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Knowledge, Attitudes, and Practices regarding Malaria Prevention among Pregnant Women Attending Antenatal Consultations at the Hospital De L'Amitié Sino-Gabonese in Franceville, Gabon

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Abstract

Background/Objectives: Malaria remains a major cause of maternal and infant morbidity and mortality in sub-Saharan Africa. This study aimed to assess the knowledge, attitudes, and practices of pregnant women regarding malaria prevention at the Hospital de l'Amitié Sino-Gabonese in Franceville. **Methods:** A descriptive and analytical cross-sectional study was conducted from June to August 2025 among pregnant women attending prenatal consultations at the HASG. A questionnaire was administered to each patient. **Results:** A total of 155 women were included. The average age was 27.9 ± 6.6 years. The media (67.7%) and health professionals (52.3%) were the main sources of information on malaria. 15.3% of participants were able to give a correct definition of malaria. Mosquito bites were the most cited mode of transmission (68.4%). The most widely known symptom was fever (84.7%), and miscarriage was the most cited consequence of malaria (50.97%). A correlation was found between the level of education and knowledge of the disease (OR > 1; $p < 0.05$). 92.6% of women were aware of malaria prevention methods. 54.8% of women

had adhered to IPT-SP. 10.9% knew when to start IPT-SP. Most women were unaware of or had incorrect knowledge of the number of doses and the number of tablets per dose of IPT-SP. **Conclusion:** This study highlights a disparity between the availability of prevention tools and their effective use, which is linked to insufficient knowledge of malaria prevention.

Keywords

Knowledge, Malaria, Prevention, Pregnant Women, IPT-SP, Franceville

1. Introduction

Plasmodium infection is one of the leading causes of morbidity and mortality in endemic areas, especially in Sub-Saharan Africa [1]. According to the World Health Organization, approximately 95% of malaria deaths worldwide occur in Africa, mainly affecting children under 5 and pregnant women, who are particularly vulnerable physiologically [1]. For pregnant women, malaria can lead to serious complications such as maternal anaemia, foetal growth restriction, low birth weight, premature births, and even maternal or neonatal deaths [2].

In light of these dangers, the WHO recommends preventive strategies such as intermittent preventive administration of Sulfadoxine-Pyrimethamine (SP), the use of Long-Lasting Insecticide-treated mosquito Nets (LLINs), and prompt treatment of febrile episodes [3]. However, the effectiveness of these strategies depends on their acceptance and adoption by pregnant women. Knowledge, perception of risk, and adherence by pregnant women are key factors in the effectiveness of these interventions.

Gabon is located in a hyperendemic malaria transmission zone with a slight increase during the rainy season [4]. Malaria prevalence initially fell from 31.2% to 18.3% between 2005 and 2008, then rose in 2011, with rates of 24.1% in Libreville, 6.5% in Port-Gentil, and 44.2% in Oyem [5] and Franceville in the province of Haut-Ogooué, where the overall prevalence of infection was 26.1% between 2017 and 2019 [4].

As in any malaria-endemic area, pregnant women are more susceptible to malaria. The application of intermittent preventive treatment with SP recommendations has led to a dramatic decrease in the incidence of malaria cases among pregnant women [6]. Later, it was shown that the prevalence of malaria in Libreville was 34.4%, 53.6%, and 18.2% in maternal peripheral blood, the placenta, and the umbilical cord, respectively [7]. There was considerable variation in compliance with preventive measures such as taking Intermittent Preventive Treatment with Sulfadoxine-Pyrimethamine (IPT-SP) and using LLIN between women. This non-compliance was often attributed to a lack of knowledge or awareness among patients. The objective of this study was to assess knowledge, attitudes, and practices of pregnant women regarding malaria prevention at the Hospital de l'Amitié Sino-

Gabonese in Franceville, Gabon.

2. Patients and Methods

2.1. Type and Period of Study

An observational, cross-sectional, descriptive, and analytical study was conducted between June 23rd and August 14th, 2025.

