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Role of community empowerment in the elimination of lymphatic filariasis in south India

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Abstract. The World Health Assembly in 1997 has targeted the elimination of lymphatic filariasis (LF) by 2020, and in India the goal has been set for the year 2015 by annual single dose mass drug administration (MDA). The role of community empowerment in enhancing the drug compliance and bringing out the function of various methods used to disseminate the information on MDA to the villagers is focused**.** A longitudinal survey was carried out in nine villages in Tirukoilur block of Villupuram district, Tamil Nadu for filarial infection variables like microfilaraemia, antigenaemia, transmission indices before and after each MDA, to determine the drug impact. Prior to each MDA, health education campaigns with different approaches were carried out with community as the leading player. These IEC approaches were assessed after 4 MDAs for its perception in the community. After four rounds of MDA, there was a significant decline in the filarial infection variables. The microfilaraemia and antigenaemia declined by 59% and 67% respectively. The transmission indices lowered by 89% and 94% (in resting and landing catch of mosquitoes respectively). The decline in these variables, with a drug consumption rate of >80% was achieved due to the effective IEC campaigns prior to each MDA. After 4 MDAs almost 97% of the respondents were aware of lymphatic filariasis. The KAP survey in the rural villages revealed that the dissemination of MDA message through autorickshaw was the most effective, followed by school students' rally. Empowerment of community through the members of women self help groups and school students were observed to be integral to mass drug administration campaigns for the enhancement of drug compliance, thus leading to LF elimination.

INTRODUCTION

As part of the Global Programme for Elimination of Lymphatic Filariasis (GPELF), annual single-dose mass drug administration (MDA) is being implemented in filaria endemic countries. The principal strategy planned to eliminate lymphatic filariasis (LF) is to interrupt transmission of infection for four to six years, which is equivalent to the fecundic life span of the parasite (Ottesen *et al.*, 1999; Ottesen, 2000). Clinical trials have demonstrated that single-dose treatment significantly suppresses blood microfilaraemia (Ottesen *et al.*, 1997) and similar results are also expected at the community level. The recommended treatment regimens are combinations of diethylcarbamazine (DEC: 6 mg/kg) and albendazole (ALB: 400mg) or of ivermectin (IVM: 200 mcg/kg) and ALB, administered yearly in a single dose were shown to be effective in reducing Mf intensity in several trials (Gyapong *et al.*, 2005). It is postulated that four to six cycles of annual treatment and interruption in transmission might facilitate LF elimination.

It is very much essential to enhance the drug compliance rate in order to achieve a better reduction in infection rates, as the percentage of population treated is an important determinant of LF elimination (Plaisier *et al.*, 2000). A mid-term evaluation of the MDA programme in Madhya Pradesh, India, observed that MDA is restricted to tablet distribution only and the major issues

of implementation in compliance, health education, side effects etc. were not being given due attention (Lahariya & Mishra, 2008). Community must play a foremost role in making any community-based disease control programme successful. Thus, empowerment of community is integral to mass drug administration campaigns which enhance the drug coverage.

In the present communication, the effect of four annual MDAs with DEC+ALB on the filarial infection parameters, and the role of community empowerment in enhancing the drug compliance is highlighted. The effectiveness of various methods used to disseminate the information of MDA to the villagers is also focused.

MATERIALS AND METHODS

Study area and design

A longitudinal filariometric surveys were conducted in 9 index villages of Tirukoilur block, Villupuram district, TN (Tirukoilur - latitude: 11°57'00"; longitude: 79°12'00") (Mani *et al.*, 2002). All the villages were within a radius of 25km and have similar ecological features. Agriculture is the predominant occupation in the study communities, and most of the houses have mud walls and thatched roofs. Wastewater from the households is collected in cess pits, where it stagnates and converts into the main breeding place for *Culex quinquefasciatus*, the vector of bancroftian filariasis parasites. The climate in the region is dry and hot with moderate rainfall during September-December. Survey was made in ten per cent of the households (by simple random sampling method), in each index village to determine the prevalence of microfilaraemia (MFP) and antigenaemia (AGP) (Rajendran *et al.*, 2002). The ethical committee of Centre for Research in Medical Entomology (Indian Council of Medical Research), Madurai, India approved the study design, as per the national guidelines.

