Podoconiosis: Tropical Lymphedema of the Lower Legs

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1 Introduction

Podoconiosis is a non-infectious, familial, geochemical lymphedema of the lower legs (Figure 1). It affects subsistence farmers in tropical highland parts of Africa and is caused by long-term barefoot exposure to red clay soil of volcanic origin (Price, 1990; Davey et al., 2007). The story of elephantiasis goes as far back as the second millennium BC. For a long period of time all forms of elephantiasis were considered infectious by most scholars until 1924 when Robles reported endemic non-filarial elephantiasis of the lower legs and described the risk factors, geographical distribution, and clinical presentations based on his study in Guatemala. Later in the 1960s and 1970s, Oomen and Price did seminal work in the epidemiology, etiology, pathology, natural history and management of non-filarial elephantiasis in Ethiopia (Oomen, 1969a; Price, 1976a; Price & Henderson, 1978). Price coined the term podoconiosis for non-filarial elephantiasis to distinguish it from filarial elephantiasis. The term was derived from the Greek terms \textit{podos} and \textit{konos}, which mean foot and dust, respectively and imply that the disease is caused by exposure of feet to irritant clay soil (Davey et al., 2007). The next sections of this chapter describe the epidemiology, genetics, pathogenesis, clinical presentation, diagnosis, treatment, prevention, and elimination of podoconiosis.

![Figure 1: Podoconiosis. (A) Nodular form of podoconiosis of an adult patient in North Ethiopia. (B) A 14 year old barefoot man plowing farming land in a podoconiosis endemic village.](image-url)

2 Epidemiology

Globally, it is estimated that there are at least four million people with podoconiosis. The disease has been reported in more than 20 countries, of which ten had high burden of the disease. Countries where podoconiosis is common are mainly found in tropical Africa, central and south America and northern India (Figure 2) (Davey et al., 2007). Yet recognition of the worldwide distribution of the disease has been delayed by many factors, and unlike filarial elephantiasis it is not reported in medical statistics.
Podoconiosis is mostly common among agricultural people who work barefoot, particularly on red clay soils of volcanic areas (Price & Henderson, 1981; Price et al., 1981; Price, 1990; Destas et al., 2003). The distribution of podoconiosis shows correlation with the distribution of red clay soil derived from volcanic rocks. This association between tropical red clay soil and the occurrence of podoconiosis has been tested and shown in the East African regions of Kenya, north western Tanzania, Ethiopia, and Rwanda (Price, 1976b). Affected areas have altitude over 1000 meters, annual rainfall above 1000mm, average temperatures of ~20°C (all of which govern the type of soil produced), and soils of volcanic origin (Price, 1990).

In endemic highland areas of these countries podoconiosis is more prevalent than commonly known diseases such as HIV/AIDS, tuberculosis, malaria, or filarial elephantiasis. Ethiopia, with an estimated 1 million podoconiosis patients, has the largest number of podoconiosis patients reported so far. Studies over the past ten years have documented that the prevalence of podoconiosis ranges from 2.8% to 7.4% in endemic areas of Ethiopia (Kloos et al., 1992; Destas et al., 2003; Alemu et al., 2011; Geshere Oli et al., 2012; Molla et al., 2012a; Molla et al. 2012b). However, podoconiosis has not yet been adequately incorporated in the health management and information systems, health professionals’ education curricula, and governmental health facility services.

Podoconiosis is more common among barefoot farmers that are exposed to currently unknown antigens in red clay soils of highland areas. Inorganic particles in red clay soils derived from volcanic rocks

Figure 2: Geographical distribution of countries in which podoconiosis is endemic or has been described.
are considered to be the putative risk or causal factors that trigger the inflammatory process. In addition, the majority of podoconiosis patients are poor and uneducated, consequently unable to afford protective shoes or unaware of the role of wearing shoes and washing feet to prevent development of the disease (Davey et al., 2007). The average age of onset of podoconiosis is in the second and third decades of life (Destas et al., 2003; Alemu et al., 2011; Molla et al., 2012b). Studies in different parts of Ethiopia have documented different patterns of burden of podoconiosis in men and women. Some studies have shown that men and women are equally affected, others have shown that the disease disproportionately affects women than men, and a third group of studies have found that the gender ratio varies by the severity of the disease with more men affected at the late stages of podoconiosis (Kloos et al., 1992; Destas et al., 2003; Alemu et al., 2011; Geshere Oli et al., 2012; Molla et al., 2012b).