2.2. Study Population and Location

The population involved in this study was pregnant women who attended antenatal consultations (CPN) at the maternity ward of the Hospital de l'Amitié Sino-Gabonese (HASG) located in the 2nd borough of Franceville city, the provincial capital of the Haut-Ogooué province in Gabon. The prenatal consultation service at the HASG maternity ward provides medical and educational care for women throughout their pregnancy and postpartum period. Only pregnant women who gave consent and agreed to participate were included. Women who came only to declare their pregnancy without effective follow-up were not included in the study.

2.3. Sample Size

A non-probability sampling method was used to select pregnant women. Due to time and funding constraints, and to ensure better patient accessibility, all pregnant women attending prenatal consultations during the study period were interviewed. The sample size was not calculated.

2.4. Operational Definitions

Knowledge: level of information about malaria and its consequences.

Attitudes: perception of risk and motivation.

Practices: actual behaviors (use of impregnated mosquito nets, taking SP).

Gravidity: number of pregnancies.

Parity: number of live births.

Knowledge, attitudes, and practices were measured with open (Example: What is malaria? During which period of pregnancy can SP be administered?...) and closed (Example: Are you aware of malaria prevention methods? Do you follow the dosage recommended in the prevention protocol?) questions in sections 4 and 5 of the questionnaire.

2.5. Study Procedure

- **Data collection tool**

A standardized questionnaire was designed for data collection by the Chronic Disease Epidemiology Research Unit, Environmental Health of the Department of Community and Social Medicine at the University of Health Sciences in Libreville. This questionnaire consisted of five (5) sections. The first section con-

cerned the socio-demographic characteristics of the patients. The questions focused on age, place of residence, educational level, marital status, and occupation. The second part concerned the medical characteristics of the women. The questions focused on the women's obstetric history and prenatal care. The third part concerned knowledge and questions focused on the definition of malaria, its mode of transmission, clinical signs, and consequences for pregnancy. The fourth part concerned attitudes and questions focused on women's perceptions of recommendations, the severity of malaria, and the usefulness of preventive measures. Finally, the last part concerned practical, and the questions focused on actual behaviours, such as taking SP (IPT-SP) and using impregnated mosquito nets.

- **Data collection**

On the day of the appointment, explanations of the objectives and conduct of the study were provided to all patients in order to obtain their consent. Once consent was obtained, data were collected during a face-to-face interview. Patient data were collected on the days of antenatal consultation.

2.6. Data Management and Statistical Analysis

All data were entered into an Excel spreadsheet and analyzed using STATA 14 software. Qualitative characteristics were described in terms of frequency (percentage) and quantitative characteristics in terms of mean (± standard deviation) and extreme values. The age variable was transformed into a binary categorical variable (age ≤ mean and age > mean). Comparison of proportions was performed using Pearson's chi-2 test. The Mantel-Haenszel chi-2 test was used to investigate the association between general knowledge of malaria and socio-demographic characteristics, estimating the Odds Ratio (OR) and its 95% confidence interval. The significance threshold for all analyses was 0.05.

3. Results

3.1. Socio-Demographic Characteristics of Patients

A total of 155 pregnant women were included. The average age was 27.9 ± 6.6 years. The proportion of women aged 29 or younger (≤29 years) was 52.9% (n = 82). More than half of the patients had a secondary education level, *i.e.*, 63.9% (n = 99), and 60.6% (n = 94) lived with a partner. Pupils/students and women in employment accounted for 37.4% (n = 58) and 36.8% (n = 57) of the sample (**Table 1**).

3.2. Obstetric Characteristics and Prenatal Care of Patients

In this study, the proportion of primigravidas was 35.5% (n = 55), that of multigravidas was 41.3% (n = 64), and that of multiparas was 32.9% (n = 51). Women between 1 and 3 antenatal care visits accounted for 67.1% (n = 104) of the sample. Most of the women included were in the second trimester (16 - 28 WA) and accounted for 40.0% (n = 62) of the sample (**Table 2**).

