

Impact of single-dose ivermectin on community microfilaria load in bancroftian filariasis infection: two years post treatment

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Abstract

The concept of annual single-dose treatment for the control and possible interruption of transmission of lymphatic filariasis has brought much hope to the previously hopeless disease. The logistics for implementing this enormous public health intervention have wide ramifications and will depend on the efficiency of drug delivery and distribution at various levels of the health system. In sub-Saharan Africa, where the public health services are inadequate, this becomes even more important. Six communities in southern Ghana known to be endemic for filariasis were treated with single-dose ivermectin in January/February 1997 as part of pilot programme activities. The 1998 treatment could not take place because of unavailability of the drug. The 1999 community microfilaraemia prevalence and intensity were reduced by only 25.5% and 39.5% of pre-treatment levels, respectively. The implications of any shortfalls on the drug delivery system on the goal of elimination of lymphatic filariasis are discussed.

Keywords: filariasis, *Wuchereria bancrofti*, chemotherapy, disease control, ivermectin, mass drug administration, microfilaraemia, Ghana

Introduction

Filariasis remains a major problem in Africa (GYAPONG, 1999). However, in recent years there has been great optimism about effective control and possible elimination of the disease, mainly through treatment to interrupt transmission (OTTESEN *et al.*, 1997). One of the major challenges to the interruption of transmission is the achievement of an effective and sustainable drug distribution system in endemic communities. In Africa, ivermectin (which has proven highly successful in treating onchocerciasis) has now been approved for use against lymphatic filariasis as well, since several studies have shown it to be equally effective (CARTEL *et al.*, 1992; EBERHARD *et al.*, 1992; CAO *et al.*, 1997). Analytical and simulation models under development suggest that, in order to achieve interruption of transmission, a high coverage of yearly treatment is needed. This study reports on the outcome of a community-based drug distribution that was initiated in an endemic district in Ghana, and discusses the key programmatic issues of reliable drug supplies.

Methods

In January/February 1997, six communities in the Winneba District in the coastal area of Ghana were identified based on findings from a previous survey for this pilot treatment study (GYAPONG *et al.*, 1998). Using a modified Expanded Programme on Immunization-cluster survey sampling method (BENNETT *et al.*, 1991), about 100 people of all ages were identified in each village and examined. All participants had a 20- μ L night-blood sample taken for detection of microfilariae (mf) using the thick blood smear method. All blood samples were labelled clearly with unique identification numbers to facilitate data processing. The thick blood smears were stained with Giemsa at pH 7.2 using standard methods and the entire field was examined and all mf were counted. As a quality control measure 10% of all slides were randomly selected and re-examined blindly by the author.

All eligible community members were treated with a single dose of ivermectin of about 200 μ g/kg, using the current field practice of the onchocerciasis control programme, which is based on height according to the following criteria and the 6-mg tablet: height 90-119 cm, 0.5 tablet; 120-140 cm, 1 tablet; 141-158 cm, 1.5 tablets; \geq 158 cm, 2 tablets.

Pregnant women were excluded based on menstrual history. Severely ill persons were also excluded. The

research team in conjunction with the district health service gave the treatment with community leaders using a community register, which was updated during the study.

The original plan was to repeat the night-blood survey and treatment in January/February 1998; however, ivermectin could not be obtained for this phase of the study. It was therefore deemed unethical to conduct the night-blood survey since the drug for treatment was not available. In January/February 1999, however, ivermectin was obtained and the survey and treatment were therefore repeated.

Statistical analysis was carried out using EpiInfo and SPSS-PC. The prevalence of microfilaraemia in the communities was standardized by age and sex using the total population of the 6 communities from the census data as the standard population. The geometric mean intensity (GMI) of microfilaraemia was also assessed for each community. Coverage of treatment of the eligible population was computed as x/n where x is the number of eligible people treated and n is the eligible population.

Results

The sex and age distribution of the studied population in both surveys was very similar to the true population structure. About 40% of the population were aged <15 years and about 51% were females. The treatment coverage of the communities is presented in Table 1. The coverage of the eligible population was generally very high. There was no significant difference in the coverage in 1997 (90.5%) and in 1999 (92.6%). Table 2 shows the prevalence and intensity of infection in the 6 communities in 1997 and in 1999. On average, there was a 25% reduction in prevalence of infection from 10.2% in 1997 to 7.6% in 1999. This reduction ranged from 7.9% in Nsuekyir to 38.1% in Atechedo (Table 2). There was a 39.5% reduction in intensity of infection from 570 mf/mL to 345 mf/mL. This reduction ranged from 28.9% in Gyahadze to 51.8% in Nsuekyir (Table 2).

