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Epidemiology of onchocerciasis and epilepsy in Ituri province, Democratic Republic of the Congo

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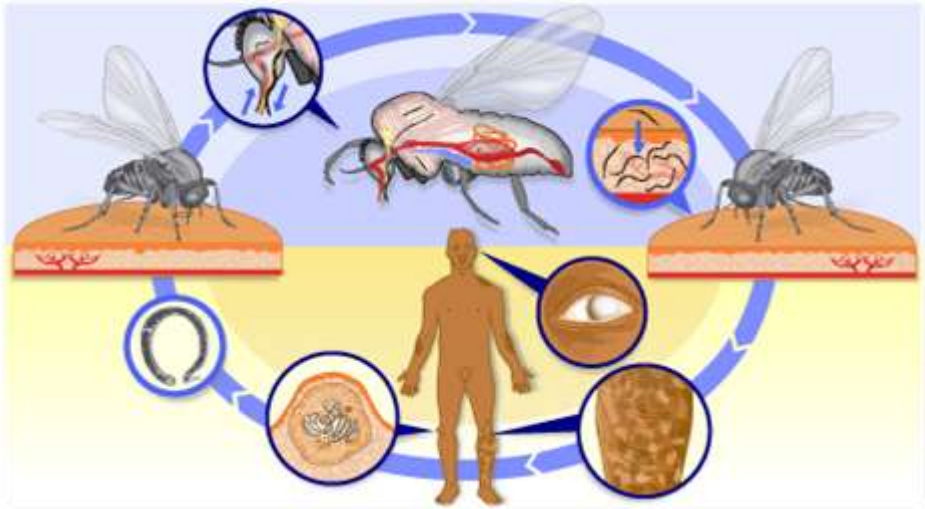
Background

Public health importance

- **Epilepsy is one of the most common neurological conditions globally**
  - ✓ Fifty million people affected worldwide
  - ✓ Close to 80% of people with epilepsy live in LMIC
  - ✓ Very heterogeneous distribution between and within countries
  - ✓ Significant demographic and socio-economic implications, especially in LMIC

- **Onchocerciasis is an important cause of eye and skin lesions in tropical areas**
  - ✓ Caused by infection with *Onchocerca volvulus* and transmitted to humans by repeated bites of infected blackflies (Simulium spp.)
  - ✓ At least 25 million people are infected with *O. volvulus* worldwide; > 99% of infected people live in SSA
  - ✓ Second leading cause of infectious blindness worldwide!



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Background

Onchocerciasis-associated epilepsy?

- **More than 70 years ago, researchers carrying out studies on onchocerciasis noticed incidentally that epilepsy prevalence was high in their study areas**

- **Following this observation, the association between epilepsy and infection with *O. volvulus* was strengthened by a number of studies:**
  - ✓ Pion et al (2009): increase in epilepsy prevalence by 0.4% for each 10% increase in onchocerciasis prevalence (West-, Central- and East-Africa)
  - ✓ Ngugi et al (2013): significant association between onchocerciasis and epilepsy, both in children (aOR 1.67; 95% CI 1.09-2.57; p 0.019) and adults (aOR 2.23; 95% CI 1.56-3.19; p < 0.001) (Kenya, South Africa, Uganda, Tanzania and Ghana)
  - ✓ Colebunders et al (2016): clustering of cases of epilepsy within and between adjacent households; association between the individual risk of epilepsy and residence close to a river infested with blackflies (DRC)
  - ✓ Hasan et al (2016): significant association between onchocerciasis and epilepsy (OR 3.47; 95% CI 1.98-6.07; p < 0.0001) (DRC)

Objectives

1. To determine the prevalence and incidence of active epilepsy in a rural population in Ituri Province, DRC

2. To determine the level of ongoing onchocerciasis transmission

3. To investigate the association between epilepsy and onchocerciasis

Methodology

- **Community-based cross-sectional study** in the Logo health zone
- **Random selection** of villages and households within these villages
- **Three-stage approach** to identify **cases with epilepsy** (ILAE guidelines 2014):
  - ✓ Stage 1: screening for epilepsy in all household members by non-medical field workers using a validated 5-item questionnaire
  - ✓ Stage 2: validation of cases of epilepsy by a medical field worker
  - ✓ Stage 3: confirmation of cases of epilepsy by a neurologist
- **Assessment of exposure to onchocerciasis**:
  - ✓ Serology-based rapid tests detecting IgG4 antibodies to *O. volvulus* antigen OV16 (SD Bioline, Inc.)
  - ✓ Individuals aged 3 years and older

