

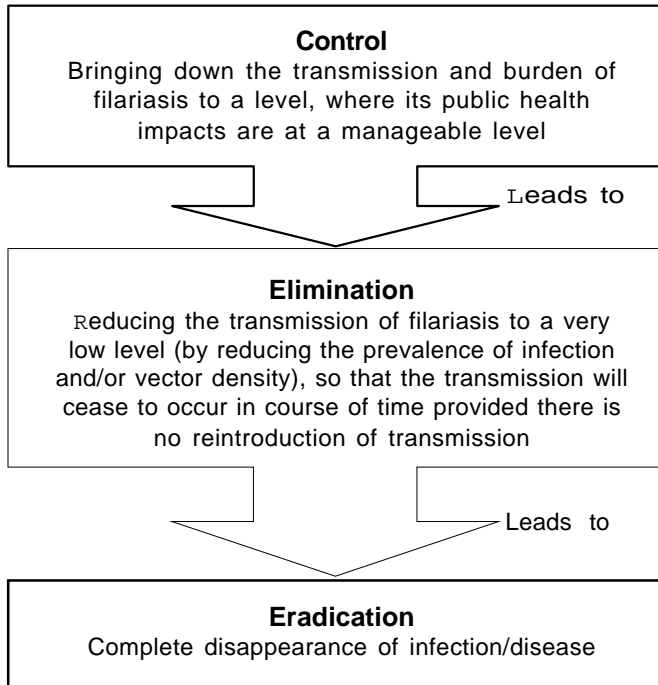


PROSPECTS OF ELIMINATION OF LYMPHATIC FILARIASIS IN INDIA

Lymphatic filariasis is a vector-borne parasitic disease caused by three lymphatic dwelling nematode parasites viz., *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. The disease manifests as progressive lymphoedema leading to disfiguring elephantiasis in both genders, hydrocele – the predominant manifestation in males or loss of respiratory function due to tropical pulmonary eosinophilia (TPE)^{1,2}. Filariasis patients suffer from episodic adenolymphangitis (ADL), which causes acute suffering and incapacitation^{3,4}. The other health problems due to filariasis include renal disease, arthritis, endomyocardial fibrosis, etc.^{2,5,6}. Filariasis is considered a hidden disease as lymphoedema is the only visible manifestation and hydrocele, the predominant manifestation in males as also other presentations are not obvious. Filariasis is a disease of the poor and is a cause and effect of poverty. The majority of the people at risk of filariasis live in rural areas. Poor sanitary conditions associated with low socio-economic status of the community make the environment conducive for proliferate breeding of vector mosquitoes facilitating transmission. While year round transmission of filariasis occurs in urban and semi-urban areas, transmission is seasonal in rural areas. The mosquito vectors involved in filariasis transmission include different species of *Culex*, *Aedes*, *Mansonia* and *Anopheles* in

the world⁷. In India, *W. bancrofti* is transmitted by the ubiquitous mosquito, *Culex quinquefasciatus*⁸; and *B. malayi* is transmitted by *Mansonia* mosquitoes (*M. annulifera*, *M. uniformis*, and *M. indiana*)⁹. *Aedes (Finlaya) niveus* is the vector of subperiodic *W. bancrofti* in Nicobar Islands¹⁰. Filariasis has been identified as one of the six diseases (among over hundred considered), which could be targeted for elimination / eradication based on considerations that human beings are the only reservoir of infection, diethylcarbamazine (DEC) is an effective drug acting on the parasite (without report of resistance in past 5 decades) and mass annual single dose community drug administration with selective vector control could result in the effective elimination of infection by interruption of transmission¹¹. This led to the articulation of the World Health Assembly Resolution for the global elimination of lymphatic filariasis¹². Based on this, the WHO has called for targeting filariasis elimination by 2020. Since India is the largest filariasis endemic country in the world, the prospects of global elimination of filariasis will very much depend on its success in the Indian sub-continent. This write-up describes the filariasis situation in India, the progress in research in filariasis which has led to the optimism for its elimination; and the major opportunities and challenges ahead in achieving the goal of elimination of filariasis in India.

The terms elimination, eradication and control need to be understood in proper perspective. The eradication is complete disappearance of infection/disease. Achieving elimination is going beyond control and reaching a situation where eradication is possible⁶.



CURRENT FILARIASIS SITUATION

According to the estimates made in 1995, globally, there are nearly 1,100 million people living in areas endemic for lymphatic filariasis and exposed to the risk of infection; and there are 120 million cases of filariasis, either having patent microfilaraemia or chronic filarial disease¹³. *W. bancrofti* accounts for approximately 90% of all filariasis cases in the world, followed by *B. malayi* and *B. timori*. *B. timori* is restricted to few islands in Indonesia. India contributes about 40% of the total global burden of filariasis and accounts for about 50% of the people at risk of infection. Recent estimates have shown that out of the 25 states/union territories in India (before bifurcation of states of Bihar, Madhya Pradesh and Uttar Pradesh), for which surveys were carried out, 22 were found endemic for filariasis, and nine states (Andhra Pradesh, Bihar, Gujarat, Kerala, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal) contributed to about 95% of total burden of filariasis. A total of 289 districts in India were surveyed for filariasis until 1995; out of which 257 were found to be endemic. In India a total of 553

million people are at risk of infection and there are approximately 21 million people with symptomatic filariasis and 27 million microfilaria carriers. *W. bancrofti* is the predominant species accounting for about 98% of the national burden, widely distributed in 17 states and 6 union territories. *B. malayi* is restricted in distribution, with decreasing trend. An overview of the traditional endemic foci shows concentration of infection mainly around river basins, and eastern and western coastal parts of India (Map)¹⁴.