Mass drug administration

Four annual, single dose MDA with DEC+ALB was carried out each in 2001, 2002, 2003 and 2004 in the entire block consisting of 98 villages. All the villagers (except children aged <2 years and pregnant women) were targeted for drugs. Each MDA programme was implemented after an extensive IEC campaign by the state health department with additional inputs from researchers.

Health education and advocacy campaign prior to MDAs

To create awareness among the public, various IEC activities were carried out by the researchers in coordination with the Tamil Nadu Public Health Department. The public health personnel, NGOs and Filaria Prevention Assistants (FPAs) were involved to convey the MDA message to the villagers during their household visits. In addition, researchers also took active role in disseminating the IEC message through school student's rallies, canvassing in auto-rickshaw etc.

(i) Role of Medical Officers

A meeting with all the Primary Health Centre Medical Officers (MOs) headed by the Deputy Director of Health Services, Kallakurichi was held to solicit their active participation in the MDA programme, to achieve the goal of LF elimination.

(ii) Messages through Media

A 3-minute video programme on MDA by DDHS, Kallakurichi HUD, was recorded, and this programme was shown by the local cable TV network in the villages, during the peak viewing time (feature film show). MDA messages were published in the regional languages of all leading local newspapers.

(iii) Contribution of NGOs in disseminating IEC messages

The local Non-Government Organizations (NGOs) *viz;* Lion's club, Rotary club, *Thirukkural mandram*, disseminated MDA messages by printing pamphlets and badges with MDA messages. The NGOs took active role in the preparation and distribution of various IEC materials like cinema slides, pamphlets and announcement through audio system prior to the MDA programme. Two

volunteers accompanied the auto-rickshaws (three wheeler vehicles) with audio systems for canvassing the MDA messages and to distribute the pamphlets to all the villages. They displayed posters of MDA in all the prominent places of the village.

(iv) School children rallies

In each village, one or two elementary schools (Std I to Std VIII) exists. Head masters (HMs) of these schools were involved in the dissemination of MDA messages prior to each MDA. During the school HM's monthly meeting at Block Development Office (BDO), a seminar was conducted to explain about the problem of filariasis in their area and the objective/goal of the national filariasis elimination programme. The HMs were asked to emphasize the message of the MDA programme daily in their morning prayer sessions. The HMs were provided with badges (bearing slogans) and the pamphlets for distribution amongst the school students. Each student was provided with a badge (donated by Rotary club), which was pinned on to his or her uniform, and students were advised to wear the badges every day for a week while attending the school. The HMs conducted students' rally in their respective villages, 2-3 days prior to the MDA programme. A "Certificate of appreciation" was issued to all HMs.

(v) Role of Self Help Group members (SHGs)

In each village, there are 2 to 3 Women SHGs (*Mahila sangham*) each representing 20-30 members, met weekly in their own village for discussing the day-to-day problems. Awareness of MDA programme, possible side effects and side reaction management were dealt in the meeting participated by the heads of each group from different villages. The SHGs were asked to spread MDA message to their group members and to all the family members in their neighborhood. They were asked to accompany the Filaria Prevention Assistants (FPAs) during the drug distribution to ensure that all the residents in their respective villages consumed the drugs distributed to them. During their meeting, SHG members enquired about the various problems encountered in their villages during the MDA, especially the side reactions after drug intake. The availability of medical assistance in their villages to manage the side reactions were explained to them.

Drug compliance / Adverse reaction

After each MDA, survey was carried out in 10% of the household of each village to assess the drug coverage and compliance. Additionally enquiry was made regarding the intestinal worm expulsion. During each survey a medical officer accompanied the team and he managed the adverse reactions.

KAP survey

A KAP survey was conducted with the study subjects after the fourth MDA programme. The questionnaire was prepared in the vernacular language (Tamil), and included open-ended questions which were prepared in consultation with sociologists and health educators. Questions were asked concerning filariasis, filariasis elimination programme at Tirukoilur, and MDA. People were enquired about the source of MDA message, and the dissemination method influenced them the most. Additional questions were asked about the MDA organization, their participation, and the management of adverse reactions. Villagers were enquired about the geohelminth infections and their awareness regarding the effectiveness of MDA on the worm burden.

