Lymphatic Filariasis in India : Problems, Challenges and New Initiatives

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Abstract

Filariasis is a major public health problem in India and inspite of existence of the National Filaria Control Programme since 1955, currently there may be up to 31 million microfilaraemics, 23 million cases of symptomatic filariasis, and about 473 million individuals potentially at risk of infection. Over the last 10 years advances have led to new diagnostic/ treatment tools and control strategies for filariasis. The new control strategy aims at transmission control through mass treatment and at disease control through individual patient management. As a signatory to 50th World Health Assembly resolution on global elimination of lymphatic filariasis in 1997, revised filariasis control program was launched in India in 13 districts in seven endemic states where mass drug administration was undertaken. Single dose mass administration annually in combination with other techniques has already eliminated lymphatic filariasis from Japan, Taiwan, South Korea and Solomon Islands and markedly reduced the transmission in China. Very high treatment coverage (probably > 85%) is required to achieve interruption of transmission and elimination in India. Hence, there is an urgent need for effective drug delivery strategies that are adapted to regional differences. This requires powerful advocacy tools and strategies as well as procedures for monitoring and evaluating the impact of elimination programme.

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Introduction

Filariasis has been a major public health problem in India. The disease was recorded in India as early as 6th century B.C. by the famous Indian physician, Susruta in his book 'Susruta Samhita' [1]. National Filaria Control Programme (NFCP) was launched in the country in 1955 with the objective of delimiting the problem and to undertake control measures in endemic areas. The manifold increase in filariasis during last four decades reflects failure of filariasis control programs [2]. Currently there may be up to 31 million microfilaraemics, 23 million cases of symptomatic filariasis, and about 473 million individuals potentially at risk of infection in the country. Lymphatic filariasis (LF) is a major impediment to socioeconomic development (estimated loss \$1 billion per year) and is responsible for immense psychosocial suffering among the affected [3].

Considerable progress has been made in diagnosis and treatment of filariasis in the last decade and new strategy for filariasis elimination aims at transmission control through mass drug administration (MDA) and at disease control through individual patient management. Annual single-dose co-administration of

two drugs (ivermectin+ diethylcarbamazine (DEC) or albendazole) reduces blood microfilariae by 99% for a full year while a single dose of one drug (ivermectin or DEC) administered annually can result in 90% reduction. Field studies confirm that such reduction of microfilarial loads and prevalence can interrupt transmission [4]. The 50th World Health Assembly recently called on member states of World Health Organisation (WHO) to identify the global elimination of lymphatic filariasis as a public health problem [5,6]. Mass drug administration to eliminate lymphatic filariasis is already in place in 32 of the 83 endemic countries [7]. In India annual mass drug administration with single dose of DEC was taken up as a pilot project covering 41 million population in 1996-97 and extended to 77 million population by 2002 [8]. This review discusses this transition in terms of problems, challenges, opportunities and the new initiatives.

Causative agents and vectors

In mainland India, *Wuchereria bancrofti* transmitted by the ubiquitous vector, *Culex quinquefasciatus*, has been the most predominant infection contributing to 99.4% of the problem in the country. The infection is prevalent in both urban and rural areas. *Brugia malayi* infection is mainly restricted to rural areas due to peculiar

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breeding habits of the vector associated with floating vegetation. *Mansonia (Mansonioides) annulifera* is the principal vector while *M(M) uniformis* is the secondary vector. The vectorial role of *M(M) indiana* is very limited due to its low density. Both *W bancrofti* and *B malayi* infections in mainland India exhibit nocturnal periodicity of microfilaraemia. In 1974-75 diurnal subperiodic *W bancrofti* infection was discovered among aborigines, inhabiting Nicobar group of Andaman & Nicobar Islands. *Aedes (Finlaya) niveus* group of mosquitoes were incriminated as the vectors for this infection [9].

Clinical manifestations of lymphatic filariasis

The clinical manifestations of LF may vary from one endemic area to another. Generally, the most common clinical form of the disease is hydrocele, with lymphoedema and elephantiasis occurs less commonly. In India and neighbouring countries, both hydrocele and lymphoedema are common. Other forms of the disease such as tropical pulmonary eosinophilia and chyluria occur less frequently. Hydrocele is not seen in areas affected by Brugian filariasis. The most significant discovery has been in the area of chronic disease, with understanding of the key role of bacterial infection in the occurrence of acute attacks and progression of the disease [10]. It has become increasingly evident that good daily hygiene practices – such as washing the affected parts and simple exercises that increase lymph flow – may play an important part in progression of the early stages of lymphoedema, thus reducing acute attacks [11].

