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Factors Associated with the Low Implementation of the National Malaria Management Protocol in Kolwezi, Democratic Republic of the Congo

Fidèle Ilunga Kabala[1,2*], Eddy Kakese Masela[2,3], Dauphin Yava Kalenga[2,3], Gabriel Kambi Mwanga[2], Freddy Bukasa Kangomba[2,3], Ghislain Mbidi Kasongo[2], Isaac Mukeng Kasaj[2], Bruno Kipimbie Mwenya[2,3], Fabrice Kapend Tshimwang[2], Fidele Sam Kadang[2], Robert Kahangu Ndondji[2,4], Fred Mbayo Bulobo[1,2], Dieudonné Mukendi Mpunga[1]

[1]Kinshasa School of Public Health, Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[2]Lualaba Provincial Health Division, Kolwezi, Democratic Republic of the Congo
[3]Faculty of Medicine and Public Health, University of Kolwezi, Kolwezi, Democratic Republic of the Congo
[4]Higher Institute of Medical Technology of Kolwezi, Kolwezi, Democratic Republic of the Congo
Email: *drkabalailunga@gmail.com

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Abstract

Introduction: The application of the national malaria management protocol is essential in all settings to reduce the transmission of parasites to other people, reduce resistance to antimalarials, and prevent the progression from to severe or even fatal. Our objective was to determine the factors associated with the low application of this protocol by Healthcare Facilities (HCFs) providers in Kolwezi city. **Methods:** An analytical cross-sectional study was conducted among healthcare providers recruited by probability sampling. Interview using a structured questionnaire and a document review using a grid were used to collect data. Chi-square tests and logistic regression measured the association between variables of interest at the alpha significance level of 0.05. **Results:** A total of 276 healthcare providers were interviewed to assess the implementation of the national malaria treatment protocol. Of the 12,602 confirmed malaria cases recorded in the patient records, 7117 (56.5%) had been treated in accordance with the national protocol at the 178 HCFs visited. Lack of continuing education (OR = 2.655, 95% CI 1.208 - 5.835; P = 0.015); lack of supervision (OR = 4.451, 95% CI 1.865 - 10.624; P = 0.001); poor knowledge of educational advice (OR = 3.369, 95% CI 1.535 - 7.391; P = 0.002); and treatment requested by the patient (OR = 2.050, 95% CI 1.058 - 3.971; P = 0.033) constitute the four associations identified in the adjusted analysis. However,

in the bivariate model: the absence of posted malaria protocols (OR = 3.735, 95% CI 2.116 - 6.594; P < 0.001); the unavailability of flowcharts or treatment guidelines (OR = 3.161, 95% CI 1.790 - 5.584); P < 0.001); the absence of a quality assurance team (OR = 4.198, 95% CI 1.905 - 9.251; P < 0.001) and a lack of awareness (OR = 2.500, 95% CI 1.354 - 4.615; P = 0.003) were associated with low adherence to the national malaria management protocol. **Conclusion:** Compliance with the national malaria management protocol is low among healthcare providers in the city of Kolwezi. It is therefore necessary to supervise, train staff, raise awareness and set up quality assurance committees in the HCFs in order to overcome the challenges related to the weak application of the national protocol.

Keywords

Associated Factors, Implementation, National Protocol, Malaria, Kolwezi

1. Introduction

Malaria remains a major public health problem in sub-Saharan Africa. Although completely preventable and treatable, malaria continues to have devastating consequences on the health and livelihoods of people around the world [1].

The WHO African region remained the most affected by malaria in 2024, with 94% of cases and 95% of deaths globally, with 75% of deaths in the region affecting children under 5 years of age. Five countries—the Democratic Republic of the Congo, Ethiopia, Mozambique, Nigeria and Uganda—accounted for more than half of all cases worldwide [2].

In order to accelerate progress towards elimination, WHO urges affected countries and global malaria actors to maximize the impact of life-saving interventions today. The Strategy is based on three pillars, the first of which is access to malaria prevention, diagnosis and treatment as part of universal health coverage [2]. WHO recommends rapid diagnosis and early treatment using artemisinin-based combination therapies (ACT) that are more than 95% effective. Universal access to WHO-recommended antimalarial drugs is essential in all settings to reduce the transmission of parasites to others, reduce resistance to antimalarial drugs and prevent progression from simple malaria to severe or even fatal malaria [1].

In 21 countries in sub-Saharan Africa, the proportion of febrile children diagnosed increased from a median of 30% in baseline studies (2005-2011) to 47% in more recent surveys (2017-2024), a median of 68% were treated with an ACT during the period 2017-2024, compared to 34% in 2005-2011 [2]. Despite this evolution, WHO recommendations for malaria prevention and management are still poorly followed by health care providers. Even recent studies in Uganda have found low proportions of 27.6% in 2019 [3] and 68.1% in 2022 [4].

However, according to the 2018 MICS survey in the DRC, the rate of malaria cases properly treated according to national recommendations appears to be very

low, at 8.8%, in stark contrast to the 57% reported by the Health Service Delivery Evaluation Survey conducted the same year in the country's HCFs [5] [6]. Even the results of the latest Demographic and Health Survey (DHS) on malaria management showed that among the children under 5 years of age having recently had a fever, the percentage of those who received a ACT increased from 5% in the DRC DHS 2013-2014 and then to 42% in the DRC DHS 2023-2024 [7]. Despite efforts in the Democratic Republic of the Congo by the National Malaria Control Program (PNLP) to improve malaria management, adherence to national guidelines by health care providers remains insufficient. Failure to comply with the national malaria management protocol compromises the quality of care and exposes patients to serious consequences, including prolonged hospitalization, increased costs of care, the emergence of antimalarial drug resistance, and continued transmission of Plasmodium in the community. It also leads to increased morbidity and imposes a heavy health, social and economic burden on patients, their families and the health system [8].

