

## The burden of lymphatic filariasis and its control strategies in Sierra Leone: A literature review

Lucas K. Kanu<sup>1,\*</sup>, Hongjuan Peng<sup>2</sup>, and Theophile Dushimirimana<sup>3</sup>.

<sup>1</sup> School of Public Health, Southern Medical University, Guangzhou, China.

<sup>2</sup> Department of Pathogen Biology, School of Public Health, Southern Medical University, Guangzhou, Guangdong, China.

<sup>3</sup> School of Public Health, Southern Medical University, Guangzhou, China.

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### Abstract

Lymphatic filariasis (LF) poses a significant health burden in Sierra Leone, with considerable socio-economic implications. LF, caused by parasitic worms transmitted through mosquito bites, leads to lymphedema, elephantiasis, and hydrocele, severely affecting individuals' quality of life. Sierra Leone, with its tropical climate and inadequate healthcare infrastructure, faces unique challenges in combating lymphatic filariasis. This review explores the epidemiological landscape of LF in Sierra Leone, highlighting endemic regions, its impact, and control strategies. In 2005, epidemiological coverage of high-dose medications, like ivermectin and albendazole, exceeded 65% annually across 12 districts in Sierra Leone. By 2013, eight districts were eligible for transmission assessment surveys (TAS). After three additional rounds of mass drug administration (MDA), four districts became eligible for pre-TAS assessments in 2017. Despite efforts to control LF through mass drug administration (MDA) programs, challenges such as low treatment coverage, logistical constraints, and community resistance persist. Moreover, the impact of the Ebola outbreak on healthcare delivery has further impeded LF control efforts. This literature review adds to our understanding of LF control in Sierra Leone, providing valuable insights into the epidemiology, impact, challenges, and potential strategies for enhancing LF elimination efforts. It contributes to the broader discourse on neglected tropical diseases and public health interventions, emphasizing the need for context-specific approaches and interdisciplinary collaboration to achieve sustained progress towards LF elimination and improves public health outcomes.

**Keywords:** Lymphatic Filariasis; Transmission Assessment Survey; Mass Drug Administration; Epidemiological

### 1. Introduction

Lymphatic filariasis, a disease transmitted by mosquitoes, is caused by microscopic parasitic roundworms known as *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*<sup>[1]</sup>. Lymphatic filariasis is one of the leading causes of chronic disability globally<sup>[2]</sup>. One billion people worldwide are at risk for lymphocytic filariasis, and an estimated 16 million people worldwide suffer from LF-associated lymphedema<sup>[3]</sup>. It is estimated that 90% of all LF cases worldwide and all cases in Africa are infections with the parasite *W. bancrofti*. Over 120 million people in over 80 countries worldwide in the tropics and subtropics and over 40 million people in Africa are infected with the parasite<sup>[4, 5]</sup>. After malaria, LF is the second most common vector-borne parasitic disease<sup>[6]</sup>.

Before mass drug administration (MDA) began, Sierra Leone had one of the highest levels of lymphatic filariasis endemicity in Africa<sup>[7]</sup>. During the early 1990s, studies indicated a 34.8% microfilariae prevalence in three villages within Moyamba district<sup>[8]</sup>. In recognition of the substantial global impact of lymphatic filariasis, the World Health Organization initiated the Global Program to Eliminate LF (GPELF), with the aim of eliminating LF<sup>[9]</sup>. Sierra Leone like

\* Corresponding author: Lucas K. Kanu

many other countries has been striving so hard to control this disease. This review aims to explore conducted studies on the prevalence, targeted interventions, and challenges in the control of lymphatic filariasis in Sierra Leone.

## 2. Literature Review

A nationwide mapping of lymphatic filariasis using immunochromatographic testing (ICT) was conducted in Sierra Leone in 2005 to identify the endemic nature and geographical spread of the disease. From 14 health districts, 1,982 participants aged 15 years or older were selected and finger-prick blood samples were tested using ICT cards. The overall prevalence of LF by ICT cards was 21% (28% in men, 15% in women). Lymphatic filariasis was found to be endemic in all districts of Sierra Leone, with a positive ICT test rate of  $\geq 1\%$ . The distribution of LF prevalence showed a strong spatial correlation pattern, with a gradual decline in high prevalence over large areas in the northeast to relatively low prevalence on the southwest coast. The prevalence of microfilariae was higher in the northeast, 6.7% in Bombali, 5.7% in Koinadugu, 4.4% in Port Loko, and 2.4% in Kono<sup>[5]</sup>.

