Transactions of the Royal Society of Tropical Medicine and Hygiene 105 (2011) 431–437

Contents lists available at ScienceDirect

Transactions of the Royal Society of Tropical Medicine and Hygiene

journal homepage: http://www.elsevier.com/locate/trstmh

Effect of annual mass administration of diethylcarbamazine and albendazole on bancroftian filariasis in five villages in south India

K.D. Ramaiah[a,*], P. Vanamail[a], J. Yuvaraj[b], P.K. Das[a]

[a] *Vector Control Research Centre (ICMR), Medical Complex, Indira Nagar, Pondicherry – 605006, India*
[b] *National Institute of Epidemiology (ICMR), Ambattur, Chennai – 600 077, India*

ARTICLE INFO

Article history:
Received 23 June 2010
Received in revised form 8 April 2011
Accepted 8 April 2011
Available online 23 May 2011

Keywords:
Lymphatic filariasis
Mass drug administration
Diethylcarbamazine
Albendazole
India

ABSTRACT

Annual mass drug administration (MDA) is the recommended strategy for lymphatic filariasis (LF) elimination. We assessed the effect of six rounds of mass administration of diethylcarbamazine (DEC) and albendazole (ALB) on microfilaria (Mf) prevalence and intensity and vector infection and infectivity rates and circulating filarial antigenaemia (CFA) in a group of five villages in south India, endemic for *Culex*-transmitted bancroftian filariasis. During different rounds of MDA, 60–70% of the eligible population (>15 kg body weight) was treated. The MDA reduced the Mf prevalence from 8.10% (CI 6.18–10.01) to 1.01% (CI 0.31–1.71) ($P<0.05$) and geometric mean intensity of Mf from 0.31 (CI 0.22–0.40) to 0.02 (CI 0.00–0.04) ($P<0.05$), equivalent to a fall of 86% and 94% respectively. The vector infection and infectivity rates declined from 13.11% (CI 11.52–14.70) to 0.78% (CI 0.16–1.40) ($P<0.05$) and 1.04% (CI 0.56–1.52) to 0.13% (CI 0.00–0.39) ($P<0.05$), respectively. Four out of the five villages recorded <0.5% Mf prevalence and 0% vector infection rate. Circulating filarial antigenaemia (CFA) fell by 86% in the total population and 100% in 1–10 year old children. One of the five villages, which showed the highest baseline vector infection rate, showed >1.0% Mf rate. The results suggest that six rounds of mass administration of DEC and ALB, with 60–70% treatment coverage, is likely to achieve total interruption of transmission and elimination of LF in the majority of villages.

1. Introduction

Lymphatic filariasis (LF) is a neglected tropical disease prevalent in 81 countries. Nearly 1.3 billion people live in endemic areas[1] and an estimated 127 million people are infected, 45 million of whom suffer from consequences of chronic disease manifestations.[2] Affected people often suffer from life-long disability, stigma and psycho-social problems. The disease is an important cause of economic loss and poverty in many endemic communities.[3]

Though the disease has been a cause of untold misery for many centuries, LF remains a neglected disease. Serious efforts to contain it were sporadic due to lack of comprehensive and feasible control strategies. However, prospects of LF control and elimination have been significantly improved following the findings of the dramatic effect of a single dose of antifilarial drugs on microfilaraemia,[4] simple methods to manage the chronic disease,[5] and rapid diagnostic tools.[6] These findings eased many operational problems related to demarcation of endemic areas, large scale treatment of the at risk population, prevention of infection, and care and treatment of people affected with chronic disease. Encouraged by this, the World Health Assembly passed resolution 59.2 in 1997, urging member states to make all efforts to eliminate LF as a public

* Corresponding author. Tel.: +91 413 2272396; fax: +91 413 2272041.
E-mail address: ramaiahk@yahoo.com (K.D. Ramaiah).

