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Review Article

Malaria-Typhoid Fever Diagnostic Confusion in Nigeria and Its Impact on Treatment Delays and Mortality Among Pregnant Women and Children

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Abstract:

In Nigeria, typhoid fever and malaria continue to be the leading causes of feverish sickness, particularly in children and pregnant women. Accurate diagnosis is difficult in locations with limited resources since both diseases are endemic and feature overlapping symptoms, such as high fever, malaise, and gastrointestinal distress. Frequent misdiagnosis is a result of this diagnostic overlap as well as systemic healthcare flaws such the Widal test's dependence, the varied sensitivity of malaria rapid diagnostic tests (RDTs), and inadequate laboratory equipment. Traditional beliefs and self-medication are examples of community-level influences that also contribute. These difficulties lead to improper administration of antibiotics, delays in treatment, and higher mortality, especially among vulnerable populations. The epidemiology, clinical overlap, and diagnostic difficulties of typhoid fever and malaria in Nigeria are summarized in this article. It draws attention to the negative effects of incorrect diagnosis, such as treatment failure, antibiotic resistance, and poor maternal-child health outcomes. The report urges system-wide changes, public education, better healthcare worker training, and enhanced diagnostics such multiplex assays and more precise RDTs. Investing in water and sanitation infrastructure, regulating unlicensed healthcare practitioners, and improving surveillance systems are some of the main proposals. Reducing diagnostic ambiguity, enhancing clinical results, and safeguarding high-risk groups all depend on filling these gaps.

Keywords: Malaria; Typhoid Fever; Diagnostic Challenges; Pregnant Women and Children; Nigeria

Introduction

Malaria and typhoid fever constitute remarkably major public health problems in Nigeria, as both diseases are equally endemic and form a large proportion of the national burden of fevers. Malaria is the leading cause of morbidity and one of the major causes of death, especially in children under five and the library of pregnant women [1]. Typhoid fever, caused by S. enterica serotypes Typhi or Paratyphi, is also endemic, largely as a result of inadequate water sanitation and hygienic facilities. These infections frequently overlap when they occur in parallel geographic and demographic environments, complicating efforts to diagnose and treat them in an overstretched national healthcare system [2].

Appropriate diagnosis of febrile conditions is important in such resource-limited settings as Nigeria. However, similar clinical presentation of malaria and typhoid, including prolonged fever, headache, easy fatiguability, and gastrointestinal symptoms, makes it challenging to differentiate them on a clinical basis [3]. The problem is often compounded by the absence of affordable and accessible diagnostic tools, resulting in empirical therapy, misdiagnosis, or inappropriate polypharmacy. These issues are heightened in rural and primary care facilities that have diminished diagnostic capabilities [4].

Pregnant women and young children are less capable of withstanding the effects of incorrect diagnoses. Among pregnant women, untreated or poorly treated malaria can lead to maternal anaemia, stillbirth, preterm delivery, and low-birth-weight infants [5]. Complicated by typhoid fever when not treated or managed properly, can result in intestinal perforation and sepsis, with a very high risk of maternal and fetal morbidities. In children, failure to be managed properly or timely manner will increase the possibility of severe complications, long-term developmental impairment, or even death [6].

We conducted this review to critically analyze the diagnostic confusion and misdiagnosis associated with malaria and typhoid fever in Nigeria, the implications of which are treatment delay and mortality in pregnant women and children. It examines epidemiological patterns, limitations of diagnosis, healthcare services, and the overall impact on clinical outcomes. This review aims to critically examine the diagnostic confusion between malaria and typhoid fever in Nigeria and its impact on treatment delays and health outcomes in pregnant women and children. We hypothesize that overlapping clinical features, weak diagnostic systems, and sociocultural practices contribute significantly to diagnostic inaccuracies and adverse outcomes. By synthesizing the current evidence, this review seeks to identify systemic gaps and propose actionable solutions to improve diagnostic accuracy and reduce mortality. The findings are particularly important in informing public health strategies in low-resource settings where malaria and typhoid fever are co-endemic.

Methods Malaria and Typhoid Fever in Nigeria: An Overview

Malaria

Malaria is still responsible for a significant proportion of ill-health and death in Nigeria, with 27% of the global malaria burden [7]. Transmission exists throughout the year, and peaks during the rainy season and the immediate months thereafter, from May to October, approximately. The disease is largely spread by the Anopheles mosquito, which breeds in the tropical climate and the standing water it creates, factors prevalent in much of the country [8]. Plasmodium falciparum is the predominant species in Nigeria, causing the most serious form of malaria. This species has a strong possibility of obtaining transferability and drug resistance, which can bring the treatment to a deadlock [9]. Recurrent episodes of malaria cause high maternal and child morbidity. During pregnancy, it raises the risk of maternal anemia, abortion, stillbirth, prematurity, and low birth weight. Malaria is a leading cause of hospitalization and death in children under 5 and leads to developmental delays and weakened immunity to other infections [10].

