Chapter 3

Indian Scenario of Elimination of Lymphatic Filariasis

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INTRODUCTION

Lymphatic filariasis (LF) caused by filarial nematodes and transmitted by mosquitoes, is one of the neglected tropical diseases (NTD) which is still a public health problem in India and is endemic in 17 states and 6 union territories. Wuchereria bancrofti and Brugia malayi are the two important parasite species that give rise to this disease. The former accounts for almost 95% of the disease burden in the tropical countries, while the latter is responsible for most of the remaining 5% of cases. Brugia malayi is prevalent in the states of Kerala, Tamil Nadu, Andhra Pradesh, Odisha, Madhya Pradesh, Assam and West Bengal. In India, the incidence of LF is of such magnitude that this country alone accounts for 40% of the world disease burden. About 31 million people are estimated to be the carriers of microfilariae and over 23 million suffer from filarial disease manifestations in India. The state of Bihar has highest endemicity (over 17%) and Goa showed the lowest endemicity. The long standing disability resulting from this disease in the form of elephantiasis of the limbs and genital region, hydrocele of the scrotal sac and the repeated acute attacks of fever and inflammation cause such suffering that this disease is thought to be only next to malaria among the tropical debilitating diseases. The total disability adjusted life years (DALYs) lost in India due to this disease is around 2.06 million, resulting in an annual wage loss of US $811 million. Recent studies have shown beyond doubt that LF infection starts mostly in childhood, even though the disease manifestations are seen more often, several years later in adulthood. The daytime antigen detection tests, ultrasonography (USG) and lymphoscintigraphy (LSG) have documented the presence of significant subclinical pathology in children, which suggest that LF often has its origin in childhood.

DISABILITY CAUSED BY LYMPHATIC FILARIASIS

The disease spectrum of LF ranges from the initial phase of asymptomatic microfilaremia to the later stages of acute and chronic clinical manifestations. The disease manifestations caused by Brugia malayi differ from those of Wuchereria bancrofti in that, in the former the lymphedema involves only the legs below the knee and upper limbs below the elbow and there is no genital involvement. Tropical pulmonary eosinophilia (TPE) syndrome is a form of occult filariasis caused by both parasites.

Asymptomatic Microfilaremia

In any endemic area for LF, among the infected individuals, the largest group consists of otherwise healthy young adults and children who have microfilaria (MF) in their peripheral blood without any overt clinical manifestation. Even at this stage, there are abnormalities of the lymph vessels like dilation and tortuosity which are demonstrable by ultrasound examination and LSG. This pathology appears to be irreversible even after treatment. This is important because ~30% of children in certain endemic communities have been shown to acquire LF infection by the age of 4 years, as shown either by the presence of MF or Wuchereria bancrofti antigen in blood. In a Brugia malayi endemic region in Kerala, LSG has demonstrated subclinical lymphatic pathology even in three year old children with asymptomatic microfilaremia.

Acute Manifestations

Acute Dermato-Lymphangio-Adenitis

Attacks of acute dermato-lymphangio-adenitis (ADLA) associated with fever and chills account for 97% of acute clinical manifestations in LF. Even though ADLA occurs both in the early and late stages of the disease, it is more frequent in higher grades of lymphedema. The affected area, usually in the extremities or sometimes in the scrotum is extremely painful, warm, red, swollen and tender. The draining lymph nodes in the groin or axilla become swollen and tender. Depending on the presence of precipitating factors, such acute attacks to recur several times a year in patients with filarial swelling.

It is now well-known that secondary infections due to bacteria like streptococci are responsible for these acute episodes and in the affected limbs, lesions favoring entry of bacteria can be demonstrated, either in the form of interdigital candidiasis, minor injuries, infections, eczema or cracks in the feet. In higher grades of lymphedema, fungal infection tends to occur in the webs of the toes and becomes aggravated during rainy season or due to household work where the feet are soaked in water. In such situations, the ADLA are more frequent and are responsible for the persistence and progression of lymphedema leading on to elephantiasis.