0035-9203/$ – see front matter © 2011 Royal Society of Tropical Medicine and Hygiene. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.trstmh.2011.04.006

health problem by the year 2020. Following this, the Global Programme to Eliminate Lymphatic Filariasis (GPELF) was initiated in the year 2000.[7] The core strategy of the programme is (i) a yearly mass administration of a single dose of diethylcarbamazine (DEC) or ivermectin combined with albendazole (ALB) to the endemic population to diminish the existing infections, interrupt transmission and prevent new infections and (ii) a community level morbidity management programme to alleviate the suffering among the people affected by the chronic disease.[7]

GPELF is one of the largest preventive chemotherapy programmes. By 2008, 51 countries had been participating in mass drug administration (MDA) activity; close to 700 million people are offered treatment annually and 2.46 billion treatments were delivered to endemic communities.[1] The programme has become an important activity of the health departments of many countries. While the programme is being expanded and strengthened, robust information on the impact of MDA on infection and transmission is required to comprehend its outcome and prospects of LF elimination. We have been evaluating the impact of mass administration of DEC+ALB on community microfilaraemia and transmission of LF in rural communities in south India. The results of the study are reported in this paper.

2. Study villages and population

The study was carried out in five villages in Villupuram district in Tamil Nadu state, south India. The population of the villages ranged in size from 517 to 2609. The five villages are located within a radius of 20 km and are well separated from one another therefore constituting independent transmission zones. The region in which the study areas are located is known to be endemic for LF caused by *Wuchereria bancrofti* and transmitted by *Culex quinquefasciatus*. Most of the houses in the study villages have mud walls and thatched roofs or brick walls with tiled roofs. Peri-domestic water collections are the important source of breeding of the vector species. The predominant occupations of the population are agriculture and weaving. Primary health centres are the source of health care for minor ailments.

3. Methods

3.1. Mass drug administration

Six rounds of MDA have been administered to the study population. Four rounds were implemented during 2001–2004; the fifth round could not be implemented in 2005 due to adverse publicity to MDA programmes in this part of India. The fifth and sixth rounds were implemented in 2006 and 2007 respectively. Prior to the first MDA, a house to house census was carried out and the name, sex, age and weight of the members were compiled in a register for each household in all five villages. During each MDA, using the census registers, two to five teams of health workers visited every household, explained the study, and administered the drugs to all consenting members directly under the observation of the teams. The treatment regimen consisted of DEC at the dose of 6 mg/kg body weight and ALB at a fixed dose of 400 mg. DEC tablets were procured from local dealers of reputed manufacturers such as Lederle and Burroughs Welcome. For the initial three rounds ALB was procured by TDR/WHO from Glaxo-Smith Kline, the manufacturer and donor of the drug to GPELF, and supplied to the study team and for the subsequent three years it was procured from reputed local manufacturers such as Cipla.

Children below 15 kg body weight, pregnant women and lactating mothers were excluded from treatment, as followed in earlier studies.[8,9] Elderly people suffering from serious illnesses were also excluded.

A team of medical and para-medical workers were stationed in the study villages for two days after each round of drug administration and people affected with adverse reactions were given supportive treatment.

During 1994–1997, the population of the five villages received a placebo drug as part of a study to evaluate the impact of mass administration of DEC alone and ivermectin alone on microfilaraemia and transmission of LF. During each year of the four year period, approximately 7% of the population was sampled for microfilaria (Mf) and the detected Mf carriers were treated with a single dose of DEC. Thus, nearly 28% of the population was sampled and hence 28% of Mf carriers were treated with a single dose of DEC once over a period of four years. This is unlikely to have any impact on the outcome of the present study as treatment of just 28% of the Mf carriers once with single dose of DEC will not have any significant impact on parasite load or transmission.[8] Also, the present study was started in the year 2000, i.e, a full three years after stopping the intervention with placebo.

3.2. Microfilaria surveys

Changes in microfilaraemia prevalence and geometric mean intensity (GMI) were assessed every year by carrying out Mf surveys few days prior to each round of MDA. For each survey, 7% of households were randomly selected in each village and all members of the selected households were blood sampled. From each person about 60 cmm of finger prick blood sample was collected between 20:00 and 24:00 hours and made into three thick smears of 20 cmm each. The thick smears were stained, using Jaswant Singh and Bhattacharya stain I, in the laboratory next day morning and examined under compound microscope for Mf. For positive blood smears, the Mf count was noted down. All the detected Mf carriers were treated with single dose of DEC.

3.3. Resting vector surveys

The impact of MDA on vector infection and infectivity rates was monitored by collection and dissection of indoor resting vector mosquitoes throughout the study period. In each village, mosquitoes were collected using mechanical aspirators at monthly interval during the months of October to March, when the vector abundance is higher. In each study village, mosquitoes were collected in 12 fixed households, spending about 15 minutes per household. The mosquito collection was brought to the laboratory; the