

There was a significant association between obstetric factors and the occurrence of malaria in pregnant women. Primigravidas had a significantly higher risk of malaria than women who had had at least two pregnancies (OR = 1.55; 95% CI: 1.07–2.25; p = 0.01). Similarly, nulliparous women were more at risk than multiparous women (OR = 1.54; 95% CI: 1.06–2.23; p = 0.01). In contrast, although women with no education or only a primary school education had a higher prevalence of malaria, the association with education level was not statistically significant (OR = 1.58; 95% CI: 0.97–2.55; p = 0.059).

Table 2: Association between behavioral and environmental factors and malaria disease

Best practices for using IBD	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
No	101(26.51)	280(73.49)	381	2.1	[1.53 ; 2.88]	21.95	0.000002
Yes	95(14.64)	554(85.36)	649	1	Reference		
Total	196(19.03)	834(80.97)	1030				
Environmental remediation	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
No	165(23.44)	539(76.56)	704	2.91	[1.93 ; 4.38]	28.05	0.00000012
Yes	31(9.51)	295(90.49)	326	1	Reference		
Total	196(19.03)	834(80.97)	1030				
Proximity to mosquito breeding grounds	**Malaria disease**		**Total**	**OR**	**IC95%**	**Chi-deux**	**p**
	Yes	**No**					
Oui	102(29.23)	247(70.77)	349	2.57	[1.87 ; 3.54]	35.62	0.00000001
Non	94(13.80)	587(86.20)	681	1	Reference		
Total	196(19.03)	834(80.97)	1030				

The lack of proper use of insecticide-treated bed nets, inadequate sanitation, and proximity to mosquito breeding sites were significantly associated with an increased risk of malaria in pregnant women. Pregnant women not using insecticide-treated bed nets correctly had a twofold increased risk of malaria (OR = 2.10; 95% CI: 1.53–

2.88; p < 0.001). Similarly, the lack of sanitation (OR = 2.91; 95% CI: 1.93–4.38; p < 0.001) and proximity to mosquito breeding sites (OR = 2.57; 95% CI: 1.87–3.54; p < 0.001) were strongly associated with the occurrence of malaria.

3.1.9. Determinants of Malaria in Pregnancy

Table 4: Determinants of Malaria in Pregnancy identified after logistic regression

Factors associated with malaria during pregnancy	Odds Ratio	IC95%	Coefficient	Standard deviation	Z-Score	p-value
Gestation (Primigestrous/Paucigeste. Multi-gestation and High Multi-gestation)	1.4576	[0.9853 ; 2.1561]	0.3768	0.1998	1.886	0.0593
Education Level (Secondary and Higher Education/Other Education Levels)	0.9491	[0.5685 ; 1.5845]	-0.0522	0.2615	-0.1997	0.8417
Use of IBD every night (Yes/No)	0.5254	[0.378 ; 0.7303]	-0.6436	0.168	-3.8307	0.0001
Indoor and Peri-Domestic Sanitation (Yes/No)	0.3536	[0.2317 ; 0.5397]	-1.0396	0.2157	-4.8194	0.0000
Proximity of Household to Mosquito Breeding Sites (Yes/No)	2.4341	[1.7561 ; 3.374]	0.8896	0.1666	5.3399	0.0000

The results of the logistic regression highlighted the following three factors, which are determinants of the occurrence of malaria in pregnant women in Lomami Province:

- Two protective factors: the first being sleeping under IBD every night [aOR = 0.52 (95% CI = 0.38; 0.73)] and indoor and peri-domestic sanitation [aOR = 0.35 (95% CI = 0.23; 0.54)];

- One (single) risk factor: proximity of the household to mosquito breeding sites [aOR = 2.43 (95% CI = 1.75; 3.37)].

3.2 Qualitative study results

3.2.1 Knowledge and Perceptions of Malaria

The pregnant women surveyed demonstrated a partial and often empirical understanding of malaria. The mosquito was generally recognized as the vector, but this transmission was described using popular metaphors such as "blood inoculation" or "the microbe left in the body," as evidenced by the following statements:

"Mosquitoes leave the malaria microbe in our bodies when we pile up dirty things, and the mosquitoes living there come and bite us and give us malaria" (FGD of pregnant women/ZS Mwene-Ditu_AS Régideso).