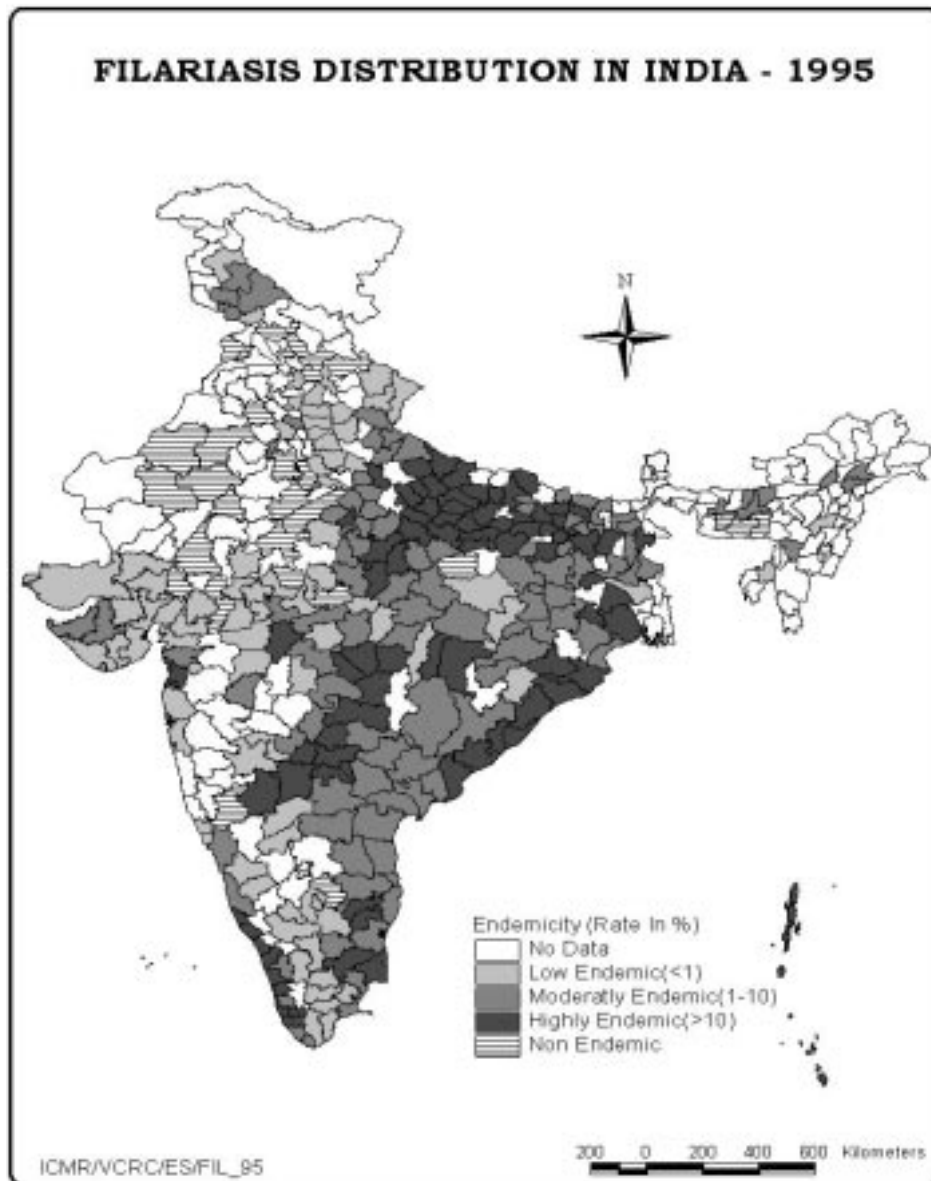
FILARIASIS CONTROL UNDER THE NATIONAL PROGRAMME IN INDIA

A National Filaria Control Programme (NFCP) was launched in India in 1955, based on the pilot scale trials carried out by the Indian Council of Medical Research (ICMR) in Orissa. The Programme has been reviewed from time to time by the ICMR and the strategy modified on the basis of recommendations⁸. Currently, the NFCP covers a population of about 40 million (7% of the population at risk), restricted to urban areas only. The current strategy includes selective chemotherapy (DEC 6mg/kg/day for 12 days) by detection of parasite carriers by night blood survey and larval control of vector mosquitoes. Although this strategy has resulted in the reduction in filariasis prevalence in areas where it has been implemented, it is inadequate for sustained control leading to elimination. The major constraints of the NFCP are that it does not cover the vast majority of population at risk residing in rural areas and that the strategy demands detection of parasite carriers by night blood surveys, which is less sensitive, costly, time consuming and poorly accepted by the community¹⁵. It is thus pertinent that any proposed elimination strategy should be able to get over these constraints.

RESEARCH FINDINGS AND CHALLENGES FOR THE DEVELOPMENT OF FILARIASIS ELIMINATION STRATEGY

Socio-economic Burden of Filariasis

Filariasis causes long-term suffering and morbidity as well as high social and economic burden to individuals, communities and the nation¹⁶⁻²¹. Since filariasis is not a direct cause of mortality, it does not get due priority by the planners and policy makers. It has been estimated that the annual economic loss due to filariasis is close to 1 billion US \$(approximately Rs. 5000 crores) for the country²⁰. Estimation of the socio-economic burden of the disease is important not only to understand the burden



and the community (consumers) to accept the programme and create a felt need for compliance.

Filarial Disease and Pathogenesis

Morbidity management/control is an important component of filariasis elimination. It is essential to understand the disease spectrum and pathogenesis in order to develop appropriate morbidity management strategies. Filariasis results in hidden infection; as most asymptomatic carriers have sub-clinical lymphatic damage²² and hydrocele, the predominant manifestation of bancroftian filariasis²³ is also not revealed normally, unless it results in gross scrotal enlargement. Children show high prevalence of filariasis antigenaemia^{8,24} making them important target for intervention.