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Results

Characteristics of study population

258 households

1,398 subjects

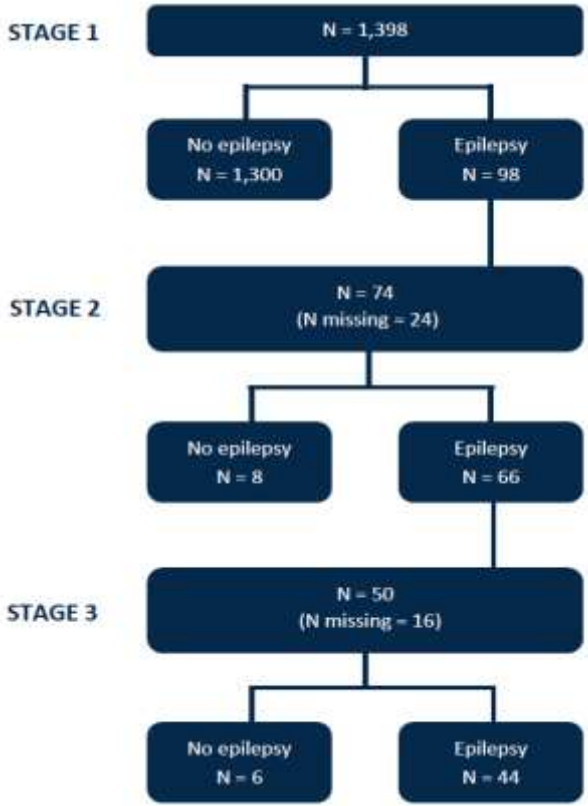
3 health areas

Median age: 15.0 years (IQR 7.0-30.0)

	N	%
Age groups		
0-9	474	34.4
10-19	376	27.3
20-29	172	12.5
30-39	120	8.7
40-49	96	7.0
50+	139	10.1
Total	1,377	100.0
Sex		
Male	676	48.9
Female	707	51.1
Total	1,383	100.0
Health area		
Draju	645	46.1
Kanga	744	53.2
Ulyeko	9	0.6
Total	1,398	100.0
Ivermectin treatment		
Yes	36	2.6
No	1,362	97.4
Total	1,398	100.0

Results

Epilepsy prevalence survey



Prevalence 7.0%

Prevalence 4.7%

Prevalence 3.2%

By reviewing the data collected at stage 1 and 2, a consensus was reached that 65 people could be considered to be cases of active epilepsy