In Kolwezi, the situation also seems worrying, the results of the analysis of the data collected in the consultation registers of 18 HCFs as part of the FETP-Frontline with AFENET/CDC Atlanta indicated that only 69.9% of the cases had been treated according to the protocol contrary to 100% required by the National Malaria Control Program (PNLP) [8]. Failure to follow the national protocol in Kolwezi, as elsewhere, is believed to be due to several factors, including problems with communication, training of health workers, supervision, availability of antimalarial drugs and malaria supplies, and the posting of protocols [4] [9]-[11].

However, the lack of a quality assurance committee in the HCFs, the non-use of Flowcharts and Updated Treatment Guide, the absence of administrative measures by providers, untimely visits by pharmacists of pharmaceutical companies with their forms of antimalarials, the care requested by the patient, the lack of regular awareness by the manager and the management policy specific to the HCF are little studied in our environment. This study was therefore conducted to identify the factors associated with the low Implementation of the national malaria management protocol among healthcare providers in Kolwezi, Lualaba Province.

2. Methods

Study framework

The Lualaba Provincial Health Division is one of 26 divisions in the DRC, with its capital in Kolwezi. It comprises 14 health zones, including the Manika zone, which has 145 health care facilities (HCFs), and the Dilala zone, which has 92 HCFs, more than 80% of which are private.

Study Design

This study was a cross-sectional analytical study conducted among healthcare providers and facilities in the city of Kolwezi from January 9 to 31, 2026. To ensure the quality of the data to be collected, an investigator's guide or manual was de-

veloped, and a two-day training session was organized for the 10 investigators. During this training, aspects of the national malaria management protocol and the research methodology were covered, followed by a one-day pre-test at the Dimev HCF in the Manika Health Zone. The trained investigators, who were not affiliated with the targeted HCFs, were deployed in the field for a period of 20 working days.

Sampling

The study populations consisted of HCFs and any healthcare provider responsible for patient consultations, with the inclusion criteria being that the provider was responsible for patient consultations in the department during the study period and had agreed to participate in the study.

Study participants were selected using a two-stage probability sampling method; of the 237 HCFs in the study area, 80% were selected using simple random sampling, and then one or two providers were randomly selected from each facility based on its level within the healthcare hierarchy and the availability of advanced medical equipment. Healthcare providers eligible for the study were physicians and nurses who were seeing patients on the day of the investigators' visit. The number of providers to be included varied depending on the type of facility and the organization of malaria care: one provider in health centers without a physician, two providers in health centers providing care for severe malaria particularly in urban settings where physicians practice in private primary-care facilities and two providers in hospitals.

The minimum sample size was calculated using Schwartz's formula ($n \geq \frac{Z^2_{apq}}{d^2}$) based on an expected prevalence of 26% from a comparable study in Uganda [3]. Thus, the minimum sample size was estimated at 296 service providers to be interviewed.

Data Collection

Data were collected using a KoboCollect questionnaire for the literature review and for individual interviews with healthcare providers. The following steps were followed: addressing the department head by title, randomly selecting on-duty providers, collecting malaria data from the records or consultation forms for the previous month, and then interviewing the providers at the facility who agreed to participate in our study.

Interest Variables

Our dependent variable was healthcare providers' adherence to the national malaria treatment protocol; which served as a proxy derived from the WHO and PNLP/DRC guidelines recommending that healthcare providers use artemisinin-based combination therapies (ACTs) to treat uncomplicated malaria and injectable artesunate to treat severe malaria following laboratory confirmation. Below are the criteria for classifying cases:

Uncomplicated malaria: Uncomplicated malaria is defined as any case of fever or a history of fever within the past 48 hours, with or without headache, chills,

body aches, lower back pain, neck pain, fatigue, chills, sweating, or nausea without signs of severity, and confirmed by a laboratory diagnosis (rapid diagnostic test or thick smear/thin smear).

Treatment for uncomplicated Plasmodium falciparum malaria must be based on the administration of artemisinin-based combination therapies (ACTs), which are as follows:

- ✓ Artesunate + Amodiaquine (ASAQ): The dose is 4 mg/kg/day of artesunate and 10 mg/kg/day of amodiaquine once daily for 3 days. It is recommended to take ASAQ as a single daily dose after a meal or with a sweetened beverage or fruit juice at a set time.
- ✓ Artemether + Lumefantrine (AL): The recommended treatment consists of administering 6 doses over 3 days at fixed times. On the first day, the second dose should be administered 8 hours after the first dose. The third dose is administered 24 hours after the first. Subsequent doses should be spaced 12 hours apart. The dosage is 1.7 mg/kg of artemether and 12 mg/kg of lumefantrine per dose, administered twice daily for 3 days. It is essential that patients and healthcare providers or caregivers be informed of the need to take this ACT immediately after a meal or drink containing at least 1.2 g of fat (a meal prepared with palm oil, peanut butter, squash, fatty meats such as pork, milk, etc.).
- ✓ Artesunate + Pyronaridine (AP): Patients should take one dose of AP every 24 hours for 3 days. The dose must be taken at a fixed time (at the same time each day).