Recurrent attacks of episodic adenolymphangitis result in progression of chronic lymphoedema from early reversible to late elephantiasis^{1,23,25}. Thus prevention of acute disease will not only bring down the suffering of patients, but also check progression of lymphoedema to disfiguring stages. Bacterial infections, particularly due to beta haemolytic streptococci are

important in the causation of acute episodic ADL attacks²⁶. In filarial lymphoedema, there is progressive persistent inflammation (chronic dermatitis) as a result of invasion of bacteria in the skin. Parasite *per se* has little role if any, in the skin changes^{27,28}. These observations are essential to formulate strategy for morbidity prevention, development of principles of disease management, empower the diseased persons for self help and develop modalities for networking healthcare facilities by strengthening the existing filariasis clinics through training (human resource development) and modernization of treatment facilities for individual patient care leading to enhanced community acceptance of the elimination programme.

on individual patients and their families, but also for providing information crucial for developing advocacy material for mobilization of resources and commitment for its control. As the estimates made so far are based on limited surveys, it is necessary to work out the national burden of filariasis using appropriate indicators (like Disability Adjusted Life Years - DALY, Quality Adjusted Life Years - QALY and others) in order to compare the burden across the diseases to facilitate the planners to prioritize diseases for control. These findings will be useful in setting up priority for filariasis against other diseases, preparation of advocacy materials for resource mobilization, generation of political will, sensitization of policy makers, planners, programme managers, media

Diagnostics

Diagnosis of filariasis is important for programme managers for situation analyses, for monitoring and evaluation of intervention measures; and for physicians in case detection and treatment/management. The problems related with the method of night blood smear examination, used under the current NFCP have already been highlighted. A need has been felt for the development of rapid, specific, sensitive and reproducible diagnostic methods for field application for the detection of infection (microfilaraemia or adult parasites) both in humans and in vector mosquitoes. A rapid day blood immuno-chromatographic card test (ICT) for detection of infection, developed elsewhere²⁹ has been found highly specific and more sensitive in India also in comparison with the night blood smear examination³⁰. Although it is costlier, it has the advantage of on the spot day blood detection of parasite carriers in large numbers (compared to the night blood smear examination). By appropriate sampling design, if the sample size could be minimized, it can be useful for the detection of infection in individuals or for delimitation of areas or for evaluation of interventions. The antigenemia detection has been recommended for certification of elimination by using a lot quality assurance sampling (LQAS) design³¹⁻³². The other newer diagnostics include Og_4C_3 antigen assay in human whole blood and sera³⁰ and DNA probes for infection detection in vector/man³³⁻³⁶.

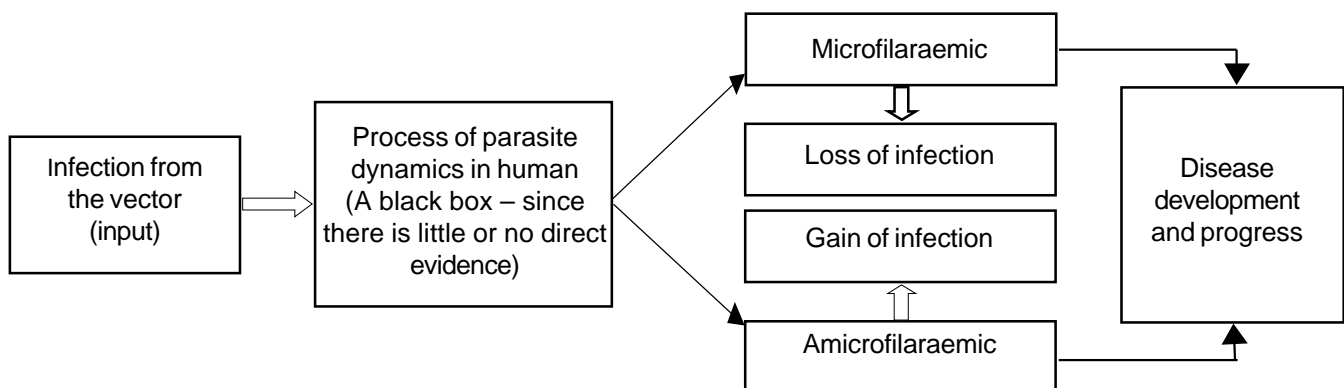
Currently the vectors are collected and dissected manually for entomological parameters. Thus rapid and sensitive methods are necessary for overcoming these difficulties. A mosquito collection trap has been developed³⁷ to overcome the problem of manual collection. The challenge ahead is in proper operationalization of these diagnostic and collection techniques in large-scale control programmes.

The development of new diagnostic tools are useful for the rapid detection of endemic areas and mapping, monitoring and evaluation of interventions, sensitive tests such as ICT kits are useful for rapid verification of attainment of end point of elimination through cost-effective sampling designs. However, there are challenges to be addressed which include identification of parasite stage specific diagnostic tools, methods to sample vector population for xenodiagnosis and simple and cost-effective methods of rapid detection of endemic areas.

Decision Support Tools

Tools for decision support are crucial for the programme managers. Considerable efforts have been made in the development of these in the past decade. Rapid assessment procedures (RAPs) to measure the prevalence of filarial disease/infection in an area have been developed and found useful for delimiting filariasis endemic areas³⁸. Physical examination of adult males by trained health workers is most useful to assess the hydrocele prevalence. Methods for rapid epidemiological mapping of filariasis (REMFIL) for rapid delimitation and stratification of filariasis endemic areas using grid sampling procedure have become available using fixed grid sampling of 25 kms³⁹⁻⁴⁰. However, it is necessary to optimize the size of the grid or to develop alternate sampling designs in order to get the real situation of the distribution of filariasis. The filariasis distribution map of India developed on GIS platform using historical database (NFCP and other published data) may be useful in prioritizing areas for intervention¹⁴.