Acute Epididymo-orchitis and Funiculitis

Inflammation of structures in the scrotal sac may result in acute epididymo-orchitis or funiculitis in bancroftian filariasis. This is characterized by severe pain, tenderness and swelling of scrotum, usually with fever and rigor. The testes, epididymis or the spermatic cord may become swollen and extremely tender. Like acute ADLA, these attacks are also precipitated by bacterial infections.

Acute Filarial Lymphangitis

Acute manifestations directly caused by adult worms are usually rare and are seen when the adult worms are killed in the lymphatics either spontaneously or by drugs like diethylcarbamazine (DEC). Small tender nodules form at the location where adult worms die,
either in the scrotum or along the lymphatics. Lymph nodes may become tender. Inflamed large lymphatics may stand out as long tender cords underneath the skin, usually along the sides of chest or medial aspect of arm, with restriction of movement of affected limb. But, these episodes are not associated with fever, toxemia or evidence of secondary bacterial infection. Rarely abscess formation may be seen at the site of dead adult worms.

Chronic Manifestations

Lymphedema and Elephantiasis

Lymphedema of the extremities is the most common chronic manifestation of LF which on progression leads to elephantiasis. Even though lower limbs are the ones frequently affected, upper limbs and male genitalia may also be involved. In females, rarely the breasts may also be affected.

In the advanced stages of lymphedema, which continues to occur the affected limb may undergo enormous enlargement and the skin is thickened, thrown into folds, often with hypertrichosis, black pigmentation, nodules, warty growth, intertrigo in the webs of toes or chronic nonhealing ulcers. Acute dermato-lymphangio-adenitis is responsible for the progression of lymphedema continues to occur with greater frequency in higher grades of edema.

Genitourinary Lesions

Hydrocele is a common chronic manifestation of bancroftian filariasis in the males. This is characterized by accumulation of fluid in the tunica vaginalis, the sac covering the testes. The swelling gradually increases over a period of time and in long standing cases the size of the scrotum may be enormous. Microfilaria may be detected in the peripheral blood or in the hydrocele fluid in some of these subjects. Occasionally, the hydrocele may have an acute onset when the surrounding lymphatics are inflamed due to the death of adult worms, This is usually self-limiting and may disappear over a period of time. Lymphedema of the scrotum and penis may occur in bancroftian filariasis. In some subjects, the skin of the scrotum may be covered with vesicles distended with lymph known as “lymph scrotum”. These patients are prone for acute ADLA attacks involving the skin of genitalia. Hematuria, chyluria and chyleocele are the other genitourinary manifestations associated with LF.

WHY LYMPHATIC FILARIASIS SHOULD BE ELIMINATED?

This disease is prevalent mostly among the socioeconomically challenged population in 83 tropical countries of the world. Several studies have highlighted the social, psychological, sexual and economic implications of this disease. The massive swellings of the limbs in elephantiasis interfere with the day-to-day activities of these subjects. They tend to work for fewer hours or change to lighter and less remunerative jobs, impairing their earning capacity. This disease hampers the marriage prospects of the young mainly females. Among children the social problems include feeling of shame, embarrassment and frequent absence from school or even discontinuation of studies. International Task Force for Disease Eradication has identified LF as one of only six potentially eradicable diseases.

GLOBAL PROGRAM FOR ELIMINATION OF LYMPHATIC FILARIASIS

In the year 1977, the World Health Assembly resolved to eliminate LF globally as a public health problem. This resolution is based on the new knowledge of the pathogenesis of LF; the biology of the parasite; development of better diagnostic tools and treatment strategies.

Global program for elimination of lymphatic filariasis (GPELF) has two components:

1. Interruption of transmission of infection in communities by mass drug administration (MDA).

2. Alleviation of the disability in those who already have the disease.

The first component of GPELF is to interrupt transmission of filarial infection in the entire “at risk” population of an endemic region by administration of single, annual doses of a two-drug regimen which in India consists of administration of DEC 6 mg/kg and albendazole 400 mg for a period of 4–6 years. Children under 2 years of age, pregnant women and severely ill patients are excluded from MDA. The principle behind this strategy is as follows. The transmission of LF infection in a community depends on the MF load in the human carriers and density of vector mosquitoes. Even though vector control is in theory the ideal, it is difficult to achieve this in practice due to difficulties encountered and the cost involved in effectively implementing this method for LF transmission control. So, the next best is to reduce the load of MF in a given community to such low levels that the mosquitoes will be unable to effectively transmit the infection. The two drug combination, in the doses mentioned above is shown to bring down the blood microfilaria levels drastically even after annual single dose administration which when repeated for up to 6 years would achieve the target of preventing transmission of LF infection. The estimated fecundity life of the adult parasite is 4–6 years which is the basis for continuing the program for the duration mentioned.

