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Adherence to national malaria treatment guidelines: A retrospective study among healthcare workers in community pharmacies, Kinshasa, Democratic Republic of the Congo

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ABSTRACT

Introduction

Malaria is one of the leading causes of mortality in developing countries and remains a major public health problem globally.

Purpose

This retrospective cross-sectional study aimed to evaluate prescribers' adherence to the national malaria management policy in Kinshasa, DRC. Eight publicly accessible community pharmacies were randomly selected to collect malaria prescriptions in the Tshangu district.

Methods

The study surveyed authorized pharmacies and patients who agreed to participate through a simple, easy-to-understand questionnaire. A total of 1,088 prescriptions were collected. Of the 448 (41.2%) for treating severe malaria, 388 (86.6%) contained injectable Artesunate, 36 (8.04%) injectable Artemether, 24 (5.36%) injectable quinine, and 428 (95.5%) antibiotics. Of the 640 (58.8%) prescriptions for treating simple malaria, 488 (76.25%) contained Artemether-Lumefantrine tablets, 68 (10.625%) quinine tablets, 36 (5.625%) other antimalarials outside the recommended therapeutic combinations, and 552 (86.2%) antibiotics.

Results

The rate of adherence to the national malaria treatment policy was 18.75% for the treatment of severe malaria and 76.25% for the treatment of simple malaria.

Conclusion

Ongoing training for prescribers on national malaria management guidelines and increased public awareness of the activities of the National Malaria Control Program (PNLP) are necessary to improve adherence to the national malaria management policy. Additionally, we recommend that authorities ensure the guidelines are enforced by conducting periodic investigations in regional medical centers, with a focus on adherence to prescription rules.

INTRODUCTION

Malaria, a global parasitic disease, affects millions worldwide and remains a major public health issue (Kaur et al., 2015; Makenga et al., 2020; World Health Organization [WHO], 2020; Yamlak et al., 2022; WHO, 2021; Centers for Disease Control and Prevention [CDC], 2016). In 2020, there were 241 million malaria cases globally, primarily from the WHO African region, which bears the largest disease burden, accounting for 94% of cases and 95% of malaria-related fatalities in 2022 (WHO, 2024). Rural African populations, living in poverty and with limited access to education, are most affected. At the current rate, the WHO global malaria strategy's key 2025 targets for reducing malaria incidence and deaths may not be met (WHO, 2020, 2024).

The Democratic Republic of Congo (DRC) has seen a sharp increase in malaria cases since 2016, with a morbidity rate of 44% in 2018. The main victims are young children and pregnant women (WHO, 2020, 2024; PNLP, 2020; Sigauque et al., 2011; Tiono et al., 2009). Despite significant progress in malaria control, more than 97% of the DRC population remains at risk of malaria (Tiono et al., 2009). Malaria continues to be the leading cause of morbidity and mortality in the country (PNLP, 2017).

Multiple prevention strategies, case management, and epidemiological surveillance are key interventions in the fight against malaria in the DRC. The WHO has outlined several approaches, including a chemotherapeutic strategy based mainly on antimalarial drugs, specifically artemisinin-based combination therapies (ACTs) or quinine tablets for uncomplicated malaria, and injectable Artesunate (AI), Artemether (ATI), or Quinine (QI) for severe malaria (WHO, 2024; Ciza et al., 2019; WHO, 2021). Proper malaria management using these drugs depends on laboratory confirmation, either by microscopy or rapid diagnostic tests (RDTs) where available (WHO, 2022).

Most African countries, including the DRC, have adopted the recommendation to expand the use of RDTs in areas lacking microscopy (WHO, 2010). This approach aims to prevent the irrational prescription of ACTs, AI, ATI, or QI and to improve malaria management while delaying the emergence of drug-resistant strains (Batwala et al., 2011; D'Acremont et al., 2011). The DRC is committed to developing and implementing strategies that guarantee universal access to effective interventions to combat malaria and reduce its socio-economic impact.