Mathematical models have been developed to predict the epidemiological trends of infection and disease and the effect of interventions and these models are based on the following conceptual framework:



Mathematical models are important for diseases like filariasis where several aspects of dynamics of infection, transmission and disease make the predictions of intervention measures difficult. The models provide a tool to solve several of these questions for which direct measurements cannot be done. Parameter estimations viz. estimation of fecundic life span of parasite⁴¹, understanding the progression of infection and disease through stages, and understanding the distribution of infection and disease at household and community level (clustering phenomenon) are important outcome of development of mathematical models. Models are also useful for prediction of outcome of different intervention measures in different endemic/epidemiological situation.

Two mathematical models namely EPIFIL and LYMFASIM developed by the Vector Control Research Centre (VCRC), Pondicherry in collaboration with Oxford University, UK and Erasmus University, Rotterdam respectively are being validated and refined under the field conditions. These models can be used as a decision making tool to select intervention(s) and plan implementation strategies. These can also be used to monitor and evaluate various intervention options⁴²⁻⁴⁴ as a feedback to the programme. A management information system (MIS), which is essential for the programme managers at different levels is also being developed by the VCRC which is expected to be an important decision support tool for situation analysis and for taking corrective measures, so that the intervention reaches the target. Establishment of an epidemiological information system will be useful for rapid dissemination of data and information on key indices. This web based information system and database can be used as a rapid feedback by programme managers and also for planning/replanning intervention measures as well as for monitoring/taking mid course corrective measures. The VCRC has established a website www.pon.nic.in/fil-free for this purpose.

Intervention Tools and Strategies

For filariasis control/elimination, intervention tools are directed either towards transmission control (by targeting parasite and/or vector) or morbidity management for preventing disease progression and reduce morbidity.

Transmission control

Mass drug administration

Mass annual single dose treatment with either a single drug (DEC or ivermectin) or in combination with albendazole is recommended for filariasis control/elimination. Use of DEC fortified salt is another intervention recommended for filariasis control. These drugs reduce parasite load in the community thereby reducing the number of parasites available for the vector population. Consequently, transmission is reduced and hence these measures are considered as transmission control tools. Single dose of DEC, ivermectin or albendazole, and co-administration of DEC either with ivermectin or albendazole in microfilaria carriers has been found to be safe and effective in reducing microfilaria intensity at the end of one year in hospital based studies⁴⁵⁻⁴⁹ (table I). The tolerability and efficacy of drugs and their co-administration were not significantly different between genders and were independent of age. However, the adverse reaction score for albendazole was much less than the other drugs. These results and other community level trials^{50,51} suggest the utility of mass single annual and semiannual dose of DEC in the transmission control. The evaluation of the impact of mass drug administration (MDA) with DEC or ivermectin or both on transmission of bancroftian filariasis is being carried out by the VCRC. The results show that DEC is as effective as ivermectin in drastically reducing the levels of transmission after six successive rounds of mass administration. Four rounds of co-administration of DEC with ivermectin resulted in reduction in the levels of transmission comparable with the six rounds of individual drugs, indicating that the two drugs together are better compared to any single drug. Complete interruption of transmission was not achieved in any of the trials, indicating that six rounds of single drug or four rounds of co-administration of both the drugs are not adequate for achieving elimination^{52,53}. These also suggest that dependence on any single method of intervention is not realistic to achieve the desired results. Interruption in the transmission of filariasis was also possible with DEC medicated salt⁵⁴⁻⁵⁵, although there are many operational problems relating to the distribution mechanisms and community acceptance of DEC medicated salt in different parts of India. To enhance the effect of mass annual single dose treatment, it is essential to identify methods to enhance coverage of drug distribution and community compliance.

Table I. Comparison of efficacy and tolerability of single dose DEC, ivermectin or albendazole alone or in combination on prevalence and intensity of mf of *W.bancrofti* carriers in Pondicherry.

Drug	Dose (Single)	No. of carriers	Adverse reactions		Efficacy (% reduction at 360 days)	
			Incidence (%)	Mean score	Prevalence	Intensity
DEC ⁴⁷	6mg	29	65.5	0.5	8.3	83.7
DEC *	12mg	20	85.0	1.8	52.6	99.5
Ivermectin ⁴⁷	400µg	30	93.3	1.5	34.8	97.0
Albendazole ⁴⁷	400mg	19	42.1	1.8	26.3	94.7
DEC+Ivermectin*	6mg+200 µg	20	90.0	5.6	60.0	99.7
DEC+Ivermectin*	6mg+400 µg	20	100.0	6.7	94.6	99.9
DEC+Albendazole ⁴⁸	6mg+400 mg	18	61.1	6.6	27.8	95.4

Superscript nos. refer to the sl no. in the reference list

*VCRG, Unpublished data;

Dose: DEC mg/kg, Ivermectin µg/kg, Albendazole mg

Vector control

Vector control can bring in sustained effect and hence it can be an integral part of comprehensive filariasis control programme. In situations where transmission interruption is not possible through mass chemotherapy alone, vector control becomes very important. It can be made cost-effective by spatial and temporal targeting (limited to specific areas and season)^{27,56}. Long-term operational effectiveness of integrated vector management (IVM) strategy for the transmission control of bancroftian filariasis was demonstrated in Pondicherry^{5,7-59}. *Bacillus sphaericus*, a bio-control agent in bancroftian filariasis control has shown to be effective in reducing vector density and transmission⁶⁰. The utility of vector control in combination with mass annual treatment needs to be explored. Vector control can be aimed to bring down the vector density below the critical level²⁷ and this can be achieved through selective vector control.

