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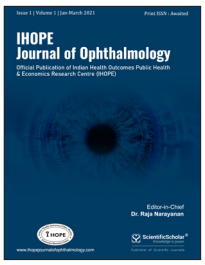

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Podoconiosis in Africa: Through research to policy

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PODOCONIOSIS: DEFINITION, EPIDEMIOLOGY, AND RISK FACTORS

Podoconiosis is a type of non-infectious, neglected tropical disease that frequently affects individuals with prolonged barefoot exposure to irritant red clay soils.[1-3] The term "Podoconiosis" is derived from the Greek language; "podos" means foot, and "konos" means dust. Podoconiosis differs from lymphatic filariasis, although it is often confused with it. Lower leg swelling (lymphoedema) is a crucial clinical feature of podoconiosis, with swelling initiating in the foot and subsequently ascending to the lower legs. Lymphoedema is commonly bilateral, asymmetric, and limited to below the knees. Podoconiosis often manifests in the second decade of life, with the disease remaining prevalent up to the sixth decade.[3]

At present, podoconiosis is found in high-altitude tropical and sub-tropical regions of 17 countries, with 12 of them located in Africa. Ethiopia has the highest number of people with podoconiosis (1.5 million cases), followed by Cameroon (42,000 cases) and Rwanda (7000 cases) in the African continent.[2] Women are at a 1.15 times higher risk of developing podoconiosis than men.[4] Common risk factors for podoconiosis include living and working barefoot on red clay soils, genetic susceptibility, and long-term exposure to red clay soils.[5,6] This condition more frequently affects poor rural communities dependent on subsistence farming and is also reported in other occupations involving prolonged contact with red clay soil.[7]

MULTIDISCIPLINARY RESEARCH ON PODOCONIOSIS

In the early 1970s, British surgeon Ernest Price conducted groundbreaking multidisciplinary research (including clinical epidemiology, pathology, genetics, and geology) to establish an association between barefoot exposure to irritant red clay soil and podoconiosis in Ethiopia. Price's work differentiated the podoconiosis from other forms of lymphoedema. However, despite Price's contributions, interventions to prevent and manage podoconiosis in Ethiopia's endemic areas were limited in those days. The multidisciplinary research on podoconiosis remained inactive for over a decade after Price died in 1990.[8]

In 2002, Professor Gail Davey from the School of Public Health at Addis Ababa University, Ethiopia, visited the "Mossy Foot Treatment and Prevention Association" (MFTPA), a small organization closely connected with individuals affected by podoconiosis in southern Ethiopia. The MFTPA provided treatment for podoconiosis and maintained patient information.[9] At that time, podoconiosis was not included in national health curricula or policies in Ethiopia, with minimal research focusing on the condition, especially in the burdened southern regions. Recognizing the importance of research in informing policy and developing effective interventions, Gail Davey and the MFTPA director decided to produce key evidence on

podoconiosis for public health academicians, implementers, and policymakers.

To initiate the research, the MFTPA collaborated with Addis Ababa University, creating a program encouraging postgraduate public health students to conduct research projects on podoconiosis in endemic areas of southern Ethiopia. The MFTPA acted as a gatekeeper between students and affected individuals, facilitating successful research activities. This collaboration resulted in 11 Ethiopian graduate students producing substantial evidence on podoconiosis, publishing nearly 15 peer-reviewed publications, with Davey as the principal investigator.[8]

Tekola *et al.* conducted an initial study to assess the total and average productivity cost associated with podoconiosis in Ethiopia. The findings revealed that individuals affected by podoconiosis lost 45% of total working days per year, and the overall cost exceeded US $16 million per year in southern Ethiopia.[10] This study played a crucial role in capturing the attention of national-level policymakers in Ethiopia. Another study by Davey *et al.* emphasized the importance of human genetic factors as determinants of susceptibility to podoconiosis, highlighting that not all individuals exposed to red clay soil developed the condition. The study demonstrated a high heritability of the condition, prompting a larger genetic study to identify the specific gene associated with podoconiosis.[6] These two studies were conducted with budgets of less than £10,000. In addition, Tekola *et al.* conducted a genome-wide association study among 194 individuals with podoconiosis and 203 controls from southern Ethiopia, revealing a genome-wide association with single nucleotide polymorphisms in the HLA class II locus [Figure 1].[5]