"We contract malaria through mosquito bites that inoculate our blood. Malaria is a bad disease: when a mosquito bites you and spills blood, if you are not covered by a mosquito net, you catch this disease" (FGD of pregnant women/ZS Kanda-Kanda_AS Lulamba).

Several symptoms of malaria were mentioned by the participants: fever, chills, vomiting, convulsions, headaches, and body aches, as well as atypical signs such as skin rashes and swollen eyes. Here are some excerpts from their statements:

"Body itching, headaches, neck pain, skin rashes, fever, swollen eyes, and coma" (FGD pregnant women/ZS Kanda-Kanda_AS Tshianvi). "*Malaria is a disease that causes fever, skin rash, headaches, and itching"* (FGD pregnant women/ZS Mwene-Ditu_AS Cindundu).

3.2.2 Conséquences perçues du paludisme pendant la grossesse

Les participantes ont unanimement associé le paludisme à des risques obstétricaux graves tels que l'avortement spontané, la mortinaissance, les malformations, l'anémie maternelle, l'hémorragie post-partum et le décès de la mère ou celui du nouveau-né. En témoignent les propos ci-après :

"A woman can miscarry because malaria settles in her back and causes pain. It can cause hemorrhaging in pregnant women due to malaria" (FGD of pregnant women/ZS Kanda-Kanda_AS Bwabwa).

"When you have a fever, you can miscarry or give birth to a stillborn child, you can give birth to an infected child. When a woman suffers from poorly treated malaria and does not follow the treatment, she can give birth to a child with birth defects" (FGD of pregnant women/ZS Mwene-Ditu_AS Munsampi).

3.2.3 Malaria Prevention and Treatment Practices

The participants discussed two aspects of malaria management: prevention and curative treatment. The insecticide-treated bed net was cited as the key tool, but its use was often hampered by practical constraints (heat, bedbugs, perceived suffocation). Furthermore, the insecticide it contains was perceived as irritating ("It tickles the face"). This leads some women to "wash" or "air out" the mosquito net before use, thus reducing its protective effectiveness. A few excerpts from their accounts are telling in this regard:

"When I receive it, I open it and place it in the shade to eliminate the insecticide; we place it in the shade to avoid tickling during use, and I wash it every two weeks" (FGD pregnant women/ZS Kanda-Kanda_AS Bwabwa).

"I can be given the mosquito net, I take it and open it, I put it in the shade for three days, and I clean it with soap to remove the insecticide, and then I attach it to the bed." Because I already tried using it without cleaning, the insecticide tickled my face a lot and caused skin rashes" (FGD of pregnant women/ZS Kanda-Kanda_AS Lulamba).

Some participants felt it was difficult to avoid malaria because mosquitoes can bite outdoors before bedtime. This led them to promote sanitation in the area surrounding their homes, as illustrated by these comments:

"There's no way to avoid malaria anymore because before going inside to sleep, mosquitoes bite us outside, and we only go inside under the mosquito net later. We cut the grass in our plots and keep our homes clean. We must always keep our plots clean, and the mosquitoes will go far away" (FGD pregnant women/ZS Kanda-Kanda_AS Lulamba).

"We must cut the grass in our plots, clean our sanitation facilities, and cut the grass all around to keep the mosquitoes away so they don't bite us" (FGD pregnant women/ZS Kanda-Kanda_AS Kabwele).

The pregnant women interviewed distinguished between traditional treatments (boiled aromatic herbs, decoctions, body washes) and modern medications (quinine, ACTs, SP). The coexistence of biomedical and traditional practices thus illustrated a form of therapeutic pluralism that can delay or impair appropriate care. Here are some excerpts from their statements:

"We use aromatic herbs as a traditional treatment; we boil them, add salt, and drink it. We are given ACTs when we are not pregnant, and we are also given 0.30 mg of quinine" (FGD of pregnant women/ZS Kanda-Kanda_AS Lulamba).

"Here, we only use aromatic herbs because we don't have effective medications. We cover ourselves with these boiled aromatic herbs." We boil them with salt and drink them; we also wash ourselves and we bend down to suck them up… » (FGD of pregnant women/ZS Kanda-Kanda_AS Bakwabowa).