Morbidity prevention/management/control

As many clinically asymptomatic infected individuals have lymphatic abnormalities, they may be at risk of developing the disease. The DEC treatment in these cases is expected to clear the infection and make them infection free, so that it is expected that the pathology will not progress to overt disease. However, scientific evidence needs to be generated in support of this, and currently

this remains more empirical. As already mentioned, the prevention of repeated episodic attacks of ADL will be important not only to prevent sufferings of patients (thus reduce the burden of disease) but also for the prevention of progression of existing chronic disease. Though available data suggest that regular foot hygiene prevents incidence of episodic ADL attacks^{5,46}, there is a need to generate comparative data on foot care versus natural trend of ADL incidence. Co-administration of daflon with DEC results in significant reduction of filarial lymphoedema⁶¹. Surgical management of lymphoedema is indicated in certain specific cases, and prevention of acute attacks after surgery is important for sustaining the benefit of surgery.

Operational Issues

Drug delivery mechanisms are important for mass drug administration. Drug delivery by community (called community directed treatment: COMDT) was compared with the drug delivery through primary health care approach (using the existing health infrastructure). The current experience in rural India suggests that the community acceptance of drug delivery through the existing governmental health infrastructure is higher compared to that by other members of the community²⁷.

A novel drug delivery approach is being evaluated in Pondicherry urban area. The partners in this approach

include different local governmental departments (social welfare, health and family welfare, state unit of NFCP, department of information and publicity), central government departments (All India Radio, Doordarshan), students (NSS) and other local volunteers (*mahila sangam, etc.*), and pharmaceutical company (M/s. Burroughs Wellcome has supplied DEC free for this programme). The VCRC is coordinating the efforts, apart from undertaking the programme evaluation. This is an example of site-specific strategy developed locally⁶².

Developing a distribution mechanism for DEC medicated salt is also a challenging task. While in Karaikal urban area, the distribution was primarily through organized efforts of the health department in close collaboration with salt providers (merchants and vendors) and with the able administrative support⁵⁴, in Kanyakumari district, the state government is implementing the same through the existing public distribution system (PDS). However, several operational issues relating to manufacture, distribution and community acceptance of the DEC medicated salt need to be addressed.

There is an urgent need for the preparation of advocacy material for intervention programmes. Findings of advocacy research will be useful for sensitization of policy makers and planners to allocate required funds, programme managers to develop sound intervention designs, implementation process and mobilize partners.

Advocacy is also important for social mobilization of the community and other important partners (such as politicians, community leaders, medical practitioners and media). Research on this aspect (including development of IEC: information, education and communication material) has already been initiated.

Pilot Scale Intervention Programmes towards Elimination of Filariasis in India

Two important large-scale pilot intervention projects have been launched in India, the results of which will decide the future design of the filariasis elimination programme. The first is the launching of National Filariasis Day (NFD) by the Directorate of National Anti Malaria Programme (for administrative reasons, NFCP forms an integral part of the NAMP, as all vector-borne diseases are addressed under a single Directorate) in 1996. The second is a multicentric study on operational feasibility and impact of co-administration of albendazole and DEC in controlling lymphatic filariasis launched by the ICMR.

The NFD experience

Even before India became a signatory to the WHA resolution on filariasis elimination, the NAMP launched a pilot project of mass drug administration covering approximately 40 million population in 13 highly endemic districts in 7 states in India (Table II). The drug distribution

Table II. Epidemiological situation of filariasis in 13 districts selected for mass annual single dose of DEC as a pilot project under NFD.

State	District	Total population (Million)	Year	mf rate (%)	Disease rate (%)	Average endemicity (%)
Andhra Pradesh	East Godavari	4.54	1983	16.70	8.90	25.60
	Srikakulam	2.32	1956	13.90	4.10	18.00
Bihar	Darbhanga	2.17	1958	14.50	16.30	30.80
	Siwan	2.51	1982	2.29	4.87	7.16
Kerala	Alappuzha	2.62	1975	13.40	8.20	21.60
	Kozhikode	2.76	1960	9.28	5.66	14.94
Orissa	Puri	1.29	1993	10.60	NA	10.60
	Khurda	1.63	1958	4.51	5.00	8.96
Tamil Nadu	South Arcot #	2.15	1958	12.90	7.60	20.50
	North Arcot \$	1.32	1958	9.63	6.20	15.60
Uttar Pradesh	Gorakhpur	3.06	1962	6.65	11.84	18.49
	Varanasi	4.86	1958	10.80	10.10	21.00
West Bengal	Puruliya	2.22	NA	NA	NA	NA

NA: Not Available; # Currently named as Cuddalore;

\$ Currently named as Thiruvannamalai

was to be carried out by observance of National Filaria Day. The DEC tablets in the dose of 6mg/kg body weight were to be distributed according to age (Table III) either by door to door visit or through drug delivery booths on a single day. The entire population of the district excluding pregnant women and infants formed the target population for the drug distribution. Vector control measures and selective chemotherapy were to be continued in the urban areas where the NFCP units were located within these 13 districts. The NAMP was to provide the drugs and money for the IEC component. The coverage of population was to be recorded in the family registers. The states had to prepare macro- and micro-plans, train the health personnel involved, provide additional resources, implement the programme and send report to the NAMP. The local programme implementation, and monitoring and evaluation are to be carried out jointly by the research institutes under the ICMR or the National Institute of Communicable Diseases (NICD), Delhi and the state programme managers.

