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Advancing diagnosis and treatment for human African trypanosomiasis in Nigeria: challenges and future directions

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Human African trypanosomiasis (HAT), commonly known as sleeping sickness, remains a significant health threat in sub-Saharan Africa. In Nigeria, the challenges of diagnosing and treating HAT are profound, especially in resource-constrained, remote areas. This article offers a perspective on the barriers to timely diagnosis and treatment of HAT in Nigeria, drawing from recent developments in diagnostic techniques and case management approaches. The focus is on improving the current diagnostic framework, decentralizing the validation process, and streamlining drug distribution to effectively halt the transmission of HAT. We discuss the potential of simple and rapid molecular diagnostics, particularly the lyophilized LAMP test, as a game-changer in resource-limited settings and the need for a national repository of drugs to ensure timely therapeutic interventions. This article also explores future directions for the elimination of HAT in Nigeria, highlighting the importance of policy reforms and increased investment in diagnostic infrastructure.

KEYWORDS

sleeping sickness, African trypanosomiasis, tsetse fly, Nigeria, diagnosis, policy, case confirmation

Introduction

Human African trypanosomiasis (HAT) is a neglected tropical disease (NTD) that continues to impact sub-Saharan Africa, with over 55 million people at risk, particularly in regions within the 10,000 km² tsetse fly belt (1, 2). In Nigeria, the disease burden is further compounded by the remoteness of affected communities, the lack of diagnostic infrastructure, insurgencies, and bottlenecks in HAT drug distribution. Recent cases of congenital and sexual transmission have been reported outside of the traditional tsetse fly-infested zones emphasizing the complexity of the elimination challenge and the need for reviewing the current diagnostic framework (3–5).

Since 2012, Nigeria has not officially reported any case to the World Health Organization due to waned national surveillance activities (6, n.d.). However, reports of

Trypanosoma brucei gambiense infection in humans (7–9) and animals (10, 11) were published. Remarkably, in 2016, a Nigeria-acquired HAT case was detected in the United Kingdom (12). These reports prove that the assumption of zero-case report in Nigeria is specious.

A passive surveillance funded by the Foundation for Innovative New Diagnostics, USA was carried out in Delta State, Nigeria in 2014-2017 by the Nigerian Institute for Trypanosomiasis and Onchocerciasis Research, the Federal Ministry of Health, Pan African Tsetse and Trypanosomiasis Eradication Campaign-Nigeria using rapid diagnostic test (RDT), fluorescent microscopy, and lyophilized loop-mediated isothermal amplification test (LAMP) as a confirmatory test. The RDT performed poorly with unreliable results which led to its withdrawal from circulation. Also, the coverage of the passive surveillance was poor due to the remoteness of the affected communities to the designated testing centers. This may justify the need for active surveillance in the actual transmission hotspots due to the prolonged latency pattern observed among HAT cases.

This article offers a perspective on the key barriers to HAT diagnosis and treatment in Nigeria, proposing actionable solutions to enhance the current system. In addition, it explores how advances in diagnostic technology and decentralized case confirmation and management frameworks could be leveraged to reduce transmission rates and support elimination efforts.

Current obstacles in HAT diagnoses and treatment

Barriers to effective diagnosis and treatment

The timeliness and accuracy of HAT diagnosis are crucial for successful treatment outcomes (13). In Nigeria, HAT diagnosis follows the WHO guidelines comprising serological tests using the Card Agglutination Trypanosomiasis Test (CATT) for mass surveys and microscopy as parasitological test. However, the current system in Nigeria faces significant barriers, particularly because the at-risk communities are located in underserved remote rural areas and insurgency-stricken communities. These regions often lack the essential amenities, healthcare infrastructure, diagnostic equipment, and skilled personnel to diagnose and stage HAT reliably, given the non-specificity of HAT hemo-lymphatic phase (14, 15). Patients from these areas experience delays in diagnosis due to far proximity to the nearest appropriately-equipped healthcare center impeding access to healthcare often exacerbated by high transportation costs, insecurity, and geographic barriers (2, 15–19). The delay leads to disease progression to the debilitating central nervous system stage and allows continued transmission within communities (20).

Recent advances in diagnostic technologies hold promise for improving HAT diagnosis. The adoption of rapid POC-friendly molecular techniques like the lyophilized loop-mediated isothermal amplification (LAMP) test has demonstrated high accuracy in resource-limited settings (21, 22) and higher sensitivity and specificity than microscopy and polymerase chain reaction (PCR) (23, 24). The LAMP test is adaptable for ambient temperaturestorage in the field, easy to use, requires no sophisticated thermal cycler, and is cost-effective, making it a suitable solution for hard-to-reach resource-constrained areas. Like other molecular diagnostic tests, the LAMP test validates the presence of a pathogen in a sample by amplifying specific portions of its DNA, with the added advantage that the endpoint can be visually read out which will be negative if the pathogen is absent. Hence it is possible to use LAMP as the basis for treating probable cases as approved and adopted for COVID-19 testing (25–31, n.d.).

