

Practices of Healthcare Providers Confronted with a Negative Malaria Test in Senegal: The Place of Arbovirus Screening

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Abstract

Introduction: Malaria and arboviral diseases have similar symptoms, including fever, body aches, and headaches. Since the introduction of rapid diagnostic tests for malaria, the diagnosis of non-malarial febrile illnesses has become a major challenge in patient management. The aim of this study is to describe and analyze the clinical practices of healthcare providers after a negative malaria test in a symptomatic patient in Senegal. **Methods:** A cross-sectional study for descriptive and analytical purposes. The work was carried out between October 2024 and March 2025. A structured questionnaire was administered online to the participants. The data collected in Excel were analyzed using R software version 4.3.1. **Results:** A total of 168 healthcare providers participated in this study, representing 60% nurses, 24% physicians, 12% midwives, and 4% other health workers. When a malaria test was negative, 63.69% proposed symptomatic treatment (antipyretic), and 20.83% prescribed antibiotics. Typhoid fever was investigated by 29.76% of providers, and dengue fever by 19.68%. **Conclusion:** The management of patients presenting with malaria-like symptoms with negative test malaria parasites can sometimes be difficult. Improving the availability of arbovirus screening methods may be beneficial in a context where diseases such as dengue fever are spreading.

Keywords

Negative, Malaria Test, Arboviral Disease

1. Introduction

Fever is a typical symptom of many infectious and non-infectious diseases. The

etiological diagnosis of fever poses a considerable challenge to healthcare professionals and surveillance systems, particularly when confirmatory tests are not available in the healthcare facility [1]. Malaria is a parasitic disease. Five parasite species of the *Plasmodium* genus are responsible for malaria in humans: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and *Plasmodium knowlesi*. Malaria is a potentially fatal disease that is transmitted to humans through the bites of a certain type of mosquito. It is mainly prevalent in tropical countries. The disease is preventable and can be treated [2]. The recent introduction of rapid diagnostic tests (RDTs) for malaria has highlighted the decreasing proportion of malaria-attributable illness in endemic areas, and the proportion of patients evaluated for fever who have a non-malaria illness is likely to continue to increase over time [3]. Unfortunately, when malaria has been excluded, there are few diagnostic tools available to guide the management of severe febrile illnesses in low-resource settings. According to WHO, the most common early symptoms of malaria are fever, headache, and chills [2]. However, other infections, including arboviruses (e.g., dengue fever, yellow fever), can also cause similar symptoms, such as fever, headache, and body aches [4]. Arboviral diseases are zoonoses caused by arboviruses (arthropod-borne viruses), transmitted from infected animals or individuals to humans by blood-feeding arthropods (mosquitoes, ticks, sand flies). They are most prevalent in tropical and subtropical regions but have been emerging in temperate regions over the past decade.

Arboviruses are enveloped RNA viruses belonging to seven families, which are themselves divided into several genera. There are more than 500 of them, about 50 of which have a clinical impact. They mainly belong to the Flaviviridae family, genus *Flavivirus*, which includes the yellow fever, dengue, and Zika viruses. Two other families are important in human medicine: the *Togaviridae* family, genus *Alphavirus*, which includes the chikungunya virus [5]. In humans, these infections are most often asymptomatic or can manifest as a flu-like syndrome, hemorrhagic fever, or even neurological damage such as meningoencephalitis [4].

According to the weekly bulletin on infectious disease emergencies issued by Senegal's public health authorities, in week 52 of 2024, Senegal had recorded a total of 902 confirmed cases of dengue fever and 25 confirmed cases of chikungunya. Several studies have documented the regularity of arbovirus epidemics in Senegal year after year [6]-[8].

This study aims to examine the role of arbovirus screening in the practices of African healthcare providers when faced with a negative malaria test, in order to better understand clinical decision-making in cases of fever not diagnosed as malaria. The objective of this study is to describe and analyze the clinical practices of healthcare providers following a negative malaria test in a symptomatic patient in Senegal.

2. Methods

2.1. Study Framework

It is a descriptive, analytical cross-sectional study. It was carried out between Oc-

tober 2024 and March 2025 in several healthcare facilities (health posts, health centers, hospitals, private clinics) located in different regions of Senegal, in order to reflect the diversity of practices.

2.2. Population

Participants are healthcare providers involved in the care of patients with fever, including doctors, nurses, midwives, and other healthcare workers (nursing assistants and community health workers).

