Lymphatic filariasis is one of the most debilitating neglected tropical diseases. It is caused by three species of filarial worms and transmitted by mosquitoes. Half the people infected with lymphatic filariasis in the world live in nine countries of the South-East Asia Region. This booklet answers some common questions, and is for the general public as well as health providers.

More information on lymphatic filariasis and other vector-borne disease is available from the Communicable Diseases Department web site:

http://www.searo.who.int/entity/world_health_day_2014
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Q 1: What is lymphatic filariasis? Is it the same as elephantiasis?

Lymphatic filariasis is a mosquito-borne parasitic disease, which is painful and very disfiguring. It is one of the oldest and most neglected diseases in the world.

It is also commonly known as “elephantiasis” because the most recognizable symptom is swelling in one or both legs – which then resemble an elephant’s leg.

Q 2: What causes this disease?

Lymphatic filariasis is caused by thread-like filarial worms. There are three species of these nematodes (roundworms): Wuchereria bancrofti, Brugia malayi and B. timori. Male worms are about 3–4 centimetres in length, and female worms are longer, measuring 8–10 centimetres. Almost 90% of all filariasis infections are caused by Wuchereria bancrofti and most of the remaining by B. malayi. The male and female worms together form “nests” in the human lymphatic system – the network of nodes and vessels that maintain the delicate fluid balance between blood and body tissues.

Q 3: How is lymphatic filariasis transmitted?

Filariae are transmitted by mosquitoes. In the mosquito, the parasite undergoes different stages while developing, of which only the third stage is infective. When a mosquito carrying the infective parasite bites a human, the parasites are deposited on the person’s skin, from where they enter the body. These then migrate to the lymphatic vessels and develop into adult worms over a period of 6–12 months, causing damage and enlargement of the lymphatic vessels.
The adult filariae live for several years in the human host. During this time, they produce millions of immature microfilariae that circulate in the blood. These microfilariae are then ingested by mosquitoes when they bite an infected person. The larval forms further develop inside the mosquito before becoming infectious to man. Thus, a cycle of transmission is established.

**Q 4: Which mosquitoes are the major vectors for lymphatic filariasis?**

Lymphatic filariasis is transmitted by different types of mosquitoes. These include the *Culex* mosquito, widespread across urban and semi-urban areas; *Anopheles*, found mainly in rural areas; and *Aedes*, seen mainly in islands of the Pacific.

For the *Brugia* parasite, the *Mansonina* species of mosquitoes serve as the major vectors, but in some areas *Anopheles* mosquitoes are responsible as well. The fact that so many different species of mosquitoes (each with its distinctive biological behaviour) are responsible for transmitting lymphatic filariasis significantly adds to the challenge of developing effective vector control strategies to eliminate the spread of these infections.

**Q 5: How common is the disease?**

Globally, more than 1.4 billion people in 83 countries live in areas endemic for lymphatic filariasis, which means they are at risk. Among those, 873 million reside in the South-East Asia Region. Bancroftian filariasis can be found throughout the tropics and in some sub-tropical areas worldwide, while the *Brugia malayi* parasite is confined to Southeast and Eastern Asia. *Brugia timori* is found in Indonesia and Timor-Leste.
Q 6: If so many people are at risk, why are so few cases reported?

There are an estimated 120 million cases of lymphatic filariasis worldwide, with about 40 million people disfigured and incapacitated by the disease. In the past, lymphatic filariasis has been largely underestimated as diagnostic and investigative tools were poor. It is also a disease of poverty, meaning it primarily affects poor communities in developing countries, often in remote, rural areas, with low visibility or political voice. The disease itself is hidden from view as the principal clinical manifestations are “covered up” because of personal shame and stigma.

This in turn has prevented a full understanding of both the scope and impact of the disease, including the exact economic and social burden on the affected communities. As the disease is not fatal, it ranks low on the health priority agenda, and the disability it causes is greatly underestimated.

Q 7: How do these worms make us ill, and what are the symptoms?

Filarial infection can cause a variety of clinical manifestations. These include:

- acute local inflammation, involving the skin, lymph nodes and lymphatic vessels and often accompanied by chronic lymphoedema (swelling of the lymph nodes).
- painful swelling of the limbs due to fluid retention
- genital disease (collection of fluid and swelling of the scrotum and penis), accompanied by high fever.
But the vast majority of infected people do not have obvious symptoms, although virtually all of them have subclinical lymphatic damage. As many as 40% have kidney damage, with proteinuria and haematuria (protein and blood in the urine, which is not normally found in healthy people).

**Q 8: How does one diagnose lymphatic filariasis?**

In the past, lymphatic filariasis diagnosis required microscopic examination of the blood specimen. To further complicate this, the blood sample must be taken according to the “microfilarial periodicity”. This makes diagnosis a difficult task, and assessing the whole population is almost impossible.

It was only after development of an antigen detection test in the late 1990s that the diagnosis of lymphatic filariasis improved. For Bancroftian filariasis, several antigen detection tests have been developed such as the immunochromatographic test (ICT) and enzyme-linked immunosorbent assay (ELISA), plus an effective parasite DNA-detection PCR assay that can be used with blood on filter paper. The last two methods require laboratories and skilled technicians.