Table III. Age groups, DEC tablet strength and number of tablets adopted for mass drug distribution in Tamil Nadu (upto 2001)

Age (years)	DEC (dose in mg)	No. of tablets (50 mg)
< 1	Nil	Nil
1-2	50	1
3-4	100	2
5-8	150	3
9-11	200	4
12-14	250	5
> 14	300	6

Pregnant women excluded

The programme was launched in August 1996, in only South Arcot (Cuddalore) district of Tamil Nadu. In other districts the programme was initiated during 1997-98. The reported coverage of drug distribution in these districts was found to range from 43.8 to 95.0% while consumption was between 12 to 89% in different sites⁶³. A mid-term programme assessment was carried out by the NAMP in January 2000. Inadequate coverage in drug distribution and consumption were found to be the major limitations of the pilot project. It was found that supervised consumption was not adhered to. Single day distribution was not found practical. Although the

first day coverage was higher, at least 4-5 additional days were required for mopping up. The constraints included inadequate manpower, lack of incentives (particularly in comparison to other community programmes such as pulse polio vaccination), poor community awareness and acceptance, inadequate funds for IEC, mobility, supervision and training. The financial commitment and support to the programme was not uniform in different states and consequently affected the resource allocation and priority settings. The review committee recommended for the continuation of the pilot project for the five rounds in each of these 13 districts and to ensure supervised consumption. The committee further recommended proper monitoring, supervision, timely review, development of site-specific IEC and social mobilization methods and mechanisms, pre-and post-assessment surveys, provision for adequate funds, orientation of medical and paramedical personnel, and other distributors. Reducing the number of tablets for consumption by increasing the strength could be important for overcoming the constraints.

Health being a state subject, the Tamil Nadu Public Health Department launched the NFD programme on its own in 10 additional endemic revenue districts (other than South and North Arcot districts already covered by NAMP) of the state covering 15 health unit districts (HUDs) from 1997 (Table IV). Mass annual drug administration using DEC alone was carried out between 1997 and 2000 in all the 15 HUDs. In 2001, while albendazole (400 mg for all the individuals equal to or above 2 years of age) was distributed along with DEC in 9 of these HUDs, DEC alone was distributed in the remaining 6 HUDs. Considering the difficulties in community acceptance of the age specific drug schedule as implemented under the NAMP project (an adult has to take 6 tablets of DEC of 50mg strength), the Tamil Nadu has revised the drug schedule using 3 age classes by distributing DEC tablets of 100mg strength (1 tablet for 2-5 years, 2 tablets for 5+ to 14 years and 3 tablets for >14 years age group) for the subsequent rounds.

Operational feasibility and impact of co-administration of albendazole and DEC

Evaluation of NFD programme has shown that improving the community compliance in DEC consumption is the major challenge. Hypothesizing that it could be improved if the community perceives its benefit, co-administration of albendazole with DEC became a

Table IV. Coverage for annual single dose of DEC/DEC+albendazole in additional districts of Tamil Nadu.

Revenue district	Health unit district	Total population (million)	Population covered (%) In 5 years					
			1997	1998	1999	2000	2001 @	
							DEC	Albendazole
Kanchipuram	Kanchipuram	1.07	94.0	ND	97.0	97.0	96.6	96.4
	Saidapet	1.89	92.0	ND	95.3	96.6	94.0	94.0
Thiruvallur	Thiruvallur	1.30	94.0	ND	95.2	94.0	97.0	94.9
	Poonamalie	1.43	93.0	ND	96.5	95.2	93.5	92.9
Vellore	Vellore	1.67	96.0	ND	94.4	93.31	96.0	96.0
	Thirupathur	1.65	95.0	ND	95.3	96.2	97.6	97.3
Nagapattinum	Nagapattinum	2.39	96.0	ND	94.7	94.2	96.0	94.5
Thanjavur	Thanjavur	2.13	96.0	ND	85.4	84.6	87.4	86.9
Thiruvarur	Thiruvarur	1.22	96.0	ND	92.5	94.1	97.2	97.2
Thiruchirapalli	Thiruchirapalli	4.11	95.0	ND	88.0	89.0	99.1	NA
Villupuram	Villupuram	1.45	88.0	ND	90.2	90.7	93.4	NA
	Kalakurichi	1.30	91.0	ND	91.7	94.0	95.0	NA
Pudukottai	Aranthangi	0.6	97.0	ND	96.9	96.7	95.1	NA
	Pudukottai	1.32	94.0	ND	94.8	95.5	93.7	NA
Kanyakumari	Kanyakumari	1.6	90.0	ND	91.5	96.2	95.9	NA

ND = Not done NA = Not applicable

@ In 2001 albendazole was distributed along with DEC in 9 HUDs and remaining 6 HUDs received DEC alone

Source: District Public Health Authorities.

potential proposition by which community compliance can be enhanced through perceived benefit of deworming. In view of this, the ICMR has initiated a study to compare the operational feasibility and impact of co-administration of DEC and albendazole with that of DEC alone at district level. This multicentric study which covers 9 districts for DEC + albendazole and 4 for DEC alone (Table V) is being carried out in the states of Tamil Nadu, Orissa and Kerala. The parameters for process evaluation include (i) reported and assessed coverage of drug distribution; (ii) assessed coverage of drug consumption; (iii) safety in terms of adverse side reaction experience report; (iv) perceived benefits - in terms of experience of expulsion of intestinal parasite; and (v) the cost. The impact is assessed in terms of (i) microfilaraemia prevalence and intensity; (ii) antigenaemia prevalence (ICT card test); (iii) transmission parameters (vector

infection, infectivity and intensity); (iv) prevalence and intensity of geohelminths; and (v) prevalence of disease. The first round of drug distribution was implemented in March 2001 in Tamil Nadu and Kerala. The results show that the reported coverage of distribution ranged between 87-100% in Tamil Nadu and 81-86% in Kerala. The assessed coverage of distribution as per the ICMR study was significantly higher in rural areas (65 to 73%) of Tamil Nadu compared to urban areas (40 to 45%). In Kerala these figures were 72 to 82% in rural areas and 67 to 85% in urban areas respectively.

