Mapping of lymphatic filariasis in Rwanda

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Abstract

Background: Infections with *Wuchereria bancrofti* causing lymphatic filariasis (LF) still represent one of the major health problems in the tropics. In Rwanda, where LF has been considered endemic by the World Health Organization (WHO) and the Global Alliance to Eliminate Lymphatic Filariasis (GAELF), there are no reliable data on distribution and prevalence of the disease. *Aims:* To obtain data on the geographical distribution of LF in Rwanda as a prerequisite to initiating national LF elimination activities. *Methods:* A community-based mapping survey was conducted in five districts likely to be endemic for LF in Rwanda. *W. bancrofti* circulating antigen was detected using commercially available immuno-chromatographic test (ICT) cards. A night thick blood smear was performed on individuals who tested positive with the ICT card. *Results:* A total of 797 individuals (400 males: 50.2% and 397 females: 49.8%) were surveyed. Their median age was 37 years (range, 15–97 years). A night thick blood smear was performed for the one individual who tested positive with the ICT card, which was confirmed positive. *Conclusions:* Only one LF case was detected, thus LF is not a public health problem in Rwanda. *Declaration of interest:* None.

Key words

Lymphatic filariasis
Rwanda
Mapping
Infection and morbidity

Lymphatic filariasis is widely distributed in tropical and subtropical areas of the world, where it results in considerable suffering and debilitating clinical disease (Onapa et al, 2001). Estimates indicate that more than 50 million people in Sub-Saharan Africa are affected (Onapa et al, 2001). In rural areas of Eastern Africa the disease is mainly due to the parasitic nematode *Wuchereria bancrofti*, transmitted by the Anopheles mosquito vector. Cultivation of land puts people in close contact with the vector and leads to a higher risk of contracting lymphatic filariasis (LF).

In Rwanda, where infection of LF was considered high by the WHO and the Global Alliance to Eliminate Lymphatic Filariasis (GAELF), there was no reliable data on distribution and prevalence of LF.

In Rwanda over 90 percent of people rely on subsistence agriculture (United Nations, 2007; www.oecd.org/dataoecd/33/55/36741760.pdf). Consequently, a proportion of the population may be exposed to the risk of infection and morbidity caused by LF while working around swampy areas. The commonly known physiological symptoms of LF are: elephantiasis (lymphoedema), scrotal swelling (hydrocele), breast swelling and hand swelling, but there are also reports of less obvious symptoms such as kidney damage and defects in immune responsiveness (World Health Organization [WHO], 1997). In resource-poor communities where treatment is not accessible, these complications can lead to loss of employment and stigmatisation. Patients with chronic filariasis have been found to spend 10–60% less time working (WHO, 1997), resulting in a high frequency of poverty among the patients and their families.

In Rwanda, where infection of LF was considered high by the WHO and the Global Alliance to Eliminate Lymphatic Filariasis (GAELF), there was no reliable data on distribution and prevalence of LF. According to the health information system of the Rwandan Ministry of Health, a few LF cases were reported

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from the former Cyangugu, Kibuye, Gisenyi and Ruhengeri provinces in 1987 and 1988, although most of the cases were from the former Cyangugu province with 59 cases (Ministère de la Santé et des Affaires Sociales, 1987, 1988). Interviews carried out by personnel from the neglected tropical diseases (NDT) control program (www.theaccessproject.com/index.php/about/ntd/) during their field work in districts to gather information on LF, found that health workers indicated that chronic lower leg lymphoedema (elephantiasis) was the key sign for diagnosis.

The objective of this study was to obtain data on the geographical distribution of LF in Rwanda as a prerequisite to initiating national disease elimination activities. The results presented are from a community-based mapping survey on LF, which, in the authors' opinion, was the first of its kind conducted in Rwanda.

Materials and methods

Population

It is widely agreed that LF transmission occurs only at altitudes below 1200m (Onapa, 2008). To provide a modicum of range, the study population was selected in any areas of Rwanda located below 1500m. This led the cross-sectional survey to be conducted in 13 villages distributed in five administrative districts. The surveyed districts were Bugesera, Rwamagana, Kayonza and Nyagatare (in the eastern province where the altitude is generally below 1500m), and Rusizi (one village in the Rusizi plain where the altitude is generally 900m).

The study population was any resident adult, defined as being over 15 years old and having lived in his/her village for more than 10 years, without ever being absent for more than six months during this period. The study was carried out in January and May 2008.