Typhoid Fever

Although true malaria-typhoid co-infections do occur, data from recent hospital-based studies suggest that up to 30–50% of reported co-infections may be due to diagnostic inaccuracies stemming from false-positive tests or overlapping symptoms [11].

Typhoid fever in Nigeria is predominantly due to Salmonella enterica serovar Typhi but is also caused by serovar Paratyphi. To get accurate national incidence data will be difficult given both underreporting and difficulties with diagnosis, but existing evidence suggests

high levels of endemicity, particularly in densely populated and underresourced regions [12]. High prevalence is enhanced by a lack of safe drinking water access, poor sanitation, and limited sanitary practices—all prevailing in slums and rural settings.

The Widal test has limited specificity and sensitivity, with a consequently high likelihood of under- or over-reporting of typhoid cases. Blood culture is still the gold standard, but is hardly accessible in most Nigerian hospitals because of cost and facility challenges [13]. Crucially, many studies have also described a disturbing increase in the rate of malaria-typhoid co-infections; however, not all of these conclusions could be well-founded, due to diagnostic errors. Real co-infections are possible because of shared transmission risks, but their frequency is not known.

Geographic and Demographic Spread

The specific patterns of both malaria and typhoid fever are apparent across the range of geography and socioeconomic environments found in Nigeria. Malaria is endemic throughout the country, with higher prevalence in rural and peri-urban areas where mosquito control is poor [14].

Recent data suggest that rural regions in Nigeria report higher malaria prevalence (30–35%) compared to urban areas (15–20%), due to poorer vector control and limited access to health services. Similarly, typhoid fever is more prevalent in urban slums where sanitation infrastructure is weak [15].

High-risk rural population

Those at highest risk are poor rural populations with substandard housing quality, poor use of insecticide-treated nets, and poor adherence to prompt treatment. Typhoid fever is also endemic throughout the country and is very common in urban slums, with its attendant risks such as water contamination, open defecation, and poor waste management, increasing the risks of fecal-oral transmission [16].

Pregnant women and children continue to be the most affected groups. Pregnancy in areas where malaria is endemic confers heightened risk from immune modulation, and children with immature immunity are highly susceptible to both infections. Typhoid fever in childhood can cause systemic illness and complications if not diagnosed and treated early [17].

Exposure risk and health consequences are strongly influenced by socioeconomic status. People in low-income households are more likely to reside in areas that are favourable for disease transmission and have limited access to timely and quality healthcare due to their financial status. Low educational level may also influence knowledge and comprehension about the measures of prevention for diseases. And poor people have limited access to clean water and sewage, and good food, all of which are needed to stop cases of both the disease and typhoid fever [18].

Malaria and typhoid fever are still a high price to pay for public health in Nigeria, with overlapping patterns of epidemiology and disproportionate effects on the vulnerable population. The interplay of biological, environmental, and social factors underlies the difficulty in controlling these diseases and the requirement for specific interventions. To contextualize the public health significance of malaria and typhoid fever in Nigeria, Table 1 presents recent prevalence estimates from national and regional surveillance data.

Table 1: Prevalence Estimates of Malaria and Typhoid Fever in Nigeria by Region

Disease	National Prevalence (%)	Rural Areas (%)	Urban Areas (%)	Pregnant Women (%)	Children Under 5 (%)
Malaria	23.8%[1]	32.2%[2]	17.1%[2]	25–30%[3]	36%[3]
Typhoid Fever	~11–16%[4]	18–25%[5]	10–14%[5]	~12%[6]	~14%[6]

Note: Typhoid data are approximated from regional studies and WHO estimates due to lack of national surveillance

[1] Nigeria Demographic and Health Survey (NDHS), 2021 – [7]; [2] Olowolafe et al., 2024 – [14] [3] Bakken & Iversen, 2021 – [10]; [4] WHO regional surveillance estimates – [16], [63]; [5] Kim et al., 2023; Uwanibe et al., 2023 – [2], [12]; [6] Minwuyelet et al., 2025 – [17]

Diagnostic Enigma: Clinical and Laboratory Dilemma

Common Clinical Characteristics

This is due in part to the extensive symptom overlap between these two diseases, which is one of the major factors contributing to the difficulties in differentiating between malaria and typhoid fever in Nigeria. Symptoms of the two diseases are frequently present as nonspecific, including high-grade fever, headache, malaise, myalgia, and gastrointestinal symptoms, including nausea, vomiting, and abdominal pain [14]. Items are difficult to differentiate in the early stages of illness,

and, given the absence of laboratory confirmation, the symptoms may be difficult to diagnose by clinicians.