Several strategic plans have been implemented, including the 2016-2020 plan, which aimed to reduce malaria morbidity and mortality by 40% compared to 2015 levels. Through the National Malaria Control Program (PNLP), the DRC recommends ACTs as first-line treatment for uncomplicated malaria: Artesunate + Amodiaquine (AS-AQ) or Artemether + Lumefantrine (AL). Quinine, combined with Clindamycin or Doxycycline, is reserved for cases of contraindication, unavailability of ACTs, or therapeutic failure (except in children under one month old). For severe malaria, AI is recommended for adults, children over two months old, and pregnant women in their second and third trimesters. AI should be administered for at least 24 hours until the patient can tolerate oral medications. Injectable treatment must be followed by an ACT—AS-AQ, AL, or Pyronaridine-Artesunate (PA)—for three days (WHO, 2024). If AI is unavailable, intramuscular ATI or QI can be used.

The proper use of ACTs as first-line treatment has led to a significant reduction in malaria-related deaths, from 39,054 in 2015 to 18,030 in 2018 (WHO, 2024). However, despite the availability of microscopy and malaria RDTs, adherence to treatment guidelines remains a challenge in Africa, particularly in the DRC, where ACTs are often prescribed to seronegative patients (Salomão et al., 2015; Chinkhumba et al., 2010). This non-adherence can be attributed to a lack of continuing education, inadequate supervision, lack of confidence in laboratory results, and socio-cultural factors (WHO, 2012; Diggle et al., 2014). Although health professionals in sub-Saharan Africa generally adhere to updated malaria management guidelines, the data are inconsistent across countries (D'Acremont et al., 2011), contributing to an increase in malaria cases in the region.

The health system in the DRC faces numerous challenges, including rapid, unplanned urbanization and population growth. This highlights the need for adjustments in how health services are organized in urban areas. Meanwhile, malaria remains the leading cause of morbidity and mortality and is endemic across most of the country.

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Several regions have experienced malaria outbreaks due to environmental changes, seasonal variations, population displacement, and disruptions in disease control efforts. Security issues, climate change, and other factors have exacerbated the rise in malaria cases, particularly in the eastern provinces (WHO, 2020, 2024).

In this context, this study aimed to evaluate the adherence of prescribers in the Tshangu district to the national malaria management policy as recommended by the PNLP in the DRC.

METHODS

The study was conducted from May to December 2022 in the city of Kinshasa, specifically in the Tshangu district. This district is one of four districts that make up the city of Kinshasa. It is characterized by a large, impoverished population, which fosters the development of makeshift health centers often run by individuals with questionable educational backgrounds. These factors make Tshangu an ideal setting to evaluate prescribers' adherence to the national malaria management policy.

A retrospective cross-sectional study was conducted in eight randomly selected, viable community pharmacies open to the public. Patients who came to purchase medication were randomly approached and invited to participate in the study, following a brief explanation of the study's importance and objectives. Written consent was obtained, ensuring both their anonymity and their agreement to participate. Only prescriptions from patients who consented to participate were included in the study. A total of 1,088 prescriptions for malaria treatment from various hospitals, clinics, and health centers in the Tshangu district were analyzed, with 136 prescriptions collected from each pharmacy.

The study data were analyzed using descriptive statistics with Microsoft Excel, and the results were presented in tables showing percentages and frequencies. Only prescriptions written by healthcare personnel working in the Tshangu district were included in the study. Among the prescribers observed were doctors, nurses, and, in some cases, individuals whose professional identities could not be verified.

RESULTS

Quantitative analysis of the data showed that out of the 1,088 prescriptions related to malaria, only 284 (26.1%) indicated the prescriber's name, 340 (31.25%) indicated their rank, 888 (81.62%) included their signature, 72 (6.62%) mentioned their registration number with the order of doctors, and 900 (82.72%) were dated. Regarding the patients, 1,008 (92.65%) of the prescriptions bore the patient's name, 28 (2.57%) indicated the patient's weight, and 924 (84.93%) mentioned the patient's age, with adults (652; 60%) being more numerous than children (272; 24.93%). Additionally, 788 (72.42%) prescriptions specified the patient's sex, with women (440; 40.42%) outnumbering men (348; 32%), while none of the prescriptions (0%) indicated the patient's height (see Table 1).