Table 1. Coverage (%) of the eligible population in six communities in Ghana with single-dose ivermectin in 1997 and 1999

Community	1997	1999
Nsuekyir	93.1	92.7
Gyanjinadzi	94.2	92.5
Ateitu	87.7	96.1
Gyahadzi	91.7	90.4
Atechedo	89.8	87.9
Osobonpayin	91.3	93.2
Total	90.5	92.6

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Table 2. Prevalence of bancroftian filariasis microfilaraemia, and intensity of infection (mf/mL), in six communities in Ghana before (1997) and after (1999) single-dose ivermectin

Community	1997			1999			Impact after 24 months		
	Number examined	Microfilaraemia (%)	Geometric mean microfilaraemia	Number examined	Microfilaraemia (%)	Geometric mean microfilaraemia	% Reduction in microfilaraemia prevalence	% Reduction in geometric mean microfilaraemia density	
Nsuekyir	109	10.1	925	108	9.3	446	7.9	51.8	
Gyanjinadzi	131	15.2	348	137	10.9	244	28.3	29.9	
Areitu	123	9.7	551	72	6.9	323	28.9	41.4	
Gyahadzi	101	9.9	470	93	7.5	334	24.2	28.9	
Arechedo	80	6.3	500	103	3.9	269	38.1	46.2	
Osubonpayin	120	8.4	500	92	5.4	281	35.7	43.8	
Total	664	10.2	570	605	7.6	345	25.5	39.5	

Discussion

The main finding in this study is that, even though there is some reduction in prevalence and intensity of infection in all the communities 2 years after a single-dose treatment with ivermectin, the reduction is not as good as what has been documented for 1 year after treatment. In this study, it was not possible to examine the population after 1 year owing to ethical reasons relating to the unavailability of ivermectin for the second round of treatment. However, it is generally known that single-dose treatment with ivermectin can reduce intensity of infection by as much as 90% of pre-treatment levels even after 1 year (CARTEL *et al.*, 1992; EBERHARD *et al.*, 1992; CAO *et al.*, 1997). Despite the very high coverage of the eligible population in this study, at the end of the second year the intensity of infection was reduced by only 39.5%.

These findings have major implications for the global programme for the elimination of lymphatic filariasis, especially in the African Region where ivermectin will be used. The use of ivermectin and albendazole in combination for filariasis control is likely to achieve a better impact than single-drug treatment as has been demonstrated in Sri Lanka and Haiti (ADISS *et al.*, 1997; ISMAIL *et al.*, 1998). It is therefore possible that, if the combination treatment were used, the impact on prevalence and intensity of infection would be greater than that achieved in this study. The follow-up activities in these communities have taken this into consideration and some of the communities are receiving the combination treatment.

The unavailability of drugs in 1998 was due to the fact that the drug procurement procedure had not been streamlined, as there was no control programme in place officially. All filariasis control activities were therefore being done on a pilot basis. Late arrival of drugs happens from time to time even with extremely efficient and generously funded global initiatives. Recently national immunizations have had to be postponed in some countries owing to the late arrival of polio vaccines. However, the message is still clear that, if for some reason we are unable to deliver the intervention in a particular year, the clock of filariasis elimination begins to tick backwards and elimination may become more difficult to achieve. The control programmes should therefore make every effort to ensure the timely delivery of all the necessary logistics including drugs. This includes an accurate estimation of drug requirements, an efficient drug delivery system within the country and probably stocking of at least 2 years of drug requirement to forestall any problems in the drug delivery process. If this stocking were achieved, the shelf-life of drugs used in the programme should be at least 2 years. The currently advocated strategy of the use of 2 drugs (ivermectin and albendazole) requires that both drugs arrive in the endemic communities at the same time. Getting the drugs to where they are most needed will require the collaboration with both local and international non-governmental organizations in the drug distribution.

The over-90% treatment coverage of the eligible population was achieved through a concerted effort of the research team, the District Health Management Team and community leaders. It was obvious from the role played by the community leaders during the treatment period that without them coverage would not have been that high in both treatment rounds, especially when only 1 disease control officer was assigned to an area of more than 30 communities. The role of the community in treatment towards the global elimination programme needs to be emphasized as has been shown in the Onchocerciasis Control Programme and the African Programme for the Control of Onchocerciasis. More recently, the use of the concept of Community Directed Treatment (ComDT) has been shown to work in Ghana and Kenya as part of a WHO-TDR initiative.

In conclusion, the concept of annual single-dose

treatment for the control and possible interruption of transmission of lymphatic filariasis has brought much hope to the hitherto hopeless disease. The logistics for implementing this enormous public health intervention have wide ramifications and will depend on the efficiency of drug delivery and distribution at various levels. In sub-Saharan Africa, where the public health services are not so efficient, the efficiency of drug distribution becomes even more important.

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