Therapeutic Failure in Malaria: This refers to a situation in which fever persists or the same symptoms prompting the patient's visit continue, 72 hours (3 days) after the start of treatment, without accompanying symptoms and/or signs of other infections, following the correct administration of reliable artemisinin-based combination therapies (ACTs) or 7 days after correct treatment with quinine combined with clindamycin, with laboratory confirmation (microscopy: thick smear/thin smear). Management of treatment failure is to be conducted exclusively at referral facilities: If failure occurs within 28 days, administer another unprescribed ACT from the list or quinine tablets combined with clindamycin at the doses indicated above as an alternative.

Severe malaria: A case of severe malaria is defined as any individual/patient presenting with fever or a history of fever within the past 2 days, accompanied by at least one sign of severity and/or dysfunction of at least one vital organ, and caused by Plasmodium falciparum (confirmed by microscopy: thick smear/thin smear).

The DRC has opted for injectable artesunate for the treatment of severe malaria in adults, children older than two months, and pregnant women in the second and third trimesters of pregnancy. Quinine administered by infusion will be used in cases where artemisinin-based drugs (artesunate and artemether) are contraindicated or unavailable:

- ✓ Injectable artesunate at a dose of 2.4 mg/kg of body weight per dose, adminis-

tered intravenously or intramuscularly upon admission (time zero), then at 12 and 24 hours, and thereafter once daily, is the recommended treatment until the patient is able to take an oral ACT for 3 days or quinine tablets plus clindamycin for 7 days.

- ✓ Injectable artemether: 3.2 mg/kg of body weight intramuscular (loading dose), followed by 1.6 mg/kg daily until the patient is able to take an oral ACT for 3 days or quinine tablets plus clindamycin for 7 days.
- ✓ Quinine: 10 mg of quinine dihydrochloride per kg of body weight diluted in 10 mL of isotonic saline per kg, administered as an intravenous infusion over 4 hours; then administer 10 mg of quinine 8 hours later. This dose should be repeated every 12 hours, counting the time from the start of the previous infusion, until the patient is able to swallow.

Data on compliance with the national malaria management protocol were collected directly from the records and consultation forms of HCFs. These tools constitute the primary sources of data collection and serve as the basis for preparing reports submitted to higher levels of the health system. The use of these primary sources was prioritized to enhance the objectivity and reliability of the study data. Indeed, monthly reports may contain discrepancies compared to the information recorded in the registries or consultation forms used by providers. Direct analysis of these documents thus made it possible to examine the information at its source and to minimize biases that might result from the compilation or transmission of health data.

HCF providers were evaluated indirectly based on the extent to which they followed protocol in their registries or consultation records from the previous month. The unit of analysis is the HCF; the level of application was calculated based on confirmed cases and cases treated in accordance with the protocol, using the following formula:

$$\text{implementation} = \frac{\text{Malaria case treated in accordance with the National Protocol}}{\text{Total confirmed malaria cases}} \times 100$$

In accordance with the national malaria management protocol in the DRC, all confirmed cases of malaria must receive appropriate treatment in accordance with national guidelines. Thus, the benchmark remains 100% compliance with management guidelines for all confirmed cases in every HCF [8]. However, for the purposes of this study, an operational threshold of 80% was adopted to classify healthcare facilities based on their level of compliance with the national protocol. A compliance rate of 80% or higher was considered satisfactory, while a rate below 80% was considered to indicate low compliance with the protocol. This choice is justified by the need for an operational classification criterion that allows for comparing the performance of facilities and providers and identifying shortcomings in implementation. It therefore serves as an analytical benchmark suited to the survey's objectives, without, however, representing a national standard for quality of care.

The independent variables were as follows: 1) the sociodemographic characteristics of healthcare providers; 2) the characteristics of healthcare facilities (HCFs); 3) healthcare providers' knowledge of the national malaria treatment protocol. To collect data in the field, administrative measures were defined as negative sanctions (punishment) imposed on providers for noncompliance with the protocol at their healthcare facility, measured on a nominal scale: "Yes" if punishment was imposed and "No" if no punishment was imposed. The healthcare facility's implementation of the National Protocol (NP) was defined as an HCF where 80% or more of malaria cases were treated according to the National Protocol, based on data from the previous month's patient visit records. This was measured on a nominal scale: "Yes" if the proportion was 80% or more, and "No" otherwise.

The provider's application to the National Protocol was defined indirectly by the HCF's level of application to the protocol, measured on a nominal scale: "Yes" if the proportion is greater than or equal to 80%, and "No" otherwise.

Data analysis

The data was collected on Kobo collect, then exported to an Excel 2016 sheet for cleaning purposes and to the SPSS (statistics package for social sciences) version 25.0 software for analyses.

For the univariate level, the continuous quantitative data were summarized by the median and its interquartile space. The categorical variables were summarized in proportions. The variables associated with the $p < 0.05$ cut-off in bivariate analysis were introduced into the multivariate model.

Ethical considerations

Each participant gave written informed consent after explanation of the objectives of the study; the data were anonymized before analysis; there were no direct benefits for the respondents but only indirect benefits as participants in the contribution or orientation on possible solutions to the weak application of the national protocol of the malaria in the DRC.

The research protocol was submitted to the Health Information and Research Office of the Lualaba Provincial Health Division (PHD) for review and approval. Before data collection began in the field, PHD officials involved in the study the majority of whom were participating as interviewers were provided with a collective authorization letter permitting them to conduct interviews with health care professionals and to access the patient records necessary for the research.

3. Results

In total, 276 of the 296 expected healthcare providers were interviewed to assess the implementation of the national malaria treatment protocol, representing a response rate of 93.2%. Of the 12,602 confirmed malaria cases recorded in patient records, 7,117 (56.5%) had been treated in accordance with the national protocol at the 178 HCFs visited.