Table 1. Socio-demographic characteristics of pregnant women.

Characteristics	Number	Percentage
Age group (years)		
≤28	82	52.9
>28	73	47.1
Education Level		
Primary	17	10.9
Secondary	99	63.9
Higher	39	25.2
Marital status		
In a relationship	94	60.6
Single	61	39.4
Occupation		
Pupils/students	58	37.4
None	40	25.8
With a profession	57	36.8

Table 2. Description of the obstetric characteristics of the pregnant women.

Characteristics	Number	Proportion (%)
Gestation		
Primigravida	55	35.5
Low parity	64	41.3
Multigesture	36	23.2
Parity		
Nulliparous	46	29.7
Primiparous	41	26.5
Paucipara	51	32.9
Multipara	17	10.9
Number of antenatal care visits		
1 - 3	104	67.1
4 - 6	34	21.9
≥7	05	3.2
Undetermined	12	07.8
Age of pregnancy (WA)		
1 - 15	39	25.2
16 - 28	62	40.0
29 - 41	36	23.2
Undetermined	18	11.6
Total	155	100.0

WA: Week Amenorrhea.

3.3. Description of General Knowledge about Malaria

Figure 1 shows that the media (67.7%) and health personnel (52.3%) were the main sources of information on malaria for the study population. Table 3 describes the general knowledge of malaria gathered from the pregnant women surveyed. Only 38.1% (n = 59) of women claimed to know the definition of malaria. Among them, 59.3% (n = 35) defined malaria as a "*disease caused by* mosquitoes".

As for the mode of transmission, most patients, 68.4% (n = 106), stated that they knew how malaria was transmitted, and among them, 93.4% (n = 99) stated that the disease was transmitted by "*mosquito bites*".

Regarding clinical signs of disease, more than 75% (n = 118) of participants reported knowing the clinical manifestations of malaria; fever was the most widely known symptom of malaria (84.7%) (Figure 2).

Finally, 62.6% (n = 97) of participants stated that they had knowledge of the consequences of malaria during pregnancy. Miscarriage was the most frequently described consequence of malaria during pregnancy, at 81.4% (n = 79).

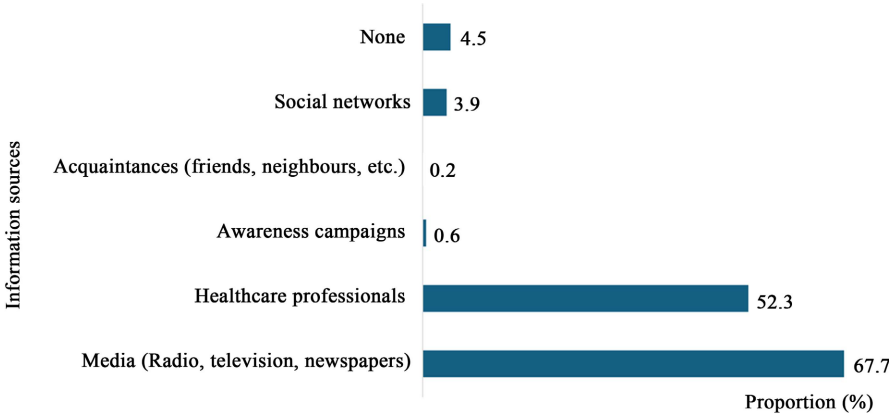

Figure 1. Participants' main sources of information on malaria.

Table 3. Description of general knowledge (definition, transmission routes, and symptoms) of malaria.