Diagnosis

Until recently, diagnosis of filarial infection depended on the direct demonstration of the parasite (almost always microfilariae) in blood or skin specimens using relatively cumbersome techniques and having to take into account the periodicity (nocturnal or diurnal) of microfilariae in blood. Alternative methods based on detection of antibodies by immunodiagnostic tests did not prove satisfactory since they both failed to distinguish between active and past infections and had problems with specificity owing to their cross-reactivity with common gastrointestinal parasites and other organisms. Circulating filarial antigen (CFA) detection test is now regarded as the 'gold standard' for diagnosing *Wuchereria bancrofti* infections. The specificity of these assays is near complete, and the sensitivity is greater than that achievable by the earlier parasite-detection assays. Two commercial configurations of this assay are available, one based on enzyme-linked immunosorbent assay (ELISA) methodology that yields semi-quantitative results, and the other based on a simple

immunochromatographic card test, yielding only qualitative (positive/negative) answers [12].

Trend and present endemicity of the filariasis in India

The estimates in 2001 indicate that about 473 million people are exposed to the risk of bancroftian infection and of these about 125 million live in urban areas and about 348 million in rural areas. About 31 million people are estimated to be harbouring microfilaria (mf) and over 23 million suffer from filaria disease manifestations. State of Bihar has highest endemicity (over 17%) followed by Kerala (15.7%) and Uttar Pradesh (14.6%). Andhra Pradesh and Tamil Nadu have about 10% endemicity. Goa showed the lowest endemicity (less than 1%) followed by Lakshadweep (1.8%), Madhya Pradesh (above 3%) and Assam (about 5%). The seven states namely Andhra Pradesh, Bihar, Kerala, Orissa, Uttar Pradesh, Tamil Nadu, and West Bengal, where MDA pilot trials are being undertaken, contribute over 86% of mf carriers and 97% of disease cases in the country [13].

B malayi nocturnal periodic infection is prevalent in the states of Kerala, Tamil Nadu, Andhra Pradesh, Orissa, Madhya Pradesh, Assam and West Bengal. The single largest tract of this infection lies along the west coast of Kerala, comprising districts of Trichur, Ernakulum, Alleppey, Kottayam, Quilon and Trivandrum, stretching over an area of 1800 square kilometer. The infection in the other six states is confined to a few villages only. Surveys undertaken recently in Kerala and a few villages in other states revealed either reduction of foci or complete elimination of the parasite as well as the vector in many villages which were known to be endemic for *B malayi* infection four decades back [13].

Filariasis control in India

After pilot project in Orissa from 1949 to 1954, the National Filaria Control Programme (NFCP) was launched in the country in 1955, with the objective of delimiting the problem, to undertake control measures in endemic areas and to train personnel to man the programme. The main control measures were mass DEC administration, antilarval measures in urban areas and indoor residual spray in rural areas. NFCP was assessed in 1960 which revealed the failure of mass DEC administration due to community non-cooperation and ineffectiveness of insecticidal indoor spray due to high resistance in the vector. The programme was withdrawn from rural areas while in urban areas, antilarval measures continued to be the main control method. The Assessment Committee in 1970 recommended selective mf carrier treatment with DEC

at a dose of 6 mg/kg per day for 12 days as a compliment to antilarval measures, delimitation of the problem in unsurveyed districts and regionalisation of control measures in contiguous areas. The Assessment Committee in 1982 recommended extension of NFPCP to rural areas through primary health care system with 100% central assistance for material & equipment, undertaking DEC medicated salt regimen in high endemic districts and control of *B. malayi* infection.

Medicated salt regimens in India during 1968-69 showed very encouraging results in pilot trials in the Uttar Pradesh and Andhra Pradesh. The distribution of 0.1% DEC medicated salt to general public for one year was implemented in Lakshadweep, comprising a population of 25,000 during 1976-77 which reduced mf rate by 80% and circulating mf by about 90%. The DEC medicated salt project with 0.2% concentration was concluded at Karaikal, Pondicherry which gave 98% reduction in microfilaria.