3.2.4 Barriers to the Implementation of Preventive Measures

Technical and Practical Barriers

The perceived poor quality of current mosquito nets, nighttime heat, fear of bedbugs, and low insecticide concentration were cited as the main obstacles. The following verbatim comments clearly illustrate this:

"No one can go without a mosquito net, but because of bedbugs, I must put it away. There's nothing else besides the heat that prevents me from sleeping under the net. Some people say that when you spread the mosquito net, it breeds bedbugs" (FGD of pregnant women/ZS Kanda-Kanda_AS Lulamba).

"My children refuse to sleep under the mosquito net to avoid suffocating and feeling like they're in a grave" (FGD of pregnant women/ZS Mwene-Ditu_AS Cindundu). *"Some avoid sleeping under mosquito nets because of bedbugs, and others say they feel suffocated. On the current nets, mosquitoes circulate and don't die. So, give us good mosquito nets: the current nets don't have a high concentration of insecticide like the old ones"* (FGD pregnant women/ZS_Mwene-Ditu_AS BIK).

Some pregnant women mentioned incorrect SP (pregnancy-specific) intake for IPT (Intermittent Pregnancy Treatment):

"I was given three malaria tablets to take, one tablet each morning" (FGD pregnant women/ZS Mwene-Ditu_AS Regideso). *"Since I have light blood, I take one tablet in the morning, one at noon, and the other in the evening"* (FGD pregnant women/ZS Mwene-Ditu_AS Munsampi).Barrières socioculturelles

Customary and religious beliefs (certain churches, the influence of mothers-in-law, marital prohibitions) were also cited as contributing factors. A few excerpts from the speeches serve as an illustration:
"Some pregnant women obey customary orders, others refuse to attend prenatal care services because of religious orders (such as the Monday worshippers and the apostles), and some still report that their husbands refuse to go to health centers" (FGD of pregnant women/ZS_Mwene-Ditu_AS Régideso). *"Some are forbidden by their husbands because of customary beliefs that say in our families, we don't have the custom of being seen by a man or giving birth in a maternity ward. Others refuse to sleep under mosquito nets or to be vaccinated based on customary beliefs, worshipping fetishes"* (FGD of pregnant women/ZS_Kanda-Kanda_AS Kabwela). "*Some pregnant women oppose it because of their husbands' customary beliefs and others refuse because of their mothers-in-law who discourage them by saying that in their time, they did not attend CPN"* (FGD of pregnant women/ZS_Mwene-Ditu_AS Cindundu).

Economic and logistical barriers

Participants mentioned the following main economic and logistical barriers: an insufficient number of mosquito nets to cover the entire family, the costs associated with healthcare (antenatal care forms, medications), and the distance between their homes and health centers. The following verbatim comments eloquently illustrate this:

"This distance prevents us from attending the health center regularly because we get very tired. A center should be set up here for us." (FGD of pregnant women/ZS_Kanda-Kanda_AS Bakwabowa). "We pay 2,000 FC for the form. If a pregnant woman doesn't have the required 2,000 FC, how can she come for antenatal care?" (FGD of pregnant women/ZS_Mwene-Ditu_AS Cindundu).

3.2.5 Areas for Improvement According to Participants

Regarding accessibility, the study participants clearly advocated for several recommendations, such as making prenatal care (ANC) effectively free, establishing local health centers, and ensuring the presence of permanent nurses. These excerpts from their statements speak volumes:

"We need a health center built here because there isn't one. We need a permanent nurse here to treat us if we get sick, even at night" (FGD of pregnant women/ZS Kanda-Kanda_AS Bakwabowa). "We should always give birth at the maternity ward, and the delivery fees, currently 48,000 FC, should be reduced, given the ongoing financial crisis" (FGD of pregnant women/ZS Mwene-Ditu_AS Cindundu).

Regarding the quality of supplies, the pregnant women selected for this qualitative research advocated for good-quality mosquito nets, free of bedbugs and skin irritation. For example, the following statements can be cited:

"We need a full-time nurse here who provides free medication. Above all, we need mosquito nets that kill mosquitoes and medication to protect us against malaria" (FGD pregnant women/ZS Kanda-Kanda_AS Bakwabowa).