Questions	Number	Proportion (%)
Do you know the definition of malaria?		
Yes	59	38.1
No	96	61.9
If yes, what is malaria?		
An infectious disease transmitted by mosquito bites	06	10.2
A parasitic disease transmitted by the bite of female Anopheles mosquitoes	03	5.1
Disease caused by the mosquito	35	59.3
Dangerous disease.	15	25.4
Do you know how malaria is transmitted?		
Yes	106	68.4

Continued

No	49	31.6
If so, which ones?		
Mosquito bite	99	93.4
Female Anopheles mosquito bite	06	5.7
Transmission from mother to child	01	0.9
Are you familiar with the symptoms of malaria?		
Yes	118	76.1
No	37	23.9
Are you aware of the consequences of malaria during pregnancy?		
Yes	97	62.6
No	58	37.4
If yes, what are the complications?		
Miscarriage	79	81.4
Abortion	12	12.3
Premature birth	02	2.1
Child ill at birth	02	2.1
Low birth weight	02	2.1

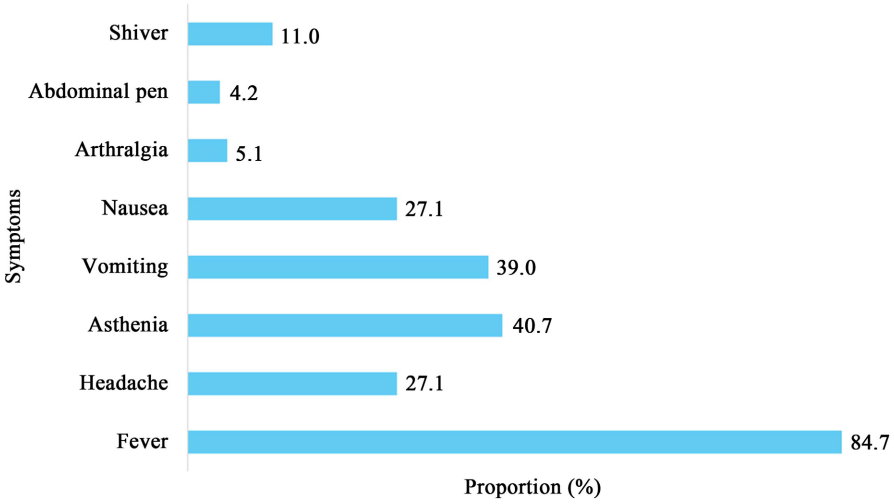

Figure 2. Knowledge of malaria symptoms among women who reported having knowledge of malaria symptoms.

3.4. General Knowledge of Malaria According to Socio-Demographic and Obstetric Parameters

Analysis of the results summarized in Table 4 and Table 5 shows that general knowledge of malaria in terms of its definition, mode of transmission, clinical manifestations, and consequences for pregnancy differed significantly between educational levels ($p < 0.05$) (Table 4). Knowledge of the consequences of malaria on pregnancy differed significantly between age groups ($p = 0.007$). A statistical association was observed between knowledge of the consequences of malaria on

pregnancy and women aged > 28 years ($OR_{95\%}$ = 2.5 [1.3 - 5.0], p = 0.007). No difference was observed between general knowledge of malaria and obstetric characteristics, particularly gestation and parity.

Table 4. Distribution of general knowledge about malaria according to socio-demographic characteristics.

	Knowledge about malaria											
Characteristics	Definition			Modes of transmission			Symptoms			*Consequences		
	Yes	No	p	Yes	No	p	Yes	No	p	Yes	No	p
Age group (years)												
≤28	25 (42.4)	52 (54.2)	0.15	47 (44.4)	30 (61.2)	0.05	58 (49.2)	19 (51.4)	0.81	40 (41.2)	37 (63.8)	0.007
>28	34 (57.6)	44 (45.8)		59 (55.7)	19 (38.8)		60 (50.8)	18 (48.6)		57 (58.8)	21 (36.2)	
Education level												
Primary	04 (6.8)	13 (13.5)		08 (7.6)	09 (18.4)		08 (6.8)	09 (24.3)		09 (9.3)	08 (13.8)	
Secondary	33 (55.9)	66 (68.8)	0.02	61 (57.5)	38 (77.5)	0.001	72 (61.0)	27 (73.0)	0.001	57 (58.8)	42 (72.4)	0.04
Higher	22 (37.3)	17 (17.7)		37 (34.9	02 (4.1)		38 (32.2)	01 (2.7)		31 (31.9)	08 (13.8)	

*Consequences of pregnancy.