2.3. Inclusion Criteria

The inclusion criteria were to be in practice at the time of the survey; to have already treated a febrile patient with a negative malaria test; and to have given informed consent to participate in the study.

2.4. Exclusion Criteria

Health professionals who were reclassified as administrative staff within health facilities were excluded from the study.

2.5. Sampling

A non-probability convenience sample was used. Providers were selected based on their availability and accessibility in the facilities visited.

2.6. Data Collection Questionnaire

A structured questionnaire was administered online. It included closed-ended questions, open-ended questions, sociodemographic variables (age, gender, occupation, place of practice, experience), and clinical variables (reaction to negative test results, tests offered, treatments, barriers, training received).

2.7. Data Analysis

The data were collected in Excel and analyzed using R software version 4.3.1. Descriptive analysis was used to determine frequencies, percentages, and means. Bivariate analysis used chi-square and ANOVA tests to compare practices according to profile. The significance threshold was set at $p < 0.05$.

3. Results

3.1. Descriptive Study

- **Socio-demographic data**

A total of 168 healthcare providers worked in various types of healthcare facilities. The majority of respondents worked in health units (60%), followed by health centers (30%) and hospitals (9%).

The majority of providers surveyed were male (65%). Nurses represented 60% of our population, followed by physicians (24%) and midwives (12%). The mean age of the providers interviewed was 38.98 years. The majority of providers were

aged 35 - 44 (42%), followed by those aged 25 - 34 (36%). Providers with less than 5 years of experience and those with 11 - 15 years of experience were the majority, each representing 30% of our sample (**Table 1**).

Table 1. Socio-demographic profile of participants.

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	110	65%
	Female	58	35%
Profession	Nurse	100	60%
	Physician	40	24%
	Midwife	20	12%
	Others: (nursing assistants and community health workers)	8	4%
Experience	0 - 5 years	50	30%
	6 - 10 years	40	24%
	11 - 15 years	50	30%
	More than 15 years	28	16%
Place of work	Health post	100	60%
	Health center	50	30%
	Hospital	15	9%
	Others	3	1%
Age group	25 - 34 years	60	36%
	35 - 44 years	70	42%
	45 years and above	38	22%

- Prescription for healthcare providers confronted with a negative malaria test
Most providers (63.69%) proposed symptomatic treatment (antipyretic), while 20.83% could prescribe antibiotics to a patient who had tested negative for malaria.
- Tests diagnoses proposed by healthcare providers

When malaria tests are negative, 10.71% of healthcare providers may propose a blood culture to patients, and 29.76% of healthcare providers propose a test to check for typhoid fever. For arboviral diseases such as dengue fever and yellow fever, 19.68% and 2.97% of providers, respectively, propose a test to diagnose these diseases (**Table 2**).

Table 2. Distribution of diagnostic tests prescribed.

Diagnostic tests requested	Frequency (n)	Percentage (%)
Blood culture	18	10.71%
Dengue test	33	19.68%
Yellow fever test	5	2.97%
Typhoid fever test	50	29.76%
Other tests	62	36.90%
Total	168	100%

3.2. Analytical Study

- Practices according to the socio-professional category of healthcare providers

Our results showed that physicians are more likely to prescribe more advanced diagnostic tests when faced with a negative malaria test result in 45.2% of cases. Nurses and midwives preferred symptomatic treatment in 74.7% and 75% of cases, respectively. This result is statistically significant with a p-value = 0.0001 (**Table 3**).

- Practices according to the number of years of experience of healthcare providers

Healthcare providers with less than 5 years of experience are more likely to prescribe a test (28.6%) or choose another course of action, while those with 11 - 15 years of experience favor symptomatic treatment (74.1%) p = 0.034 (**Table 3**).

- Practices according to the workplace

Our results showed strongly varying practices according to the workplace of the providers. Those working in health units are more likely to institute symptomatic treatment (78.4%), while hospital providers are more likely to prescribe further diagnostic tests (35.3%) or choose another course of action (47.1%) (p = 0.0002).

Table 3. Analysis of service providers' practices according to professional profile.