Dr. Kebede Deribe from Brighton and Sussex Medical School conducted spatial analysis research as part of his doctoral and post-doctoral work to identify environmental factors linked to podoconiosis within and beyond Ethiopia. Deribe *et al*. found that factors such as altitude, rainfall, and soil type were associated with podoconiosis occurrence, estimating that around 34.9 million people lived in environmentally suitable places where the chance of podoconiosis occurrence is high.[11] Building on this study, Molla *et al*. collaborated with a geologist to closely examine the soil composition in areas with a high burden of podoconiosis. They discovered that smectite, quartz, and mica in the soil were significantly associated with the prevalence of podoconiosis.[12]

Davey *et al*. successfully generated substantial evidence supporting Ernest Price's initial work, highlighting the connection between long-term exposure to irritant red soil and the genetic susceptibility of individuals to podoconiosis.[6]

EVIDENCE-BASED PODOCONIOSIS PREVENTION AND MANAGEMENT

Preventive measures for podoconiosis include both pharmaceutical and non-pharmaceutical interventions. Primary prevention focuses on avoiding prolonged contact between irritant soil and the skin of susceptible individuals. Simple non-pharmaceutical interventions, such as consistently wearing robust footwear and covering floors or roads with irritant red soil, can achieve this goal. There is robust evidence demonstrating a significant reduction in the prevalence of podoconiosis in countries such as France, Scotland, and Ireland when individuals consistently wear shoes.[13] Ayode *et al*. conducted a qualitative study to explore barriers associated with footwear use in podoconiosis-endemic areas. Limited financial resources to purchase more than one shoe, using shoes only on special occasions, perceived unsuitability for daily activities, and a low-risk perception of contracting diseases were identified as key barriers to the consistent use of footwear.[14]

Both secondary and tertiary prevention of podoconiosis involve similar interventions. Patients with lymphoedema often experience acute dermatolymphangioadenitis (ADLA), characterized by malaise, fever, chills, limb swelling, diffuse inflammation, lymphangitis, adenitis, and skin peeling.[15] ADLA leads to a considerable loss of working days among individuals with lymphoedema. Sikorski *et al*. found that simple lymphoedema treatments, including patient awareness, daily foot hygiene (washing with soap and water), regular use of emollients and antiseptics, elevation of the limb during sleep, and consistent use of socks and shoes, can decrease the progression of lymphoedema and improve the patient's quality of life.[16] Building on this study, a pragmatic randomized controlled trial was conducted to assess the effectiveness of a simple lymphoedema management package on the incidence of ADLA. The study revealed that this management package was effective in reducing the frequency and duration of ADLA.[17]

PODOCONIOSIS RESEARCH INTO VARIOUS POLICY ACTIONS

To date, Dr. Gail Davey have conducted a series of research studies aimed at assessing the distribution and burden of podoconiosis in Ethiopia.[7] The Wellcome Trust Brighton and Sussex Centre for Global Health Research consolidated these studies and developed advocacy packages. These packages serve as guides for governments of affected countries by demonstrating the efficacy of simple treatment methods and emphasizing the importance of simple health messages in preventing podoconiosis. Functioning as an international, multidisciplinary research hub, the center is now poised to explore the global mapping of podoconiosis, delve into its immunology and pathogenesis, and work towards developing a point-of-care diagnostic test over the next four years.[18]

In February 2011, the World Health Organization (WHO) officially classified "Podoconiosis" as a non-tropical disease (NTD), adding it to a list of 19 other NTDs. Davey *et al.*

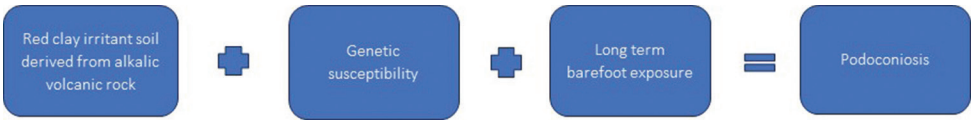

Figure 1: Picture illustrating the etiological factors of podoconiosis.[6]

initiated the International Podoconiosis Initiative, also known as "Footwork." This initiative seeks to bring together public and private partners to prevent and treat podoconiosis not only in Ethiopia but in other affected countries as well.[19] The Ethiopian national master plan prioritized podoconiosis as one of the eight NTDs in June 2013. WHO responded by publishing a separate factsheet on podoconiosis and launching an open online course designed to train healthcare workers at district and national levels in the identification and management of skin NTDs.[3]

