A BASELINE STUDY OF RURAL BANCROFTIAN FILARIASIS IN SOUTHERN INDIA

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Abstract. Night mass blood surveys were carried out for parasitological evidence of Bancroftian filariasis in 45 rural areas belonging to 9 National Filaria Control Program (NFCP) zones of East Godavari and West Godavari districts of Andhra Pradesh, India during the period 1998 to 2001. Mf prevalence range between 2.9 to 10.2%, and mf intensities in 20 mm^3 blood samples ranged from 1-281. The present study explains the trend of microfilaria dynamics in the rural population, where mass drug delivery has been implemented since 1997, and anti-larivicidal and adulticidal control measures have not been adopted.

INTRODUCTION

Even at the completion of several decades of fighting against filariasis, it has remained an intractable public health problem (Wayne, 2002) and identified as the second leading cause of disability (WHO, 1995). India alone contributes 40% of the global disease burden (Michael *et al*, 1996) and annual economic loss of nearly 1.5 billion US dollars every year (Ottesen *et al*, 1997). Bancroftian filariasis is prevalent in both urban and rural areas. It is caused by the nematode worm *Wuchereria bancrofti* transmitted by female *Culex quinquefasciatus*. The major prevalence is among the poorer sections of society and it is an important cause of poverty (Ramaiah *et al*, 2000). Rural filariasis has not received mosquito control operations (Rajagopalan *et al*, 1981). The existing National Filaria Control Programs (NFCP) caters for only 11% of the population who live in the endemic foci (Sharma *et al*, 1995) and its control measures cannot be adopted in rural areas because of operational problems and cost considerations (Ramaiah *et al*, 1989). The 50th World Health Assembly (1997) recommended implementation of mass drug delivery (MDD) in highly endemic filarial areas of India. Hence, the present study was taken up to understand the dynamics of microfilariae in rural communities in Andhra Pradesh, where anti-vectoral control measures have not been adopted.

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MATERIALS AND METHODS

Study area

Geography and climate. The two Godavari districts lie between the 16.25º-18.10º latitude North and 80.75º-82.65º longitude East on the Bay of Bengal coast of peninsular India. These two districts are abundant in natural resources, such as monsoon rain, fertile soil, perennial rivers, for systematic crop production. These two districts are separated by the river Godavari. The climate is characterized by a humid summer (46º-20ºC), winter (32º-11ºC), and monsoon (June-December). The south-west monsoon plays a major role in determining the climate of the state. The northeast monsoon is responsible for about one-third of the total rainfall in Andhra Pradesh. There was no proper wastewater disposal system in any of the study villages, and often cesspools of stagnated water, which can facilitate favorable conditions for the breeding of *Culex quinquefasciatus*, the vector of Bancroftian filariasis.

Selection of villages. Stratified random sampling methodology was applied for selection of

Table 1
Sex and NFCP unit prevalence of microfilaremia (mf) in East (E) and West (W) Godavari districts of Andhra Pradesh (AP).

Name of unit	Total no of persons examined			Total mf carriers			Total mf rate (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Amalapuram	455	530	985	19	32	51	4.17	6.03	5.17
R.C. Puram	478	525	1,030	42	28	70	8.78	5.33	6.97
Mandapeta	490	520	1,010	14	16	30	2.85	3.07	2.97
Kakinada	349	457	806	15	10	25	4.29	2.18	3.10
Peddapuram	556	479	1,025	56	48	104	10.00	10.02	10.14
Pithapuram	461	557	1,018	42	44	86	9.11	7.89	8.44
Rajahmundry	474	578	1,052	21	21	42	4.43	3.63	3.99
Tanuku	503	527	1,030	52	34	86	10.33	6.45	8.34
Palakollu	479	536	1,015	32	42	74	6.68	7.83	7.29
Total	4,245	4,709	8,971	293	275	568	6.9	5.83	6.33

the villages for the entire study area. The study was conducted from October 1999 to March 2001 in 1,804 households of 45 rural areas in East and West Godavari districts, Andhra Pradesh. Previous researchers have stated that the study regions are endemic for filariasis (Raghavan, 1957).

Parasitological studies

A total of 8954 blood smears was collected from the 1,804 households of the two districts in Andhra Pradesh. About 20 mm^3 of blood was collected, between 2000 and 2300 hours, from each person by finger-prick method and a smear prepared on clean glass slides (Sasa, 1976). Next morning, the blood smears were processed - they were dehemoglobinized in tap water, fixed in methanol, stained in JSB II solution, and allowed to dry. The dried smears were examined for mf using a compound microscope. The mf status and the number of mf for positive individuals were recorded.

RESULTS

In East Godavari district, the microfilaremia (mf) rate ranged from 2.97 to 10.14% among 7 NFCP zones. In West Godavari district the mf rates of the Tanuku and Pallakollu units were found to be 7.29 and 8.34% respectively (Table 1).

The age-group prevalence of microfilaremia in the 9 NFCP zones is shown in Fig 1. The prevalence of microfilaremia steadily increased from the 0-5 age group. The prevalence of microfilaremia showed a rise and was stable at 11-20 and 21-30 age groups. Then, there was a decrease among 31-40 and 41-50 age groups. The highest mf prevalence was recorded for the 51-60 age group, due to the available sample size, which was relatively lower than the other age groups. Microfilarial densities of the two districts are represented in Fig 2, and the mf counts ranged from 1-281 for the entire study. The calculation of mf density is generally expressed by the number of mf per unit volume of blood sample. Table 2 explains the dynamics of the pathogen in the children. The mf rates ranged from 2.61 to 2.92%.