Concerning hygiene and infrastructure, recommendations included clean maternity wards, bedbug control, and the availability of water and sanitation facilities. This is clearly demonstrated by the following statement: "Our hospital needs improvement by upgrading the sanitation facilities and making water available" (FGD pregnant women/ZS Mwene-Ditu_AS Bik). *"The maternity ward beds need replacing because of bedbugs" (FGD of pregnant women/ZS Kanda-Kanda_AS Kabwela).*

Regarding ongoing awareness-raising, participants suggested using community liaisons, traditional chiefs, and peer educators. These excerpts from their main speeches serve as evidence:

"The neighborhood chief should appoint some residents as monitors to patrol the streets and prevent people from dumping garbage. All our plots should be clean, and there should be garbage pits on all our plots" (FGD of pregnant women/ZS Mwene-Ditu_AS Munsampi).

IV. Discussion

4.1 Burden of Malaria During Pregnancy: Prevalence, Parasitemia, and Qualitative Insights

This study highlights a significant burden of malaria during pregnancy in Lomami Province, with a prevalence of 19.03% (95% CI: 16.75–21.54) and high parasitemia (mean: 4,490 ± 3,410 parasites/µL; median: 3,250 parasites/µL). These levels confirm that malaria during pregnancy remains a priority public health problem, likely to increase the risk of maternal and perinatal complications. Although no statistically significant difference was observed between the Kanda-Kanda Rural Health District and the Mwene-Ditu Urban Health District

(p=0.23), the observed trend toward a higher prevalence in rural areas appears consistent with increased vector exposure intensity. This appears to be linked to precarious housing conditions, inadequate sanitation practices, and the proximity of larval breeding sites, factors highlighted by qualitative analysis. In Sub-Saharan Africa, similar prevalence rates were observed in Cameroon (22.4% and 22.9%), while Nigeria had a higher prevalence (41.6%) of observed cases [13,14]. Conversely, a lower prevalence of 8.9% was reported in Ghana [15]. The variations observed between countries and contexts can be explained by differences in the intensity of transmission and the coverage of preventive interventions, particularly the use of insecticide-treated bed nets and IPTp in the SP, as well as access to prenatal care.

The observed parasite density appears higher than several estimates reported in other African contexts, specifically the average of 800 trophozoites/µL described in Nigeria and 1,091 ± 2,825 trophozoites/µL in Burkina Faso [14, 22]. In the humid tropical context of Lomami Province, stable transmission can promote repeated exposures and parasite accumulation, reinforcing the need for effective prevention and early screening in antenatal care [20]. Clinically, the predominant symptoms reported (fever, headache, pain, and vomiting) mainly suggest uncomplicated forms, consistent with regional observations in Burkina Faso where fever and headache were reported in 65% and 54% of cases, respectively [12].

The contribution of the combined approach proved decisive. Indeed, the qualitative data revealed an acute awareness of obstetric severity (miscarriages, stillbirths, anemia, hemorrhage, death). While some representations remain imprecise or symbolic (malaria perceived as a "back disease" or a "disease linked to blood inoculation"), these accounts reflected a real level of awareness of the risks associated with malaria during pregnancy. These qualitative perceptions help explain healthcare-seeking behaviors and highlight the importance of appropriate communication to correct misinterpretations without minimizing the perceived severity.

These qualitative results are consistent with biomedical data, widely documented in the literature, which indicate that malaria during pregnancy is associated with an increased risk of maternal anemia, miscarriage, premature birth, low birth weight, congenital malaria, and maternal and neonatal mortality [3–9].

A recent meta-analysis confirms an overall prevalence of 18.95% (95% CI: 16.95–21.11) [23]. This analysis also shows that infected pregnant women have a significantly increased risk of anemia (OR=2.40), low birth weight (OR=1.99), prematurity (OR=1.65), and stillbirth (OR=1.40), thus confirming the significant health and obstetric burden of malaria during pregnancy in sub-Saharan Africa [23]. Overall, the quantitative and qualitative results found in our study converge to highlight that malaria during pregnancy constitutes a greater clinical, epidemiological, and social burden in Lomami Province, requiring the strengthening of prevention strategies, communication for behavior change, and integrated care.

