Risk Factors for Podoconiosis: Kamwenge District, Uganda September 2015

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Podoconiosis: Non-filarial elephantiasis

- Contact with irritant soils: red clays from alkaline volcanic rock
- Areas >1000m (330ft), Annual rainfall of 1000mm
Disease process

Mineral particles penetrate skin

↓

Taken up by macrophages in lymphatics

↓

Inflammation: *(Genetically predisposed)*

↓

Lymphatic Fibrosis and Blockade

↓

Disabling Lymphedema
Podoconiosis not documented in Kamwenge district

Kamwenge

Legend
- Lakes
- Podoconiosis
- Kamwenge district
- District Border

0 50 100 150 200 km
Events leading to investigation

Lymphatic Filariasis Mapping by MOH, VCD


WHO, VCD alerted of increased cases of “elephantiasis”

2nd Alert

Investigation

Podoconiosis in Kamwenge
Objectives

- Identify risk factors for Podoconiosis in Kamwenge district
- Provide evidence for public health action
Case definition

- **Suspected Case**: Asymmetrical lower limb swelling (non-pitting oedema) for ≥1 mon, plus ≥1 of:
  - Itching of skin, burning sensation
  - Plantar-oedema (swelling of sole of foot)
  - Lymph ooze
  - Prominent skin markings
  - Hyperkeratosis (skin hardening)
  - Formation of moss-like papillomata/nodules
  - Rigid toes in a Kamwenge resident.

- **Probable Case**: Suspected case with negative microfilaria antigen immunological card test
Active Case finding in collaboration with:

- District health team
- Village health team
- Office of the RDC
Case count

- 52 Suspected cases
- 40 Probable Cases
Age distribution of cases

- Cases <13y: 0
- Mean age: 48 (range: 13-80) yrs
Epidemic curve shows stable number of cases over time

Case count

Year of Onset

Podoconiosis in Kamwenge
## Higher attacker rates in Busiriba sub-county

<table>
<thead>
<tr>
<th></th>
<th>Attack Rate/1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>1.0</td>
</tr>
<tr>
<td>Busiriba Sub-county</td>
<td>1.3</td>
</tr>
<tr>
<td>Kamwenge Sub-county</td>
<td>0.65</td>
</tr>
</tbody>
</table>
### Higher attacker rates among females

<table>
<thead>
<tr>
<th>Population</th>
<th>Attack Rate/1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>1.0</td>
</tr>
<tr>
<td>Female</td>
<td>1.2</td>
</tr>
<tr>
<td>Male</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Cases spread over 27 villages in two sub-counties

Podoconiosis in Kamwenge
## Hypothesis generation interview

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>% (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers (growing crops)</td>
<td>100</td>
</tr>
<tr>
<td>Never wore shoes at work</td>
<td>60</td>
</tr>
<tr>
<td>Washed feet at end of day</td>
<td>65</td>
</tr>
</tbody>
</table>
Case-control study

- 40 cases
- 80 controls: Asymptomatic Kamwenge residents
- Matched by Age, Sex and Village of residence
- Foot exposures at home and work: wearing shoes, type of shoes, washing feet, floor type/cover.
### Not wearing shoes significantly associated with disease

<table>
<thead>
<tr>
<th>Wearing shoes before disease onset</th>
<th>Exposure rate (%)</th>
<th>OR&lt;sub&gt;M-H&lt;/sub&gt; (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases n=40</td>
<td>Controls n= 75</td>
</tr>
<tr>
<td>Not wearing shoes at work</td>
<td>93</td>
<td>31</td>
</tr>
<tr>
<td>Not wearing shoes at home</td>
<td>80</td>
<td>55</td>
</tr>
</tbody>
</table>
## Stratified analysis

<table>
<thead>
<tr>
<th>Wearing shoes at:</th>
<th>OR&lt;sub&gt;kiu&lt;/sub&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work and home</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Work only</td>
<td>4.2</td>
<td>0.74- 24</td>
</tr>
<tr>
<td>Home only</td>
<td>5.5</td>
<td>0.32- 87</td>
</tr>
<tr>
<td>Neither at work nor home</td>
<td>8.8</td>
<td>1.9- 40</td>
</tr>
</tbody>
</table>
Delay in washing feet significantly associated with disease