Table 2
Summary of the filariasis survey of <20-year-old children.

Total villages covered	45
Smears collected from children	3,483
Number of cases recorded	215
Microfilaria rate	6.17%
Number of boys with mf	102
Microfilaria rate	2.92%
Number of girls with mf	91
Microfilaria rate	2.61%

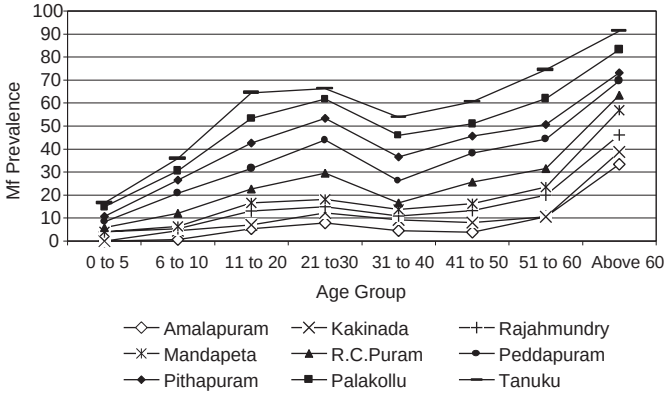

Fig 1–Mf prevalence by age in the nine NFCP units of East and West Godavari districts of AP.

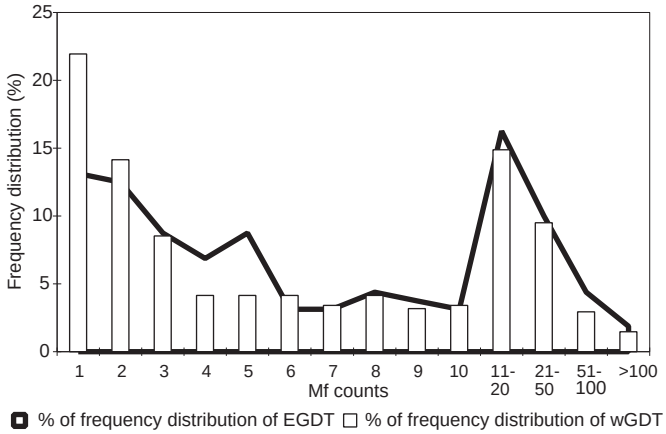

Fig 2–Frequency distribution of mf counts from the rural communities of Andhra Pradesh, India.

DISCUSSION

Most of the rural areas, except Mandapeta (2.99%), Kakinada (3.1%), and Rajahmundry (3.99%), have shown alarming rates (above 5%) of the filarial infection. The lowest mf rates were due to the impact of mass drug delivery and active participation of the locally related control units, *ie* the National Filaria Control Programs, National Institute of Communicable Diseases (NICD) at Rajahmundry, and the Regional Filaria Training & Research Center (RFT&RC) at Kakinada. The range of highest mf rates was recorded from the rural areas Peddapuram (10.14%), followed by Pithapuram (8.44%), Tanuku (8.34%), Palakollu (7.29%), R.C.Puram (6.97%), and Amalapuram (5.17%). The highest microfilaria rates were observed among the male community, except in Mandapeta, and Kakinada. This was because of the harvest season, when most male workers spent considerable time in the field. It is evident from earlier studies that in general, the male population has shown a higher mf prevalence than females, due to greater exposure to mosquito bites. Hydrocele is the predominant sign of filariasis in endemic areas of *Wuchereria bancrofti* in the Indian Sub-continent, Southeast Asia, Africa, and Latin America (Beye and Gurian, 1960; Dondero *et al*, 1976; Hawking, 1976; Sasa, 1976; Rajagopalan *et al*, 1981; Ramaiah 1989; Estamble *et al*, 1994; Simonsen, 1995).

Microfilaria infection has steadily increased along with the age group, and maximum prevalence was observed in the 11-30 age group, which was similar to previous studies (Rao *et al*, 1980). We recorded the highest mf rates in the >60 year group, which is quite uncommon. This demonstrates the persistence of parasite load in the community due to lack of awareness of the disease.

The mf counts are considered an important parameter to assess the transmission level in the host population (Vanamail *et al*, 1990) and the mf intensity is the most useful tool for understanding the transmission dynamics in filarial endemic areas (Hariston *et al*, 1968). The highest microfilaria count, 281, was recorded from a 10-year-old boy from Pithapuram, East Godavari District, followed by 194 from a 13-year-old girl from Tanuku, West Godavari District. Similar studies were also conducted in Pondicherry, and highest mf count recorded was 280 (WHO, 1982).

Filarial infection has been recognized as an important cause of morbidity in children (Ananthakrishnan and Das, 2001). So, to assess child morbidity due to filariasis, quantitative studies were conducted in the group aged <15 years, the mf rate has increased along with the age group.

The 6-7, 9-10, 11-12 and 13-14 age groups showed highest rates of mf followed by 5-6 and 10-11 age groups.

In conclusion, Bancroftian filariasis is considered an urban disease that spreads from urban to rural areas (Anonymous, 1961; Hawking, 1973), and which is most prevalent in rural areas. The high mf prevalence recorded in some rural areas may be due to natural changes, improper drainage systems, prolonged exposure to mosquito bites, lack of awareness of the disease pattern, etc. The prevalence of mf in the rural population has shown a trend to decrease when compared with statistics of the last 3 decades. This clearly shows that mass drug delivery (MDD), which has been implemented in East Godavari district, may be a major reason for the decrease in mf. If MDD is strictly implemented for another period of 3 years, the mf load in the rural population can be reduced.

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