It has been shown further that at least 80% of the “at risk” population should consume the drug once annually to achieve transmission control in the time frame mentioned above. Otherwise the drug administration will have to be continued for many more years. Among the LF endemic countries, MDA program is now in place in 51 countries. Ten countries did not require any more MDA since they have eliminated transmission of the disease.

The benefits obtained so far from the MDA conducted globally during the past 8 years (2000–2007) have been remarkable. In the treated communities, in an estimated 6.6 million newborns who would otherwise have acquired LF, nearly 1.4 million cases of hydrocele, 800,000 cases of lymphedema and 4.4 million cases of subclinical disease have been averted in their lifetimes. Similarly, MDA has protected 9.5 million individuals who were previously infected but without overt manifestations of disease from developing hydrocele (6.0 million) or lymphedema (3.5 million). These LF related benefits, by themselves translate into 32 million DALYs averted. In a recent study, it was clearly shown that drugs used in MDA reversed the subclinical lymphatic pathology in children with filarial infection.

PRESENT SCENARIO OF LYMPHATIC FILARIASIS ELIMINATION IN INDIA

In India, MDA with DEC alone was launched as a pilot project in 13 districts of 7 states in the year 1996 covering a population of 41 million. The program was scaled up to cover a population of 77 million in 2002, when 19 districts were under DEC alone and 11 were covered with DEC + albendazole. During the year 2004, a population of about 468 million from 202 districts was targeted for MDA. It was also proposed to observe “National Filaria Day” every year from 2004 in all endemic districts. From 2006 onward, November 11 is observed as “National Filaria Day”. The National Task Force on Elimination of LF recommended the coadministration of DEC 6 mg/kg and albendazole 400 mg to all endemic districts from 2006. From 2007 the entire endemic population of 590 million in 250 districts
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in India was targeted for MDA. Even though the drug distribution ranged from 83% to 90%, actual consumption was much lower than the desired 80% in most of the districts covered under MDA. Even then, in most endemic districts the MF prevalence rates have declined after initiating the MDA program. Thus, MF rates have declined below 1% MF rate in 176 districts. In 2008, as the first step toward elimination of LF transmission, immunochromatographic test (ICT) card survey for detection of Wuchereria bancrofti is initiated in six districts with less than 1% MF rates in Tamil Nadu. This is being conducted by National Institute of Communicable Disease (NICD) and Vector Control Research Center (VCRC) for which, World Health Organization (WHO) have supplied 19,500 ICT cards.29

Alleviation of Disability Due to Lymphatic Filariasis

Disability management is an important arm of GPELF. In order to achieve a “visible impact” of the program in the community, it is necessary that components that address disability control are built-in.51

Treatment of Acute Dermato-Lymphangio-Adenitis

The most distressing aspect of disability in LF is the acute attacks of ADLA which prevent the patient from attending his daily activities for several days. In most instances, they can easily be treated and further episodes can be prevented. Bed rest and symptomatic treatment with simple drugs like paracetamol are enough in mild cases. Any local precipitating factor like injury and bacterial or fungal infection should be treated with local antibiotic or antifungal ointments. Moderate or severe attacks of ADLA require oral or parenteral administration of antibiotics depending on the general condition of the patient, together with analgesic/antipyretic drugs. Commonly used antibiotics like penicillin, tetracycline, ampicillin, amoxicillin or cotrimoxazole may be given in adequate doses till the infection subsides. Bacteriological examination of swabs from the entry lesions may help in selecting the proper antibiotic in severe cases. Systemic antifungal agents are rarely required since the fungal infections of the skin act only as entry points for the bacteria and fungi themselves do not cause the ADLA.30