Selection of participants

After explaining the purpose of the study to the village leaders and obtaining their permission, all resident adults of the village (over 15 years old) were asked to gather at a central point. The study was then explained in Kinyarwanda, and those willing to participate were asked to form two lines, one with males and another with females. Twenty-five individuals were randomly selected from each line using systematic sampling, resulting in an overall sample of 25 males and 25 females. In some villages, 100 individuals (50 males and 50 females) were randomly chosen via the same method. Data was recorded on the data sheets as soon as the participants were selected.

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Diagnosis of *W. bancrofti* infection

Informed consent was obtained from the individuals or their parents and the test was performed by trained laboratory technicians, according to the manufacturer's instructions.

The patient's left index finger was cleaned with 70% isopropanol and punctured using a sterile lancet. The initial sample of blood was removed using a cotton swab, and sufficient fresh blood was then obtained to fill a 100-µl capillary tube (*Figure 1*). The blood was transferred from the capillary tube to the pad on an immuno-chromatographic test (ICT) card and the card was sealed (*Figure 2*). ICT™ filariasis cards allow for the detection of circulating *W. bancrofti* antigen (ICT Diagnostics, Balgowlah, New South Wales, Australia, product number FLO.1; patent now sold and produced as NOW®, ICT filariasis kits; Binax, Portland, ME) (Weil et al, 1997).

The result of each ICT card was read after 15 minutes. A positive result was when two pink lines appeared on the card's window, and a negative result was when a single line was seen. Test results with the individual's ID number were recorded both on the card, and on each individual's data sheet. A nocturnal thick blood smear was required as a confirmation test when the ICT card was twice positive for any individual.

Statistical analysis

Data were entered and analysed in Epi-Info 3.2.2 (Centers for Disease Control and Prevention, Atlanta, GA) and Stata/MP 10.0 programmes.

Ethics

The survey received ethical clearance from the National Ethics Committee

Figure 1. Collection of blood samples for ICT card.

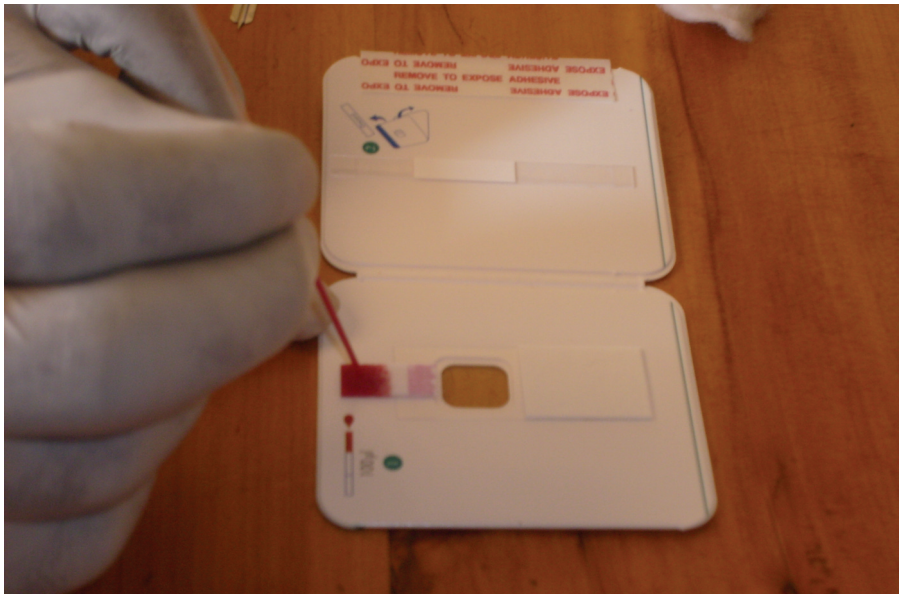

Figure 2. Immuno-chromatographic test (ICT) card.

and the Institutional Review Board of Columbia University, USA. Individual informed consent was obtained from each participant or (if they were aged <21) from one of their parents or guardian. The confirmed *W. bancrofti* infection was treated by co-administration of one tablet of albendazole 400mg and the required dose of ivermectin, as indicated by a dose-pole.

RESULTS

Demographic data

Seven hundred ninety-seven individuals (400 males: 50.2% and 397 females: 49.8%), aged from 15 to 97 years (median age 37; mean: 39.5; SD 15.8) were included in the study (*Table 1*).

Using ICT cards to detect circulating *W. bancrofti* antigen, only one individual was found positive, indicating a very low prevalence of LF in the surveyed population of 0.1% and 2% (1/50) in the village (*Table 2*).