According to this Table 1, out of 12602 cases of malaria confirmed by rapid diagnostic test (RDT) or thick/thin smear (TS/TS) in the registries/consultation

records from last month, only 7,117 were treated in accordance with national guidelines at the health facilities visited, representing 56.5 percent. State-run health facilities were nearly twice as likely to follow the national malaria treatment protocol as private health facilities (P < 0.001). Similarly, health centers were more likely to follow the protocol than secondary-level facilities (P < 0.001).

Table 1. Application of the national malaria Management protocol in the registers of the HCFs of Kolwezi City, 2026.

Variables	Cases treated according to the national protocol		Raw OR (95% CI)	P value
	Yes	No		
Membership of the HCF				
State	353 (71.5)	141 (28.5)	1.96 (1.60 - 2.40)	**<0.001**
Private	6764 (55.9)	5344 (44.1)	1	
Structure level				
First Echelon (Health Center)	5555 (58.9)	3882 (41.1)	1.47 (1.35 - 1.60)	**<0.001**
Second level (General Referral Hospital)	1562 (49.4)	1603 (50.6)	1	
Comprehensive Application of the National Protocol (NP)	**7117 (56.5)**	**5485 (43.5)**		

It appears from this Table 2 that out of 178 HCFs visited, only 59 of them had applied the national malaria management protocol with the consultation registry data (33.1%), in contrast to the data in the monthly activity report (85.4%). With regard to the evaluation of HCE providers, 72 providers had applied the national malaria protocol in the consultation registry (26.1%), in contrast to the providers' statements during the interview (72.1).

Table 2. Implementation of the National Malaria Management Protocol by Health Facilities and Providers in the City of Kolwezi, 2026.

Variables	Frequency n = 178	Proportion (%)
Application of the HCF NP in last month's Report		
Yes	152	85.4
No	26	14.6
Application of the HCF NP in last month's registers/consultation sheet		
Yes	59	33.1
No	119	66.9
Do you follow the NP every time? (Individual declaration)	**n = 276**	
Yes	199	72.1
No	77	27.9
Application of the NP by the service provider in the registers/consultation sheet of the last month		
Yes	72	26.1
No	204	73.9

Compared to Table 3, the majority of the healthcare providers interviewed (88.8%) were nurses, half of whom were under 35 years of age. More than 6 out of 10 providers (64.1%) had been working in their current positions for 5 years or more. Of these interviews, 260 (94.2%) took place in private and/or faith-based health facilities, and 254 (92.0%) in primary-level health facilities. Regarding the stock of antimalarial drugs and malaria supplies, more than 7 out of 10 providers (73.6%) did not report having sufficient stock of antimalarial drugs in the health facilities during the previous quarter. However, less than half (42.8%) reported not having received regular supplies of antimalarial drugs. Regarding the source of antimalarial drugs commonly used to treat malaria, most (39.5%) reported that they were procured using HCF funds, while 36.6% stated they came from the Kolwezi Essential Medicines Supply Center (Camekol). As for the existence of a quality assurance team or committee (QAC) within the HCF, more than 8 out of 10 providers (89.5%) did not acknowledge its existence. Administrative measures in the form of negative sanctions or punishments for noncompliance with the national malaria treatment protocol were not regularly enforced (85.1%), according to the providers, nor were incentives or encouragement provided to those who complied (81.5%). Regarding the availability of protocols, more than 7 out of 10 providers had not confirmed the availability and posting of malaria treatment protocols (70.3%) and did not use flowcharts or treatment guidelines (71.4%). Regarding visits by pharmaceutical companies to health facilities, more than 6 out of 10 providers reported having received a visit from a pharmaceutical company in the past month to promote antimalarial drugs (65.9%).

Table 3. Characteristics of Healthcare Facilities and Healthcare Providers Visited in the City of Kolwezi, 2026.

Variables	Frequency n = 276	Proportion (%)
Sex		
Feminine	105	38.0
Masculine	171	62.0
Median age with EIQ: 35 [29 - 41] years old		
Professional Category		
Nurse	245	88.8
Doctor	31	11.2
Level of education attained		
Secondary	54	19.6
Academic	222	80.4
Seniority in the department		
< 5 years old	99	35.9
≥5 years old	177	64.1

Continued

Membership of the HCF		
State	16	5.8
Private/Religious	260	94.2
Echelon of the HCF according to the health pyramid of the DRC		
First Echelon (Health Center)	254	92.0
Second level (General Referral Hospital)	22	9.0
Availability of sufficient stock of antimalarials in the last 3 months		
Yes	73	26.4
No	203	73.6
Availability of sufficient stock of RDTs in the last 3 months		
Yes	98	35.5
No	178	64.5
Regular supply of antimalarials and other malaria inputs in the HCF		
Yes	158	57.2
No	118	42.8
Origin of antimalarials commonly used for the treatment of malaria		
Purchase by HCF funds	109	39.5
Kolwezi Central Purchasing Office for Essential Medicines(camekol)	101	36.6
Don't know	45	16.3
Purchase by the patient (medical prescription)	21	7.6
Existence of administrative measures such as negative sanction or punishment of claimants		
Yes	41	14.9
No	235	85.1
Existence of administrative measures such as positive sanction or praise of claimants		
Yes	51	18.5
No	225	81.5
Existence of a quality assurance team or committee in your HCF		
Yes	29	10.5
No	247	89.5
Are there guidelines, standards and protocols for malaria treatment in your HCF posted?		
Yes	82	29.7
No	194	70.3
Existence of flowcharts or management guidelines on the look-up table		
Yes	79	28.6
No	197	71.4