4.2 Sociodemographic Profile

The study population was predominantly composed of young women (20-34 years old), living in stable unions, with low levels of education (primary level being the most common), and belonging mainly to a low socioeconomic status. This profile corresponds to contexts where structural vulnerability (poverty, economic dependence, low decision-making autonomy) can limit access to information and interventions. It is comparable to some observations made in Nigeria regarding age [24]. However, it differs from Cameroonian results regarding the proportion of married women, which is around 68% [13]. This difference could be explained by the sociocultural norms specific to the Lomami Province, where women place a central place in married life, with marriage constituting a valued and often early social marker.

The level of education appears particularly low compared to some contexts where the proportions of women with secondary or higher education are higher: 11% of women in Cameroon have higher education, while a Nigerian study by Ezebialu reported 30.4% [3,13]. The qualitative approach enriches our understanding by identifying early marriage (16-18 years old) as a frequent explanatory factor that can interrupt schooling. This reality, which is not merely a social marker, can reduce exposure to prevention messages, limit the ability to correctly interpret health recommendations, and reduce decision-making autonomy.

A significantly higher prevalence was observed in primigravidas and nulliparous women (p=0.01). This is consistent with the literature on immunological vulnerability specific to first pregnancy [4,8,24,25]. From a pathophysiological standpoint, this susceptibility is explained by the absence, in primiparous women, of anti-adhesion antibodies directed against parasites that bind to chondroitin sulfate A (CSA) at the placental level [26]. Pregnancy-specific immunity is acquired progressively during successive pregnancies, following repeated exposures to the parasite [27]. Several studies have shown that this effect is primarily dependent on parity rather than age, although these two variables are closely correlated in intertropical zones [28].

However, after adjustment, the association with gravidity was no longer statistically significant (p = 0.059), although a trend persisted, suggesting that the crude effect could be mediated by other determinants such

as prevention behaviors, environmental exposure, access to care, and social norms. Qualitative data support this interpretation: some first-time mothers reported less experience with antenatal care, late entry into prenatal monitoring, and poor understanding of preventive measures. This may amplify the risk. After adjustment, education level, socioeconomic status, and housing type did not show a statistically significant association. However, consistent trends persisted: lower infection rates among women with higher levels of education and higher prevalence in socioeconomically lower households. The lack of significance could be due to the small proportion of women in higher socioeconomic categories, reducing statistical power, as well as the relative homogeneity of living conditions within the communities studied. This interpretation aligns with the idea that, in contexts where poverty is widespread, factors directly modifiable by programs (immune diseases, sanitation, access to antenatal care, quality of services) can become more discriminating than socioeconomic markers.

Contrary to our findings, Fana and colleagues demonstrated a significant association between malaria prevalence and education level ($\chi^2 = 20.9$; $p < 0.001$), with prevalence decreasing with educational attainment [14]. Similarly, in Burkina Faso, Ouédraogo and colleagues reported a significantly higher risk among unschooled pregnant women [29]. These differences highlight the sensitivity of associations to local contexts: social structure, intervention coverage, and service quality. Likewise, the interpretation of malaria as a "disease of poverty," described in analyses in the DRC, may be mitigated here by the homogeneity of poverty [30]. This was confirmed by the accounts of participants who described similar conditions.

Regarding housing, the lack of association is consistent with some findings in Africa [12]. Conversely, an increased risk has been observed in poorly constructed housing [31,32]. One contextual hypothesis is that the homogeneity of construction in the studied areas limits the discriminatory power of this variable.

Thus, the sociodemographic profile of pregnant women in Lomami Province revealed a multidimensional vulnerability (low schooling, economic dependence, gender norms, early marriage) shaping exposure to and adherence to interventions, even when some statistical associations were not significant after adjustment.

4.3 Use of ANC, IPTp-SP, and IBD Services

The study highlighted insufficient and delayed use of ANC services, the cornerstone of the malaria prevention continuum during pregnancy. Only 59.4% of pregnant women reported attending ANC services, with significantly higher usage in urban areas than in rural areas ($p < 0.001$). A delay in initiation was observed: most pregnant women surveyed began ANC in the second trimester, while a very small proportion received prenatal care in the first trimester (approximately 7%). This pattern compromises the optimal administration of IPTp-SP and reduces repeated exposure to prevention messages.