Moreover, after LF was mapped in Sierra Leone in 2005 and by that time all 14 districts were found to be endemic for the disease, the provincial Mass Drug Administration (MDA) identified LF microfilariae. Unpaid Community Health Volunteers (CHVs) carried this out. Other health campaigns, such as Maternal and Child Health Week (MCHW), pay for services delivered at the community level, and these individuals are called community health workers<sup>[10]</sup>

In 2010, the LF MDA in 12 districts in the Southern, Northern and Eastern Provinces unexpectedly matched the global distribution of long-lasting insecticidal nets (LLITN) during MCHW. In-process monitoring of the LF MDA was conducted to ensure that effective coverage was achieved in hard-to-reach places in both urban and rural areas where vulnerable people live. Coverage monitoring in hard-to-reach locations in the four most rapidly urbanizing cities was performed after 4 weeks of high doses of LF therapeutics and again after 8 weeks in all 12 districts.

The study found that only one city achieved an effective program coverage rate (80% or higher) after 4 weeks, after which all counties recruited community health workers for LF MDA. After 8 weeks only 4 of 12 districts reached effective coverage, so LF MDA was extended for a further month in all districts. By 12 weeks, effective program coverage was reached in all districts except Port Loko and there was no significant difference between those interviewed in communities versus households or by sex. Effective epidemiological coverage (65% or higher) was reported in all districts and overall was significantly higher in males versus females. There were challenges to LF mass drug administration, which include the late delivery of ivermectin in the country, remuneration for CHWs, simultaneous distribution of LLITN and the rapid movement of populations seeking employment due to urbanization as per the Maternal and Child Health Week<sup>[10]</sup>.

It was observed that the midterm survey showed a notable decrease in both microfilariae (mf) prevalence and overall mf density from baseline data, followed by a slight increase at pre-TAS<sup>[11]</sup>. This fluctuation may stem from the convenience sampling method, which depends on volunteers, potentially leading to varied population samples being tested.

Sierra Leone has made significant progress in eliminating LF. Epidemiological coverage of mega dose drugs, including ivermectin and albendazole, was reported to be greater than 65% per year in all 12 districts. In 2013, eight districts qualified to conduct transmission assessment survey (TAS), but the Ebola epidemic (2014-2016) delayed it until 2017. In 2017, four districts qualified to conduct the pre-TAS again after completing three more rounds of MDA, and the final two districts also qualified to conduct the pre-TAS<sup>[12]</sup>.

In the aftermath of conflict in Sierra Leone, a study examined lymphatic filariasis (LF) transmission in urban regions amid significant rural-urban migration. Mosquitoes from Freetown were screened for *Wuchereria bancrofti*, alongside a transmission assessment survey (TAS) in Bo and Pujehun districts. Predominantly *Culex* species were captured, with minimal *Anopheles* presence. Polymerase Chain Reaction (PCR) analysis of 1731 *Anopheles gambiae* and 14342 *Culex* mosquitoes revealed limited infection, mainly in *Culex* pools in Freetown. *An. gambiae* numbers were insufficient for sustained transmission. TAS findings in Bo and Pujehun indicated antigen prevalence below WHO's recommended threshold for halting Mass Drug Administration (MDA) in *Anopheles* transmission zones<sup>[4]</sup>.

In 2007-2008, a baseline survey found 14 districts in Sierra Leone to be endemic with lymphatic filariasis; and 12 districts with both lymphatic filariasis and onchocerciasis. In 2006 the country started mass drug administration with ivermectin for onchocerciasis, which was modified with the addition of albendazole in 2008 to include LF treatment. By 2011, there was a significant reduction in the prevalence of microfilariae in the country. The findings showed that Sierra Leone is making a significant progress in the reduction of lymphatic filariasis.<sup>[13]</sup>

### 3. Conclusion

Tackling lymphatic filariasis in Sierra Leone requires a multifaceted approach integrating preventive measures, community engagement, and sustained healthcare infrastructure. Through comprehensive strategies, the burden of LF can be alleviated, fostering improved health outcomes and enhanced quality of life for affected populations. Through activities such as pre transmission assessment surveys (pre-TAS), annual mass drug administration of ivermectin and albendazole across the world can greatly help in achieving the Global Program to Eliminate Lymphatic Filariasis (GPELF) established by the World Health Organization. Additionally, initiatives such as health education about lymphatic filariasis, distribution of insecticide-treated mosquito nets, prompt identification of LF cases, elimination of mosquito breeding grounds, etcetera can significantly contribute to the worldwide management and eradication of the illness.

### Compliance with ethical standards

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#### *Disclosure of conflict of interest*

The authors declare no competing interests.

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