The ICT test has been widely used as it is simple and easy to do. It is formatted as a card test which provides results in 10 minutes. However, ICTs do not work satisfactorily for the minority Brugian type of filariasis, which requires different diagnostic tests.

For clinical assessment, ultrasound and lymphoscintigraphy have proven to be important for patient management and monitoring. Lymphoscintigraphy involves injecting a mildly radioactive dye which flows through the lymph ducts, allowing physicians to map the severity and extent of the disease on a computer and treat it accordingly.
Q 9: Why is it difficult to make a correct diagnosis?

To understand this, one has to understand the lifecycle of the worms. The adult worms release their young or microfilaria (MF) into the blood. However, not all infected individuals are infested with MF, many have active infection with living adult parasites but with no MF circulating in the blood, thus making diagnosis difficult.

There is also the issue of “microfilarial periodicity”. Nocturnal periodicity means the MF only circulate in the blood during the few hours on either side of midnight, and if diagnosis is based on detecting MF then it has to be done during this time. This feature of lymphatic filariasis infection exists almost everywhere in the world except in some regions of the Pacific and South Asia (where MF are present in the blood for most of the day, often peaking in late afternoon). Such microfilarial periodicity has been an enormous practical barrier for diagnosing lymphatic filariasis and understanding its distribution.

Q 10: Is there any treatment, or a drug that can kill these worms?

Albendazole along with diethylcarbamazine citrate (DEC) is given in combination as mass drug administration (MDA). DEC is used for individual treatment (6 mg per kg per body weight).

Q 11: What is the treatment strategy?

There are two parts to the treatment strategy.

- Treatment of the community to progressively reduce and interrupt transmission.
- Treatment of the patients, to prevent and alleviate disabilities due to lymphatic filariasis.
Two dramatic advances in understanding how best to use available anti-filarial drugs have changed the entire approach of lymphatic filariasis control:

- The fact that single doses of any of the three available drugs (DEC, ivermectin, albendazole) were very effective at reducing microfilaraemia for up to 12 months.
- The discovery that combining any two of those three drugs was significantly more effective than any drug alone.

**Q 12: How does one manage lymphoedema?**

Lymphoedema can develop even after the adult worms die.

- Ask your physician for a referral to see a lymphoedema therapist for specialized care.
- Prevent the lymphoedema from getting worse by following basic principles of hygiene.
- Carefully wash the swollen area with soap and water every day.
- Elevate and exercise the swollen arm or leg to move the fluid and improve the lymph flow.
- Disinfect any wounds. Use antibacterial or antifungal cream if necessary.

**Q 13: What is mass drug administration?**

WHO recommends a two-drug regimen of DEC + albendazole given through a mass drug administration (MDA) campaign to the entire endemic population once every year for 4–6 years.

To interrupt transmission in an endemic community, the microfilarial load must be reduced below that necessary to sustain transmission, and for a period long enough to exceed the fecund (fertile) life span
of adult worms. This is estimated to be between 4–6 years, during which if MF are absent or less than 1% of the population. This only happens if a large part of the population (over 80%) takes the drugs. That is why it is very important to achieve high coverage of MDA in all endemic and at-risk communities.

**Q 14:** Is mass drug administration safe? Can the drugs be given to everybody?

Extensive safety and pharmacokinetic studies have shown that these drugs are safe and essentially without side-effects when administered to people who do not have microfilaria in their body.

In patients with microfilaraemia, side reactions do occur as a result of rapid MF destruction, mostly in people who are heavily infected. These reactions include fever, headaches and enlarged lymph glands, and occasionally rash, itching and other symptoms. Normally the side-effects can be managed in the field settings. In areas where onchocerciasis (another kind of worm that causes blindness and is most common in Africa) is also endemic, DEC cannot be used as it can induce severe reactions, and is substituted with ivermectin.

**Q 15:** How can we make sure that people do take the drugs during mass drug administration?

MDAs are very complex and require considerable resources and logistic mobilization. Some countries have organized “Filaria Days” or “Filaria Weeks”, others have used community-directed treatment, or some other local adaptation. Ideally the drug-giver should directly observe that the drug is taken but this is often not possible. A set of monitoring and evaluation activities of MDA have been developed, with special surveys to assess the drugs coverage in MDAs.
By giving albendazole, which is also effective in killing other worms in the body, the perceived health benefits for the community are increased, and this has proven to improve compliance.

Q 16: Is there any other way to interrupt transmission, apart from mass drug administration every year?

An alternative effective strategy for reducing MF to interrupt transmission is to substitute regular table/cooking salt with DEC-fortified salt. This was used widely in China and WHO recommends that the DEC-fortified salt strategy is applied for a period of 1–2 years. However, this approach has only been used by very few countries, and sometimes as a supplement to the regular MDA strategy.

Q 17: What else can we do to control lymphatic filariasis?

