

An Epidemio-Dermatological Assessment Of Onchocercal Skin Diseases In Awhum, Enugu State, Nigeria

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Abstract

A cross-sectional epidermiological and dermatological survey of onchocercal skin diseases (OSD) and the associated itching was conducted in Awhum, Enugu State, Nigeria. For quantitative data, compounds in each village were randomly selected and within the selected compound every individual in each household was systematically examined using the non-invasive nodule palpation technique. A nodular prevalence of 21.3% was recorded indicating the community was mesoendemic for onchocerciasis. No absolute control village was observed and the inter-village nodular prevalence was statistically significant ($p < 0.05$). Nine hundred and ninety nine (86.0%) subjects in the study population ($n = 1161$) had onchocerciasis-induced reactive and non-reactive morphological skin diseases (Acute papular onchodermatitis, APOD; chronic papular onchodermatitis; CPOD; lichenified onchodermatitis; LOD; depigmentation, DPM; Atrophy, ATR.) to varying degrees. Concomitant prevalence of OSD with nodules affected 20.0% of OSD-positive patients. The most prevalent cutaneous skin change was LOD which affected 52.03% of study population ($n=1157$). All reactive morphological skin changes were most prevalent among the younger age groups. While APOD was most prevalent (38.5%) in the 5-9 years age bracket, CPOD peaked at age 19 years and LOD increased till the age of 39 years. Females appeared to be more disposed to atrophy attacks than the males. Prevalence of troublesome itching was associated with the reactive and non-reactive skin diseases (Odds ratio=1.36).

Keywords: Mesoendemic, reactive, onchodermatitis, onchocerciasis, troublesome itching, nodules

Introduction

Onchocerciasis (river-blindness) which is caused by the filarial nematode *Onchocerca volvulus* constitutes a serious global public health and socio-economic problem in focal endemic communities of tropical Africa, Latin America and Yemen in the Arabian peninsula. The adult female *O. volvulus* produces large numbers of larvae/microfilariae (mf) in nodules beneath the skin from where they migrate to various body organs, causing most of the disease manifestations of onchocerciasis. Transmission of the larvae to humans is by the various haematophagous (blood-feeding) sibling species of the *Simuliid* (black fly) of the genus *Simulium*. In Nigeria, the vectors are the *S. damnosum* complex.

The current global estimate suggests that 88.5 million people are at risk of contracting the disease in the endemic countries. About 18 million people are infected, a million visually impaired, over 350,000 are blind while about 95 percent of infected individuals live in Africa (Omugenyi, 1998). In Africa, the known foci are West and East Africa accounting for about 90 percent of the global total of infected people. Nigeria accounts for more than 33% of the global problem of human onchocerciasis. The disease is endemic in all the states of the federation with the exception of Lagos, Rivers and Akwa Ibom

States where infections are sporadic (WHO, 1995).

The most common consequence of onchocerciasis is blindness, but the severe skin diseases and the associated intense itching cause chronic suffering and severe disability to affected individuals. (Nwoke, 1990; Amazigo and Obikeze 1991; Amazigo *et al* 1998).

The burden associated with itching alone has been estimated to be as great as that associated with blindness. Affected individuals usually scratch themselves with various objects resulting in pain and open ulceration which are susceptible to secondary bacterial infections (Evans, 1995; Okello, *et al*; 1995; Ovuga *et al* 1995, Amazigo *et al* 1998; Benton, 1998). Evaluation of the effects of onchocercal skin disease (OSD) on labour input, and of severe reactive skin disease in the house-hold, and on school attendance by children have been carried out (Amazigo and Obikeze, 1991; Nwoke, 1990; Ovuga *et al*. 1995). Individuals infected with OSD were estimated to spend the equivalent of US\$20 or more each year on health-related expenditures than people without OSD (Benton, 1998). It is generally recognized that people afflicted with OSD spend significantly less time on productive activities.