Analysis of data from Tamil Nadu shows a significant positive correlation between drug coverage by distribution and consumption. The gap between population covered and total population is wider than the gap between coverage and compliance (drug consumption on

Table V. Population, endemicity level and coverage of drug distribution in districts included to compare the impact of co-administration of DEC and albendazole with that of DEC alone

Centre	Institution	State	District	Drug	Population (in millions)	Endemicity rate (%)	Reported coverage (%) in 2001	
							DEC	Alb
Bhubaneswar	RMRC	Orissa	Puri	DEC	1.57	10.6	ND	NA
			Balesore	DEC +Alb	1.80	4.5	ND	NA
			Ganjam	DEC +Alb	2.90	24.9	ND	NA
Chennai	TRC	Tamil Nadu	Trichy	DEC	2.44	2.7	96.64	NA
			Kanchipuram	DEC +Alb	2.72	19.3	96.59	96.45
			Vellore	DEC +Alb	3.33	15.7	96.90	93.80
			Thiruvallur	DEC +Alb	2.73	19.2	97.09	94.21
Pondicherry	VCRC	Tamil Nadu	Thiruvannamalai	DEC	2.19	15.6	92.13	NA
			Thanjavur	DEC +Alb	2.14	15.9	87.36	86.87
			Thiruvarur	DEC +Alb	1.18	15.9	97.67	95.15
			Nagapattinam	DEC +Alb	1.54	15.9	100	97.97
Delhi	NICD	Kerala	Kozhikode	DEC	2.80	7.1	85.90	NA
			Alappuzha	DEC +Alb	2.20	21.3	80.80	84.49

Alb: Albendazole; ND = Not done; NA = Not applicable

distribution). Therefore there is a scope to increase coverage (Fig.1a&b). Performance of providers can be

improved by training and manpower development. In Kerala the gap between coverage and consumption is

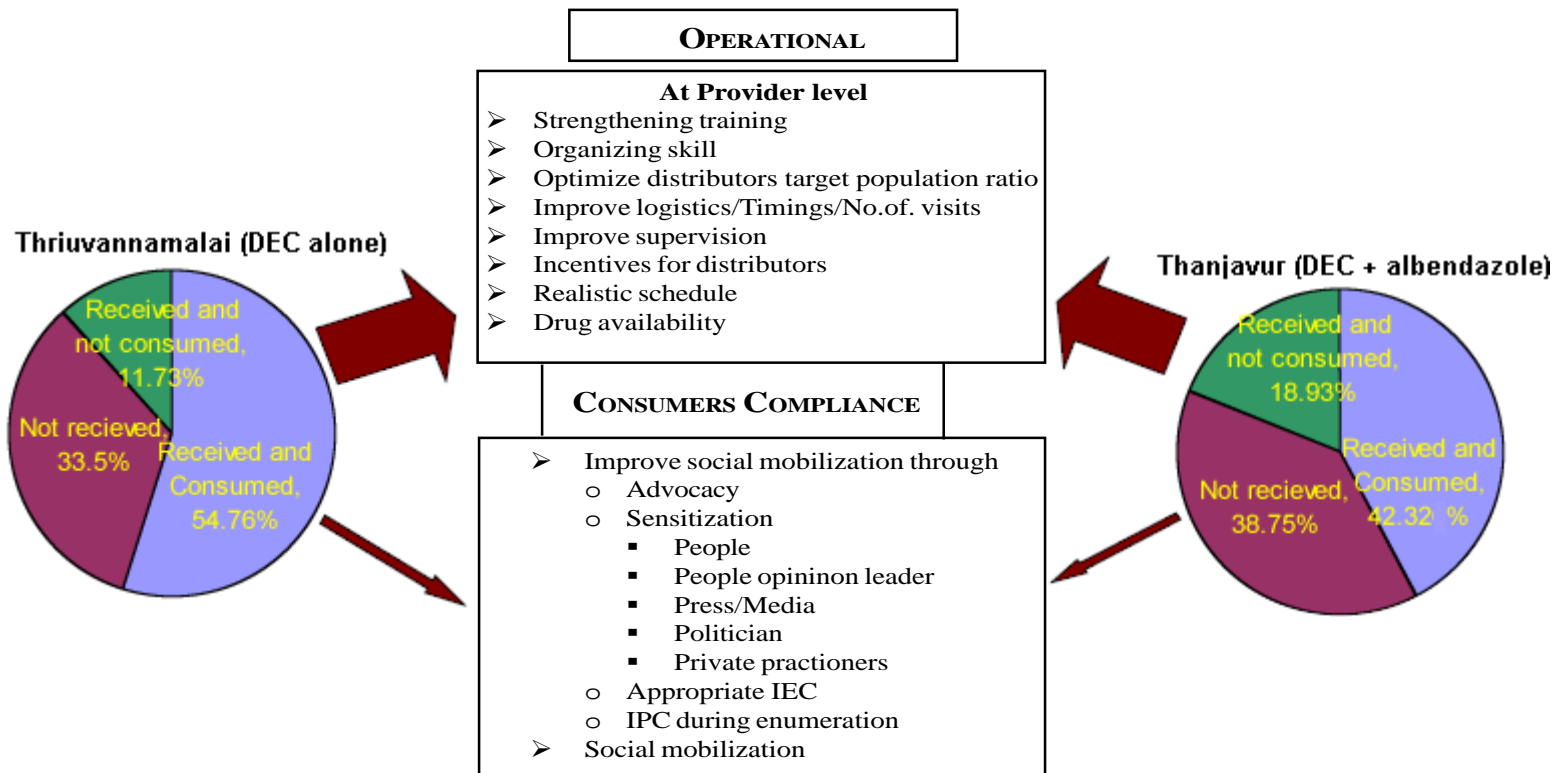


Fig.1a. Recommendations for programme improvement based on the assessed coverage and compliance during the first round of MDA in Tamil Nadu (2001)