Table 1:
Socio-demographic and other characteristics among health workers and patients

Characteristics	Categories (n)	Frequency (%)
Prescriber name	284	26.1
Prescriber fonction	340	31.25
Prescriber signature	888	81.62
Registration number	72	6.62
La date of the prescription	900	82.72
The name of the patient	1008	92.65
The weight of the patient	28	2.57
The size of the patient	0	0.00
The age of the patient		
Adults	652	60.00
Children	272	24.93
The patient gender		
Male	348	32.00
Female	440	40.42

Qualitative analysis of the prescriptions in relation to the medications prescribed revealed that the average number of medications per prescription was five. Of the 1,088 prescriptions, 980 (90.07%) contained antibiotics, with 588 (51.47%) containing one antibiotic, 308 (28.31%) containing two antibiotics, 80 (7.35%) containing three antibiotics, and four (0.37%) containing four antibiotics. The total number of antibiotics prescribed was 1,460, giving an average of 1.34 antibiotics per prescription. Additionally, 448 (41.2%) prescriptions contained the treatment plan for severe malaria, while 640 (58.8%) treated simple malaria (see Table 2). It is important to note that the high number of antibiotic prescriptions contradicts WHO guidelines for malaria treatment, which recommend the use of antibiotics only in specific circumstances. In this survey, a high number of antibiotics (58.8%) were prescribed for simple malaria, which is contrary to WHO recommendations. Moreover, the prescribed antibiotics in these cases were

neither Clindamycin nor Doxycycline, the only antibiotics WHO recommends for use in severe malaria in combination with Quinine.

Table 2:
Quality of prescriptions in relation to the drugs used

Charateristics	N	%
Average drugs per prescription	5	-
Total number of prescriptions with antibiotics	980	90.07
Number of prescriptions with one antibiotic	588	51.47
Number of prescriptions with two antibiotics	308	28.31
Number of prescriptions with three antibiotics	80	7.35
Number of prescriptions with four antibiotics	4	0.37
Total number of antibiotics prescribed	1460	-
Average antibiotics per prescription treating malaria	1.34	-
Number of prescriptions treating severe malaria	448	41.2
Number of prescriptions treating uncomplicated malaria	640	58.8
Charateristics	N	%
Average drugs per prescription	5	-
Total number of prescriptions with antibiotics	980	90.07
Number of prescriptions with one antibiotic	588	51.47
Number of prescriptions with two antibiotics	308	28.31
Number of prescriptions with three antibiotics	80	7.35
Number of prescriptions with four antibiotics	4	0.37
Total number of antibiotics prescribed	1460	-
Average antibiotics per prescription treating malaria	1.34	-
Number of prescriptions treating severe malaria	448	41.2
Number of prescriptions treating uncomplicated malaria	640	58.8

The National Malaria Control Program (PNLP) recommends the use of injectable artesunate (AI) for adults, children over two months, and pregnant women in the second and third trimesters with severe malaria. After injectable treatment, ACTs such as ASAQ, AL, or PA should be administered for three days at the recommended doses. If AI is unavailable, intramuscular artemether (ATI) or Quinine injections may be used. Among the 448 prescriptions treating severe malaria, 388 (86.6%) included AI, with 292 (65.18%) containing only AI, 76 (16.96%) containing AI + AL, eight (1.79%) containing AI + Sulfadoxine-Pyrimethamine (SP), eight (1.79%) containing AI + Artesunate-Sulfamethoxypyrazine-Pyrimethamine (ASuP), and four (0.89%) containing AI + ATI. Thirty-six prescriptions contained ATI, with 28 (6.25%) containing only ATI, eight (1.79%) containing ATI + AL, and 24 (5.36%) containing Quinine. Contrary to PNLP recommendations, a total of 344 prescriptions for severe malaria were not associated with ACTs (see **Table 3**).