Before control programme based on mass treatment can begin, the particular communities to treat must be identified. The established method for determining geographical distribution

of onchocerciasis is the Rapid Epidemiological Mapping of Onchocerciasis (REMO). This method, developed by WHO special programme for research and training in tropical diseases (TDR) has been used by the African Programme for Onchocerciasis control (APOC) which covers 19 countries and aims to establish, before 2008, effective and self sustainable community-based ivermectin treatment. In Nigeria, a Rapid Epidemiological Assessment (REA) team had carried out a survey for the presence of palpable onchocercal nodules based on ordinary topographical maps (Gemade *et al.* 1998). Abanobi (1999) cross validated the usefulness of the REMO studies in Anambra State, Nigeria. Achievement of the onchocerciasis control objective is, to a large extent dependent on the determination of the distribution of the infection in remote areas and in identifying the "at-risk" communities. It has been established that many onchocerciasis endemic communities especially those in forest zones with low rates of onchocerciasis blindness have a significant burden of onchocerciasis skin diseases. The prevalence, endemicity and intensity of onchocerciasis have been reported in other parts of Enugu State, Nigeria (Amazigo and Obikeze, 1991; Nwaorgu, *et al.*, 1994; WHO, 1995).

The current study was designed to investigate the prevalence, distribution and clinical activity (itching) of onchocerciasis-induced skin diseases in an endemic community in the guinea-savanna mosaic belt of Enugu State. The result of the study presented here will provide surveillance data for the National Onchocerciasis Control Programme (NOCP) in its control activities.

Materials And Methods

Study area and demography: The cross-sectional epidemiological and dermatological survey was conducted in the seven villages of Awhum community in Udi Local Government Area (L.G.A), an ecologically homogeneous area of Enugu State lying within the forest-savanna mosaic vegetational belt of south-eastern Nigeria. Udi L.G.A. lies within latitudes $16^{\circ}5'N$ and $16^{\circ}42'N$ and longitudes $7^{\circ}10'E$ and $7^{\circ}28'E$ with an area of 973 square kilometers (Iloeje, 1990). Awhum community is located in the northern one-third of Udi L.G.A. The community was selected for the study as a result of the substantial levels of onchocercal skin diseases (OSD) observed during an earlier pilot survey using nodular palpation rates and depigmentation in adult males. Besides, Awhum community which is located at a distance of about 30 kilometers from Enugu, the capital city of Enugu State, along the old Enugu to Nsukka road is important as a

religious centre. All the seven villages of Isiogwu, Amabo-Amari, Ibite-Uwani, Umawka, Ibite-Uweni, Amoifibite, Obiagu-Amachala constituted the study endemic villages. Based on the 1990 Nigeria National population census data, the population of Awhum was projected at 5064 individuals with a sex ratio of 1:1. The population is stable, ethnically homogeneous and predominantly Christian with about 3% who are traditional believers. The area is ecologically homogeneous and the mainstay of the economy is agriculture which provides employment for about 60% of the population while $\leq 20\%$ are traders and crafts-men. Health facilities in the area include one health centre, an antituberculosis clinic and a few traditional herbal homes. The perennial Iyioke river which is located about 3 kilometers from the community centre provides the area with its only source of water for drinking and domestic use although a pipe-borne water scheme is underway. The river further serves as the breeding focus for the *Simulium damnosum* (black-fly) complex, the vectors of *O. volvulus*.

Dermatological examination: Prior to the commencement of the survey, an intensive dermatological course was received at the Dermatology Department, University of Nigeria Teaching Hospital (UNTH), on physical skin examination and recognition of onchocerciasis-induced cutaneous changes. Rapport was also established with the leaders at both the community and village levels to ensure maximum cooperation of the subjects. For quantitative data collection compounds in each village were randomly selected and visited accompanied by a village-based (VB) guide specially provided by each village head. Within each selected compound, every individual was systematically examined for onchocerciasis-induced cutaneous changes employing the non-invasive nodule palpation technique. Altogether 1161 individuals were examined for morphological skin changes which were classified, using the grading and classification system of Murdoch *et al.* (1993) into reactive Acute Papular Onchodermatitis, APOD; Chronic Papular Onchodermatitis, CPOD; Lichenified Onchodermatitis, LOD; non-reactive Depigmentation, DPM; and Atrophy, ATR. Atrophy was considered an onchocerciasis-induced abnormality when found in individuals aged ≤ 50 years to avoid confusion arising from the characteristic senile atrophy. All the identified dermatological cases were subjected to confirmation by an experienced dermatologist attached to the UNTH, Enugu. Qualitative information on clinical activity in terms of itching was also obtained for each subject at the beginning of the cutaneous examination. The

responses were recorded in standard structured questionnaire data sheet.