Variable	Category	Other action (%)	Prescribe a test (%)	Treatment (%)	p-value
Sex	Female	8.3	23.6	65.3	0.8123
	Male	16.7	20.8	60.4	
	Other	26.3	15.8	57.9	
Profession	Nurse	9.2	12.6	74.7	0.0347
	Physician	21.4	45.2	33.3	
	Midwife	0.0	20.0	75.0	
	0 - 5 years	17.1	28.6	51.4	
Experience	6 - 10 years	5.6	33.3	58.3	0.0002
	11 - 15 years	10.3	13.8	74.1	
	>15 years	20.5	17.9	59.0	
Workplace	Health post	8.0	10.2	78.4	0.0002
	Health center	8.7	37.0	54.3	
	Hospital	47.1	35.3	17.6	
	Other	17.6	29.4	47.1	

4. Discussion

In Germany, among travelers returning from sub-Saharan Africa, *Plasmodium falciparum* malaria has been shown to be the most common cause of fever during consultations at infectious disease and tropical medicine centers, affecting approximately 50 out of every 1000 travelers. Among people returning from South-east Asia, dengue fever was the most common infectious disease, affecting 50 to

160 travelers per 1000 [9].

However, in recent years, sub-Saharan African countries have faced an increase in arbovirus epidemics [10].

This study examines the role of arbovirus screening in the practices of healthcare providers when dealing with suspected cases of malaria with negative diagnostic tests.

In the present study, nurses represented 60% of the providers surveyed, followed by physicians at 24% and midwives at 12%. The profiles of our providers are comparable to those found in several African studies, notably in the work of Katshongo *et al.* in the Democratic Republic of Congo and in the study by Sidebé *et al.* in Guinea [11] [12]. Indeed, in these different countries, the important role played by nurses in patient care has been demonstrated. In Kenya, nurses constituted the majority of health professionals, and their contribution is essential to achieving the goals of universal health coverage and improving the quality of health services, particularly the promotion of primary care [13].

Those nurses who provide patient care in health units are more likely to institute symptomatic treatment (78.4%), while hospital providers, particularly physicians, most often prescribe more advanced diagnostic tests (35.3%) $p = 0.0002$. In low-resource contexts, current fever management is often fragmented or based on non-specific clinical data and empirical treatment. Numerous studies have shown that this approach is harmful and that there is an urgent need to implement integrated diagnostic pathways for febrile illnesses [14]. When confronted with a negative malaria test, most healthcare providers search for a bacterial infection, particularly typhoid fever (29.76%). This search for typhoid fever can be explained by the findings of Diallo *et al.* in Mali, which identified 23.4% of typhoid fever cases in patients presenting with other causes of non-malaria fever [15]. In addition, 19.68% of our service providers offer patients testing for arboviruses such as dengue fever. This result is also supported by the work of Ka *et al.*, who found 46 cases of arbovirus infection in their series of 206 patients, representing a positivity rate of 22.3% with a high prevalence of dengue fever cases (79.5%) [16]. Dengue is the most frequently occurring arbovirus infection worldwide and the one that is spreading most rapidly due to the expansion of the *Aedes aegypti* and *Aedes albopictus* vectors [5] [17]. In our study, when the malaria test was negative, the majority of providers (63.69%) may choose to offer symptomatic treatment (antipyretics), while 20.83% may prescribe antibiotics. In Congo, where 63.6% of healthcare providers prescribe antibiotics, the reasons given for these double prescriptions are mainly patient satisfaction (28.5%), the absence of a clear reason (27.7%), prevention of complications (21.5%), treatment support (16.2%), and, to a lesser extent, prevention of diagnostic errors (6.2%) [8]. In other instances, antibiotic therapy may be prescribed based on recommendations and protocols [18]. In many regions, antibiotics are routinely administered in cases of fever, which, in addition to promoting antimicrobial resistance, delays diagnosis and optimal management of the true cause [19] [20].

5. Conclusion

Malaria and arboviral diseases have very similar clinical symptoms, and it is generally impossible to distinguish between the two conditions based on clinical manifestations alone. This study revealed the diversity of clinical practices implemented by healthcare providers in Senegal when treating symptomatic patients with negative malaria diagnostic tests. The increase in arbovirus epidemics, particularly dengue fever, should encourage the development of validated rapid diagnostic tests locally to improve patient management. Strengthening the capacity of healthcare providers at all levels to manage arbovirus infections could also reduce empirical practices in patient management through the elaboration of integrated fever management algorithms, including arbovirus screening tests and the development of targeted training modules for primary healthcare personnel.

Limitations

The limitations of our study lie in the use of a non-probability convenience sample, with providers recruited based on their accessibility, which may not reflect the population.

Conflicts of Interest

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

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