Malaria may begin with chills, sweats, and rigors, while typhoid fever has a more insidious onset of sustained fever, sometimes with constipation or diarrhea. Yet, these classic presentations are not often found in reality. Atypical, co-infections with other febrile diseases due to this syndrome will confuse clinical diagnosis in many patients. For pregnant women and children, who are unable to accurately report symptoms or who present with atypical symptoms, distinguishing between these diseases becomes even more difficult, and, as a result, patients are often misdiagnosed and overtreated [6]. The overlap of clinical symptoms of malaria and typhoid fever (Figure 1) is a significant factor in the difficulty of arriving at a diagnosis in febrile patients in Nigeria.

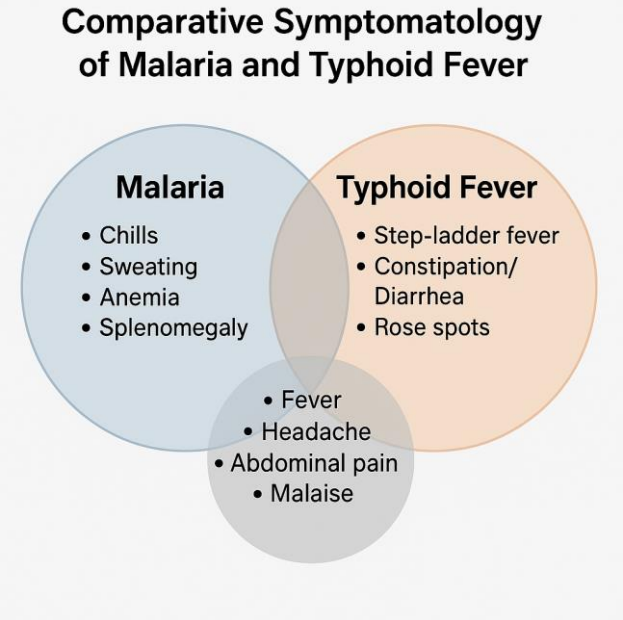

Figure 1. Comparative Symptomatology Between Malaria and Typhoid Fever.

The overlapping clinical features (e.g., fever, malaise, abdominal pain) contribute to diagnostic confusion in febrile patients. Distinctive signs such as chills (malaria) or rose spots (typhoid) are often under-recognized.
Source: Conceptualized by authors based on clinical literature [6, 14, 20].

Current Diagnostic Tools Fail to Fully Characterise Salmonella

Over 70% of typhoid diagnoses in public hospitals in Nigeria still rely on the Widal test, despite well-documented limitations [13]. Common diagnostic methods have certain deficiencies. Nigeria continues to practice suboptimal, accuracy and availability-driven diagnostic methods for both diseases, based on outdated technologies. Despite its numerous drawbacks, the Widal test is still widely applied for the diagnosis of typhoid fever in many healthcare facilities [19]. It detects agglutinating antibodies to Salmonella antigens, although cross-reaction, previous vaccination, and endemic exposure may give a false-positive result. Moreover, single Widal test results are of little diagnostic significance where there are no paired samples demonstrating rising titers [20].

Similarly, RDTs have enhanced access to diagnosing TB RDTs Malaria in rural and peripheral settings access to diagnosis in remote and peripheral settings, but are poorly sensitive in some situations. Some RDTs either miss low parasitemia levels or return false positives following recent treatment for malaria, owing to remaining circulating antigens [21]. Although microscopy (which is the gold standard for malaria diagnosis) is not readily available or of low quality in many primary health centers because of poor equipment and a lack of trained staff [22].

For typhoid fever, the gold standard for diagnostic confirmation, is bacterial culture, and in Nigeria, access to blood culture is constrained by cost, infrastructure, and turnaround time. Most of the centers are not equipped with adequate aseptic procedures, reagents, and well-trained microbiologists. These constraints make healthcare workers apply presumptive diagnosis, with them making clinical judgments rather than evidence-based ones [23].

Operational Approaches of Diagnosis in PHCS

Estimates suggest that more than **60%** of febrile illness cases in Nigeria are treated **empirically** without diagnostic confirmation [25]. Diagnostic practices are influenced by systemic barriers, such as limited funds, lack of diagnostic infrastructure, and skilled personnel, in primary care facilities in Nigeria. Health care workers working there often use syndromic case management, in which antibiotics are prescribed irrespective of whether there is laboratory confirmation, because treatment depends on the most likely clinical diagnosis. Although being pragmatic in resource-poor settings, such an approach induces an additional risk of misdiagnosis and treatment failure [24].

Cost and availability also come into play in diagnostic decision-making. Patients often have to pay for lab tests, and many can't. Here, patients (and treating physicians) may opt to diagnose with no option at all

and prematurely initiate therapy using symptoms alone. This leads to over-prescription of antimalarials and antibiotics, drives up drug resistance, and raises the cost of medical care [25].

Patent medicine vendors and informal pharmacies have a significant role in the provision of primary care in Nigeria. In many cases, these are non-emergency services and do not have access to blood testers or other methods of diagnosis. A large number of people provide medicine without a proper prescription or patient education, aggravating the cycle of inadequate and irregular treatment [26].