WHO recommends that whenever possible and affordable, vector-control techniques should be used to supplement MDA activities. This means avoiding mosquito bites in lymphatic filariasis-endemic areas through personal protective measures – such as using mosquito repellents, bednets and insecticides. Mosquitoes often breed in stagnating polluted water bodies, such as blocked drains and sewers, and hence good sanitation is essential to reduce mosquito breeding places. Integrated vector management and personal protection measures are useful complements to MDA.

Q 18: What can we do for people who already have disabilities as a result of lymphatic filariasis?

The common disabilities are lymphoedema, particularly of extremities (hands and feet) in both males and females, and hydrocele (scrotal swelling) in males. Affected patients are empowered to effectively
manage lymphoedema through simple but rigorous hygiene techniques. Avoidance of secondary bacterial infection is essential, and preventive antibiotics may be indicated for some patients.

However, the cornerstone of management is hygiene and adequate skin care. The public health goal of lymphoedema management is home-based self-care, and this requires strong health education, support to patients and family members or any informal caregivers, and referral networks for acutely infected or complicated patients. Sometimes, the already-damaged vessels are irreversible. For patients with hydroceles, the principal management remains surgery (hydrocelectomy).

Q 19: Given that mosquitoes are the vectors, how can one eliminate, and not just control, the spread of lymphatic filariasis?

There are several factors favourable to lymphatic filariasis elimination, such as the fact that humans are known to be the only reservoir host for *Wuchereria bancrofti*. The MF do not multiply in other creatures or in the environment. Also, adult worms do not multiply in the human host.

The vectors of lymphatic filariasis transmission are inefficient biological transmitters. The infection does not amplify itself within the vector (as opposed to malaria, schistosomiasis and other diseases).

The low “force of infection” of lymphatic filariasis also supports elimination. People do not acquire lymphatic filariasis after a single bite but require prolonged exposure with multiple infective mosquito bites, for a minimum of 3–6 months, according to some observations. Therefore, it is feasible to interrupt transmission once the parasite load in the
individual is reduced. There are tools available that can be used for elimination including affordable, safe and effective drugs, diagnostic kits and monitoring tools, and other technologies being developed.

Another important factor is the operational feasibility: such elimination has already been achieved in different settings with a number of different strategies. China, Japan and the Republic of Korea have shown the world that the task is not impossible. Infrastructure, clear guidelines, strong political commitment and community cooperation are vital components in the success of the programme. Drug donation from partner organizations is also crucial in bringing the cost down for countries to implement the MDAs.

Q 20: What can I do at the individual level to prevent lymphatic filariasis infection?

The best way to prevent lymphatic filariasis is to avoid mosquito bites. The mosquitoes that carry the microscopic worms usually bite between the hours of dusk and dawn. If you live in an area with lymphatic filariasis:

● sleep under a mosquito net at night
● wear long sleeves and trousers and
● use mosquito repellent on exposed skin between dusk and dawn.

Q 21: Can I get lymphatic filariasis from a single mosquito bite?

No. Many mosquito bites over several months to years are needed to get lymphatic filariasis. People living for a long time in tropical or sub-tropical areas where the disease is common are at the greatest risk for infection. Short-term tourists are at a very low risk.
Q 22: Are there any targets for elimination of lymphatic filariasis?

Both treatment and control strategies for lymphatic filariasis have undergone a profound “paradigm shift” in the past decade because of a rapid increase in knowledge and understanding gained from scientific and medical research. The predominantly patient-centred approach has shifted to the public health dimension, with the aim being to eventually eliminate lymphatic filariasis as a public health problem.

This means that the microfilarial rate in endemic areas should stay below 1% and the elimination goal should be achieved by the year 2020.

WHO established the Global Programme for Elimination of Lymphatic Filariasis (GPELF) in 2000. Since then many partners and actors have come forward, and a public-private partnership called the Global Alliance for Elimination of Lymphatic Filariasis (GAELF) was formed to assist the programme.

Political will and partnerships are vital components in achieving the goal. Ministries of health work with international agencies, non-governmental organizations (NGOs), scientific institutions, academic organizations and others to implement their national lymphatic filariasis elimination programmes. A framework and guidelines are available and WHO supports countries in monitoring and evaluation of the programme through a South-East Asia Regional Programme Review Group.

Q 23: What progress has been made in eliminating lymphatic filariasis from the South-East Asia Region?

Considerable progress has been made in eliminating lymphatic filariasis in the Region. All the countries have finished mapping lymphatic filariasis-endemic
areas as the initial step in MDA, and most have started MDA since early 2000. Among 9 endemic countries in the WHO South-East Asia Region, Maldives, Sri Lanka and Thailand have both stopped MDA and are now in the process of verification of lymphatic filariasis elimination.

However, a lot more remains to be done if we want to achieve the target by 2020. The principal challenges include finding the necessary financial resources for programme implementation (some countries have had to interrupt MDAs due to lack of funds), undertaking operational research to fix gaps in implementation, utilizing strategies for vector control methods, and lastly, identifying the impact of programme.
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