Table 5. Relationship between general knowledge about malaria and socio-demographic characteristics.

	Knowledge about malaria							
Characteristics	Definition		Modes of transmission		Symptoms		*Consequences	
	OR [95% CI]	p	OR [95% CI]	p	OR [95% CI]	p	OR [95% CI]	p
Education level								
Primary	1		1		1		1	
Secondary	1.62 [0.5 - 5.4]	0.02	1.8 [0.6 - 5.1]	0.0001	3.0 [1.02 - 8.7]	0.001	1.2 [0.4 - 3.4]	0.04
Higher	4.2 [1.1 - 16.4]		20.8 [2.6 - 165.6]		42.7 [2.6 - 696.2]		3.4 [0.9 - 12.4]	

3.5. Knowledge of Malaria Prevention Measures

The description of patients' knowledge of malaria prevention measures in Table 6 showed that most women (92.6%, n = 128) reported having knowledge of malaria prevention methods. All women (100%) who reported having knowledge of malaria prevention methods described the use of mosquito nets (sleeping under a mosquito net), the use of insecticide, and environmental sanitation as methods of preventing malaria (Figure 3).

The majority of participants, 94.2% (n = 146), stated that a Long-Lasting Insecticide-treated mosquito Net (LLIN) could be used during all seasons. However, 52.2% (n = 81) of women were unaware that LLINs were provided free of charge to pregnant women during antenatal consultations.

More than half, 62.6% (n = 97) of patients stated that IPT-SP could be administered during the first trimester of pregnancy, and 58.7% (n = 91) of women surveyed stated that SP could be administered until delivery. In addition, 43.9% (n =

68) of women did not know the minimum number of SP doses during pregnancy, and 29.7% of participants stated that the minimum number of SP doses during pregnancy was between 3 and 5. For 34.2% (n = 53) of women, the minimum interval between two doses of SP was one month, and 41.9% of women did not know the minimum interval between doses of SP. Finally, 57.4% (n = 89) of patients stated that the number of tablets per dose of SP was 3 tablets, while 31.0% (n = 48) stated that they did not know.

Table 6. Description of knowledge of malaria prevention measures

Questions	Number	Proportion (%)
Are you aware of malaria prevention methods?		
Yes	128	92.6
No	27	17.4
When is the recommended time of year for pregnant women to use LLIN?		
During the rainy season	03	01.9
All seasons	146	94.2
Don't know	06	03.9
Is LLIN free for pregnant women during antenatal care?		
Yes	66	42.6
No	81	52.2
Undetermined	08	05.2
Questions	Number	Proportion
During which period of pregnancy can SP be administered?		
1st trimester	97	62.6
2nd trimester	17	10.9
3rd trimester	01	0.6
Can IPT-SP be administered until delivery?		
Yes	91	58.7
No	35	22.6
Don't know	29	18.7
What is the minimum number of doses of IPT-SP during pregnancy?		
<3	21	13.5
3 - 5	46	29.7
>5	20	12.9
Don't know	68	43.9
What is the minimum interval between doses of IPT-SP?		
1 month	53	34.2
More than one month	37	23.9
Don't know	65	41.9

Continued

How many SP tablets are administered per dose?		
<3	17	11.0
3	89	57.4
>3	01	0.6
Don't know	48	31.0