New initiatives for the control of lymphatic filariasis in India

Revised program was launched in 1996-97 in 13 districts in seven endemic states namely Andhra Pradesh, Bihar, Kerala, Orissa, Uttar Pradesh, Tamil Nadu and West Bengal, where MDA was undertaken. The main strategy comprises of single day mass therapy (DEC) at a dose of 6 mg/kg body wt annually, management of acute and chronic filariasis through referral services at selective centres and information education communication (IEC) for inculcating individual/community based protective and preventive measures for filaria control. The mf carriers detected in filaria clinics to be treated with standard dose of DEC 6 mg/kg body wt. per day for 12 days.

Management of acute and chronic filariasis cases requires development of adequate referral centres and treatment of adenolymphangitis (ADL) with antibiotics since majority of acute episodes appear to be of bacterial aetiology. Rigorous local hygiene measures with or without local antibiotic and antifungal agents should be promoted to prevent ADL so as to permit the reversal of lymphoedema. Early treatment with standard 12 day therapy of mf carriers is to be adopted to prevent further lymphatic damage and renal failure.

Mass Drug Administration with DEC single dose annually (Filaria Day)

The International Task Force for disease eradication had identified lymphatic filariasis as one of the only seven infectious diseases considered eradicable or potentially eradicable. The single dose mass therapy with DEC has been found to be as effective as 12 day therapy, as a public health measure, with lesser side effects thus

enhancing public compliance, decreased delivery costs [14]. It does not require complex management and infrastructure. It can be integrated into the existing primary health care system for delivery compliance. Single dose mass administration annually in combination with other techniques has already eliminated lymphatic filariasis from Japan, Taiwan, South Korea and Solomon Islands and markedly reduced the transmission in China [15, 16].

Major problems and challenges for disease control

Although there is now greater international momentum for lymphatic filariasis elimination, several important issues remain to be resolved, before the disease can be eliminated from India. These includes uncertainty about the required coverage and duration of annual treatment to achieve elimination and its relation to endemicity levels and vector/parasite complexes. There is an urgent need for appropriate tools, procedures and criteria for monitoring and evaluating the impact of elimination programmes. It is also becoming increasingly important to be able to predict and demonstrate the public health and socioeconomic impacts of the elimination efforts (especially for areas where interruption may not be easily/completely achieved). The available interventions have significant limitations. The current drugs require repeated annual treatment and there is a need for the development of macrofilaricidal / curative drugs. Drug resistance may become a critical issue after prolonged mass treatment with the current drugs. Therefore there is a need for early detection of resistance to drugs and replacement drugs.

The major challenge with the currently available drugs is that the interruption of transmission requires very high treatment coverage (probably > 85% of the total population) to achieve elimination [17], but current approaches to drug delivery do not achieve this (only 40-60% gets treated if mass treatment is executed by the regular health services). Hence, there is an urgent need for more effective drug delivery strategies for lymphatic filariasis elimination that are adapted to regional differences and variations in health sector development [18,19]. A special challenge will be drug delivery in urban settings while other problems are the low priority given to a disease like lymphatic filariasis and poor compliance with DEC treatment. These problems require powerful advocacy tools and strategies.

Research needed to address these constraints

Among the research priorities are longitudinal studies of the impact of treatment with the current drug combinations on transmission and parasite reservoir,

together with modelling to predict the required duration of treatment for elimination. Better diagnostics and procedures need to be developed for monitoring and surveillance. Research is required on the progression and reversibility of disease manifestations, especially in children and after (mass) treatment. Another priority is development of new drugs or drug combinations for curative treatment or sustained suppression of the (larval) microfilarial forms of the parasite. Further evaluation is required for the efficacy and safety of albendazole combinations. Research on the parasite genome is important to help identify leads for new drugs.

Conclusion

India contributes to 41 % of global lymphatic filariasis. As a signatory to 50th World Health Assembly resolution on global elimination of lymphatic filariasis in 1997, India must intensify the efforts to eliminate filariasis. The single dose mass therapy with DEC has been found to be as effective as 12 day therapy as a public health intervention. Very high treatment coverage (probably > 85%) is required to achieve interruption of transmission and elimination. Hence, there is an urgent need for more effective drug delivery strategies that are adapted to regional differences in India.

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