African regional progress and status of programme to eliminate lymphatic filariasis: 2000-2020

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Abstract

To eliminate lymphatic filariasis (LF) by 2020, the World Health Organization (WHO) has launched a campaign against the disease. Since the launch in 2000, significant progress has been made to achieve this ambitious goal. In this article we review the progress and status of LF programme in Africa through WHO neglected tropical disease PC database, Expanded Special Project for Elimination on Neglected Tropical Diseases (ESPEN) Portal and WHO and other publications. In the African Region, there are 35 countries endemic for LF. The Gambia, was reclassified as not requiring preventive chemotherapy in 2015 whilst Togo and Malawi have eliminated LF as a public health problem in 2017 and 2020 respectively. Cameroon discontinued mass drug administration (MDA) and transitioned to post MDA surveillance to validate elimination. The trajectory of coverage continues to accelerate; treatment coverage increased from 0.1% in 2000 to 62.1% in 2018. Geographical coverage has also significantly increased from 62.7% in 2015 to 78.5% in 2018. In 2019, 23 out of 31 countries requiring MDA achieved 100% geographic coverage. Although, much remains to be done morbidity management and disability prevention services have steadily increased in recent years. Vector control interventions conducted by other programmes particularly malaria vector control had a profound effect in stopping transmission in some of endemic countries in the region. In conclusion, significant progress has been made in the LF programme in the Region whilst we identify the key remaining challenges towards achieving an Africa free of LF.

Keywords: Lymphatic filariasis, LF, Mass drug administration, Elimination, Neglected tropical diseases, NTDs, Africa.
Introduction

In the past 20 years momentum to eliminate lymphatic filariasis (LF) in Africa has significantly improved as a result of development of single-dose treatment strategies, point-of-care diagnostic tools, generous donations of medicines from pharmaceutical companies, and the financial support for programme implementation from the donor community. The African Region of the World Health Organization (AFRO) carries 38.3% of the global population and 31 of the 49 countries requiring preventive chemotherapy for LF, a debilitating vector-borne infection which affects the poorest populations. In Africa it is caused by *Wuchereria bancrofti* and is mainly transmitted to humans by mosquito species belonging to *Anopheles* and *Culex*. In 2000, there were 39 countries believed to be endemic for LF in the WHO African region. By that same year, 405.9 million people in 39 countries in Africa were estimated to require Preventive Chemotherapy. However, according to GPELF’s progress report for 2000–2009, the evidence for active transmission of LF in many of the 39 endemic countries was weak and some probably did not require MDA. The status of 5 countries (Burundi, Cape Verde, Mauritius, Rwanda and Seychelles) were reviewed in 2011 and were reclassified as non-endemic, reducing the number of endemic countries in Africa to 34 (inclusion of South Sudan following independence in 2011 now makes 35). Of the 35 LF endemic countries in the region, 2 have eliminated LF as a public health problem (Malawi and Togo), The Gambia reclassified as not requiring preventive chemotherapy and Cameroon is under post MDA surveillance to validate if elimination targets have been achieved. In the remaining 31 countries there remain 341.4 million people who require preventive chemotherapy for LF.
Table 1. Lymphatic filariasis implementation status in the WHO African Region as of beginning of 2020

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Number of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries verified as eliminating LF as a public health problem</td>
<td>2 (Malawi &amp; Togo)²,⁶</td>
</tr>
<tr>
<td>Countries stopped MDA (Under surveillance)</td>
<td>1 (Cameroon)²</td>
</tr>
<tr>
<td>Countries implementing MDA with 100% geographical coverage</td>
<td>23 countries: Benin, Burkina Faso, Chad, Comoros, Congo, Côte d’Ivoire, Eritrea, Ethiopia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Mali, Mozambique, Niger, Senegal, Sao Tome and Principe, Sierra Leone, Uganda, United Republic of Tanzania, Zambia and Zimbabwe⁶</td>
</tr>
<tr>
<td>Countries implementing MDA in only in part of the geographical area considered in need of treatment</td>
<td>6 countries: Angola, Central African Republic, Democratic Republic of the Congo, Madagascar, Nigeria and South Sudan.⁶</td>
</tr>
<tr>
<td>Countries reclassified as not requiring preventive chemotherapy</td>
<td>1 (The Gambia)²</td>
</tr>
<tr>
<td>Countries where MDA not yet started</td>
<td>2 countries: Equatorial Guinea &amp; Gabon²</td>
</tr>
<tr>
<td>Countries with mapping gap</td>
<td>1 country: Equatorial Guinea⁶</td>
</tr>
</tbody>
</table>