Besides the high prevalence of podoconiosis in endemic areas, it also imposes immense physical, social and economic burden on affected communities (Yakob et al., 2008; Tekola et al., 2009; Yakob et al., 2010; Tora et al., 2011). Most patients experience recurrent bacterial and fungal super infection of the lower leg leading to loss of productivity. Almost all patients have five or more episodes of acute lymphadenitis per year, and on average loss one month of an annual economic activity because of morbidity (Alemu et al., 2011; Molla et al., 2012a; Molla et al., 2012b). An estimation of the economic costs of podoconiosis in southern Ethiopia has shown that in an area with 1.7 million residents, the annual economic cost of podoconiosis is more than 16 million USD per year, costing Ethiopia more than 200 million USD. Comparison of affected and unaffected people employed with the same job shows that individuals with podoconiosis are half as productive as those without. In addition, podoconiosis patients loss 45% of their economically productive time because of morbidity associated with the disease (Tekola et al., 2006). About 25% of patients have diminished ability to participate in economically productive work, and some resort to begging in bigger cities (Kloos et al., 1992; Molla et al., 2012b). Podoconiosis is also known to have catastrophic social burden in disease endemic communities. In endemic areas podoconiosis is one of the commonest causes of stigmatization against community members. The main reasons for prevailing discrimination against patients and affected families are the erroneous belief that the disease cannot be prevented, treated or controlled; association of the disease with curses; and the belief that the disease runs in families through hereditary factors that are inevitable. Once a diseased individual is identified in a family lineage (bloodline), the whole family becomes subjected to social stigma and discrimination. Consequently, young women have meager prospects for marriage; adult patients are excluded from public gatherings such as religious places, social meetings, and public transportation facilities because of bad odor of oozing discharge; and children with podoconiosis are discriminated by peers and teachers and drop out of school. Because of such wide scale and severe stigmatization, patients also undergo self-stigmatization and isolate themselves from unaffected community members; hide their swollen legs; and hesitate to seek treatment at health facilities. Even worse, misconceptions about the cause of podoconiosis and discriminatory attitudes and practices are also exhibited by the majority of health professionals that work in disease endemic areas (Yakob et al., 2008; Yakob et al., 2010; Tora et al., 2011).

3 Familial Clustering and Genetics

Familial aggregation of podoconiosis has been reported through expert observations, epidemiological studies, and pedigree analyses. Observations in Ethiopia and Rwanda showed that several households have more than one affected member (Price, 1972b; Price, 1976b). In addition, recently, studies in north
and west Ethiopia have shown that reportedly one-third to half of patients have other affected close relatives (Alemu et al., 2011; Molla et al., 2012b). Price conducted a pedigree study in Ethiopia and for the first time, indicated that there is a genetic component in podoconiosis susceptibility with 15-40% risk genotype frequency (Price, 1972b). After a gap of more than two decades, in 2005 a pedigree study was conducted in Ethiopia using multiply affected and multi-generational families. The results showed that the genetic basis of podoconiosis is strong. The sibling recurrence risk ratio was 5.07 (i.e., the sibling of an affected person is at five times increased risk of developing podoconiosis when compared to a person in the general population); the heritability of podoconiosis was estimated to be 0.629 (i.e., 63% of the variation in development of podoconiosis is accounted for by genetic factors); and the most parsimonious model revealed the contributions of a major gene, and the roles of age, and history of use of footwear as environmental covariates (Davey et al., 2007). In 2012 a genome-wide association study involving population-based podoconiosis cases and unaffected controls from southern Ethiopia revealed that genetic variants in the HLA locus of chromosome 6 confer susceptibility to podoconiosis. Specifically, single nucleotide polymorphisms in or near the class II HLA genes namely HLA-DQA1, HLA-DRB1, and HLA-DQB1 were found to be at significantly higher frequency among podoconiosis cases than controls recruited from the same area and population group. The study findings were further corroborated with family-based association test and high resolution sequence-based HLA typing, suggest that podoconiosis is a T-cell mediated inflammatory condition (Tekola Ayele et al., 2012a). Further studies to discern the causal genetic variants, the immunologic and pathologic mechanisms are underway.

