

Perspective

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The enduring story of Lassa fever: Advancing the case for sustainable management strategies

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Lassa fever (LF) is an acute viral hemorrhagic illness caused by the Lassa virus (LASV), an enveloped, spherical virus belonging to the Arenaviridae family. LASV possess a single-stranded RNA genome of negative polarity and exhibits high genetic diversity, corresponding to the geographical distribution of its seven principal distinct clades across West Africa[1]. LASV was first isolated in 1969 from an American missionary nurse stationed in the rural town of Lassa, Borno State, Nigeria, following her return from a brief vacation in the United States[2]. Although she had travelled through Sierra Leone and made a stop in Jos, Nigeria, before arriving at her station, the virus was contentiously named after Lassa town. LF is endemic in several West African countries, particularly within the Mano River Union countries (Guinea, Liberia and Sierra Leone) and Nigeria, where annual outbreaks are consistently reported. Additionally, cases of LF or the detection of the virus have been reported in other West African countries, including Benin, Côte d'Ivoire, Mali and Togo. Sporadic exported cases have also been reported in Asia, Europe and North America, highlighting LF's potential as a global health threat if not adequately addressed[3].

LASV is primarily hosted by the multimammate rat *Mastomys natalensis*, which typically remains asymptomatic and can harbor the virus throughout its lifespan. Infected rats shed LASV through their urine, faeces[4], saliva, and respiratory secretions, contaminating household surfaces, foodstuffs and other environmental materials. Human infection occurs predominantly through direct contact with infected rats or indirectly *via* exposure to contaminated items, especially the consumption of contaminated foodstuffs, and rarely through human-to-human transmission *via* contact with bodily fluids of an infected person or contaminated medical equipment[3]. LF presents with a wide clinical symptoms, ranging from asymptomatic to mild or severe illness and in severe cases, LF can lead to life-threatening complications including hemorrhage, respiratory distress, neurological disorder and multiple organ failure, particularly when diagnosis and treatment are delayed[5].

LF affects an estimated 897 700 people annually, with 18 000 deaths in the West Africa region[6]. The true burden of LF is likely underestimated due to several factors: early symptoms often mimic those of other common febrile illnesses, diagnostic capacity in many endemic areas is limited, and underreporting is exacerbated by social isolation "stigma" stemming from LF's association with rats–disease of poverty, and certain cultural/religious beliefs seldom discourage victims from seeking medical care. Fatal outcomes are particularly high among pregnant women, where LF can lead to spontaneous abortion and elevated maternal mortality[7]. Survivors may suffer from long-term complications, such as sensorineural hearing loss, neurological impairments and other chronic health conditions, all of which can significantly diminish quality of life and increase economic burden on individuals, families and the government[5,7]. At a broader level, LF imposes a substantial socio-economic burden on affected countries through both direct costs such as medical

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treatment and indirect costs, including lost productivity due to the illness, long-term disability, and premature death. These impacts are especially devastating for families where the affected individual is the primary breadwinner, often leaving dependents in poverty or financial instability.

Given the substantial socioeconomic burden posed by LF and other zoonoses, exacerbated by recent global experiences such as the COVID-19 pandemics, there is growing interest in strengthening the management of zoonotic threats. While advancements in vaccine development and public health interventions have led to notable reductions in the morbidity and mortality of many infectious diseases, similar progress has been limited for rodent-borne diseases like LF. To date, there is no World Health Organization (WHO)-licensed vaccine against LASV[8]. This general bottleneck in LF management could be in part due to LASV's extensive genetic diversity, complex transmission dynamics shaped by environmental and socioeconomic conditions, and the persistent difficulty of controlling the rat reservoir responsible for maintaining viral circulation in endemic regions. As efforts towards vaccine development continue, it is important to implement integrated preventive strategies, such as improved housing and sanitation, public education to minimize human exposure to rats, to reduce human risk of LF and other rodent-borne diseases.

In contrast to many high-income countries, many nations in the Global South, particularly in LF-endemic regions lack national or regional specific policies dedicated to rodent surveillance and population management, despite prominent rodent public health- and economic-related problems in the regions. Funding and institutional support for rodent- and rodent-borne disease research remain minimal if not non-existent, especially when compared to vector-borne diseases such as malaria. Additionally, there is marked shortage of trained rodent control specialists within endemic regions. Consequently, vulnerable communities are often left without effective or sustainable mitigation strategies. In many cases, local populations resort to the indiscriminate use of rodenticides, which are not only ineffective in the long-term but also pose significant risks to non-target species, including humans, due to accidental poisoning.

The continued escalation of factors driving rat proliferation, such as climate change, rapid urbanization, overcrowding, increasing slum inhabitants, inadequate personal hygiene, precarious sanitation infrastructure, poor waste management and deepening poverty, pose a growing threat, particularly in LF endemic regions. These deteriorating conditions, common in both rural and urban communities across West Africa, could increase the frequency and intensity of human-rat interactions. Given the well-documented association between rat abundance and rodent-borne disease transmission risk, public health experts are sounding alarm over the heightened potential for future zoonotic outbreaks. It is no gainsaying to warn that LF-endemic regions are metaphorically "sitting on a powder keg" poised for emergence of potentially new zoonotic threats unless substantial interventions are prioritized. Such event could have devastating socioeconomic consequences, especially in communities of West Africa that are already grappling with persistent LF outbreaks and the recently declared viral mpox outbreak[9].

In conclusion, the complex transmission dynamics of LF, compounded by diagnostic challenges, limited treatment options and the lack of WHO-licensed vaccine, underscore the need for a comprehensive and multisectoral response. With case number rising steadily over the past decade, effective mitigation must extend beyond clinical management to address the socio-environmental determinants of transmission. Specifically, governments/policymakers should implement (a) sustained health education campaigns to raise community awareness about LF risk factors, transmission pathways and preventive practices; (b) coordinated investment in integrated research and action involving key stakeholders, including local community, academia, healthcare providers, ministries of health, agriculture, information and education, waste management authorities and the currently non-existent national rodent and vector control agencies. Such collaboration should aim to develop locally tailored protocols for rodent surveillance and population management to reduce human-rodent interactions and subsequent spillover of pathogens into human population; (c) enhanced case surveillance, early detection and rapid response mechanisms to limit potential outbreaks; (d) national policies to promote improved personal and community hygiene and sanitation practices to minimize LASV contamination; (e) stigma reduction strategies, including anti-discrimination policies and post-recovery reintegration programs to encourage timely health-seeking behavior and community support for survivors; (f) policies to discourage the consumption of bushmeat, particularly rodents, and encourage safer agricultural practices–such as storing harvested crops in rodent-proof containers; and (g) investment in the laboratory infrastructure and workforce (re)training to strengthen prompt confirmation and treatment. Collectively, these interventions will not only curb LF incidence but also reduce the risk of other zoonotic disease spillovers, thereby enhancing the overall resilience and wellbeing of the vulnerable populations, especially in endemic regions.

Conflict of interest statement

The authors declare that there is no conflict of interest.

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Authors' contributions

AMA conceived and designed the study and wrote the first draft of the paper. Both AMA and UB contributed to literature search, critically revised and improved the presentation of the paper and approved the final manuscript.

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