Prevention of Acute Dermato-Lymphangio-Adenitis

Presently there is a simple, effective, cheap and sustainable method available for prevention of these attacks. Many recent studies have shown that this can be achieved by proper “local-hygiene” of the affected limbs, carried out regularly.14 Foot-care aimed at prevention of fungal and secondary bacterial infections have become the mainstay for disability alleviation in GPELF:51 This method requires only the common facilities available for washing in any household and hence can be carried out by the patients themselves in their home. Patients, community health workers and also providers of “home-care” should be trained in this foot-hygiene program. This foot-care program to prevent ADLA attacks consists of the following:

- Washing the affected area, especially the webs of the toes and deep skin folds, with soap and water twice a day or at least once before going to bed and wiping dry with a clean cloth
- Clipping the nails at intervals and keeping them clean
- Preventing or promptly treating any local injuries or infections using antibiotic ointments
- Applying antifungal ointment in the webs of the toes, skin folds and sides of the feet to prevent fungal infections
- Regular use of proper footwear
- Keeping the affected limb raised at night, using bricks to elevate the foot end of the cot.

In patients with late stages of edema proper local care of the limb is not always possible due to deep skin folds or warty excrescences. If such patients continue to have ADLA attacks, long-term antibiotic therapy using oral penicillin or long acting parenteral benzathine penicillin is indicated. Recent studies have shown that antifilarial drugs like DEC have no role either in the treatment or prevention of the acute ADLA attacks occurring in cases of lymphedema which are caused by bacterial infections.32

In endemic areas, regular foot-care should be encouraged from early age, in view of the fact that LF is first acquired mostly in childhood and that the early asymptomatic stage of the infection itself is associated with irreversible lymphatic damage. This would help in preventing the acute attacks and probably in arresting the development of future lymphedema and elephantiasis in children and young adults.

Treatment and Prevention of Lymphedema

In early stages of the disease when the adult worms are sensitive to DEC, treatment with this drug might destroy them and thus logically prevent the later development of lymphedema. Equally important is the prevention of ADLA attacks in these patients since the occurrence of lymphedema and its progression are related to these repeated infections. Once lymphedema is established there is no permanent cure and as mentioned already, treatment with DEC does not seem to reverse the existing lymphatic damage. The following treatment modalities offer relief and help to prevent further progression of the swelling:

- Using elastocrepe bandage or tailor made stockings while ambulant
- Keeping the limb elevated at night after removing the bandage
- Regular exercising of the affected limb
- Regular light massage of the limb to stimulate the lymph vessels and to promote flow of lymph toward larger patent vessels
- Intermittent pneumatic compression of the affected limb using single or multiciell jackets
- Heat therapy using either wet heat or hot ovens
- Surgical procedures: There are various surgical options available to offer relief of lymphedema, like lymph nodo-venous shunts, omentoplasty and excision with skin grafting. Even after surgery the local care of the limb should be continued for life, so that ADLA attacks and recurrence of the swelling are prevented. Hydrocele of the scrotum and lymphedema of the external genitalia are amenable to surgery.

Oral and topical benzopyrones and flavonoids are advocated for the treatment of lymphedema. These drugs are supposed to reduce high protein edema by stimulating macrophages to remove the proteins from the tissues when administered for long periods. Further controlled trials are needed to substantiate this claim.

CONCLUSION

Lymphatic filariasis is still a public health problem in India harboring 40% of world disease burden. The social, psychological, sexual and economic implications of this disease are enormous. Elimination is all the more important since it is now known that LF infection first starts in childhood even though the clinical manifestations appear much later. The early pathology is dilatation of lymph vessels caused by the adult worms which was thought to be irreversible even after treatment. This has prompted the launching of GPELF to eliminate this parasitic infection through MDA. It may be noted that drugs used in MDA reversed the subclinical lymphatic pathology in children with filarial infection. India aims to eliminate LF by 2015 through annual MDA using DEC and albendazole. This is one of the most economical and beneficial disease control strategies undertaken so far in public health programs.

REFERENCES

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