The barriers to accessing antenatal care (ANC), which were primarily structural and economic, were as follows: living in rural settlements (30.86%), lack of resources (20.81%), remoteness (20.33%), and fatigue and self-reported neglect (16.26%). Qualitative data showed that these constraints were not abstract. They were embedded in daily life, where distance, agricultural activities, partner availability, and costs (both direct and indirect) created trade-offs unfavorable to antenatal care.

The proportion of pregnant women who received prenatal care (56.7%) was lower than the program's targets, with significantly better performance in urban areas than in rural areas ($p < 0.001$). Lack of ANC access was the main reason for not receiving prenatal care. This aligns not only with a Cameroonian survey conducted by Tonga and colleagues, which revealed that participation in antenatal care and education level significantly influenced the use of progesterone (PS), but also with Ouédraogo's observations in Burkina Faso, highlighting the key role of supervised administration of intermittent preventive treatment (IPT) [29, 33]. However, the absence of a statistically significant association between reported IPT and malaria in this study was an important finding. The qualitative approach revealed major operational dysfunctions: inadequate adherence (fractional doses), confusion between prevention and treatment, unsupervised administration, stockouts, and insufficient counseling. Thus, reporting PS use does not guarantee either adherence to the protocol or biological efficacy. This may negate the protective effect observed in multivariate analyses.

Conversely, the use of insecticide-treated bed nets (ITNs) appeared to be a robust protective factor. Women not sleeping under ITNs had a significantly higher prevalence of malaria, and non-use was strongly associated with malaria in multivariate analysis ($p < 0.001$). This result corroborates data from the literature showing a reduction in parasite prevalence and density among ITN users, as well as studies indicating high risks in cases of non-use [14, 34].

However, qualitative data qualify the interpretation: despite recognition of the usefulness of bed nets, their use is hampered by heat, the feeling of suffocation, bedbugs, skin irritation, and insufficient household availability. Furthermore, certain practices (prolonged ventilation, repeated washing before use) can reduce the insecticide content, potentially decreasing effectiveness. The observed "paradox"—declared adherence but

suboptimal use—highlights that access to inputs is insufficient: programmatic effectiveness depends on quality, acceptability, and usage behavior.

The results are consistent with national data reporting insufficient availability of IBDs relative to household size and low IPT coverage, illustrating the incompleteness of the prevention continuum: although 70% of households have at least one IBD, only 37% have one IBD for two people, which aligns with the constraints mentioned by pregnant women. Similarly, 60% of pregnant women reported sleeping with an IBD the night before the survey, while only 22% received two doses of SP for IPT, confirming the incompleteness of the prevention continuum [17]. Previous studies have confirmed the role of health education: participation in educational sessions as a predictor of IPTp-SP use, and knowledge of malaria as a predictor of ITN use [35]. Other studies show that remoteness and waiting times influence the adoption of IPTp-SP 3+ [36], which is consistent with the constraints described in Lomami Province.

Thus, malaria prevention in pregnancy in Lomami Province relies on an incomplete continuum: late access to antenatal care, insufficient and sometimes ineffective IPTp-SP coverage, and suboptimal use of ITNs. This clearly argues for integrated interventions such as improved access, secure supply, supervised administration, standardized counseling, and communication tailored to both the perceptions and constraints of pregnant women.

4.4 . Environmental and Behavioral Factors

Multivariate analysis using logistic regression highlighted the central role of environmental and behavioral factors in the occurrence of malaria during pregnancy. Two significant protective factors were identified: regular use of insecticide-treated nets (ITNs) and indoor and outdoor sanitation (cleaning of ditches, elimination of breeding sites, and cleanliness of plots). Conversely, proximity to breeding sites was a major risk factor, substantially increasing the probability of developing malaria. This hierarchy is consistent with transmission models: exposure depends on a combination of local vector density, the presence of breeding sites, and behavioral barriers (ITNs, timing, and practices).