Difficulties in Verifying Co-infections

There has been a rise in the prevalence of malaria and typhoid co-infections over the years as reported in Nigeria, but most of these diagnoses are suspect owing to challenges of diagnostic specificity [6]. Genuine co-infections, in which both pathogens are simultaneously present and pathogenic, are observed in the real world, particularly in environments of common risk factors: low sanitation status and high risk of malaria infection. However, discriminating true co-infection from false positives in unreliable tests is still difficult [27].

While Widal tests false positives and persistent antigens in malaria RDTs could yield a potentially misleading co-infection diagnosis, leading to polypharmacy [28]. This not only exposes patients to side effects from many drugs, but also enhances the probability of the emergence of antimicrobial resistance, especially to antibiotics such as ciprofloxacin and third-generation cephalosporins [29]. In addition, co-infection diagnoses are seldom confirmed by gold-standard techniques such as blood culture and malaria microscopy, which are scarce in most health facilities.

Moreover, there are few descriptions of the clinical impact of co-infections, and what is known is incomplete. Due to a lack of validated algorithms for diagnostics and consistent treatment guidelines for suspected co-infections, healthcare providers are commonly provided with very little useful guidance, tending to overtreat [30]. Confusion with the diagnosis of both malaria and typhoid fever in Nigeria arises from symptom overlap, unreliable diagnostic tests, and poor health system support, with particular regard to rural and primary care facilities. This confusion leads to delayed or unwarranted care, particularly among pregnant women and children, and underscores the urgent need for better diagnostic capability and evidence-based clinical treatment [31]. To contextualize the diagnostic ambiguity between malaria and typhoid fever, Table 2 summarizes selected studies that report co-infection or misdiagnosis rates in Nigeria.

Table 2. Selected Studies on Malaria-Typhoid Co-Infection or Misdiagnosis in Nigeria

Study	Setting	Population	Diagnostic Method	Co-Infection or Misdiagnosis Rate	Remarks
Olowolafe et al., 2024[1]	Urban tertiary hospital	980 febrile patients	Widal + RDT	36% co-infection	Likely overestimated due to test limitations
Kuenzli & Neumayr, 2024[16]	Review	NA	Literature Review	~30–50%	Many diagnoses were clinically suspect
Ohanu et al., 2019[12]	Eastern Nigeria	402 patients	Widal vs. Culture	17% Widal+, 6% culture-confirmed	Widal lacked specificity
Odikamnoro et al., 2017[40]	Rural community	Adults	RDT + Widal	28%	Diagnostic accuracy was limited
Nakisuyi et al., 2023[10] (Uganda)	Regional comparison	Febrile children	RDT + Culture	12%	Included for SSA benchmark

Impact of Misdiagnosis and Late Treatment

Inappropriate Use of Antimicrobials and Antimalarials

Malaria and typhoid misdiagnosis often results in irrational use of antimalarials and antimicrobials, an action that has serious consequences for control efforts and public health [31]. There is a widespread unguided prescription of empiric antibiotics of fluoroquinolones, cephalosporins, and macrolides in Nigeria for febrile illnesses without confirmatory diagnostics, leading to an upsurge in AMR. On the other hand, the artemisinin-based combination therapy (ACT), the reference ther-

apy of malaria, is often given without parasitological diagnosis, leading to the risk of resistance to first-line anti-malarial drugs [29].

Other than the risk of non-adherence, unwarranted polypharmacy imposes an additional financial burden on already economically vulnerable families. The economic burden of administering multiple and frequently useless drugs (including laboratory investigations, re-consultations, and more days in the hospital because of treatment failure) can be catastrophic for families living below the poverty line. Additionally, the total pill burden increases the risk of non-adherence, poor therapeutic response, and pharmacological interaction, especially for pregnant women and children, who are more susceptible to the adverse drug effects.

The irrational use of antimicrobials also disturbs the microbiome, weakens the immune responses, and leads to a vicious circle of recurrent infections. In the absence of timely action to enhance diagnostic stewardship, this movement is poised to erode hard-won gains in the management of infectious diseases and further destabilize an emerging worldwide crisis of antimicrobial resistance [29].

The missed or delayed diagnosis of severe cases

Failure to diagnose and promptly treat severe malaria and typhoid fever greatly increases the hazard of fatal complications. In the case of malaria, particularly that caused by Plasmodium falciparum, failure to offer a diagnosis and treatment promptly can lead to cerebral malaria with fits, coma, and a high case mortality. Unrecognized malaria in pregnant women can lead to placental malaria, which affects the fetus nutritionally and oxygenally and contributes to poor pregnancy outcomes [32].