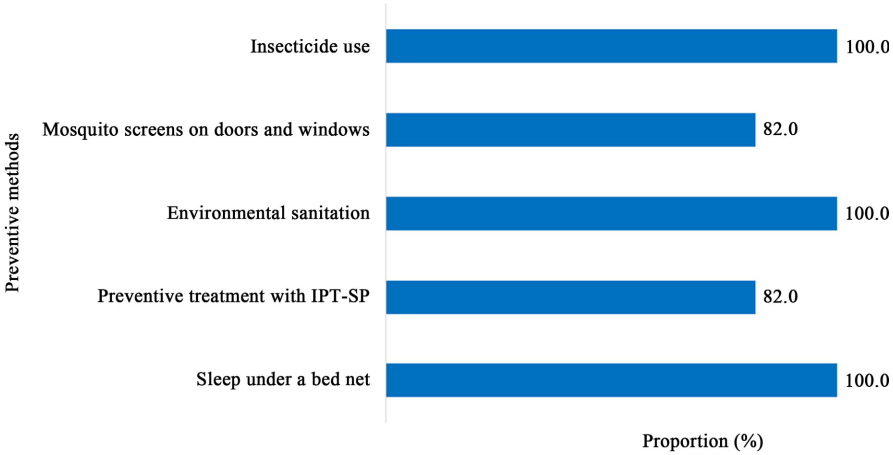

Figure 3. Description of malaria prevention methods among women who claim to have knowledge of malaria prevention methods.

3.6. Attitudes and Practices Regarding Compliance with IPT-SP and the Use of Mosquito Nets as Preventive Treatment during Pregnancy

Table 7 reports the attitudes and practices of the pregnant women surveyed regarding IPT-SP and the use of mosquito nets. It shows that 54.8% (n = 85) of women reported taking IPT-SP during pregnancy. Furthermore, 52.3% (n = 81) of these women reported not having followed the dosage recommended in the prevention protocol, and 95.9% (n = 71) of women who reported following the IPT-SP dosage said they had taken one tablet per dose of IPT-SP.

Regarding mosquito net use, 49.7% (n = 77) reported not sleeping under a mosquito net. Not receiving a mosquito net (41.4%) and discomfort (32.2%) were the main reasons given for not using a mosquito net.

Table 7. Attitudes and practices regarding IPT-SP during pregnancy.

Questions	Number	Proportion (%)
Did you have to take IPT-SP prophylaxis during this pregnancy?		
Yes	85	54.8
No	56	36.1
Don't know	14	09.03

Continued

Do you follow the dosage recommended in the prevention protocol?		
Yes	74	47.7
No	81	52.3
If yes, number of tablets per dose?		
1 tablet per dose	71	95.9
2 tablets per dose	01	1.4
3 tablets per dose	02	2.7
Do you sleep under a mosquito net?		
Yes	68	43.9
No	77	49.7
Sometimes	10	06.4
If no/sometimes, what are the reasons?		**%**
I have not yet received a mosquito net.	36	41.4
It suffocates me; I don't like it.	28	32.2
His lover doesn't like it.	07	08
Allergy to substances on mosquito net.	02	02.3
Not impregnated.	12	13.8
Other reasons.	02	02.3

4. Discussion

This cross-sectional study assessed the knowledge, attitudes, and practices of pregnant women in relation to malaria prevention at the Hospital de l'Amitié Sino-Gabonese in Franceville, Gabon. The average age of the women was 27.9 ± 6.6 years, reflecting a relatively young population, as the majority were under 28 years of age. These results were similar to observations made in Bamenda, Cameroon, where most pregnant women were between 15 and 30 years of age [8].

More than half (61.0%) of the participants had not reached the quota of Antenatal Consultations (ANC) recommended by the WHO (four ANC). This result could be justified by the fact that most women were in the first and second trimesters of pregnancy. However, there was still a proportion of women whose number of ANCs was undetermined. This result could reflect either a deliberate desire not to admit to not having had prenatal consultations or the subjective nature of the collection of this information, as the number of prenatal consultations is often recorded in the pregnancy follow-up booklet or the late start of ANCs. This finding was also reported in a Malian study in 2022, where 46% of women had started antenatal care in the 2nd trimester of pregnancy [9]. The results obtained could also illustrate the limitations encountered in the antenatal care of pregnant women, the effectiveness of health education, and access to preventive measures, as noted in other African contexts [10] [11].