Progress and achievements

Mapping the geographical distribution of LF

Mapping the geographical distribution of a disease is a key step prior to the implementation of any public health intervention. In 2000, the first LF mapping was initiated in Africa, and by 2001, 4 countries have already completed mapping (Benin, Burkina Faso, Ghana and Togo)⁸. Mapping was subsequently conducted in the remaining countries within the region from 2002 to 2012 with the support of different stakeholders and from 2013 to 2015 under the leadership of the WHO AFRO Mapping Project. The AFRO Mapping Project accelerated the mapping of LF in many countries. Nonetheless, mapping was delayed in three countries (Central African Republic, Mauritania and South Sudan) due to security related challenges. It was only in 2018 and 2019 that these countries were able to complete LF mapping under the leadership of the WHO Expanded Special Project for the Elimination of Neglected Tropical Diseases (ESPEN).
Currently, only one implementation unit (Annanbon) in Equatorial Guinea is unmapped because of its inaccessibility.

**Mass drug administration**

Mass drug administration with albendazole in combination with either ivermectin or diethylcarbamazine (the latter combination in countries non co-endemic for onchocerciasis) or albendazole alone were implemented progressively in endemic counties. In 2000, the African Region treated only 363,607 compared to 212.7 million people in 2018, according to data from the WHO neglected tropical diseases PC databank\(^9\) (Figure 1)\(^{10,11}\). By the beginning of 2020, a total of 23 out of 31 countries have implemented at least one round of MDA in all endemic IUs\(^{11}\). Only two countries (Equatorial Guinea and Gabon) have yet to commence MDA\(^{11}\). The trajectory of coverage continues to increase from 0.1% in 2000 to 62.1% in 2018. Similarly, the proportion of countries which achieved national effective coverage (defined as coverage of at least 65% for lymphatic filariasis) has increased from 68.1% in 2015 to 90.2% in 2018\(^{7,11}\). The proportion of implementation units delivering preventive chemotherapy of IUs requiring MDA has reached 78.5% in 2018 from 62.7% in 2015\(^{7,11}\). LF programme is one the biggest deworming programme in Africa. As all LF endemic countries are also endemic for soil-transmitted helminthiasis (STH), many school-age children have benefited for STH through the LF programme, although the impact has yet to be quantified\(^{12}\).

**Triple therapy**

The treatment, known as triple therapy or IDA, involves a combination of ivermectin, diethylcarbamazine citrate and albendazole in areas where onchocerciasis is not endemic\(^{13}\). Studies have demonstrated that IDA is superior to that obtained with the previous standard regimens of diethylcarbamazine plus albendazole (two-drug regimen)\(^{14,15}\) as IDA clears microfilaria more efficiently from the blood than the two-drug regimen and is equally safe\(^{14,16}\). In 2017, WHO released a new guideline recommending, triple-therapy MDA regimen
of ivermectin, diethylcarbamazine and albendazole (IDA) as an alternative treatment strategy in certain settings where onchocerciasis was not endemic\textsuperscript{13}. In May 2018 in Nairobi, WHO convened a technical meeting on IDA in Africa to review progress of seven countries eligible for IDA for the elimination of LF and guide the implementation of the strategy. Kenya, was the first country in the region to implement the strategy in three sub counties targeting 278,291 individuals\textsuperscript{2}. A year later, São Tomé and Príncipe treated 148,460 out of 206,194 individuals with the triple drug regimen reaching a 72\% national coverage. All the treated implementation units achieved effective coverage. Building on that success, Comoros, Eritrea and Madagascar have planned the implementation of IDA in 2021. With more than four rounds of MDA with the double therapy, Zambia was not found to be eligible for IDA, while Zimbabwe with two rounds of MDA with DA will re-evaluate its situation in 2020 before deciding if IDA should be implemented.