Evaluation of filarial infection in human subjects

In each microfilaraemia survey, the finger prick method was used to collect 20µl blood between 21.00 and 24.00hr; and 100µl of blood from the same individual was used to estimate antigenaemia using ICT card test (NOW® ICT-BINAX from USA) (Rajendran *et al.*, 2002, 2006). On each occasion, about 450-650 subjects in childhood (2-9 years) and young adulthood (10-25 years) were screened. The post-MDA assessments were carried out one year after each MDA.

Survey of soil transmitted helminth infection

To determine the impact of antifilarial drug *viz;* DEC+ALB on the prevalence and intensity of soil transmitted helminthes, stool samples from school children of 9 and 10 year old in the 9 index villages were screened before, 3 weeks, 6 months and 12 months after each MDA. The WHO recommended procedure of Kato-Katz cellophane quantitative thick smear technique was employed to estimate these infections.

Data analysis

The statistical packages SPSS/PC+ version 11.0 and Epi Info version 6.0 (CDC, Atlanta) were employed to assess the impact of four MDAs by comparing the prevalence and GMI of microfilaraemia and the AGP between pre-treatment (March 2001) and post-treatment periods for two age classes of 2-9 and 10-25 years. The significance of changes in the AGP after 4 MDAs was estimated by χ^2 analysis. Microfilarial geometric mean intensities (GMIs-Mf) were calculated as antilog $[(\Sigma \log (x + 1))/n] - 1$, with x being the number of Mf/20 µl of blood and n the number of individuals examined. The data of the KAP survey was digitalized and analysed using SPSS *ver* 11.0.

RESULTS

Community drug compliance and adverse drug reactions (ADR)

After MDA in March 2001, a total of 703 HHs were surveyed in 9 index villages to obtain the awareness and drug consumption pattern by them. It was observed that 87% of the HHs had accepted the tablets but consumption was only 52%. A separate survey on drug consumption in 2-5 year-old children revealed 53% compliance. Survey carried out at the family level indicated that expulsion of worms was reported by 4% of the adult respondents. On the other hand a survey at school level indicated a greater proportion (53.5%) of school children perceived the benefits of worm expulsion. After 4 MDAs, the drug consumption increased to 88%. The adverse drug reactions during MDA I was 10.6% which reduced to 1.06% (n=1483) during MDA IV. The reactions were mild which included fever, head ache, myalgia, which was managed by the Medical Officers.

Awareness of filariasis and MDA

A KAP survey conducted after the fourth MDA involved 444 households. Almost 97% of the respondents were reported to be aware of LF. Although the cause of the disease was not known to many (98%) (Table 1), it was interesting to note that 48% of the HHs were aware that mosquito bites are responsible for disease transmission. Among the respondents 96% were aware of the MDA programme while only 2.7% knew the name of the drug being distributed. With respect to the helminth infection, the knowledge was very poor and 71% of the respondents did not have any information on them.

Perception of community regarding source of IEC messages

The most common reported sources of information about the MDAs were through autorickshaw-mediated message dissemination (45%). Other sources of information dissemination reported were through pamphlets (18%) and school students (13%), while through television, newspaper and health worker was 2-6%. The rally by school students in their respective villages prior to MDA was effective, especially in the rural settings. The MDA messages on television and newspapers were widely present, but in the rural setting like the present study, these were found to be less effective.

Filarial infection variables in the community after four MDAs

The prevalence and geometric mean intensities of microfilaraemia (MFP & GMI) for different age groups was observed to decrease which each MDA. The microfilaraemia prevalence (MFP) gradually declined from 5.21% to 2.12% after 4 MDAs (Table 2, Fig. 1), with an overall percentage reduction of 59.3%. The trend for geometric mean intensity (Mf) was similar. The regression line showed a downward slope (b= -0.0238) with each MDA. The equation of the line was $Y = 0.134 - 0.0238X$ (R^2 =

Table 1. Knowledge on lymphatic filariasis (LF) in study area (n=444) after four MDAs in Tirukoilur, Tamil Nadu