Analysis of general knowledge about malaria showed that the media (67.7%) and health professionals (52.3%) were the main sources of information for women. These results differed from those reported in Cameroon, where health professionals were the main source of information on IPT-SP for pregnant women (91.8%) [12]. Although the media are an effective tool for raising awareness, their impact remains limited when it comes to conveying specific technical knowledge, such as the IPT-SP protocol. This situation remains a cause for concern, as several studies have shown that education provided by healthcare professionals is more effective in strengthening adherence to preventive practices [13] [14]. The secondary role of healthcare personnel in Franceville thus appears to be a major obstacle to a thorough understanding of malaria and the effective implementation of preventive recommendations. This study showed that, although slightly more than one-third (38.1%) and 68.4% of pregnant women reported knowing the definition and mode of transmission of malaria, some of this knowledge was incomplete or even incorrect. This result could reflect a marked deficit in understanding of this disease. Conversely, in Bamenda, Cameroon, 64% of women had a general knowledge of malaria that was considered adequate [10] [11].

In terms of clinical signs, fever was the symptom most frequently cited by women. These results further confirm that fever is the most commonly observed clinical sign during malaria episodes [15] [16].

Awareness of the effects of malaria on pregnancy and its impact on malaria risk remains limited. These observations were comparable to those of previous Gabonese studies conducted in the south and southeast [15] [17].

The study highlighted a relationship between educational level and knowledge about malaria. Thus, having a high level of education increases the chances of having knowledge about malaria ($OR > 1$; $P < 0.05$). These results were comparable to those obtained in Tanzania and Gabon [17] [18], suggesting that formal education is a key lever for improving knowledge and perception of malaria risk.

This study found that almost all (92.6%) women were aware of malaria prevention methods. However, more than half of the women were unaware that a mosquito net was free for pregnant women. It was also found that the use of mosquito nets (sleeping under a mosquito net) was still low despite their availability, which could reflect a relaxation of public health measures by the National Malaria Control Programme. These results were similar to those in Burkina Faso [19]. The data also showed that even though mosquito nets are free, they are underused due to a lack of distribution and discomfort.

Analysis of attitudes and practices revealed that, in terms of malaria chemoprophylaxis, more than half of the women had adhered to IPT-SP. However, there appears to be confusion about the IPT-SP administration protocol, which seems to be poorly understood and poorly applied. Very few women knew when to start IPT-SP, the recommended number of doses, or the number of tablets per dose. The irregularity of women's attendance at consultations could explain this result, as described in the 2018 study by Tshibola Mbuyi [20].

Some limitations were observed in the study. The sample size was not large enough for an overall assessment of knowledge. Furthermore, limiting inclusion to women attending prenatal consultations restricts the extrapolation of knowledge to all pregnant women in Franceville.

5. Conclusion

Malaria remains a public health problem and is one of the main reasons for seeking medical advice. This study showed a notable disparity between the availability of prevention tools (mosquito nets, IPT-SP) and their effective use, which is linked to a lack of knowledge about malaria prevention, non-compliance with the dosage of IPT-SP, non-reception of mosquito nets, and discomfort with using them. Adherence to prenatal consultations and improved education of women by health professionals could be major determinants of better adherence to preventive measures.

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Authors' Contributions

M. N. S., E. M. J. M. and **I. E.** participated in the design of the project, statistical analysis of the data, and writing of the article. **A. O. A.** participated in data collection and management. **L. W. B. J.** participated in the implementation of the study and writing of the article. **P. M. I.** participated in the proofreading of the article**,** and **E. B. N. and J. B. L. D.** participated in the design and management of the project and the proofreading of the article.

Ethical and Regulatory Considerations

This study was approved by the steering committee of the HASG of Franceville. An informed consent form and an information leaflet were provided to each participating subject. The confidentiality and anonymity of the information were maintained during data collection and data analysis. Medical confidentiality was also guaranteed.

Conflicts of Interest

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

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