4 Clinical Presentation

The clinical picture and course of podoconiosis vary based on time of presentation (early and late) and type of the lymphedema (water bag versus sclerotic or both) (Price, 1990) (Figure 3).

![Figure 3: (A) Early edema of the foot with splaying of the big toe. (B) Lichenification on the dorsum of the anterior foot. (C) Mossy growth on the lateral part of the foot in slippery distribution.](image)

4.1 Early Symptoms

The main presentation of the patient early on the course can be burning sensation or/and itching on the foot. The burning foot is characterized by patients, as on and off burning sensation on the foot following a day-long barefoot exposure on the farm or field. Occasionally, the patient may associate the condition
with traditional beer consumption or for females with menstruation. Sometimes the burning pain may extend into the lower leg and be associated with fever and a tender femoral lymph node. In most patients this may continue for several years affecting one limb. Onset in the other limb may not occur for many months or years. Each episode of attacks resolves spontaneously or after a few days of rest and elevation of the affected limb. The itching on foot is described by the patient as persistent or intermittent itching of the dorsum of the foot, often over the dorsum of the anterior one third and in the first or second web space. Constant rubbing leads to a reactive thickening of the skin (lichenification) suggesting chronic eczema. Repetitive scratching may lead to a breach in barrier function of the skin, which may lead to recurrent cellulites or lymphangitis (Barreiro et al., 2008).

4.2 Early Signs

Identification of the earliest signs of podoconiosis is helpful for timely intervention which will have the potential to halt progression of the disease. The three key early signs are (i) Leg swelling – a transient edema of the lower leg specially the foot which increases following long working day and disappears in the morning after overnight rest (leg elevation). At this stage the edema can be pitting. The unilateral foot edema can be associated with pitting on the anterior foot pad and splaying of the forefoot, widening of the forefoot with separation of the toe, particularly between the first and the second toes. The swelling of the forefoot may cause the toes to lack their usual curvature, appearing as sausages. The deep edema of the plantar foot may lift the toe off the ground (Figure 3A). (ii) Thickening of the skin – the skin over the anterior and dorsum one third of the foot becomes lichenified and thickening can occur which renders the skin (Figure 3B), particularly overlying the first toe web space, stiff and unable to be pinched (positive Stemmer’s sign). The increased skin markings, usually longitudinal, may be evident and exaggerated by squeezing together the toes; it is significantly visible between the first and second toes. (iii) Mossy foot – warty and papilomatous growth with rough surface are usually seen on the foot involving the dorsum of foot in the anterior one third and the sole of foot in slippery distribution accentuating lateral side of sole and the heel of foot. This hyperkeratotic and wart growth looks like a ‘moss’ but it is rough to touch (Figure 3C). Patients who have started to wear shoes usually do not have the hyperkeratotic lesion. A mismatched and asymmetric enlargement of the second toe on the affected foot is a common finding (Price, 1990).