Continued

Visit of a pharmacist from a pharmaceutical company/PWSE for the promotion of drugs in the HCF		
Yes	182	65.9
No	94	34.1
How many times have you received last month a pharmaceutical company/bachelorette party for the promotion of antimalarials in your HCF?	**n = 182**	
Only once	29	15.9
2 to 4 times	128	70.3
More than 5 times	25	13.7

Regarding Table 4, the results indicate that nearly 8 out of 10 healthcare providers (77.5%) had not received training on the national malaria treatment protocol, and more than 7 out of 10 (73.6%) were not supervised by their superiors. With regard to the national malaria protocol in the DRC, the most commonly used antimalarial drug for treating malaria was Artemether-Lumefantrine (A-L) (60.1%). Nearly half of the providers were familiar with the national guidelines for the management of severe malaria (47.1%), and only 16.3% of providers were familiar with the guidelines for treatment failure in malaria. Regarding the operational definitions of the different forms of malaria, 27.8% of providers were unable to define uncomplicated malaria in practical terms, and more than half (56.9%) were unaware of the operational definition of treatment failure in malaria. Biological confirmation was not mandatory for 18.8% of providers at the health care facilities visited, and 23.9% of these providers were unaware that following national guidelines could reduce the transmission of parasites to others. It should be noted that more than 6 out of 10 providers (60.9%) used the treatment requested or preferred by the patient rather than following the malaria treatment protocol; 40.2% of providers confirmed the existence of an internal malaria treatment policy separate from that issued by the national malaria control program in the DRC. Regarding communication between providers and patients after prescribing ACTs, only 22.8% of providers were knowledgeable about the educational advice to give to patients treated with ACTs. Nearly 8 out of 10 providers had not received training last year on adherence to the national protocol. However, more than 6 out of 10 (64.9%) were still aware that their inappropriate prescribing practices could contribute to antimalarial drug resistance.

Table 4. Distribution of healthcare providers in Kolwezi according to their level of knowledge of the national malaria management protocol, 2026.

Variables	Frequency n = 276	Proportion (%)
Have completed training on malaria Management within the last 3 years		
Yes	62	22.5
No	214	77.5

Continued

Have received specific supervision on malaria in the last 3 months		
Yes	73	26.4
No	203	73.6
Are you aware of the guidelines on the treatment of simple malaria in the DRC?		
Use artemisinin-based combination therapies (ACTs)	163	59.1
Use ACTs and if ACTs are not present: Quinine tablet + Clindamycin	34	12.3
Use Artesunate-Amodiaquine(AS-AQ) combinations only	33	12.0
Use Artemether-lumefantrine (A-L) combinations only	13	4.7
Others to be specified	33	12.0
Type of ACT commonly used in HCEs?		
Artesunate -Amodiaquine	97	35.1
Artemether -lumefantrine	166	60.1
Quninine + clindamycin	5	1.8
Other	8	2.9
Are you aware of the guidelines on the management of severe malaria in the DRC?		
Use injectable artesunate as a first-line treatment	130	47.1
Use the injectable arthemether as a first-line treatment	12	4.3
Use quinine as an infusion only	50	18.1
Use quinine as an infusion at a dose of 20 mg/Kg	48	17.4
Others to be specified	36	13.0
Knowledge of the guidelines on management of simple malaria treatment failure in the DRC?		
Using quinine as an infusion	156	56.5
Use another ACT or quinine + clindamycin	45	16.3
Use injectable artesunate only	18	6.5
Use the injectable arthemeter only	9	3.3
Others to be specified	48	17.4
Knowledge of the operational, or practical definition of simple malaria		
Yes	199	72.1
No	77	27.8
Knowledge of the operational, or practical definition of treatment failure simple malaria		
Yes	119	43.1
No	157	56.9
Knowledge of the operational, or practical definition of severe malaria		
Yes	185	67.0
No	91	33.0

Continued

Mandatory recommendation for biologic confirmation (RDT/GE) of malaria prior to treatment		
Yes	224	81.2
No	52	18.8
Reduction of parasite transmission to others through the application of the national management protocol		
Yes	210	76.1
No	66	23.9
Do you sometimes practice the treatment requested or preferred by the patient for his or her quick recovery?		
Yes	168	60.9
No	108	39.1
Availability of an internal policy or protocol specific to the HCF?		
Yes	111	40.2
No	165	59.8
Type of internal policy or protocol specific to the HCF		
Use of Artesunate Injection for Simple Malaria	58	52.3
Use of Quinine as an infusion in case of therapeutic failure of PS	27	24.3
All suspected cases undergo GE prior to malaria treatment	18	16.2
Use of Arthemeter Injection	8	7.2
Do you know the 5 recommendations to give to a patient with malaria being treated with ACTs according to the DRC treatment guidelines?		
Yes	62	22.8
No	213	77.2
Sensitization on national malaria guidelines last year in the department		
Yes	58	21.0
No	218	79.0
Be aware of being the source of antimalarial resistance?		
Yes	179	64.9
No	97	35.1

Compared to Table 5, certain variables derived from HCFs characteristics are associated with poor adherence to the malaria management protocol in bivariate analyses: the absence of punishment as a negative administrative measure increases the likelihood that providers will not follow the national malaria protocol by a factor of 3.3 ($P < 0.001$); the absence of praise or encouragement (a positive administrative measure) would increase the likelihood that providers would not follow the national protocol by a factor of 2.9 ($P = 0.001$); the absence of posted malaria protocols would increase the likelihood that providers would not follow the national protocol by a factor of 3.7 ($P < 0.001$); Providers who did not have

flowcharts or protocols on the examination table were 3.1 times more likely to deviate from the protocol (P < 0.001), and the absence of a quality assurance team or committee within the HCF increased the likelihood of prescribing providers deviating from the protocol by a factor of 4.1 (P < 0.001).