Variables	Response	% of respondents
Awareness on LF	Aware	97.1
	Unaware	2.9
Causes of LF	Parasitic worm	0.7
	Virus & Bacteria	1.5
	Don't know	97.8
Awareness of LF transmission	Mosquito bite	47.5
	Water contamination	3.2
	Others	7.2
	Not known	42.1
MDA programme	Aware of drug distribution	96.2
	Aware of drug name	2.7
Knowledge on cause of geohelminth infection	Eating of unboiled rice	22.1
	Eating of decayed food	5.8
	Environmental pollution	1.1
	Do not know	70.9

Table 2. Impact of four annual single dose of MDA with DEC+ALB on microfilaraemia in two age groups

Age groups (years)	Mf prevalence			Mf intensity (GMI/sampled)		
	Pre-treatment (March 2001)	Post treatment IV (September 2005)	% reduction	Pre-treatment (March 2001)	Post treatment IV (September 2005)	% reduction
2–9	2.07 (290)	0.84 (359)	59.42	0.0719	0.0200	72.18
10–25	10.53 (171)	3.95 (227)	62.49*	0.2910	0.0884	69.62
2–25	5.21 (461)	2.12 (586)	59.31*	0.1484	0.0478	67.80

* Change in values was significant at $P<0.05$

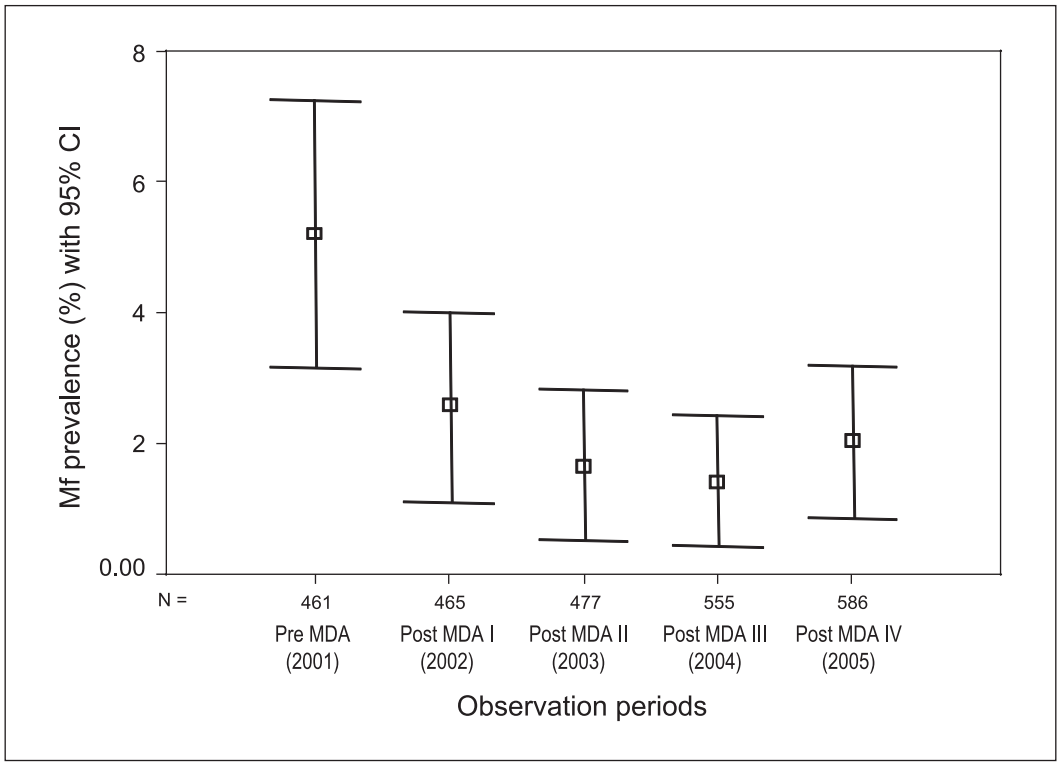

Figure 1. Prevalence of microfilaraemia in 2-25 years after each MDA.