Qualitative data strengthen the plausibility of the interpretation: participants explicitly linked mosquito proliferation to unsanitary conditions (tall grass, waste, latrines, empty containers). Even if the biological mechanisms are not always fully understood, the existence of shared empirical knowledge presents an opportunity for intervention: community health and social services (CHS) messages can build upon already established beliefs ("Cleanliness means fewer mosquitoes") by reinforcing them with simple, non-stigmatizing explanations.

Some behavioral factors (such as animal domestication and bedtime) were not significantly associated with the occurrence of malaria, possibly due to homogeneity of practices and/or the dominant influence of environmental factors. These results are perfectly consistent with studies that have established that the risk of malaria is linked to the presence of stagnant water near the home and that human activities bring malaria sites closer to dwellings, including in urban areas [37,38]. Furthermore, other recent studies show that spousal involvement, proximity to health facilities, early initiation of antenatal care (ANC), and the quality of the provider-patient interaction significantly influenced the effective use of antenatal services, with a social gradient according to the wealth index [39]. Although these results concern the use of ANC, they are conceptually linked: better use of antenatal services promotes access to interventions (IPT-SP, IBD, screening) and can therefore indirectly contribute to reducing malaria risk.

Thus, modifiable environmental determinants (such as malaria sites, sanitation, and exposure) have emerged as central in Lomami Province. This justified an integrated approach: the correct use of quality ITNs, sustainable sanitation, community mobilization, and targeted communication to reduce vector exposure.

4.5 Barriers to malaria prevention during pregnancy

Qualitative analyses identified major barriers that, although less apparent in quantitative analyses, significantly influenced pregnant women's access to and adherence to malaria prevention interventions. These obstacles stemmed from various dimensions (sociocultural, economic, and organizational) and helped explain the observed gap between reported knowledge of preventive measures and their actual implementation.

From a sociocultural perspective, the influence of the spouse and mothers-in-law proved decisive in the decision to attend antenatal care (ANC), give birth in a facility, and use ITNs (immune therapy). Prohibitions based on modesty (refusal to be seen by a man), traditional norms, and mistrust of certain preventive measures (ANC, vaccination, supplies) were reported. Some religious beliefs and customary practices may also discourage the use of health services. ANC was sometimes perceived as a “new” practice, unfamiliar to older women, a discourse that openly trivialized the lack of follow-up. These factors underscore the need to integrate gender norms and local value systems into community health and social care (CHSC) strategies. Economically and logistically, the direct cost (records, medications) and indirect cost (transport, time) inevitably constituted a major obstacle. Even modest amounts (e.g., 2,000 FC for an ANC record) can be prohibitive in a context of poverty. Distance,

fatigue, and discouragement limited the continuity of healthcare, particularly in rural areas. Organizationally, the lack of permanent staff, stockouts of essential medications (including SP), and the perception of inconsistent reception reduced trust and acceptability.

These hard-won results are consistent with those of other studies showing that the adoption of IPT-SP was influenced by supply, the effective provision of free services, and community awareness [40]. In Ethiopia, similar obstacles (including shortages of prophylactic acid bacteria, staff shortages, and gaps in data surveillance) have been documented in other contexts [41]. In contrast, the effect of spousal support and geographical barriers have been highlighted [39]. In Uganda, trust in health workers has been identified as a driver of acceptance despite financial and geographical constraints [42]. Outside of Africa, the role of self-medication and traditional healers in the healthcare pathway and the impact of the cost of care underscore the need for approaches that include community leaders and economic determinants [43, 44]. In summary, improving malaria prevention in Lomami Province requires an integrated approach through the reduction of financial barriers, improved service organization, community engagement, and consideration of sociocultural norms.

4.6 Strengths, Limitations of the Study, and Implications for Malaria Elimination

The most significant strengths of this study were the large sample size (n = 1030), the comparison of two contrasting areas (urban/rural), the mixed-methods approach (allowing for the integration of lived experiences), the multivariate analysis (controlling for confounding factors), and the consideration of multiple determinants (clinical, sociodemographic, environmental, behavioral, and organizational) of malaria. The combination of these elements strengthens the programmatic relevance of the results and their potential for inference to similar contexts.