<table>
<thead>
<tr>
<th>Washing feet after work</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 hours</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>2-4 hours</td>
<td>4.8</td>
<td>0.89-26</td>
</tr>
<tr>
<td>End of Day</td>
<td>11</td>
<td>2.1- 57</td>
</tr>
</tbody>
</table>
Study area is at high altitude, rich in volcanic soils

- Altitude: 1163-1328m above sea level
- Deep rich volcanic fertile soils: *Assessment by Paulos Chanie (2014)*

*Innovative Water Resource use & Management for Poverty Reduction in Sub-saharan Africa*
Differentiation from filarial elephantiasis

- Clinical
  - Bilateral oedema
  - Asymmetrical
  - Below knee oedema
  - No genital involvement

- Lab
  - Negative filarial test in 40 cases tested

- Geographical
  - Altitude
  - Volcanic soils

Podoconiosis in Kamwenge
Conclusions

- This is non-filarial elephantiasis consistent with Podoconiosis
- Prolonged foot exposure to volcanic soils is a risk factor for Podoconiosis
Recommendation

- Health education on foot protection and prompt washing of feet after work
- Provision of gumboots to Kamwenge farmers
Acknowledgement

- Epidemiology & Surveillance Division
  - Ben Masiira, PHFP-FET Fellow
  - Dr. Monica Musenero
  - Dr. Opar Bernard

- Vector Control Division
  - Gabriel Matwale

- World Health Organization
  - Dr. Miriam Nanyunja
  - William Z. Lari

- PHFP
  - Dr. Bao-Ping Zhu
  - Dr. Ario Alex
  - Dr. Frank Kaharuza

- Kamwenge District Local Government, District Health Team
<table>
<thead>
<tr>
<th>Foot protection (wearing of shoes)</th>
<th>Odds Ratio</th>
<th>P value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearing shoes while at work and home</td>
<td>Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing shoes while at work only</td>
<td>4.2</td>
<td>0.104</td>
<td>0.74-23.7</td>
</tr>
<tr>
<td>Wearing shoes while at home only</td>
<td>5.5</td>
<td>0.247</td>
<td></td>
</tr>
<tr>
<td>Not Wearing at all</td>
<td>8.8</td>
<td>0.005</td>
<td>1.91-40.1</td>
</tr>
<tr>
<td>Risk Factors</td>
<td>Cases</td>
<td>Controls</td>
<td>Exposure rate Cases</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------</td>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Wearing shoes while at work:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>37</td>
<td>23</td>
<td>93</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>52</td>
<td>8</td>
</tr>
<tr>
<td>Wearing shoes while at home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>39</td>
<td>80</td>
</tr>
<tr>
<td>Yes</td>
<td>8</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>Family history of illness similar to podoconiosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22</td>
<td>10</td>
<td>31</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>65</td>
<td>87</td>
</tr>
</tbody>
</table>
Podoconiosis a neglected tropical disease

- 4 million people affected worldwide
- 5% population in endemic areas: Tropical Africa, South America, India
- Eliminated from North Africa, Europe
- High Prevalence 10%
  - E. Africa: Ethiopia, Kenya, TZ, Uganda, Rwanda, E. Guinea, Cameroon
- Podoconiosis in Uganda:
  - Kapchorwa
  - Kabale

Podoconiosis in Kamwenge
Symptoms among Podoconiosis Case-patients

- Bilateral lower limb swelling: 100%
- Plantar Oedema: 98%
- Itchy Skin: 93%
- Papillomata Formation: 85%
- Hyperkeratosis: 85%
- Burning Sensation: 82%
- Rigid Toes: 79%
- Prominent Skin Markings: 75%
- Others: 22%
Distribution of cases by age group

- 10-18: 6
- 19-30: 8
- 31-60: 55
- Above 60: 31

Podoconiosis in Kamwenge