\textit{Transmission assessment survey}

A Transmission assessment survey (TAS) is recommended in an evaluation unit (EU) after a successful preliminary survey (Pre-TAS) to determine when infections have been reduced below target thresholds (interruption of transmission) and MDA can stop after at least five consecutive rounds of MDA with effective coverage. It is recommended to conduct three TAS with an interval of two years between each. As of December 2019, TAS had been conducted in 370 EUs covering 1533 IUs in 16 countries. In total, TAS1 has been implemented in 749 IUs, TAS2 in 581 IUs and TAS3 in 203 IUs representing respectively, 31.6\%, 24.5\% and 8.6\% of the 2372 endemic IUs, with the technical and financial support of either WHO or other partners.

\textit{Morbidity management and disability prevention}

The morbidity alleviation, the second pillar of the global program, was almost inexistent in 2000. By 2015 the number of endemic countries reporting hydrocele and lymphedema patients
were 11, while 12 countries reported on morbidity management and disability prevention (MMDP) services. There has been steady progress over the years, 22 and 23 countries reported on lymphedema and hydrocele cases respectively as of the beginning of 2019. A study in Malawi documented hydrocele surgery improves quality of life significantly at 6 month post-surgery. Another study showed that the lifetime benefits of hydrocelectomy by far exceed the costs of repairing hydrocele. MMDP activities have generally lagged behind MDA and there is a need to improve the coverage of MMDP and the number of countries implementing the patient-oriented morbidity interventions.

*Vector control*

The WHO Position Statement on Integrated Vector Management (IVM) recommends integrated vector control of malaria and LF. These recommendations are pertinent in Africa because *Anopheles* species are the common vectors of both infections and vector control interventions particularly insecticide-treated mosquito nets and indoor residual spraying impacts on transmission of both *Plasmodium* and *Wuchereria* shown initially in the Solomon Islands. Studies documented that the prevalence of *W. bancrofti* infection in The Gambia was among the highest in Africa in the 1950s. Nonetheless, different surveys conducted in 1975 and 1976 revealed a significant decline in endemicity in the absence of MDA. A study conducted in 2013, using the TAS methodology confirmed the transmission interruption of *W. bancrofti* in the Gambia. The studies attributed the decline in prevalence to a significant reduction in mosquito density through the widespread use of insecticidal treated nets as part of the national malaria control programme, which accords with the results of a study conducted in Zambia. Another study highlighted the role of competitive exclusion might contribute to the low endemicity of LF in Central Africa. In ecology competitive exclusion states that two species competing for the same resources cannot stably coexist when all other ecological
factors are constant. When one species has even slightest advantage over the other, then one will dominate in the long term, or one of the competitors will adapt via a behavioural shift towards a different ecological niche. Six filarial parasites can infect people in sub-Saharan Africa, including *W. bancrofti, Onchocerca volvulus, Loa loa, Mansonella perstans, Mansonella streptocerca, and Dracunculus medinensis*. Although there is some degree of co-endemicity among these filarial parasites, there are also areas where competitive exclusion is proposed to reduce this co-endemicity, which reduces the likelihood of competition for resources given the distribution of adult and microfilaria larvae into separate niches in the human host through spatial and temporal segregation as shown by the different niches of adult filariae and the different periodicities of the microfilariae or sites (peripheral blood or skin) whilst the vectors of African filariae are from different insect groups-mosquitoes, *Chrysops, Simulium* and *Culicoides* with different biting habits.