Data analysis: All the dermatological data were entered into IBM computer using the EpiInfo 5 software package. Prevalences were determined on the basis of the result of the nodule palpation. To determine endemicity ranges, villages were classified based on the current WHO/APOC classification of levels of endemicity into

Hyperendemic = nodule prevalence of greater than 40%

Mesoendemic = nodule prevalence of 20-39%

Hypoendemic = nodule prevalence of \leq 19%

Differences in categorical variables (sex, etc) between groups were compared using X^2 test, while differences between continuous/numerical variables (age, etc) were compared using student's t-test. P-values below 0.05 were considered statistically significant. Odds ratio is used to compare risks in different groups.

Results

Table 1 shows the distribution, by age and sex of the study population of 1161 individuals composed of 683 (58.8%) females and 478 (41.2%) males. Generally, females constituted about three-fifths of all individuals examined for the infection. Younger subjects aged (5-19) years ($n = 512$) had the highest proportion (44.1%) of those examined, followed by adults aged (20 - 29) years ($n = 306$), constituting 26.4% while the elderly adults (60 - \geq 70) years presented only 50 subjects (4.3%) for the study. The age and sex distribution of the study population was statistically significant ($p < 0.05$).

The prevalence of onchocerciasis-induced nodules in Awhum is shown in Table 2.

Table 1: Age and sex distribution of study population in Awhum

Age group (years)	Male (%)	Female (%)	Total (%)
0 - 4	62 (48.8)	65 (51.2)	127 (10.9)
5 - 9	120 (46.7)	137 (53.3)	257 (22.1)
10 - 19	116 (45.5)	139 (54.4)	255 (22.0)
20 - 29	37 (21.6)	134 (78.4)	171 (14.7)
30 - 39	43 (31.9)	92 (68.1)	135 (11.6)
40 - 49	42 (36.5)	73 (63.5)	115 (9.9)
50 - 59	26 (51.0)	25 (49.0)	51 (4.4)
60 - 69	23 (60.0)	15 (39.5)	38 (3.3)
Total	478 (41.2)	683 (58.8)	1161 (100)

Table 2: Village-specific prevalence of palpable onchocerciasis nodules in the study villages of Awhum

Village	Number examined (%) (n = 1161)	Number with palpable nodules (%)	Community nodule prevalence
Isiogwu	164 (14.1)	38 (23.2)	3.3%
Amabo Amani	105 (9.0)	29 (27.6)	2.5%
Ibite Uwani	156 (13.4)	35 (22.6)	3.0%
Umwaka	117 (10.1)	19 (16.2)	1.6%
Ibite Uwenu	482 (41.5)	92 (19.0)	7.9%
Amoifibite	33 (2.8)	6 (18.2)	0.5%
Obiagu	104 (9.0)	28 (26.9)	2.4%
Amachala	1161 (22.9)	247 (21.3)	21.3%

P value = 0.003

From an estimated population of 5064 in the community, 1161 (22.9%) subjects from 7 study villages were clinically examined out of which a total of 247 (21.3%) individuals presented with nodules. Village-specific prevalence ranged from 16.2% in Umwaka to 27.6% in Amabo Amani. There was no absolute control village although Umwaka (16.2%), Amoifibite (18.2%) and Ibite Uwenu (19.0%) were, by definition hypoendemic for the disease (nodule prevalence \leq 19%). Inter-village nodule prevalence was statistically significant ($p < 0.05$). Altogether, a community nodule prevalence of 21.3% was recorded indicating that the community is mesoendemic for onchocerciasis (nodule prevalence range = 20-39%).