Table 3. Impact of four annual single dose of MDA with DEC+ALB on antigenaemia in two age groups

Age groups (years)	Pre-treatment (March 2001)	Post treatment IV (September 2005)	% reduction
2–9	12.76 (290)	4.46 (359)	65.05
10–25	29.24 (171)	8.33 (227)	71.50*
2–25	18.87 (461)	6.18 (586)	67.23*

Number screened in parenthesis
* Change in prevalences was significant at P<0.05

0.57). The GMI (Mf) was 0.0477 during post MDA IV, with an overall reduction of 68%.

The prevalence of antigenaemia in 2-25 years was 18.87% during the baseline (March 2001), which declined to 6.18% after 4 MDAs (Table 3). After each MDA the decline was gradual (Fig. 2). The impact of 4 MDAs on the prevalence reduction in the 2 age groups was similar (65% - 71%).

Reduction in soil transmitted helminth infections

In the baseline survey carried out in March 2001, 60.4% of the students harboured one of the three intestinal helminths. *Ascaris* was the predominant species in 54% of the students followed by hookworm infection (17%); and *Trichuris* were in less percentage (5%).

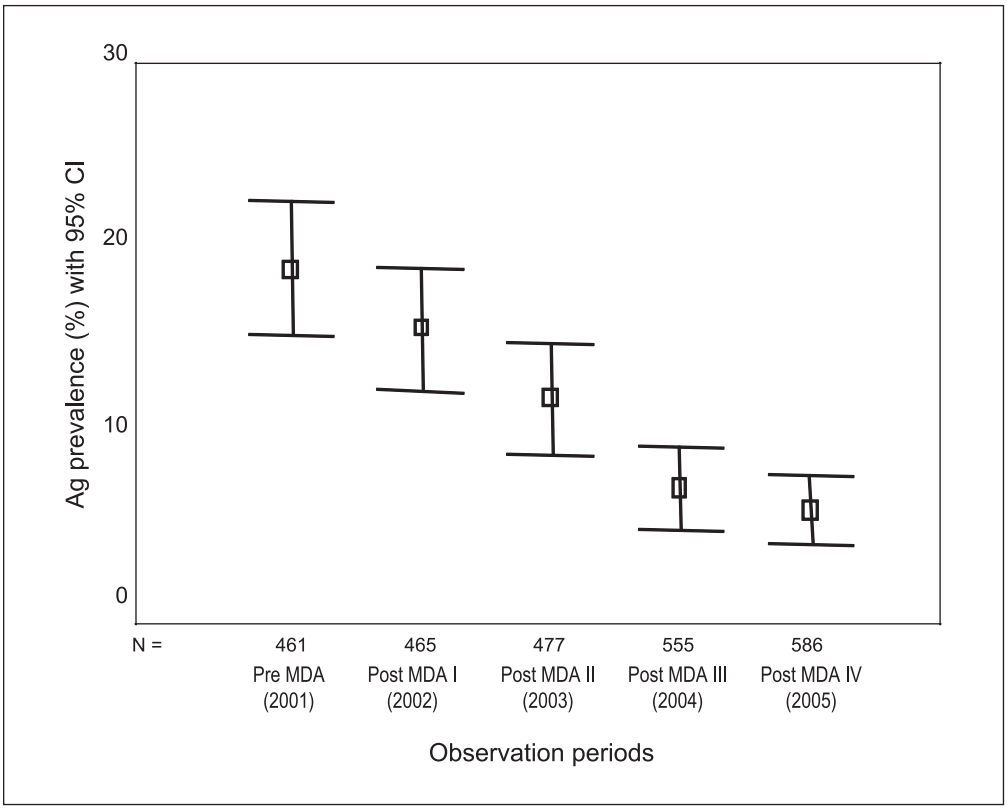

Figure 2. Prevalence of antigenaemia in 2-25 years after each MDA.

After 4 MDAs there was 78% decline in the prevalences of any of the 3 helminths (P<0.0001), which was statistically significant. After each MDA, a marked reduction was observed in helminth infection during 3 weeks post treatment. At 6 months and one year post treatment, the infection was found to increase moderately. The overall percentage reduction after 4 MDAs for individual helminthes was 79%, 87% and 67% for *Ascaris*, hookworm and *Trichuris* respectively (P <0.05) (Table 4). The decline in the mean egg intensity was much higher. There was 98% reduction (P<0.001) in GMI (epg) for any of the 3 worms in October 2005, one year after MDA IV (Fig. 3).