**Elimination of LF as a public health problem**

Two countries Togo and Malawi from the WHO African Region eliminated LF as a public health problem in 2017 and 2020 respectively. In 2019, Cameroon, discontinued MDA programmes and transitioned to post-elimination surveillance. Several countries (Benin, Burkina Faso, Ethiopia, Ghana, Madagascar, Mali, Nigeria, Senegal, Uganda, and the United Republic of Tanzania) have stopped MDA in at least one evaluation unit based on data from ESPEN Portal. (Figure 2)

**Programme Challenges**

Despite these achievements in the African region, several challenges have been encountered such as the security problems reducing access and political instability in some countries which has contributed to the delayed mapping of LF and the conduct of transmission assessment surveys. For instance, Central African Republic, Mauritania and South Sudan completed their
mapping only in 2018 and 2019. Another challenge to be highlighted is the co-endemicity with *Loa loa* in most of the countries in central African which has contributed to the delay in the implementation of MDA in some countries until the WHO recommended of biannual MDA with albendazole in LF-Loa co-endemic settings\textsuperscript{13,27,29}. Implementation of an ivermectin-based community treatment strategy for the elimination of LF has been delayed in Central Africa because of the occurrence of serious adverse events, including post-ivermectin encephalopathy and death, in persons with high levels of circulating *Loa loa* microfilariae\textsuperscript{30-32}. *Loa loa* cross reactivity continued to be a challenge for mapping LF in central Africa. Studies have documented that antigen based tests such as Filarial Test Strip (FTS)\textsuperscript{33,34} provide false positive results in areas where *Loa loa* is highly prevalent, indicating the need for developing confirmatory mapping strategy for such scenarios\textsuperscript{35}.

MDA is designed for rural populations and pose significant challenges when implemented in urban areas due to population density, population mobility, and challenges on how to define target areas for implementation of the strategy\textsuperscript{36,37}. Re-evaluation of MDA is recommended given the challenge of achieving effective coverage of MDA in such settings\textsuperscript{36}. While ongoing transmission of *W.bancrofti* in cities in east Africa\textsuperscript{36} is possible in west Africa transmission might not be ongoing due to the fact that *Culex* spp mosquitoes are inefficient vectors of *W.bancrofti* in the west Africa\textsuperscript{38,39}. Prevalence less than 1\% were registered in many of the cities including Monrovia, Freetown, Conakry and urban areas in Kano State in Nigeria\textsuperscript{37,40,41}. Therefore, re-evaluation of the current endemicity status of the urban areas in the west Africa would be important.

Much of the focus in LF elimination programme has been given to MDA and there was little progress in the implementation of the second pillar- morbidity management and disability prevention. It is only in recent years that countries are giving due emphasis to this necessary intervention and scaling up the services for those in need. The increasing level of resistance to
present pyrethroid-based insecticides is another challenge to the vector control aspect of the programme.\textsuperscript{42}

**LF Elimination Prospects for 2030**

The new NTD Roadmap targets by 2030, validation for elimination of LF as a public health problem from 81% of the endemic countries globally.\textsuperscript{43} In Africa Region, building on the lessons learnt in LF elimination from Malawi and Togo endemic countries in the Region should use the opportunity to defat LF once and for all from the Region. Lessons learnt from Togo demonstrated that strong political commitment, integration with existing health interventions, innovative resources mobilization and very strong partnerships were success factors.\textsuperscript{44} The country secured joint malaria/LF granted by the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), which facilitated the implementation of joint programme for the two diseases.\textsuperscript{44}

**Conclusion**

Over the past 20-years significant progress has been achieved in the African Region of the World Health Organization, as a result of innovation in treatment and diagnostics, the provision donated medicines, financial support and strong partnerships allied to greater country commitment. Several key milestones have been achieved: mapping has been almost completed, MDA has been scaled up in almost all countries with the majority of the countries reaching 100% geographical coverage, to accelerate the elimination, and IDA-MDA has been started in the Region. Most importantly two countries eliminated LF as a public health problem in the Region. Despite this significant progress there are remaining challenges which need to be addressed to see Africa free of LF.

**Authors’ statements**
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Figure Legend

**Figure 1.** Number of people treated and progress in preventive chemotherapy coverage, 2000–2018 Data for this figure were accessed from neglected tropical diseases PCT databank.9

**Figure 2.** Status of lymphatic filariasis programme implementation in Africa. Data for developing the maps were accessed from ESPEN Portal.28.