Davey *et al*. approached podoconiosis from a multidisciplinary perspective, generating evidence through three main strategies: (1) collaboration with local and international institutes, (2) involvement of local investigators and graduate students in research activities, and (3) engagement with a wide range of academic and other institutions. These efforts have played a pivotal role in successfully translating podoconiosis research into various policy and advocacy actions in Ethiopia.[9]

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Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Price EW. The association of endemic elephantiasis of the lower legs in East Africa with soil derived from volcanic rocks. Trans R Soc Trop Med Hyg 1976;70:288-95.
2. Deribe K, Simpson H, Cano J, Pigott DM, Weaver ND, Cromwell EA, *et al.* Mapping the global distribution of podoconiosis: Applying an evidence consensus approach. PLoS Negl Trop Dis 2019;13:e0007925.
3. Podoconiosis (non-filarial lymphoedema). Available from: https://www.who.int/news-room/fact-sheets/detail/podoconiosis-(non-filarial-lymphoedema) [Last accessed on 2023 Nov 30].
4. Berhe B, Legese H, Mardu F, Tesfay K, Adhanom G, Kahsay T, *et al.* Epidemiology and sex differences of podoconiosis in Ethiopia: A systemic review and meta-analysis. Heliyon 2021;7:e05446.
5. Tekola Ayele F, Adeyemo A, Finan C, Hailu E, Sinnott P, Burlinson ND, *et al.* HLA class II locus and susceptibility to podoconiosis. N Engl J Med 2012;366:1200-8.
6. Davey G, Gebrehanna E, Adeyemo A, Rotimi C, Newport M, Desta K. Podoconiosis: A tropical model for gene-environment interactions? Trans R Soc Trop Med Hyg 2007;101:91-6.
7. Davey G, Tekola F, Newport MJ. Podoconiosis: Non-infectious geochemical elephantiasis. Trans R Soc Trop Med Hyg 2007;101:1175-80.
8. Deribe K, Tomczyk S, Tekola-Ayele F. Ten years of podoconiosis research in Ethiopia. PLoS Negl Trop Dis 2013;7:e2301.
9. Davey G, Burridge E. Community-based control of a neglected tropical disease: The mossy foot treatment and prevention association. PLoS Negl Trop Dis 2009;3:e424.
10. Tekola F, Mariam DH, Davey G. Economic costs of endemic non-filarial elephantiasis in Wolaita Zone, Ethiopia. Trop Med Int Health 2006;11:1136-44.
11. Deribe K, Cano J, Newport MJ, Golding N, Pullan RL, Sime H, *et al.* Mapping and modelling the geographical distribution and environmental limits of podoconiosis in Ethiopia. PLoS Negl Trop Dis 2015;9:e0003946.
12. Molla YB, Wardrop NA, Le Blond JS, Baxter P, Newport MJ, Atkinson PM, *et al.* Modelling environmental factors correlated with podoconiosis: A geospatial study of non-filarial elephantiasis. Int J Health Geogr 2014;13:24.
13. Price E. Podoconiosis: Non-filarial elephantiasis. Oxford: Oxford Medical; 1990.
14. Ayode D, McBride CM, de Heer HD, Watanabe E, Gebreyesus T, Tora A, *et al.* A qualitative study exploring barriers related to use of footwear in rural highland ethiopia: Implications for neglected tropical disease control. PLoS Negl Trop Dis 2013;7:e2199.

15. Fischer PU, Hoerauf A, Weil G, Simonsen PE, Weil GJ. The filariases; 2014. Available from: https://www.researchgate.net/publication/262048581 [Last accessed on 2023 Nov 31].
16. Sikorski C, Ashine M, Zeleke Z, Davey G. Effectiveness of a simple lymphoedema treatment regimen in podoconiosis management in southern ethiopia: One year follow-up. PLoS Negl Trop Dis 2010;4:e902.
17. Negussie H, Molla M, Ngari M, Berkley JA, Kivaya E, Njuguna P, *et al.* Lymphoedema management to prevent acute dermatolymphangioadenitis in podoconiosis in northern Ethiopia (GoLBeT): A pragmatic randomised controlled trial. Lancet Glob Health 2018;6:e795-803.
18. The elimination of podoconiosis. Available from: https://www.bsms.ac.uk/research/global-health-and-infection/wellcome-trust-brighton-and-sussex-centre-for-global-health-research/current-research/podoconiosis/the-elimination-of-podoconiosis.aspx [Last accessed on 2023 Nov 30].
19. Davey G, Bockarie M, Wanji S, Addiss D, Fuller C, Fox L, *et al.* Launch of the international podoconiosis initiative. Lancet 2012;379:1004.

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