Typhoid fever, if poorly managed or misdiagnosed, may result in severe complications including intestinal hemorrhage, perforation, peritonitis, and septicemia. These are emergency conditions needing surgical treatment and intensive care, which are not accessible in rural, under-resourced regions [33]. Furthermore, since typhoid fever is an insidious infection, early misdiagnosis may lead to silent dissemination of infection to a point where therapeutic options are limited and the prognosis is grim. Such outcomes are especially tragic in resource-limited areas with minimal critical care capacity, where any delay in referral or transportation infrastructure may cause such deaths to be preventable [34].

Impact on Vulnerable Populations

Pregnant Women: Pregnancy induces immunological and physiological changes that increase a woman's susceptibility to infections and their complications. In the context of malaria, incomplete or delayed diagnosis and mistreatment can result in a cascade of adverse pregnancy outcomes, including miscarriage, intrauterine growth restriction, low birth weight, prematurity, and others. Notably, the sequestration of *Plasmodium falciparum* parasites in the placenta impairs maternal–fetal exchange, leading to placental insufficiency, chronic maternal anemia, and elevated risk of maternal mortality [35].

While typhoid fever during pregnancy is less frequently documented, it is equally serious. Severe bacteremia can result in septic abortion, preterm labor, and fetal loss. Moreover, maternal fever and systemic inflammation during critical periods of embryogenesis may disrupt organ development, potentially resulting in congenital anomalies and developmental delays[36].

These risks are particularly pronounced in resource-limited settings, where diagnostic tools are scarce, antenatal care is inconsistent, and emergency obstetric services are limited. Addressing diagnostic ambiguity is therefore essential for improving maternal health outcomes and achieving Sustainable Development Goals.

Children: The consequences of overdiagnosis and delayed treatment in children—especially those under five years of age—can be severe. Untreated malaria may rapidly progress to severe anemia, cerebral malaria, hypoglycemia, and death. Similarly, delayed diagnosis of typhoid fever can result in prolonged illness, dehydration, intestinal perforation, systemic sepsis, and high mortality among pediatric patients [37].

Beyond acute illness, recurrent or severe episodes of malaria and typhoid in early childhood can impair physical growth and neurocognitive development. In Nigeria, widespread childhood malnutrition exacerbates vulnerability to infections and hinders recovery, thereby perpetuating a vicious cycle of disease and developmental delay. The socioeconomic impact is substantial: long-term illness leads to parental work absenteeism, school dropouts, and increased healthcare costs—factors that contribute to intergenerational poverty [38]. The diagnostic overlap between malaria and typhoid fever is a significant factor in preventable deaths and long-term morbidity among Nigerian children. Early and accurate diagnosis remains vital for safeguarding child survival and development.

Characteristics of the Health Care System for Diagnostic Uncertainty

The diagnostic overlap between malaria and typhoid in Nigeria is more than a clinical conundrum; it is symptomatic of serious underlying weaknesses in the health system. Many health systems challenges— poor access to diagnostic resources, a lack of skilled human resources, and weak disease surveillance—converge to provide an environment conducive to misdiagnosis [39]. Resolving these issues is important for the development of interventions to increase the likelihood of diagnosing AF and reduce mortality in high-risk groups, including pregnant women and children.

Gaps in infrastructure and resources

One of the greatest challenges to accurate diagnosis is the gross insufficiency of laboratory infrastructure at health facilities in Nigeria. Most of the primary care settings do not have a functioning laboratory or are equipped with some basic diagnostic facilities, which are not updated and are poorly maintained. Stockouts of critical commodities such as malaria RDT, blood culture bottles, stains for microscopy, and even basic reagents are frequent as a result of poor procurement systems and unreliable supply chains. These limitations necessitate a heavy dependence on clinical diagnosis or substandard tests such as the Widal test, leading to a direct contribution to diagnostic uncertainty [40].

Another critical vulnerability is the referral system. In most rural areas, health service delivery is fragmented without a clear system and referral pathway for referral of difficult or non-diagnosed cases to a higher level of care. This fragmentation results in delays in confirming difficult diagnoses, such as typhoid fever, where blood culture is required, but generally not available at the first point of contact. Even for those who are referred, patients are frequently unable to travel to a centre either for financial reasons, distance, or simply because they are unaware of the possibility, and opportunities for accurate diagnosis and appropriate treatment are lost [41].

In addition, there is poor continuity among patients as there is no system for follow-up and patient tracing. Patients who are treated empirically in the absence of a confirmed diagnosis are rarely followed up to determine treatment response or complications, leading to cycles of empirical management and poor outcomes [42]. In northern Nigeria, for instance, many primary health centres lack on-site blood culture facilities and rely on patients traveling over 30 km for referral diagnostics—an often prohibitive distance due to cost and transport limitations [43].

Resource Human Constraints

Lack of trained health workers has been a common problem in Nigeria's health system for ages and an enabler of diagnostic confusion. The majority of health facilities are staffed with CHEWs or nurses with basic clinical diagnostic skills. There are few – if any – trained laboratory scientists or medical officers, particularly in rural and remote regions, which forces non-expert personnel to make important clinical decisions [44].