DISCUSSION

The GPELF programme aims at reducing microfilaraemia, for which an effective coverage and compliance of drug consumption should reach critical levels of 80 - 90% (Ottesen, 2000). This level of high drug compliance can be achieved only with effective IEC campaign. The principle used in educating and motivating people towards community empowerment had emerged as a practical reality. Community empowerment is the ability for a group to empower others to create a chain reaction that translates to others by multiplying and expanding that knowledge until an entire neighborhood, community or society becomes self-sufficient. Awareness was the mainstay of the success of the program. The awareness programme brought together NGOs, school teachers, local administrative people like BDOs, Panchayat leaders etc. During a KAP survey (carried out after 4 MDAs), it was observed that the MDA message dissemination through auto-rickshaw followed by students rally were found to be the most effective means. Lower

Table 4. Change in the prevalence and intensity of soil transmitted helminths (STHs) after 4 annual MDAs

Helminths	Prevalence (%)			Egg Intensity (GMI)		
	Pre MDA*	Post MDA IV**	% reduction	Pre MDA*	Post MDA IV**	% reduction
Ascaris	54.83	11.65	78.75	23.51	0.60	97.45
Hookworm	16.51	2.2	86.67	1.48	0.09	93.92
Trichuris	4.67	1.54	67.02	0.27	0.07	74.07
Any 3 worms	60.44	13.41	77.81	36.45	0.74	97.97

* February 2001
** October 2005

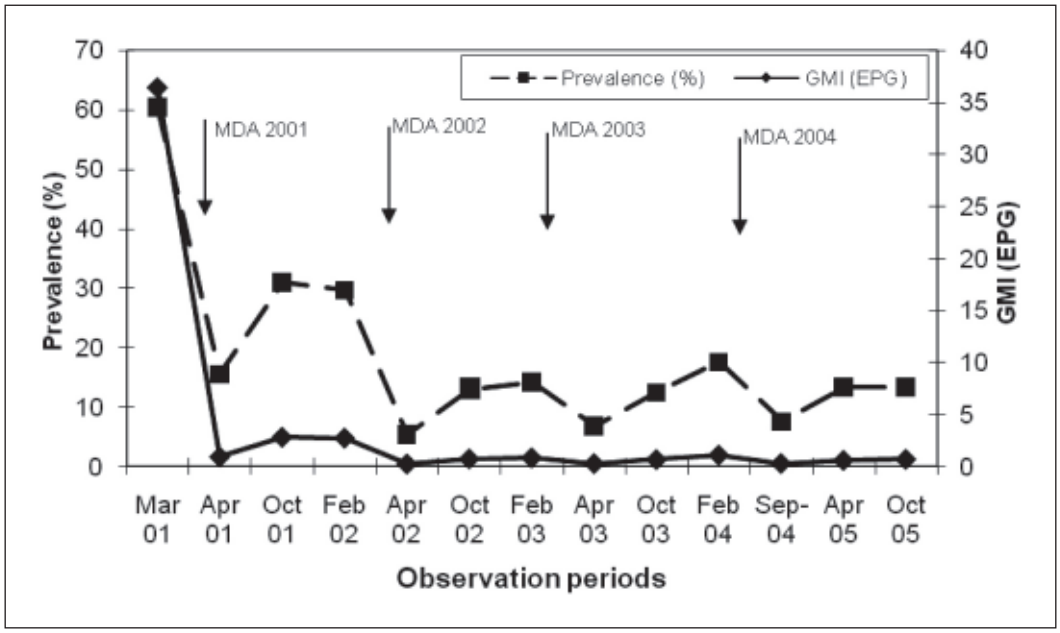

Figure 3. Impact of MDAs on STHs infection.

levels of knowledge about filariasis have been reported earlier in India (Ramaiah *et al.*, 1996; Babu & Kar, 2004) and in Malaysia (Riji, 1986). In Kerala, India, it was pointed out that the main reason for non-compliance of the drugs is that the community was not convinced about the programme and the knowledge of the medical and para-medical workers was certainly a factor in the success of programme implementation and is vital (Showkath *et al.*, 2008). In our study after 4 annual MDAs, 97% of the community was aware of LF, and a comparable percentage of the respondents were aware of the MDA programme. But only half the respondents knew that the mosquito was the transmitting agent for LF parasite. Hence extra emphasis should be placed on the importance of mosquito in LF transmission during the health education campaigns.