Table 5. Factors associated with low implementation to the national malaria management protocol by healthcare providers in the city of Kolwezi, 2026.

Variables	Application of the NP by Healthcare providers		Bivariate analysis		Multivariate Analysis	
	No (204)	Yes (72)	OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Professional Category						
Nurse	177	68	0.386 (0.130 - 1.143)	0.076	0.440 (0.126 - 1.531)	0.197
Doctor	27	4	1		1	
Seniority in service						
< 5 years	75	24	1.163 (0.660 - 2.043)	0.602	0.992 (0.483 - 2.041)	0.983
≥5 years	129	48	1		1	
Availability of sufficient stock of antimalarial drugs in the past 3 months						
No	156	47	1.729 (0.965 - 3.097)	0.064	2.292 (0.989 - 5.303)	0.053
Yes	48	25	1		1	
Availability of sufficient stock RDTs in the last 3 months						
No	130	48	0.878 (0.498 - 1.549)	0.654	0.707 (0.316 - 1.579)	0.397
Yes	74	24	1		1	
Administrative measures /punishment for non-compliance with the NP						
No	183	52	3.352 (1.689 - 6.652)	**0.000**	0.616 (0.184 - 2.063)	0.432
Yes	21	20	1		1	
Administrative measures /Congratulations for respecting the NP						
No	176	49	2.950 (1.562 - 5.573)	**0.001**	1.524 (0.493 - 4.711)	0.464
Yes	28	23	1		1	
Existence of guidelines and protocols malaria displayed?						
No	159	35	3.735 (2.116 - 6.594)	**0.000**	2.287 (0.982 - 5.327)	0.055
Yes	45	37	1		1	
Existence of flowcharts or management Malaria Guidelines on the consultation table						
No	159	38	3.161 (1.790 - 5.584)	**0.000**	1.401 (0.608 - 3.226)	0.428
Yes	45	34	1		1	
Existence of a team or committee Quality assurance in your HCF						
No	191	56	4.198 (1.905 - 9.251)	**0.000**	0.646 (0.185 - 2.249)	0.492
Yes	13	16	1		1	

Continued

Promotion of Antimalarial Drugs by Pharmaceutical Companies in Your HCF						
Yes	141	41	1.692 (0.973 - 2.942)	0.061	1.133 (0.526 - 2.438)	0.750
No	63	31	1		1	
Follow-up training						
No	178	36	6.846 (3.688 - 12.710)	**0.000**	2.655 (1.208 - 5.835)	**0.015**
Yes	26	36	1		1	
Formative supervision received						
No	173	30	7.813 (4.268 - 14.303)	**0.000**	4.451 (1.865 - 10.624)	**0.001**
Yes	31	42	1		1	
Do you know the 5 recommendations to give to a patient with malaria being treated with ACTs according to the DRC treatment guidelines?						
No	170	43	3.474 (1.905 - 6.335)	**0.000**	3.369 (1.535 - 7.391)	**0.002**
Yes	33	29	1		1	
Have an internal policy for the Management Simple malaria in your HCF						
No	122	43	1.003 (0.580 - 1.735)	0.990	0.604 (0.291 - 1.252)	0.175
Yes	82	29	1		1	
Practice requested treatment or preferred by the patient for its rapid recovery						
Yes	133	35	1.980 (1.149 - 3.414)	**0.013**	2.050 (1.058 - 3.971)	**0.033**
No	71	37	1		1	
Awareness of the guidelines last year at the service?						
No	170	48	2.500 (1.354 - 4.615)	**0.003**	1.211 (0.522 - 2.809)	0.655
Yes	34	24	1		1	
To have the consciousness of being What causes resistance in antimalarials?						
No	75	22	1.321 (0.742 - 2.352)	0.343	2.036 (0.958 - 4.324)	0.064
Yes	128	50	1		1	

The results also indicate that a lack of training on malaria in the past 3 years increases the likelihood of noncompliance with the protocol by a factor of 7 ($P < 0.001$); a lack of supervision in the past quarter increases the likelihood of a provider failing to follow protocol by a factor of 8 ($P < 0.001$); limited knowledge of educational counseling following ACT prescription increases the likelihood of failing to follow protocol by a factor of 3 ($P < 0.001$); providers who sometimes prescribe the treatment requested or preferred by the patient are twice as likely to deviate from the protocol ($P = 0.013$); providers who were not trained on compliance with national guidelines last year in their department are three times more likely to deviate from the protocol ($P = 0.003$).

In the multivariate model, the results indicate that a lack of continuing education ($P = 0.015$); a lack of supervision ($P = 0.001$); limited knowledge of educational guidance ($P = 0.002$); and treatment requested by the patient ($P = 0.033$)

were associated with poor adherence to the national protocol. In fact, the results show that providers who had not received training on malaria were three times more likely to deviate from the protocol than those who had been trained (OR = 2.655; 95% CI 1.208 - 5.835; P = 0.015). Healthcare providers who had not been supervised were four times more likely to deviate from the protocol compared to those who had been supervised (OR = 4.451; 95% CI 1.865 - 10.624; P = 0.001). Providers with limited knowledge of educational counseling when prescribing ACTs were up to 3 times more likely to deviate from the protocol compared to those with good knowledge (OR = 3.369; 95% CI 1.535 - 7.391; P = 0.002). Healthcare providers who prescribed the treatment requested or preferred by the patient were twice as likely to deviate from the protocol (OR = 2.050; 95% CI 1.058 - 3.971; P = 0.033).