A deeper problem also lies in the absence of ongoing CPD and medical education. Diagnosis algorithms and treatment guidelines are not well communicated and updated periodically, and healthcare workers often work with outdated information and practices. This dearth in knowledge becomes particularly worrying in malaria and typhoid, where emergent resistance trends and revised diagnostic thresholds call for continuous training and oversight [44].

Without investments in human capital development, i.e., training, mentorship, and career incentives, the quality of diagnostic decision-making will continue to be suboptimal, compromising wider public health needs.

Lack of Data and Surveillance Gaps

Strong data systems are crucial for successful disease control, but Nigeria's health information systems are fragmented, hobbled by inconsistent and poor record-keeping. A lot of places are still using paper registers, with dubious or incomplete entries. The findings of laboratory tests, if any, are seldom found in patient records, impeding the benefit of decision-making or follow-up [45].

Malaria surveillance systems are relatively well-established thanks to consistent donor funding and attention at the global level, while typhoid fever is a neglected disease with limited incorporation into national surveillance. Sources of typhoid data are few, however, and we have no common scheme to monitor malaria-typhoid co-infections or diagnostic accuracy rates. This means policy decisions are made with incomplete epidemiological information, while health workers do not have a good sense of local disease trends to inform diagnosis and treatment [46].

By not having digital health systems that are integrated, real-time data sharing and coordination of care, and those feedback loops that are needed for quality improvement are lost. Unless there are investments in modernizing our record keeping using electronic medical records, regular data audits, and health information

training, the misdiagnosis of febrile diseases will continue to plague our system [45]. Health system challenges — inadequate infrastructure and supply problems, for example, as well as staff shortages and gaps in data and surveillance — provide a critical backdrop to the ongoing uncertainty over malaria and typhoid diagnoses. Enhancing these aspects is critical for obtaining an accurate diagnosis and better clinical outcomes, particularly in the case of higher-risk populations, including pregnant women and children [47]. As described in Figure 2, both system-wide and community-level challenges converge to produce a cycle of delayed diagnosis and treatment failure in the health environments of Nigeria.

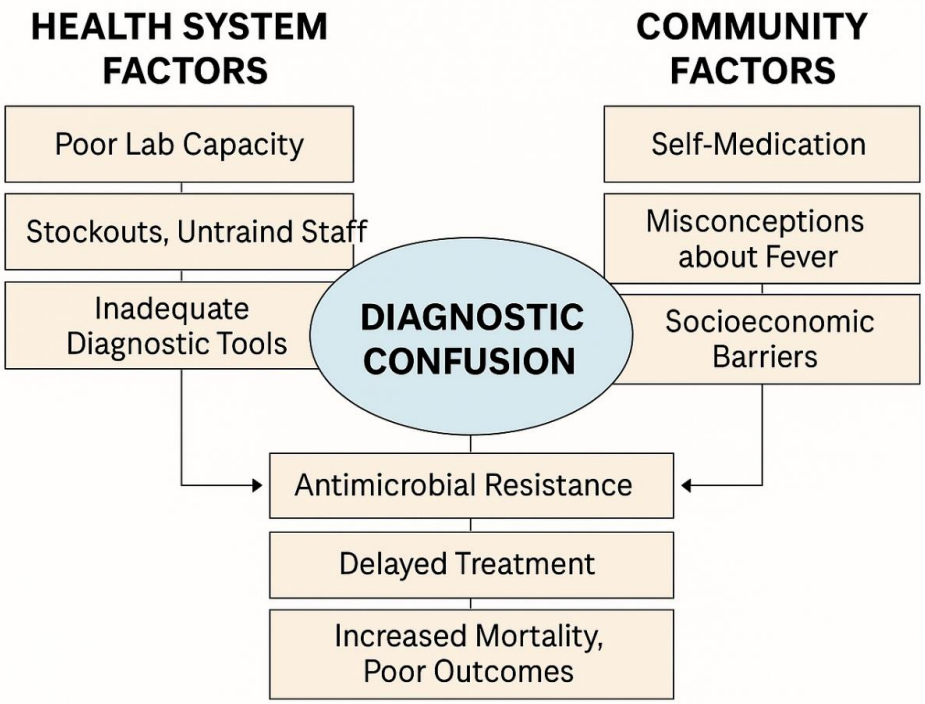

Figure 2: National and Community Drivers of Diagnostic Confusion in Nigeria.

This figure illustrates how health system factors (e.g., poor diagnostics, stockouts) and community behaviors (e.g., self-treatment, cultural beliefs) compound misdiagnosis. Adapted from Olowolafe et al., 2024 and Kuenzli & Neumayr, 2024 [14, 16].

Community Attitude, Care-seeking Practices, and Self-medication

In addition to clinical and health system challenges, community-level factors also drive patient misdiagnosis and mistreatment for Malaria and Typhoid fever in Nigeria. How people make sense of symptoms, respond to sickness, and navigate healthcare is influenced by a complex interplay of cultural beliefs, past experiences, and the reality of their social circumstances. The delay in correct diagnosis, due to these factors, promotes inappropriate treatment, especially in vulnerable populations such as pregnant women and children [48].