Table 3:
Combination of anti-malarial drugs used to treat severe malaria

First drug	Second drug	N	%
	None	292	65.18
	Artemether-Lumefantrine tablet	76	16.96
Artesunate Injectable	Sulfadoxine-Pyrimethamine tablet	8	1.79
388 (86,6%)	Artesunate-Sulfamethoxypyrazine-Pyrimethamine tablet	8	1.79
	Artemether injectable	4	0.89
Artemether Injectable	None	28	6.25
36 (8,04%)	Artemether-Lumefantrine tablet	8	1.79
Quinine Injectable			
24 (5,36%)	None	24	5.36
Total		**448**	**100**

Regarding the management of uncomplicated malaria, the PNLP recommends ACTs (AS-AQ or AL) as the first-line treatment. If ACTs are contraindicated, unavailable, or fail therapeutically, Quinine tablets combined with Clindamycin or Doxycycline may be used. Analysis of the 640 prescriptions treating uncomplicated malaria in this study showed that 488 (76.25%) contained AL, 68 (10.625%) contained Quinine, 36 (5.625%) contained antimalarials other than ACTs, 16 (2.5%) contained ASuP, 16 (2.5%) contained Artemisinin-Piperaquine (AP), 12 (1.875%) contained Dihydroartemisinin-Piperaquine (DHAP), and four (0.625%) contained Dihydroartemisinin-Pyrimethamine-Sulfalene (DHAPyS) (see **Table 4**).

Table 4:
Anti-malarial drugs used to treat uncomplicated malaria

Drug used	n	%
Artémisinine – Lumefantrine tablet	488	76.25
Quinine tablet	68	10.625
Antimalarials other than ACTs	36	5.625
Artesunate-Sulfamethoxypyrazine-Pyrimethamine tablet	16	2.5
Artémisinine – Piperaquine tablet	16	2.5
Dihydroartemisinine-Piperaquine tablet	12	1.875
Dihydroartemisinine-Pyrimethamine-Sulfalene tablet	4	0.625

The systematic use of antibiotics was observed in the management of severe malaria. Of the 448 prescriptions, 382 (85.2%) contained AI + antibiotics, 26 (5.8%) contained ATI + antibiotics, and 20 (4.5%) contained Quinine + antibiotics. Only a few prescriptions did not include antibiotics: 10 (2.24%) for ATI, six (1.34%) for AI, and four (0.92%) for Quinine (see **Table 5**).

Table 5:
Combination of anti-malarial and antibiotic drugs used to treat severe malaria

Antimalarial	Antibiotic	n	%	%
Artesunate injectable	None	6	1.34	
Quinine injectable	None	4	0.92	4.5
Artemether injectable	None	10	2.24	
Artesunate injectable	Antibiotic	382	85.20	
Quinine injectable	Antibiotic	20	4.5	95.5
Artemether injectable	Antibiotic	26	5.8	
Total		**448**	**100**	**100**

ACTs are recommended as first-line drugs in the management of uncomplicated malaria, without the use of antibiotics. In some cases, Quinine can be combined with specific antibiotics (Clindamycin or Doxycycline), which are used as antiparasitics in these situations. However, a significant use of antibiotics was noted during this study. Of the prescriptions treating simple malaria, 464 (72.5%) contained ACT + antibiotics, 60 (9.4%) contained Quinine + antibiotics, and 28 (4.3%) contained antimalarials other than ACT + antibiotics. Unfortunately, the antibiotics associated with Quinine were neither Clindamycin nor Doxycycline. Only a few prescriptions did not include antibiotics: 72 (11.2%) contained only ACTs, eight (1.3%) contained Quinine, and eight (1.3%) contained antimalarials other than ACTs (see Table 6).

Table 6:
Combination of anti-malarial and antibiotic drugs used to treat uncomplicated malaria

Anti-malarials	Antibiotic	n	%	%
ACT tablet	None	72	11.2	
Quinine tablet	None	8	1.3	13.8
Anti-malarials other than ACTs	None	8	1.3	
ACT tablet	Antibiotic	464	72.5	
Quinine tablet	Antibiotic	60	9.4	86.2
Anti-malarials other than ACTs	Antibiotic	28	4.3	
Total		**640**	**100**	**100**

Table 7 presents the antibiotics most frequently used to manage malaria, categorized according to the AWARE classification.