4. Discussions

This study is based on the factors associated with the low application of the national malaria management protocol in the HCE of the city of Kolwezi. The results showed a low application in the city of Kolwezi. Our results are almost similar to those found in Burkina Faso in 2015 (57.4%) [12], in Guinea Conakry in 2016 (60.2%) [13], in Malawi in 2013 (58%) [10] and Mali in 2021 (51%) [14]. However, our results appear to be lower than the results found by Jane Frances *et al.* in Uganda in 2022 (68.1%) [4], far lower than the 2013 results by David Sears *et al.*, also in Uganda (94.5%) [15] and Malawi in 2016 (85%) [16]. Our results are higher than the Uganda studies in 2015 (39.6%) and 2019 (27.6%) [3] [17], far superior to the results of the 2018 MICS (Multi-Indicator Cluster Survey) in the DRC, where the rate of malaria cases properly treated according to national guidelines was very low at 8.8% [5].

Public healthcare facilities had a higher proportion than private ones in our study: public healthcare facilities were nearly twice as likely to follow the national malaria treatment protocol as private healthcare facilities. This is very similar to the results of a study conducted in Nigeria in 2016, where adherence to guidelines was higher in public health facilities (60.6%) than in private ones (27.3%) [9]. This situation can be explained by the stability of staff in both state and private HCFs as well as their flexibility in receiving feedback from the higher level.

Our findings indicate that the HCFs we visited had implemented the national protocol only to a limited extent, which contrasts with the results of the monthly activity reports. These findings contradict national guidelines, which recommend that at least 80% of suspected malaria cases be diagnosed of which 100% must be treated in accordance with national policy and that antimalarial drugs and specific supplies be available in more than 80% of health facilities [8]. This situation appears to be due to service providers filling out the monthly activity report incorrectly; the data they submit to higher levels does not conform to the source tools. These results clearly demonstrate that service providers may have an inaccurate understanding of the national malaria protocol. The finding was that, in the ma-

jority of health facilities, all malaria cases that had received antimalarial treatment and were recorded in the patient registry were systematically reported as treated cases in accordance with the DRC's national malaria control protocol in the monthly activity reports.

Regarding the stock of antimalarial drugs and malaria supplies, many providers did not report having sufficient stocks of antimalarial drugs in health facilities last quarter; the same was true for rapid diagnostic tests (RDTs). This situation is comparable to the findings in Uganda in 2022 and in the 2023 African Union (AU) report, which showed that the lack of recommended antimalarial drugs made it impossible to follow the protocol [4] [18]**.** This is the opposite with Oluyomi *et al.* in Nigeria where the availability of antimalarial drugs was the main factor influencing the prescription of treatment [9]. This discrepancy could be explained by irregular supply, as noted in our study, in which some providers (42.8%) reported that they had not received a regular supply of antimalarial drugs. This was due to stakeholders' failure to meet drug delivery deadlines, as they were reeling from the suspension of USAID support in 2025 in Lualaba Province.

In this study, the most commonly used ACT for the treatment of uncomplicated malaria was A-L (60.1%). These results show similarities with those found by David Sears (Artemether-Lumefantrine accounted for 97.3% of the ACTs prescribed) and Richard Nyeko (88.3%) in Uganda [15] [19]. In our context, this is explained by its greater availability on the market but often incorrectly prescribed by providers on dosing aspects and supplemental feeding to enhance its effectiveness.

For this study, the results showed that healthcare providers were not familiar with national guidelines, which was attributed to their limited knowledge of the management of uncomplicated and severe malaria, limited knowledge of the guidelines for treatment failure in malaria, and limited knowledge of the definition of treatment failure; many providers still perform the RDT test in cases of treatment failure instead of the thick smear/thin smear (TS/TS) and prescribe intravenous quinine instead of another ACT. This discrepancy was due to a lack of malaria-specific supervision, a lack of training, a lack of follow-up in patient care, and a lack of awareness within HCFs.

The absence of disciplinary action (punishment), the absence of a policy for written commendations or encouragement, the absence of posted malaria protocols, the absence of flowcharts or malaria management protocols on the examination table, the lack of awareness among providers, and the absence of a quality assurance team or committee in the HCF were associated with poor adherence to malaria management protocols. From this perspective, these results are largely consistent with those found in the DRC by Losimba *et al.* in 2012, where the factor significantly associated with the prescribing of artesunate-amodiaquine (AS-AQ) by providers was the availability of a treatment guide ($P = 0.040$) [20], similar to a 2016 study conducted in Uganda that showed that the absence of posters about malaria treatment in examination rooms was associated with poor adherence to

guidelines (P = 0.004) [11]. Having a quality assurance team in primary HCFs is essential and enables the implementation of a program to evaluate clinical practices through capacity building for providers, feedback to prescribers, periodic awareness-raising (reminder) programs, and the development of financial incentives or coercive mechanisms.

However, the existence of an internal malaria policy (in-house protocol) within the HCFs and the promotion of antimalarial drugs through visits by pharmaceutical wholesalers were not associated with poor adherence to the malaria management protocol. These findings contradict the results of Oluyomi *et al*., who reported that drug promotion by manufacturers (45.8%) had a major influence on the prescribing practices of healthcare workers [9]. In our study, 40.2% of healthcare providers confirmed the existence of an internal policy separate from that issued by the national malaria control program; of these, 52.3% confirmed the routine use of injectable artesunate for the treatment of uncomplicated malaria, while 24.3% confirmed the use of quinine via infusion, few providers confirmed the routine use of thick smear plus thin smear (TS/TS) for all suspected malaria cases in their health facilities (16.2%), which is contrary to the DRC's national protocol. This discrepancy can be explained by the fact that the majority of health facilities lack physicians at the primary-care level (health centers), and these facilities are often visited by pharmaceutical companies, which sometimes provide antimalarial drugs not included in the national protocol.