Erroneous Popular Beliefs and Practices about Fever

Febrile episodes are not commonly considered in many Nigerian societies as a sign of can entail different possible disease; rather, it is treated as one specific disease, frequently identified nonspecifically as “malaria” or “typhoid.” Cultural beliefs and rudimentary biological knowledge tend to reinforce the idea that it has to be one or the other of the two. This results in self-diagnosis and self-medication, often empirically, and without laboratory testing. Malaria is often a slight occurrence, and diagnosis by observation is difficult.' The case in point has done more to keep up the impression than all the others in that decade.'The term "malaria" is used very loosely as a blanket term to describe what is often nothing more than an unexplained illness, and where treatment for malaria has failed, "Typhoid" is often the diagnosis, to complicate an already difficult diagnosis.

Moreover, supernatural, spirit-caused, and folk perceptions of illness (e.g., bewitchment or body "overheating") continue to have a great influence in numerous farming areas. Such beliefs may cause delayed presentation to formal healthcare facilities and the application of herbal or spiritual treatments before formal medical consultation, thus increasing the likelihood of untreated infection and its complications.

Previous Experiences and Community Norms

The experiences of the sick and the healing strongly shape the health-seeking behaviour of both individual and collective persons. Anecdotal knowledge or previous experiences frequently inform families' treatment decisions [49]. For instance, in case one, the child had recovered from febrile sickness through a given drug in the past, a caregiver may repeat the same treatment without consulting health workers, irrespective of the cause of the new febrile sickness.

Diagnostic beliefs are also influenced by peer pressure and community norms. Citizens widely trade prescriptions, diagnostic assessments, and treatment hacks, building a shadow network of information that runs apart from the state. Such dependency on the community knowledge source, however, may reinforce diagnostic assumptions and impede the proper utilization of health care services.

Pharmacies and Patent medicine vendors are at the core

The abundance of pharmacies and patent medicine vendors (PMVs) in Nigeria is an avenue for easy accessibility of drugs but encourages unsuitable self-medication. These types of vendors, often working without any medical training, are in many settings the first port of call for febrile patients, particularly in resource-limited areas. And they often prescribe antimalarials, antibiotics, or even combinations of the above based solely on a patient's reported symptoms, without conducting diagnostics [26]. Although they bridge the gap in healthcare access, their practice biases towards misdiagnosis, polypharmacy, and antimicrobial resistance. Furthermore, they erode trust towards official health systems, while patients may prefer the apparent convenience and affordability of PMVs over professional advice.

Influence of Sociodemographic Status on Health Care Seeking Behaviors

Socioeconomic issues profoundly determine how people react to illness. The direct out-of-pocket (OOP) expenses required for outpatient healthcare services such as consultation fees, diagnostics, transport, and drugs are too expensive for most families in Nigeria, especially in rural and peri-urban regions. In these cases, self-medication tends to be a rational decision as patients cannot afford to pay for professional treatment [50].

Poor health literacy, poor access to decent healthcare services, and financial insecurity all combine to create an environment where diagnostic ambiguity is not scuppered by systemic inadequacies alone but also flourishes in the fact of people who cannot afford to know what is wrong with them. Consequently, individuals who are most at risk of presenting with treatment delays and poor health outcomes, such as pregnant women and children, are left exposed [51].

Areas for improvement and recommendations

Addressing the diagnostic overlap between malaria and typhoid fever in Nigeria requires targeted, practical strategies that involve all levels of the healthcare ecosystem. These recommendations are structured to guide key actors—health authorities, frontline providers, community leaders, and regulatory bodies—in implementing feasible, context-specific interventions. The goal is to reduce misdiagnosis, improve treatment accuracy, and protect vulnerable populations, especially pregnant women and children [52].

Diagnostic Improvements (Led by: Federal Ministry of Health, Diagnostic Partners)

- Adopt and deploy improved rapid tests for malaria and typhoid with higher specificity, especially dual-antigen malaria RDTs and validated typhoid antigen tests suitable for field use [53].
- Promote integrated diagnostic platforms, such as multiplex tests, capable of identifying multiple febrile illnesses from a single sample [54].
- Prioritize point-of-care diagnostic access in rural and under-resourced areas through mobile labs or decentralized testing hubs [55].
- Establish national evaluation and procurement guidelines for diagnostic tools to ensure reliability and reduce use of unvalidated tests like the Widal [56].