Prevalence 4.6%

Results

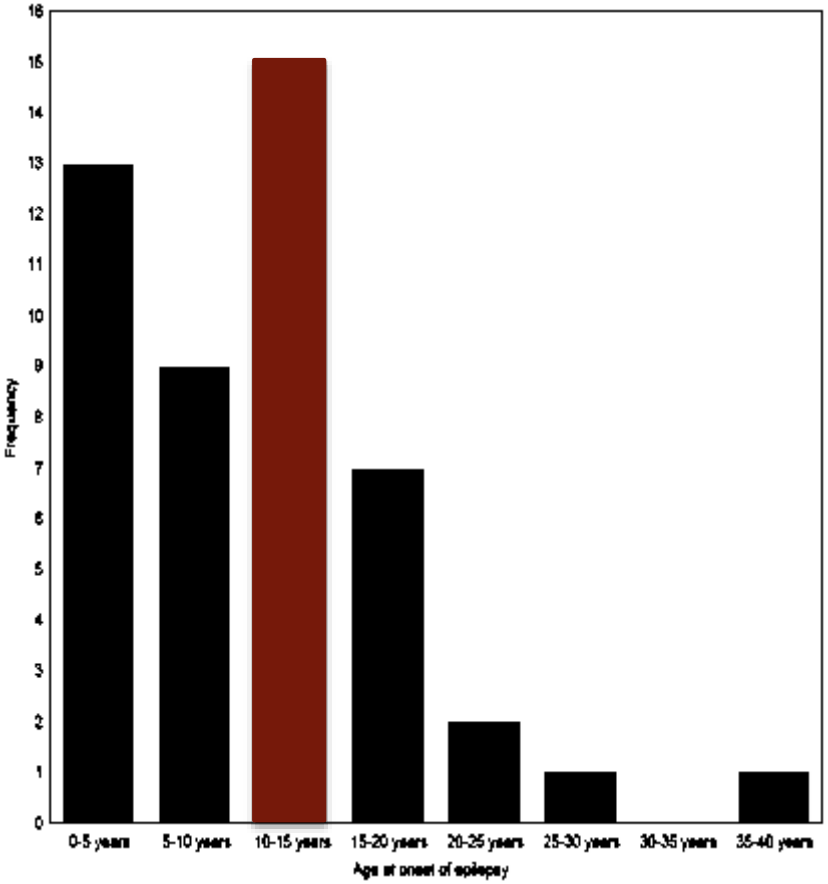
Characteristics of epileptics

	N of cases	%	Total sample	Variable-specific prevalence
Age groups				
0-9	13	20.0	474	2.7
10-19	21	32.3	376	5.6
20-29	16	24.6	172	9.3
30-39	8	12.3	120	6.7
40-49	5	7.7	96	5.2
50+	2	3.1	139	1.4
Total	65	100.0	1,377	4.7
Sex				
Male	31	47.7	676	4.6
Female	34	52.3	707	4.8
Total	65	100.0	1,383	4.7
Health area				
Draju	34	52.3	645	5.3
Kanga	30	46.2	744	4.0
Ulyeko	1	1.5	9	11.1
Total	65	100.0	1,398	4.6
Ivermectin use				
Yes	2	3.1	36	5.6
No	63	96.9	1,362	4.6
Total	65	100.0	1,398	4.6

Results

Age at onset of epilepsy

- Median age at onset of epilepsy: 10.0 years (IQR 4.0-14.0)
- Occurrence of first seizures between the ages of 5 and 20 in 31/48 subjects (64.6%)
- In 10/48 subjects, seizures appeared for the first time during the 12 months preceding the survey (incidence: 7.5 per 1,000 person-years)



Results

Seroprevalence of O. volvulus

	N of OV16+	N of OV16-	% of OV16+
Age groups			
0-9	12	267	4.3
10-19	51	196	20.6
20-29	52	64	44.8
30-39	55	30	64.7
40-49	48	34	58.5
50+	62	48	56.4
Total	280	639	30.5
Sex			
Male	126	309	29.0
Female	154	330	31.8
Total	280	639	30.5
Health area			
Draju	155	278	35.8
Kanga	123	356	25.7
Ulyeko	2	5	28.6
Total	280	639	30.5
Ivermectin use			
Yes	17	12	58.6
No	263	627	29.6
Total	280	639	30.5

Results

Association between onchocerciasis and epilepsy

- Significant association between exposure to onchocerciasis and epilepsy, both in the unrestricted (p 0.014) and restricted analysis (p 0.045)

Unrestricted analysis		No epilepsy	Epilepsy	Total
OV16 negative	N	610	29	639
	%	*70.5*	*53.7*	*69.5*
OV16 positive	N	255	25	280
	%	***29.5***	***46.3***	***30.5***
Total	N	865	54	919

Restricted analysis		No epilepsy	Epilepsy	Total
OV16 negative	N	619	20	639
	%	*70.2*	*54.1*	*69.5*
OV16 positive	N	263	17	280
	%	***29.8***	***45.9***	***30.5***
Total	N	882	37	919

- After adjusting for residence, sex, age and ivermectin use, the association between exposure to onchocerciasis and epilepsy remained significant, both in the unrestricted (aOR 3.03; 95% CI 1.58-5.79; p 0.001) and restricted analysis (aOR 2.63; 95% CI 1.23-5.66; p 0.013)

Conclusions

- Higher prevalence of active epilepsy in the Logo health zone (4.6%) than in African non-onchocerciasis endemic regions (1.4%)
- Association between onchocerciasis and epilepsy, consistent with the results from several other studies conducted in SSA
- Clustered distribution of epilepsy with the highest proportions of cases of epilepsy in areas with the highest proportions of positive OV16 test results
- Mass drug administration of ivermectin is urgently needed in these villages where onchocerciasis is endemic

Team at work in Ituri

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