Table 7:
Antibiotics mostly used to manage malaria based on AWARE classification

Num	Antibiotic	AWARE Group	n	%	%
1	Ceftriaxone	Watch	408	27.9	
2	Ciprofloxacin	Watch	136	9.3	
3	Cefixime	Watch	64	4.4	
4	Cefotaxime	Watch	32	2.2	
5	Norfloxacin	Watch	32	2.2	
6	Ofloxacillin	Watch	32	2.2	
7	Azythromycin	Watch	24	1.6	
8	Lincomycin	Watch	24	1.6	
9	Cefpodoxin	Watch	16	1.1	
10	Lévofloxacin	Watch	8	0.5	54
11	Tazobactam	Watch	8	0.5	
12	Kanamycin	Watch	8	0.5	
13	Metronidazole	Access	144	9.9	
14	Gentamycin	Access	120	8.2	
15	Amoxycillin	Access	104	7.1	
16	Amoxycillin + Acide clavulanic	Access	88	6.0	
17	Clindamycin	Access	40	2.7	
18	Sulbactam	Access	40	2.7	
19	Ornidazole	Access	32	2.2	
20	Cefadroxyl	Access	16	1.1	
21	Penicillin	Access	16	1.1	
22	Chloramphenicol	Access	16	1.1	
23	Furadizin	Access	12	0.8	
24	Doxycycline	Access	8	0.5	
25	Flucloxacillin	Access	8	0.5	
26	Tinidazol	Access	8	0.5	

DISCUSSION

In the Democratic Republic of the Congo, malaria remains an endemic illness. Sufficient medical attention continues to be a crucial component in successfully battling this illness. One can gain insight into the quality of care patients receive by reviewing medical orders, which provide information about prescribers. The findings revealed that 26.1% of prescriptions included the prescriber's name, 31.25% included the prescriber's function, and only 6.62% of prescriptions included the doctor's registration number. Given that a prior study conducted in the same district in 2020 reported significantly higher results—19.72%, 55%, and 53.05%,

respectively—there is concern that patient care may be declining at an alarming rate. These results indicate a decline in the quality of prescriptions. In fact, pharmacists can contact the doctor directly if they have any questions or need clarification regarding the prescription. The pharmacist can verify whether the prescriber is officially recognized by a doctor's order and, thus, permitted to prescribe medications for human use by using the registration number (Manyando et al., 2014).

There were five drugs on average per prescription. This result is significantly higher than the average of 1.65 reported by Yilma et al. (2020) and Mana et al. (2021). To prevent polypharmacy, the World Health Organization suggests a maximum of three prescription drugs (Yilma et al., 2020). The term "polypharmacy" refers to the administration of multiple medications to a single patient. This practice can promote unchecked drug interactions, reduce patient adherence to treatment plans, and increase the cost of medical care. Consequently, it may induce resistance in cases of uncomplicated malaria or opportunistic infections when treating severe malaria, apart from being a major reason for low adherence (World Health Organization [WHO], 2002). Furthermore, polypharmacy, when not respecting severe malaria guidelines, may result from a lack of training, supervision, and resources for prescribers, leading primarily to treatment failure and resistance emergencies.

Moreover, according to the WHO, no more than 30% of prescriptions should contain antibiotics (Yilma et al., 2020). However, ninety percent of the prescriptions in this study contained antibiotics, demonstrating excessive and illogical use of antibiotics, which implies that instances of antibiotic resistance are emerging quickly (Assefa et al., 2018). The varieties of antibiotics used in this investigation highlight this potential for resistance. According to the AWARE classification, of the antibiotics used, 54% came from the Reserve group, and only 46% from the Access group. This demonstrates irrational use of antibiotics, as the AWARE classification advises using Access group antibiotics as a first intention because they have a narrow range of activity and will not readily cause resistance cases (Akinde et al., 2018). Moreover, the irrational combination of multiple antibiotics with antimalarials in malaria management can exacerbate resistance, as these drugs are prescribed when not recommended for uncomplicated malaria and misused in cases of severe malaria by prescribing unsuitable products. This cocktail of products encourages non-adherence to treatment and, in turn, the selection of resistant microbial strains.