4.3 Later Symptoms

Following the recurrent burning episodes associated with transient swelling, the leg diameter progressively increases and establishes a persistent lymphedema. The late clinical picture can vary greatly. Conventionally, three main forms of lymphedema are distinguished in podoconiosis: (1) Soft and pitting (“water bag” type) – subdermal edema that is soft to the touch and pits with pressure; it has little dermal fibrosis. Usually the swelling has a narrow neck around the knee and wider base on the foot. The skin will have a smooth and dumpy surface, with occasional lymphorhea especially on the foot which attracts flies. Often there is loss of normal hair. With time, the foot and lower leg become large and flabby (Figure 4A). With elevation there is considerable reduction in size. Swelling may lead to redundant skin folds around the ankle joint and ballooning over the toes. The disability to the patient is due to the great size of the limb and heaviness. (2) Hard and sclerotic/fibrotic or leathery leg ‘elephantiasis’ – sclerosis governs the changes in the skin and sub cutis, which become woody hard and grossly thickened. The overlying epidermis on the foot takes on a sandpaper-like appearance which eventually, due to increasing hyperkeratosis, takes on the so-called ‘mossy’ appearance (Figure 4B).
Under areas of compression, such as a sandal strap, the skin remains smooth and dumpy. The stiff, sclerotic nature of this altered skin especially on the ankle compromises the normal flexibility of the ankle and toe which makes it vulnerable to cracking and trauma, in addition to ankylosis of the joints. (3) Mixed elephantiasis – characterized by grossly swollen limb below the knee and non-pitting edema, not reducible overnight (leg elevation) and no sclerotic change. There may be variation in the compressibility between the lymphedema below the ankle and above the ankle.

4.4 Other Clinical Features Associated with Podoconiosis

(1) Fibrous nodules – these lumps of redundant skin with subepidermal fibrosis occur mostly on the dorsum of the toe and foot (Figure 4B). They tend to occur mostly with the fibrotic (sclerotic) and the mixed lymphedema. The nodules can start as smooth surface skin folds and progress to timorous growth which considerably inhibits footwear.

(2) Inter-digital and skin fold maceration – whitish and wet patches on the interdigital space with occasional fissuring. The maceration is associated with oozing (lymphorhea) and usually has bacterial and fungal infections. Dumpy foot from the lymphorhea with microbial super-infection leads to the foul smell which adds to the stigma and social isolation of the patient (Figure 4C).

(3) Acute lymphangio adenitis (ALA) or cellulites – in general lymphedematous limb is said to have compromised immunologic clearance mechanism which leads to recurrent infection. One of the commonest causes of morbidity in podoconiosis is ALA affecting about 97% patients (Aleme et al., 2011) with a recurrence rate of 5 to 5.5 times per year and in each attack the patient becomes bedridden for 4 days. ALA manifests as acute pain on the limb with fever, chills and rigor. The limb becomes reddened, hot and tender with tender swelling in the draining femoral lymph node (Aleme et al., 2011; Molla et al., 2012b).

(4) Fusions of toes – some podoconiosis patients present with toe fusions which starts on the fourth and second interdigital spaces forming a web-like skin growth connecting the toe from proximal and extending distally (Price, 1990).
(5) Scaring and de-pigmentation—recurrent itching and ulcerative skin on the dorsum of foot results in scarring and de-pigmentation of the skin on the distal foot. The scarring causes toe resorption which confuses with leprosy (Price, 1990; Davey et al., 2007; Barreiro et al., 2008).

5 Pathogenesis

The etiology of podoconiosis has not yet been completely understood. Based on existing evidence the most accepted cause of podoconiosis is inorganic particle induced inflammatory response on a background of genetic susceptibility (Davey et al., 2007). Mineral particles, absorbed through the skin of the foot, are taken up into macrophages in the lower limb lymphatics and induce an inflammatory response in the lymphatic vessels, leading to fibrosis and obstruction of the vessel lumen. This leads initially to edema of the foot and the lower leg, which progresses to elephantiasis: gross lymphedema with mossy and nodular changes of the skin (Price, 1976a).