Significant decline in the prevalence and intensities of microfilaraemia were observed after 3 or 4 rounds of MDA in Egypt, Samoa, Vanuatu and Zanzibar (Molyneux, 2003). The drug combination DEC+ALB showed a decline in Mf intensities (Fox *et al.*, 2005), as observed in the present study, which demonstrated significant reductions in MFP and GMI after 4 MDAs. It was reported (Michael *et al.*, 2006) that, optimal drug coverage required to achieve <0.5% Mf prevalence threshold within six years would be around 75% at a pre-control Mf prevalence of 5%. In the present study, the pre control Mf prevalence was 5.2%, which declined to 2.4% after 4 MDAs using DEC+ALB. The percentage drug compliance was >80% during 2nd, 3rd and 4th MDA showing an increase from 53% recorded in the first MDA. With further MDAs the prevalence could have reduced to <0.5%, but due to administrative reasons MDAs were not carried out during the next two years in the study area. Hence the continuity of annual MDAs is crucial to obtain the cumulative impact of MDAs on the filarial infection variables and thus to achieve the goal of LF elimination. The overall decline of 59% and 67%, respectively in microfilaraemia and antigenaemia prevalences could be attributed to the considerable effort put into the IEC campaign prior to each MDA.

During the KAP survey carried out in the villages, majority of the respondents were not aware of the cause of intestinal helminth infection. It is worth including the additional benefits of reducing the helminth infection by MDA in the IEC campaigns, especially during the meetings with SHGs, school Head Masters, local administrative authorities like panchayat leaders etc. The drug compliance can be enhanced if these messages can reach the household level through women and children. In Nigeria, the school health club increased adult knowledge about onchocerciasis and its treatment (Shu *et al.*, 2000). Schoolchildren were able to supplement the information, education and communication (IEC) aspect of health care delivery in a community. IEC campaign should include the local cultural practices persisting in the place to make it more effective. In Milne Bay province (Selve *et al.*, 2000), PNG, majority of the island's population were Christians and hence passages from the Bible were used as a framework for IEC, which demonstrated greater impact in reducing filarial infection in the rural community.

Community is the prime advocate for its own health, rather than a mere beneficiary of health services and in onchocerciasis control programme it was observed that community ownership was among the important determining factors of sustainability of community-based programmes (Amazigo *et al.*, 2007). This consideration must influence the way interventions are designed, planned, implemented and evaluated, jointly with the community. People who have LF manifestations are important stakeholders because of their first-hand experience of human, social and health-related consequences of the disease. Hence during any IEC campaigns/meetings at village level, involvement of these affected persons can explain in simple terms the severity of the disease. The problem of long distance migrant population, forming about 25% of the community, is yet another aspect to be considered to achieve higher drug compliance, which has been emphasized (Sunish *et al.*, 2003).

Effective drug compliance could be achieved by community empowerment which enables local citizens to lead collaborative efforts involving education, health, and human service programs on behalf of other citizens residing in the area. Research on large-scale Mectizan use for the control of onchocerciasis illustrated the importance of evidence-based results, the need for social science in community-driven endeavours and operations research, and the value of empowering communities as allies in disease control (Boatin, 2008). In African Programme of Onchocerciasis Control (APOC) the goal was achieved, *via* a public-private partnership, using a strategy, of community-directed treatment (CDT) based on the empowerment of target community. A key component of the Programme was the co-implementation of onchocerciasis control

with other health interventions that was delivered at the community level. This approach has proved highly effective, leading to higher levels of therapeutic coverage for onchocerciasis control as well as improved delivery of other services, especially vaccination programmes (Amazigo, 2008). The IEC campaign should be channelized through appropriate groups involving effective tools which are area specific, like the use of auto-rickshaw and student rallies for dissemination of MDA messages to make the GPELF programme more successful.

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