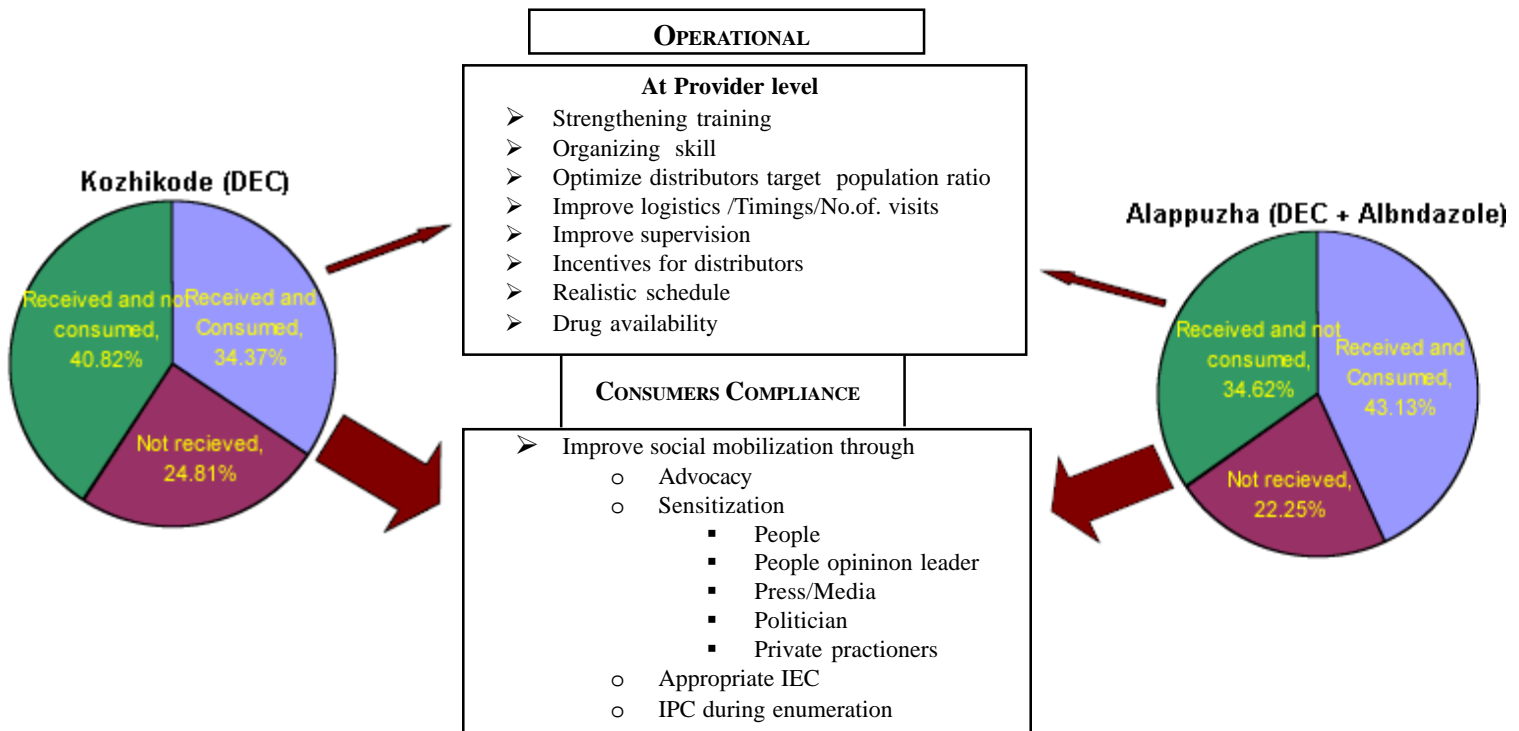


Fig. 1b. Recommendations for programme improvement based on the assessed coverage and compliance during the first round of MDA in Kerala (2001)

wider and therefore efforts are necessary to improve the consumption. This can be achieved by health education and IEC. Being out of station and forgetfulness were the reasons cited for non-receipt or non-consumption of drugs in the districts of Tamil Nadu. In Kerala, the reasons cited for not consuming the drugs were the fear of side reactions and the feeling that drugs were not necessary for the individuals.

The drugs (either alone or in combination) were found safe to administer. The perceived adverse reaction reported in Tamil Nadu was 7% with DEC alone and 12% with DEC+ albendazole. Whereas, in Kerala the reported adverse reaction was less than one per cent of those who consumed the drug(s).

Based on the results of process evaluation, certain changes have been made for improving the drug distribution. This include involvement of volunteers (one volunteer for every 50 houses) to offer achievable target and thereby good coverage of distribution, supervised drug administration to ensure compliance, reducing the number of tablets and treatment class for community acceptance and coverage and limiting drug distribution to one day only to overcome community resistance.

CONCLUSIONS

India has shown a political commitment for filariasis elimination by becoming a signatory to the WHA resolution. However, the prospects of elimination will depend on converting the commitment to practical action in the field. These include the articulation of a policy statement, preparation of a blue print of national, regional and local plan of action, social mobilization, generation of necessary funds, effective implementation through a partnership approach, monitoring and evaluation and to progress dynamically by taking evidence based decisions with timely review.

While implementing the recommended control strategy, research in certain areas is also essential to address issues related to monitoring and evaluation, morbidity management and enhance elimination process. This include development of stage specific diagnostics, information on disease pathogenesis particularly lymphoedema and hydrocele, strain variation in relation to response to drugs and clinical manifestations, disease burden estimation, monitoring and evaluation strategies - application and validation of models for incorporation in national control programmes, sampling strategies,

modification and incorporation of other interventions such as vector control and medicated salt along with MDA, optimization of MDA implementation process, modeling of disease dynamics and progression, developing and validating advocacy and social mobilization measures, cost-effectiveness of interventions, defining operational criteria of elimination, setting up of morbidity management centers, rapid mapping and delimitation of areas, policy issues at national and state level, training and man power development, partnership issues - international, regional, national, state, district and local, documentation, utilization of knowledge gained through other control/elimination programmes, methods for dissemination of information including research findings, etc.

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