The historical account of studies conducted to identify the etiology of podoconiosis goes back to the 1960s. A possible etiology was suggested by Heather and Price on observing inorganic silica particles in section of femoral lymph node. A study by Price and Pitwell about the mineral content of the lymph nodes in barefoot people with and without elephantiasis confirmed presence of elements including silicon, aluminum, and iron in all barefoot people, with slightly higher amount in those with elephantiasis suggesting the etiological significance of these particles (Price & Henderson, 1978). In addition, endemic areas were free of filariasis; footwear had a protective effect; birefringent silica particles were found in the lymph node macrophages; and the dermal content of various mineral elements was consistent with local soils, leading to the postulation of soil induced disease (Price, 1972a; Price, 1976a; Price, 1990). After he conducted epidemiological and geological studies, Price indicated that silicate particles cause subendothelial edema, endolymphangitis, collagenisation and obliteration of the lymphatic lumen (Price, 1976a). Biopsies from inguinal and femoral lymph nodes of affected individuals have shown the presence of birefringent particles and foreign body granuloma (Price, 1972a). Electron microscopy of the lymph node biopsy and micro-analysis showed that the particles are found inside the macrophages and consist dominantly silica with varying amount of aluminum, titanium and iron oxide (Price & Henderson, 1978).

Histopathological examination of the lymph nodes showed that they contained birefringent minerals which, by microanalysis, were identified as sub-micron particles of kaolinite and small amounts of quartz, hematite, geothite and gibbsite (Abrahams, 2002). When crystalline silica was injected into lymphatic vessels in the legs of rabbits, it resulted in macrophage proliferation followed by lymphatic fibrosis and blockage similar to that seen in podoconiosis (Fyfe & Price, 1985). Price hypothesized that individual differences in the tissue handling of absorbed minerals plays a role in development of full-blown podoconiosis (Price, 1990). It is probable that certain minerals reach the nodes by transit through the afferent lymphatics after being absorbed through the plantar skin. Because of the known fibrogenic potency of silica, the hypothesis has emerged that the disease is an obstructive lymphopathy caused by fibrotic response to silica of soil origin. Animal study of injecting silica particles has shown that the obstructive effect of silica within the lymphatic system is on the lymphatics themselves and not on the draining lymph nodes (Price et al., 1981).

Histological examination of the lymphedematous skin shows epidermal hyperkeratosis, acanthosis and hypergranulosis (Figure 5).
This may be a consequence of growth factors released by the inflammatory cells, which are attracted to the irritant. The papillary dermis shows fibrosis and a perivascular infiltrate of lymphocytes, mast cells, and plasma cells plus coarse, wiry bundles of collagen. The deeper dermis shows sclerosis, reflecting temporal progression of the fibrosis. The presence of dilated blood vessels with surrounding fibrosis mimics the findings of stasis. But, there are no hemosiderin deposits. This feature, together with dermal sclerosis, contributes to the hardness and irreversibility of lesions.

A recent study in northern Ethiopia has indicated that patients with podoconiosis have significantly lower stratum corneum hydration in the skin of their lower legs and feet than unaffected individuals from the same community, suggesting increased risk of cracking, susceptibility to infection, and lymphedema (Ferguson et al., 2013). By comparing cases of podoconiosis at early and advanced disease stage and unaffected controls from the same area, a study has found differences in serum levels of oxidative stress biomarker levels and TGFβ1, suggesting their role in pathogenesis of podoconiosis (Addisu et al., 2010).

6 Diagnosis

In endemic areas, the diagnosis of podoconiosis is usually made clinically by enquiring the history of illness and pattern of progression of the swelling, physical examination of the swollen sites, exclusion of other causes of lymphedema, and sometimes family history of the disease. At presentation, patients characterize the illness as burning sensation of the foot followed by an upwards progressive swelling that starts from the foot or lower legs and progresses upwards to the level of the knees and a gradual increase in leg circumference (Price, 1990).