Strengthening Frontline Care (Led by: State Ministries of Health, Primary Healthcare Agencies)

- Train primary care providers and laboratory staff on up-to-date diagnostic protocols for malaria and typhoid, including interpretation of RDTs and when to refer for confirmatory testing [57].
- Integrate malaria and typhoid case management into standardized fever algorithms, supported by decision-support tools like flowcharts adapted for pregnant women and children [58].
- Improve health facility readiness by ensuring consistent availability of RDT kits, basic microscopy supplies, and transport logistics for specimen referral.
- Introduce structured diagnostic checklists in primary health centres to guide symptom-based differentiation and reduce reliance on empirical treatment. Figure 3 illustrates a context-adapted diagnostic and treatment algorithm that may guide clinical decision-making during febrile illness, especially in resource-limited settings [59].

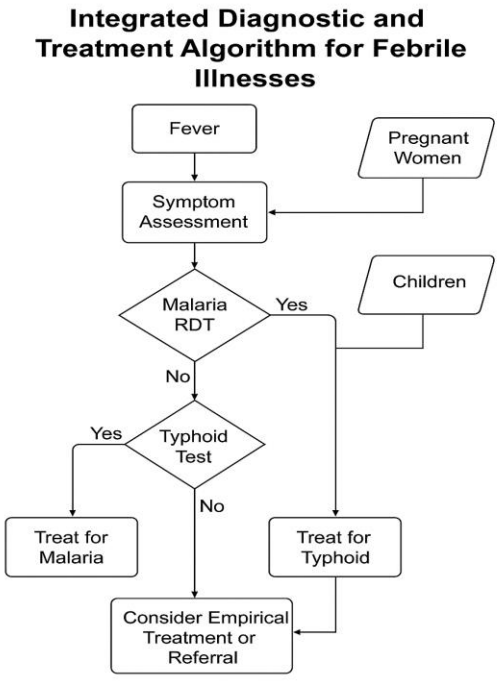

Figure 3: Integrated Clinical Decision Flow Chart for Febrile Illness in Resource-Poor Settings. Designed for use in PHCs to aid diagnosis and treatment of malaria and typhoid, especially among pregnant women and children. *Adapted from WHO malaria diagnostic flowcharts and context-specific protocols [7, 58]*

Community-Level Interventions (Led by: Community Health Workers, NGOs, Traditional Leaders)

- Conduct targeted health education campaigns to correct misconceptions (e.g., "all fever is malaria or typhoid") and promote early presentation to health facilities.
- Empower community health workers (CHWs) to act as diagnostic liaisons—assisting with RDT use, referrals, and follow-up in hard-to-reach areas [60].
- Discourage self-medication and polypharmacy by promoting awareness of diagnostic testing before treatment through radio, religious gatherings, and peer groups.
- Foster community engagement around water safety and hygiene to reduce the risk of typhoid transmission [61].

Policy and Regulatory Action (Led by: NAFDAC, NHIA, Legislators)

- Enforce stricter regulation of diagnostic and pharmaceutical practices, including restricting Widal test use without confirmatory protocols and curbing over-the-counter antibiotic sales.
- Develop and distribute national guidelines on febrile illness diagnosis and treatment, tailored to different facility levels and translated into local languages [62].
- Expand diagnostic coverage under the National Health Insurance Scheme (NHIS) to reduce out-of-pocket costs and disincentivize presumptive treatment.
- Scale up investment in WASH infrastructure in typhoid-endemic areas, focusing on safe water supply, sanitation, and food safety enforcement [63].

Conclusion

The recurrent misdiagnosis of malaria and typhoid fever in Nigeria is a prevailing public health crisis with serious public health implications. The two diseases have similar clinical manifestations and affect the same geographical and social circumstances, as a result of which they are often misdiagnosed. The consequences of the diagnostic uncertainty are especially dire for a pregnant woman and a child, as these populations are already heavily burdened by diseases but are more vulnerable than others to the negative effects of a delayed or inappropriate management [64].

As the review indicates, the impact of diagnostic uncertainty is compounding: inappropriate antimicrobial application drives resistance, life-threatening sequelae result from untreated infection, and financial investments in therapies that are ineffective are wasted. These results are compounded by health system bottlenecks, including weak laboratory infrastructure, inadequate capacity for health-worker training, and suboptimal surveillance. In addition, issues at the community level, such as cultural attitudes, self-medication, and financial constraints, inter alia, further add to the delay in, and inadequate, care.

Solving this issue would take a system-wide effort. Advances in diagnosis, particularly the point-of-care diagnostics suited to low-resource settings, need to be combined with investments in healthcare workforce development, integrated disease management strategies, and community-level education. There should be a policy that encourages the regulation of diagnostics and pharmaceuticals, and promotes infrastructure in clean water and sanitation in order to prevent the occurrence of typhoid.

More research will be required to justify the resources needed to verify context-specific diagnostic approaches and understand local epidemiologic trends [65]. A similar policy alignment and political will will be necessary at the national and subnational levels to maintain the gains. In the end, disentangling diagnostic uncertainty is not just a clinical necessity, but a moral one: The best way to conquer avoidable disease and death among Nigeria's most vulnerable people.

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