Nevertheless, some limitations must be considered. The cross-sectional design certainly limits causal inference, and several variables rely on simple self-reporting (MOSQUITO NET, SP, ANC), thus exposing the study to both recall bias and social desirability bias. However, the convergence of results, alignment with the literature, and the contribution of the qualitative component of the study mitigate these limitations by clarifying plausible mechanisms such as inadequate adherence, structural barriers, and sociocultural norms.

From an operational perspective, the most modifiable determinants in the short and medium term were the correct and consistent use of insecticide-treated bed nets, sanitation, reduction of exposure to breeding sites, and the removal of barriers (financial and geographical) limiting access to antenatal care and IPTp.

Achieving malaria elimination goals in Lomami Province requires simultaneous action on three key areas: vector control (high-quality ITNs, environmental management), community-based strategies (community liaisons, leaders, involvement of men and mothers-in-law), and the quality and accessibility of antenatal care (effectively free of charge, availability of prenatal care, supervised administration, and culturally appropriate reception).

This study has provided evidence to guide integrated and contextualized interventions, essential not only for the sustainable reduction of the burden of malaria during pregnancy but also for progress towards elimination by 2030 in Lomami Province.

V. Conclusion

This mixed-methods study, with a sequential explanatory design, provided an integrated assessment of the burden of malaria among pregnant women and its determinants in two Health Districts of Lomami Province (Kanda-Kanda and Mwene-Ditu). Quantitatively, the overall prevalence of malaria in pregnant women was 19.0% (95% CI: 16.75–21.54), associated with high parasitemia (mean: 4490 ± 3410 parasites/µL; median: 3250 parasites/µL), indicating significant transmission in a context of stable endemicity. Prevalence was found to be higher in Kanda-Kanda (rural Health District) than in Mwene-Ditu (urban Health District), but the difference was not statistically significant ($p = 0.23$). The clinical picture was dominated by fever (52.9%) and frequent associated symptoms, including headaches (76%), abdominal pain (45%), and muscle aches (39%), while seizures and diarrhea were rarely observed.

The pregnant women were primarily between 20 and 34 years old, mostly married, with a primary education, living in low socioeconomic households and often in precarious housing. Regarding the continuum of health services, approximately 6 out of 10 women reported attending antenatal care (ANC), but most often starting in the second trimester, thus reducing opportunities for optimal prevention. Most pregnant women (56.7%) received prenatal care for intermittent preventive treatment (IPT), although access to effective free malaria treatment was very limited (12.9%). Out-of-pocket expenses for malaria treatment remained significant given the context of poverty.

In terms of prevention, while 85.9% of pregnant women reported knowing about prevention methods, the actual nightly use of insecticide-treated bed nets (ITNs) (63%) was hampered by the unavailability of mosquito nets, negative perceptions (heat, suffocation, bedbugs, irritation), and inappropriate use. Household and peri-domestic sanitation was not systematic, and nearly a third of the women lived near mosquito breeding sites, increasing their exposure.

Multivariate analysis identified three main determinants of malaria: regular use of ITNs and household/peri-domestic sanitation as protective factors, and proximity to breeding sites as a major risk factor ($p < 0.0001$). The qualitative data significantly illuminated the quantitative results obtained by revealing a partial understanding of malaria, therapeutic pluralism (the simultaneous use of traditional remedies and modern medicines), and both structural (costs, distance, supply disruptions, quality of supplies) and sociocultural (beliefs, influence of husbands and/or in-laws) barriers that literally limited adherence to recommended interventions.

In short, malaria during pregnancy in Lomami Province proved to be a result of the complex interaction between environmental exposure, living conditions, prevention practices, healthcare access, and social norms. Priority levers (such as the correct use of ITNs, sanitation, and the reduction of exposure to malaria sites) should guide targeted and integrated interventions to sustainably reduce the burden and improve both maternal and neonatal outcomes.

Thus, the sustainable reduction of malaria during pregnancy in the Province of Lomami requires the coordinated implementation of integrated interventions combining the strengthening of vector control, the improvement of the ANC-IPT-care continuum, the removal of financial and geographical barriers, community engagement and programmatic accountability, with the support of technical and financial partners.

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