Table 3 shows the prevalence of onchocercal skin diseases (OSDs) in the study population ($n = 1161$) as well as in individuals presenting with palpable nodules in the endemic villages. At the community level, 999 (86.0%) of the entire study population presented with varying degrees of onchocercal morphological reactive skin changes characterized as acute papular onchodermatitis (APOD), chronic papular onchodermatitis (CPOD), lichenified onchodermatitis (LOD), and non - reactive depigmentation (DPM) and atrophy (ATR). Six (6) out of the 7 villages were hypoendemic for the onchocerciasis-induced OSDs at the community level, ranging from 2.8% in Amoifibite to 12.1% in Isiogwu while Ibite Uwenu was hyperendemic (41.3%). At the village level all 33 (100%) subjects examined at Amoifibite had overt onchocercal skin diseases while only 92 (78.6%) of those examined at Umwaka presented with onchocercal skin lesions. Concomitant infections

Table 3: Prevalence of onchocercal skin diseases and nodules in the endemic villages of Awhum

Village	No examined	No OSD +ve (%)	OSD community prevalence. (n = 1161)	No nodule + ve (%)	No OSD with nodule + ve (%)	Comm. OSD with nodule prevalence (n = 1161)
Isiogwu	164	140 (85.4)	12.1	38 (23.2)	28 (20.0)	2.4
Amabo Amani	105	83 (79.0)	7.1	29 (27.6)	19 (22.9)	1.6
Ibite Uwani	156	126 (80.8)	10.9	35 (22.6)	22 (17.5)	1.9
Umwaka	117	92 (78.6)	7.9	19 (16.2)	17 (18.5)	1.5
Ibite Uwenu	482	430 (89.2)	41.3	92 (19.0)	83 (19.3)	7.1
Amoifibite	33	33 (100)	2.8	6 (18.2)	5 (15.2)	0.4
Obiagu Amachala	104	95 (91.3)	8.2	28 (26.9)	26 (27.4)	2.2
Total	1161	999 (86.0)		247 (21.3)	200 (20.0)	17.2
P – value		0.0003		0.11		

OSD = Onchocercal skin disease

Comm. = community

(onchocercal skin disease with nodules) were common in the villages and affected 200 (20.0%) persons of all onchocercal skin disease-positive persons indicating that certain individuals presenting with palpable nodules did not develop any onchocercal skin disease. At the community level, a prevalence of 17.2% was recorded for concomitant infections of onchocercal skin lesions with nodules while the prevalence of concomitant infections at the inter-village level ranged from 15.2% in Amoifibite to 27.4% in Obiagu Amachala.

The age – and sex – specific distribution of the various overt human onchocercal skin diseases is shown in table 4. Acute papular onchodermatitis (APOD) was most prevalent in the younger age groups especially among females aged ≤ 20 years (0 – 19) years). The prevalence thereafter tends to decrease with increasing age. Peak prevalence of acute papular onchodermatitis (38.5%) was recorded among children in the 5 – 9 years age bracket. Generally more females (59.0%) than males (41.0%) were affected by APOD but this association was not statistically significant ($p = 0.05$).

The age and sex distribution of chronic papular onchodermatitis (CPOD) follows the same pattern as APOD. More females (51.3%) presented with chronic phase of the disease than males (48.7%). The prevalence of chronic papular onchodermatitis rises rapidly with age peaking at age 19 years (51.2%) and thereafter tends to decline and at ≥ 70 years only 3 males were diagnosed with the condition. The between-age and sex relationship of chronic papular

onchodermatitis was statistically significant ($p < 0.05$).

The age-specific pattern of lichenified onchodermatitis (LOD) was similar to that observed for chronic papular onchodermatitis with increase of the prevalence of lichenified stage with age till the age of 39 years. More females (63.8%) presented with this condition with a rapid rise at the ages of 20 – 39 years after which there is a decline and a gradual levelling-off among the male population. The between-age and sex prevalence of lichenified onchodermatitis is highly significant ($p < 0.05$). The prevalence of the non-reactive onchocercal skin disease atrophy was generally low. Although atrophy was not observed for individuals aged 0-9 years, the prevalence of the condition generally increases with increasing age. The between-sex prevalence of atrophy was significantly higher ($p < 0.05$) for females (66.3%) than males (33.7%).