With regard to training, the lack of training among healthcare providers was associated with poor adherence to the national malaria clinical management protocol. These findings are nearly identical to those of Charles *et al*., who reported that healthcare providers who had not received training on malaria were twice as likely to deviate from the national protocol as those who had been trained (P = 0.001) [11]**.** Three other authors have confirmed this hypothesis in their own contexts [13] [20] [21]. A lack of supervision was also associated with this outcome. These findings are similar to those of James *et al*., who reported that supervised providers were more likely to follow the recommended protocol (OR = 0.5, 95% CI 0.2 - 0.9) [4]. Regular in-service capacity building helps to update the knowledge of providers.

Our results indicate that the requested treatment was associated with low application of NP (P = 0.033); this is in contrast to the results found in Uganda by James where the requested care was associated with appropriate or recommended treatment (OR = 0.4, 95% CI 0.3 - 0.5) [4]. This discrepancy can be explained by the fact that most HCE are private and subscribe to mining companies with a certain tolerance because they are for profit. This is the regular use of injectable artesunate instead of ACTs for the treatment of simple malaria.

Compared to communication between providers and patients after the prescription ACTs, a lack of knowledge about what advice to give patients was associated with poor application to the protocol. Our findings are not in line with the national ACT prescribing protocol in the DRC, which recommends providing ad-

vice on the appropriate dosage, side effects, and complementary foods or beverages for each type of ACT, as well as follow-up appointments or when to return, and malaria prevention methods [22]. Similarly, these findings also contradict those of Charles Bawate in 2024, who reported from Uganda that providing patients with instructions on how to take the medication increased their likelihood of adhering to ACT treatment by a factor of 7 [23]. Another author has also reported this issue in his or her context [24]. In Kolwezi, this situation could be linked to insufficient continuing education for healthcare providers, infrequent supervision, high staff turnover among healthcare workers in private healthcare facilities, and insufficient use of national clinical practice guidelines.

5. Limitations of the Study

This study has both strengths and limitations. Among its main strengths, selection biases were reduced through the use of probability sampling of health care facilities (HCFs) and health care providers. In addition, information biases were minimized through prior training of interviewers and pretesting of data collection tools, thereby helping to improve the quality of the information collected.

Nevertheless, certain limitations must be taken into account when interpreting the results. First, information biases could not be completely eliminated. Indeed, the assessment of providers' performance was based primarily on an analysis of records and consultation forms from the month preceding the survey. Although this approach provides more objective data than providers' self-reports, it may underestimate their actual activity. To mitigate this risk, data triangulation was performed by cross-referencing information from consultation records, consultation logs for the corresponding period, and interviews with providers. However, the results highlight associations between provider characteristics and the overall level of protocol adherence within the HCF. Any interpretation of these results must, however, take into account the level of analysis used; the available data do not allow for a direct correlation to be established between the observed practices and each individual provider.

Furthermore, the study covered approximately three-quarters of the health care facilities in the city of Kolwezi, which ensures that the results are representative of the urban setting and allows them to be generalized to all health care facilities in the city. However, these results cannot be extrapolated to rural areas, where organizational characteristics and operating conditions may differ. Conducting comparative studies that include rural areas would allow for a better assessment of any disparities and strengthen the external validity of the results at the province-wide level in Lualaba.

6. Conclusions

The results of this study highlight poor adherence to the national malaria management protocol in health care facilities in the city of Kolwezi, in Lualaba Province a situation that remains a cause for concern given its implications for the

quality of care. Health care providers' low level of knowledge constitutes a major obstacle to the proper implementation of national recommendations, leading to irrational patient management and increasing the risk of the emergence of resistance to antimalarial drugs. Several factors have been identified as contributing to this low level of implementation, including provider training, malaria-specific supervision, and provider awareness.

To improve the implementation of the national malaria management protocol, it is recommended to strengthen providers' capacity through continuing education and regular supervision, ensure the availability of treatment guidelines and flowcharts in all health facilities, establish functional quality assurance committees, develop mechanisms to motivate providers and ensure their accountability, and strengthen communication and awareness-raising regarding best practices for prescribing ACTs. Implementing these interventions would help improve adherence to the national protocol, enhance the quality of care, and reduce the risk of developing resistance to antimalarial drugs and of parasite transmission within the community.

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Author Contributions

Fidele Kabala Ilunga designed the study, developed the research protocol, supervised data collection, and contributed to the data analysis. Dieudonné Mpunga Mukendi approved the research protocol and supervised the data analysis. Fred Bulobo Mbayo authorized the study, facilitated access to medical records, and reviewed the manuscript. Eddy Masela Kakese participated in data collection and analysis. Dauphin Kalenga Yava contributed to data collection and analysis as well as to the revision of the manuscript. Isaac Kasaj Mukeng participated in data collection and the revision of the manuscript. Gabriel Mwanga Kambi contributed to data collection and the revision of the manuscript. Freddy Kangomba Bukasa participated in data collection and analysis as well as in the revision of the manuscript. Ghislain Kasongo Mbidi contributed to data collection and the revision of the manuscript. Bruno Mwenya Kipimbie revised the research protocol, participated in data collection, and revised the manuscript. Fabrice Tshimwang Kapend, Fidele Kadang Sam, and Robert Ndondji Kahangu contributed to data collection and manuscript revision.

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Conflicts of Interest

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

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