Centralized case confirmation: a bottleneck to timely treatment

The current protocol for HAT diagnosis in Nigeria involves multiple levels of sample referral, further delaying case confirmation and subsequent treatment. Due to lack of resources, facilities, and a shortage of competent medical experts to diagnose HAT, local healthcare centers refer suspected persons to the Nigerian Institute for Trypanosomiasis (and Onchocerciasis) Research (NITR) in Kaduna, which then refers confirmed samples to the WHO Collaborating Centre in Burkina Faso for validation through the Federal Ministry of Health HAT Desk Office. This multi-step process can take weeks, if not months, leading to loss of patient trust in the health system and, in many cases, death occurs before treatment is initiated as HAT drugs are released through the Federal Ministry of Health HAT Desk Office only after a case has been validated by the WHO Collaborating Centre in Burkina Faso. These delays amplify inequalities in access to diagnostic and treatment services.

National-level certification of existing regional laboratories and decentralizing HAT case confirmation to regional laboratories used for COVID-19 testing could significantly alleviate these delays and benefit HAT elimination endgames; also allow optimization of the existing laboratory facilities, personnel, and equipment, especially the cold-chain lines. Furthermore,the adoption of rapid molecular diagnostic tests like LAMP could allow healthcare providers to confirm cases on-site point-of-care (POC) and initiate treatment immediately. Decentralization would also reduce the bureaucratic hurdles plaguing the diagnostic and treatment systems; by decentralizing diagnostic capabilities and adopting rapid reliable molecular testing, Nigeria could significantly reduce the turnaround time for case confirmation improving patients' treatment and management outcomes.

Drug availability and distribution: a critical gap

The availability of HAT drugs at the point-of-care in Nigeria is contingent on the validation of cases by the WHO Collaborating Centre and the Federal Ministry of Health (FMoH). This requirement, while intended to ensure accurate diagnosis, contributes to treatment delays. Given the geographic isolation of

many HAT-affected areas, the absence of readily available drugs poses a significant risk to patient survival and allows the silent transmission of HAT to persist.

Given the safety of the current HAT drug Fexinidazole (32, 33), its easy oral administration and efficacy across both stages of HAT, unlike the old parenterally-administered toxic drugs, a national repository of HAT drugs could serve as a solution to this issue, ensuring that drugs are accessible at regional healthcare facilities as soon as a case is confirmed. The availability of Fexinidazole, which eliminates the need for invasive lumbar punctures (34) would simplify the treatment process, increase patients' acceptance, and bolster the success of HAT elimination endgames.

Future directions for HAT elimination in Nigeria

The future of HAT elimination in Nigeria depends on several key reforms:

1. Decentralization of Diagnostic and Treatment Processes

By decentralizing diagnostic confirmation and drug repository, Nigeria can drastically reduce delays in treating HAT patients. National certification of regional laboratories should be prioritized, allowing healthcare providers to make timely patient care decisions without the need for external validation. In addition, more investment in diagnostic infrastructure, particularly for molecular tests, will be crucial in reaching underserved communities.

The core component of successful HAT elimination involves strengthening rural Nigeria's healthcare infrastructure. The Nigerian government, in collaboration with international partners, should focus on building diagnostic and treatment capacity in remote rural areas, ensuring that every patient has access to timely care.

2. Policy Reforms and Investment

Elimination efforts will also require strong policy reforms and sustainable investment in NTDs programs. The Nigerian government should prioritize restructuring HAT diagnostic and treatment frameworks, reducing bureaucratic delays, and ensuring the availability of necessary resources. Expanding national control programs and fostering partnerships with international organizations can provide the support needed to achieve elimination.

Discussion

Nigeria stands at a crossroads in its efforts to eliminate HAT. While recent advances in diagnostic technology offer hope, the barriers to timely diagnosis and treatment remain formidable. Decentralizing both diagnostics and drug distribution is a critical step in overcoming these barriers. The government must act quickly to implement reforms that improve patient outcomes and prevent further transmission. Collaboration with international partners will also be essential in addressing the systemic issues that plague Nigeria's healthcare system.

To successfully eliminate HAT, Nigeria must invest in both the physical infrastructure of its health system and the policy frameworks that guide diagnosis and treatment. The use of rapid, portable diagnostic tests like the LAMP method and the decentralization of diagnostic authority to regional laboratories offer practical solutions to some of the most pressing challenges. Additionally, ensuring that HAT drugs are available at the point of care will prevent unnecessary deaths and support the country's elimination goals.

Conclusion

The elimination of HAT in Nigeria will require a multifaceted approach, focusing on decentralization, infrastructure improvement, and policy reform. Recent diagnostic advancements like the lyophilized LAMP test provide a pathway to more efficient case confirmation in resource-constrained POCs, while a national repository of HAT drugs would streamline treatment. Addressing these systemic issues will be crucial for the success of Nigeria's HAT elimination efforts, ensuring that no patient dies from a treatable disease.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

KZ: Conceptualization, Funding acquisition, Supervision, Writing – original draft, Writing – review & editing. RE: Conceptualization, Writing – original draft, Writing – review & editing.

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