The commonest differential diagnoses of podoconiosis are filarial elephantiasis, lymphedema of systemic disease and leprotic lymphoedema. In podoconiosis, the foot is the site of first symptoms (which occur elsewhere in the leg in filarial elephantiasis); the swelling is bilateral, asymmetric, usually below the level of the knees, and rarely involves the groin, whereas in filarial disease, it is predominantly unilateral and extends above the knee; sensory perception of the peripheral nerves is intact in the toes and forefoot, neurotrophic ulcers and thickened neurovascular nerves are lacking, and there is no hand involvement (unlike leprotic lymphoedema) (Price, 1990; Davey et al., 2007). Earlier studies, between 1935 and 1940, of numerous cases of elephantiasis in Shoa, the then central province of Ethiopia, revealed no mi-
crofilariae in the peripheral blood taken either by day or by night. Similarly, no microfilariae were detected in 50 cases of elephantiasis examined in the Harar province, Eastern Ethiopia (Cohen, 1960; Oomen, 1969a). Likewise, onchocerciasis and lymphatic filariasis were not reported in a mission hospital in Wolaita zone, southern Ethiopia for more than 30 years, which made the presence of Wuchereria bancrofti unlikely (Oomen, 1969b). Recently, a study using both midnight thick film examination and Binax™ antigen cards has excluded filariasis as the cause of podoconiosis in Wolaita zone (Desta et al., 2007). A study in central Ethiopia has also shown absence of W. bancrofti in the serum of individuals diagnosed with podoconiosis by lay and shortly trained community health workers (Geshere Oli et al., 2012). Endemic Kaposi’s sarcoma and podoconiosis share common features, such as involvement of the lymphatic system in barefoot farmers, and high prevalence in volcanic areas. This may suggest a common pathogenesis. However, they do not seem to co-exist in endemic areas (Ziegler, 1993; Ziegler et al., 2001; Nenoff et al., 2009). A recent study has assessed the extent to which podoconiosis can be accurately diagnosed by community health workers’ clinical examination in comparison with a ‘gold standard’ rapid filarial antigen testing using Binax antigen cards. The study found that clinical examination of patients with podoconiosis in endemic communities has a strong predictive value to exclude filarial elephantiasis, and a valid means for diagnosing podoconiosis (Desta et al., 2007).

Diagnosis of podoconiosis is often delayed because of the erroneous belief that podoconiosis can neither be treated or controlled, the prevailing stigmatization against patients when they disclose their illness, and health professionals’ confusion of podoconiosis with filarial elephantiasis (Yakob et al., 2010). As a consequence, active treatment seeking by patients at modern health facilities is poor. Mobilization of patients and case tracing through house-to-house surveys was the most prominent practice to encourage patients to seek care at facilities that provide such services (Davey & Burridge, 2009).

### 7 Treatment and Prognosis

The conventional therapy in a poor setting is composed of five components:

1. **Foot hygiene** — patients will be advised to wash their feet daily in an antiseptic solution for 10 to 15 minutes and rinse it with clean water (Figure 6A).

2. **Application of emollient and massaging the skin of the affected limb.**

3. **Elevation of the foot above the hip whilst resting, at least at night but also as often as is practical during the day.**

4. **Compression therapy with short stretchable bandage** — patient will be trained on bandaging technique. The bandage will be applied throughout the day except on the bathing time. If this is not possible, some compression can be achieved with the wearing of long socks (Figure 6B).

5. **Footwear** — custom made shoes are advised where possible until the foot is of a size where more generic shoes can fit. This is to provide protection of the foot from the irritant soil as well as supporting compression (Figure 6C).

Early stages of podoconiosis lymphedema can be reversed and those with water bag type of lymphedema will have a control compatible to normal socio-economic position. Patients with woody hard fibrous nodules (Figure 3) on the foot and leg tend not to respond to this conventional therapy since the nodules are too hard to be reduced by compression bandaging.
Removal of the nodules in these patients allows them to use custom designed shoes and to control disease progress with the conventional simple management plan described above. However, any surgical intervention in patients with lymphoedema has its risks. Wound healing is known to be impaired in the context of lymphoedema so surgical intervention is advised to be undertaken with caution. Surgical excision of the nodules (nodulectomy) has been practiced in Ethiopia and we have demonstrated that surgical nodulectomies can be performed with satisfactory healing rates, encouraging lack of complications and leading to significant improvement in quality of life in a tropical low income setting (Figure 7).