A nocturnal thick blood smear was performed on the individual who tested positive by ICT card and the result was positive (microfilariae were detected). The patient was a 48-year-old female (illiterate, agricultural worker, from Agatare village, Rwamagana district). She was treated with ivermectin and albendazole 400mg according to the WHO guidelines.

Discussion

In Rwanda, there was no mass drug administration (MDA) by diethylcarbamazine (DEC) and ivermectin for lymphatic filariasis, nor were there any control programmes before the initiation of the NTD control programme in 2007.

The present survey shows that infection with *W. bancrofti* in Rwanda is unlikely to be endemic, contrary to previous information on the disease.

The survey on lymphatic filariasis presented in this report is part of several surveys on neglected tropical diseases (NTDs), which include soil-transmitted helminths, schistosomiasis and trachoma. Results on the other parasites will be reported elsewhere. The present survey shows that infection with *W. bancrofti* in Rwanda is unlikely to be endemic, contrary to previous information on the disease. On a first test, four individuals were found positive by ICT cards. However, after further testing, only one individual was confirmed positive by ICT card and mid-night thick blood film (for the detection of microfilariae). These results were obtained from the first mapping exercise where 596 individuals from nine villages were surveyed in January 2008.

The confirmed *W. bancrofti* case was from Rwamagana district, in the Eastern province, where further mapping was recommended. Four additional villages were therefore investigated in May 2008 in Rwamagana district, and all 200 selected individuals were tested negative by ICT card.

For the diagnosis of *W. bancrofti* infection we used a commercial assay based on the monoclonal antibody AD12.1, which detects a circulating 200-kDa antigen in sera from patients with Bancroftian filariasis (Weil et al, 1987). This ICT filariasis card test has previously been shown to be highly sensitive for infections with *W. bancrofti* and highly specific with respect to other filarial parasites, including *O. volvulus, Brugia malayi, Loa loa* and *Mansonella streptocerca*, when compared with other standard tests for the diagnosis of *W. bancrofti* infections (Freedman et al, 1997; Weil et al, 1997; Bhumiratana et al, 1999; Phantana et al, 1999). Thus, the results obtained in the authors' study are robust, and conclude that LF is not a public health problem in Rwanda.

Lymphatic filariasis is one of the forms of elephantiasis. Indeed, several non-filarial forms do exist, which lead to similar clinical manifestations. Because the previously reported LF cases in Rwanda were defined by clinical assessment, the authors hypothesise that these cases were wrongly diagnosed and were, in fact, non-filarial. The distribution of non-filarial elephantiasis of the lower legs in Rwanda was studied elsewhere (Price, 1976).

To the authors' knowledge, this community-based mapping survey on LF using ICT cards was the first in Rwanda. It has been shown that the results of ICT filariasis cards better reflect the real situation of the frequency of *W. bancrofti* infection than detection by microscopy (Freedman et al, 1997; Weil et al, 1997). From the only one case of lymphatic filariasis detected, the authors concluded that this disease does not have public health significance in Rwanda. JL

Table 1

Distribution of the participants by education level and occupation

Education	N	% (95% CI)	Occupation	N	% (95% CI)
None	300	38.5 (35.1–41.9)	Agriculture worker	771	97.0 (95.8–98.2)
Primary	458	58.8 (55.3–62.3)	Seller	4	0.5 (0.01–0.99)
Secondary	20	2.6 (1.4–3.7)	Student	15	1.9 (0.9–2.8)
University	1	0.1 (0.1–0.4)	Other	5	0.6 (0.07–1.17)
Total	**779**	**100.0**	**Total**	**795**	**100.0**

Table 2

Results of ICT card test

ICT card test 1	N	% (95% CI)	ICT card test 2	N	% (95% CI)
Negative	792	99.5 (99.00–99.98)	Negative	795	99.87 (99.30–99.99)
Positive	4	0.5 (0.01–0.99)	Positive	1	0.125 (0.003–0.697)
Total	**796**	**100.0**	**Total**	**796**	**100.0**

Key points

- Lymphatic filariasis is widely distributed in tropical and subtropical areas of the world, where it results in considerable suffering and debilitating clinical disease (Onapa et al, 2001).
- The study was undertaken to obtain data on the geographical distribution of LF in Rwanda and to enhance knowledge of the risk factors that influence lymphatic filariasis infection.
- Using ICT cards to detect circulating *W. bancrofti* antigen, only one individual was found positive, indicating a very low prevalence of LF in the surveyed population.
- From the only one case of lymphatic filariasis detected, the authors' concluded that this disease does not have public health significance in Rwanda.

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