Regarding the state of malaria management, it was observed that 640 (58.82%) of the prescriptions dealt with uncomplicated malaria, while 448 (41.18%) addressed severe malaria. A study conducted in Ethiopia in 2022 produced similar findings, with 48.6% of cases classified as severe malaria and 51.4% as uncomplicated malaria (WHO, 2021). Only 18.72% of the cases that met the criteria for severe malaria adhered to the PNLP guidelines regarding treatment, which called for oral AL followed by ART or AI. This compliance rate of 18.72% is significantly low compared to the results of Gindola et al. (2022) (95%) and Irikefe (35.4%) regarding NMCP recommendations for the management of severe malaria (WHO, 2021; Gindola et al., 2022). This may be attributed to inadequate awareness of the country's malaria management policy or a lack of oversight by public health authorities. The remainder were non-compliant; 3.58% employed AI or ART followed by SP or ASuP (oral forms not advised by PNLP), 0.89% employed AI followed by ART, and ultimately, 76.81% utilized AI, ART, or QI alone without adhering to oral forms. In contrast to the findings of Irikefe, who discovered that AI (40.0%), ART (26.7%), and IQ (27.6%) were the most often prescribed antimalarial medications for complicated malaria, in our study, AI (86.60%) was most common, followed by ART (8.04%) and QI (5.36%) (Gindola et al., 2022).

Ninety-five point five percent of prescriptions for treating severe malaria contained antibiotics, out of a total of 100%. This figure is significantly higher than the 26% discovered in a study conducted concurrently in Ghana and Uganda (Irikefe, 2019). The use of antibiotics in addition to antimalarials may be explained by doctors' attempts to address other pathologies that may coexist with severe malaria. While treating physicians must effectively address the causes of serious illness while awaiting definitive laboratory confirmation, such prescriptions may be pragmatic in the treatment of seriously ill patients, particularly in situations where clinical examination results may take time to return (Irikefe, 2019).

The national policy on antimalarial drug adherence was high (76.25%) regarding the management of uncomplicated malaria, with AL being the most prescribed antimalarial. This result is comparable to that of Irikefe (Gindola et al., 2022), who found adherence at 78.5%. In fact, most studies indicate that AL remains the most commonly used ACT, which can be attributed to the nearly complete lack of adverse effects associated with this treatment combination. The PNLP also recommends quinine for treating uncomplicated malaria, but it must always be taken in conjunction with an antiparasitic drug such as clindamycin or doxycycline. In our investigation, quinine tablets were used at a dosage of 10.625% but not in combination with any of these antibiotics that need to be paired with it. This unequivocally demonstrates that most prescribers are gravely ignorant of the national malaria management policy. Eighty-six percent of prescriptions for uncomplicated malaria contained antibiotics. This outcome surpasses the 30.8% of antibiotics reported by Ampadu et al. (2019). This wide disparity clearly illustrates the irrational use of antibiotics in Kinshasa, as previous research has already demonstrated (Dodoo et al., 2009; Mankulu et al., 2023).

CONCLUSION

Very low adherence to the malaria treatment guidelines recommended by the PNLP was observed, such as the use of the recommended ACT in combination with antibiotics (86%, surpassing the limit of 30.8% found in the literature) to treat uncomplicated malaria, which was not in accordance with national policy. Additionally, 10.625% of quinine dosages used in the management of severe malaria were not combined with appropriate antibiotics. Despite existing scientific information showing that compliance with guidelines leads to better outcomes for patients and prevents the emergence of resistance to antimalarial treatments, the administration of ACTs for subsequent treatment, as recommended by the PNLP, was not followed. An almost systematic co-prescription of antibiotics was noted. While quinine tablets, which should be prescribed in combination with doxycycline or clindamycin, have not been associated with any of these antibiotics.

Thus, ongoing training of prescribers on national malaria treatment guidelines and the popularization of PNLP activities is necessary to achieve effective malaria treatment. We also recommend that the national program (PNLP) organize campaigns on the rational use of antibiotics and antimalarials, with a particular focus on each type of malaria management policy. Moreover, it is essential to raise awareness about the consequences of antibiotic misuse, either in self-medication or in combination with other products, as in the case of malaria, where only selected antibiotics (doxycycline and clindamycin) are recommended for severe malaria. Additionally, we recommend that authorities supervise and follow up on antimalarial prescriptions in compliance with the announced policy and organize updating training for practitioners, emphasizing the main points of the national policy for malaria management.

Ethics Approval: Ethical approval for this study was obtained from the National Health Ethics Committee, Ministry of Public Health, Democratic Republic of the Congo (n°161/CNES/BN/PMMF/2020 du 29/01/2020)

Conflict of Interest: None declared.

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