Treatment outcome and prognosis is monitored with indicators such as reduction of leg circumference, improvement of skin texture, clinical stage of the disease, and rate of wound healing (if they have). A one year follow-up of podoconiosis patients in Southern Ethiopia has shown dramatic improvement in the quality of life of patients (Sikorski et al., 2010).
8 Prevention and Elimination

Podoconiosis is a preventable disease. Existing evidence indicates that effective prevention of podoconiosis can be achieved by regularly wearing shoes and washing feet from childhood. In early onset disease, foot hygiene is very helpful to halt and reverse progress. It involves washing feet with soap and water, use of antiseptic and emollients, and consistently wearing shoes and socks. Treatment of early stages of podoconiosis helps improve the quality of life of patients as demonstrated in a Dermatology Life Quality Index (DLQI) measurement study (Henok & Davey, 2008). In endemic areas a gradual rise in shoe wearing has been reported. For example, in north and west Ethiopia 76% and 91% of podoconiosis patients approached for surveys conducted in 2010 and 2011 were observed to be wearing shoes (Alemu et al., 2011; Molla et al., 2012). Discounting the more rigorous use of footwear among patients after the disease develops, it can be estimated that a large majority of community members have started wearing shoes. These figures are higher than those reported two to three decades ago (Kloos et al., 1992). However, financial barriers have still impacted the ability of individuals to afford better quality and more number of shoes per year (Klimentidis et al., 2011). Whether the shoes worn by the communities provide sufficient protection against the irritant particles in the soil and the consistency of usage of shoes needs thorough investigation. In addition, podoconiosis is getting a relatively better attention by global health advocates and local health institutional management bureaus. These elements can be harnessed to increase resources available for health education on personal hygiene and for improving access to shoes and water.

In addition to being a preventable disease, podoconiosis can also be eliminated from a country or an endemic area. The experience of countries such as Ireland, France, the Canary Islands that had podoconiosis in the past but have no cases currently gives hope that with universal use of foot wear and proper personal hygiene elimination of podoconiosis from endemic countries is within reach. In 2007 the Mossy Foot Treatment and Prevention Association (MFTPA) in southern Ethiopia has developed and implemented a strategy that aimed to prevent podoconiosis by targeting resources such as shoes to children who are from families with history of podoconiosis. Family history of podoconiosis captures genetic, socio-economic and behavioral risk factors shared among family members. Using this approach, the MFTPA has distributed over 40,000 pairs of shoes to children at high risk for podoconiosis (Tekola Ayele et al., 2012b). Scaling up this strategy throughout endemic areas can help to prioritize targets for disease elimination efforts. In addition, integration of podoconiosis treatment and prevention programs with government health delivery systems is crucial to successfully eliminate the disease (Figure 6C).

9 Way Forward

As we have described in this chapter, podoconiosis is a debilitating disease common in several countries across the world. Despite its huge socio-economic and public health burden, podoconiosis has remained neglected in clinical, public health, and policy agendas until quite recently. The clinical presentation of the disease and its geographic distribution makes it distinct. The recent findings on the genetics of the disease and the experience of targeting resources to poor settings by using genetic information (family health history) are found to be effective in accelerating eradication of podoconiosis. Further investigation of the immunopathogenesis of podoconiosis will give insight into the disease mechanisms and therapeutic targets. We recommend that environmental and biomedical studies should be conducted to identify the causal environmental antigen(s) in red clay soil areas and to understand the mechanism through which
these factors initiate and propagate the inflammatory immune response in genetically susceptible individuals.

Recent policy level developments shed some light into the future. For example, in 2011, the World Health Organization included podoconiosis in its list of NTDs (http://www.who.int/neglected_diseases/diseases/podoconiosis/en/). The Ethiopian Ministry of Health included podoconiosis in the National Master Plan for NTDs and in modules for the upgrading of Health Extension Workers. In addition, initiatives including Footwork - the International Podoconiosis Initiative, and the Ethiopian National Podoconiosis Action Network have been formed with vision to eliminate podoconiosis.

References