As examination for depigmentation (DPM) included individuals with pale brown leopard skin and those with complete depigmentation, the condition was rare in those in the age-bracket (0-19) years with only one subject manifesting the condition. Depigmentation, like atrophy, increased in prevalence with advancing age in both sexes. The condition was evenly distributed in the study population with 70 (47.3%) males and 70 (52.7%) females presenting with the condition.

Table 5 shows the prevalence of troublesome itching in subjects presenting with onchocercal skin diseases and nodules. The results indicate that the prevalence of troublesome itching is associated with the presence of the reactive (acute papular onchodermatitis, chronic papular onchodermatitis,

Table 4: age- and sex-specific prevalence of various onchocercal skin diseases in Awhum, Nigeria

AGE GROUP (YEARS)	APOD (n = 1161)			CPOD (n = 1160)			LOD (n = 1157)			ATROPHY (n = 1161)			DPM (n = 1161)		
	M (%)	F (%)	TOTAL (%)	M (%)	F (%)	TOTAL (%)	M (%)	F (%)	TOTAL (%)	M (%)	F (%)	TOTAL (%)	M (%)	F (%)	TOTAL (%)
0-4	10 (55.6)	8 (44.4)	18 (15.4)	28 (52.8)	25 (47.2)	53 (13.8)	0 (0)	0 (0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
5-9	19 (42.2)	26 (57.8)	45 (38.5)	62 (53.4)	54 (46.6)	116 (30.1)	35 (48.6)	37 (51.4)	72 (12.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
10-19	12 (37.5)	20 (62.5)	32 (27.4)	63 (51.2)	60 (48.8)	123 (32.0)	45 (45.5)	54 (54.5)	99 (16.4)	31 (41.9)	43 (58.1)	74 (22.1)	1 (100)	0 (0.0)	1 (0.7)
20-29	2 (20.0)	8 (80.0)	10 (8.5)	11 (27.5)	29 (70.5)	40 (10.4)	17 (14.5)	100 (85.5)	117 (19.4)	16 (19.5)	66 (80.5)	82 (24.5)	3 (25.0)	9 (75.0)	12 (8.1)
30-39	3 (60.0)	2 (40.0)	5 (4.3)	5 (29.4)	12 (70.6)	17 (4.4)	34 (27.9)	88 (72.1)	122 (20.3)	25 (29.4)	60 (70.6)	85 (25.4)	15 (39.5)	23 (60.5)	38 (25.7)
40-49	2 (50.0)	2 (50.0)	4 (3.4)	6 (31.6)	13 (68.4)	19 (4.9)	33 (32.4)	64 (67.6)	102 (16.5)	41 (43.6)	53 (56.4)	94 (28.1)	20 (41.7)	28 (58.3)	48 (32.5)
50-59	0 (0.0)	1 (100)	1 (0.9)	5 (83.3)	1 (16.7)	6 (1.6)	44 (55.7)	35 (44.3)	79 (13.1)	-	-	-	27 (61.4)	17 (38.6)	44 (29.7)
60-69	0 (0.0)	12 (100)	12 (1.7)	4 (57.1)	3 (42.9)	7 (1.8)	8 (72.7)	3 (27.3)	11 (1.8)	-	-	-	4 (80.0)	1 (20.0)	5 (3.4)
≥ 70	0 (0.0)	0 (0.0)	0 (0.0)	3 (10.0)	0 (0.0)	3 (1.0)	7 (70.0)	3 (30.0)	10 (1.7)	-	-	-	0 (0.0)	0 (0.0)	0 (0.0)
TOTAL	48 (41.0)	79 (59.0)	127 (10.9)	87 (48.7)	197 (51.3)	384 (33.07)	223 (27.0)	384 (63.8)	607 (52.03)	113 (33.7)	222 (66.3)	335 (28.9)	70 (47.3)	70 (52.7)	148 (100)

P - value = 0.5

P - value = 0.011

P - value = 0.00

P - value = 0.02

P - value = 0.0601

Key: APOD = Acute Papular Onchodermatitis, CPOD = Chronic Papular Onchodermatitis, LOD = Lichenified Onchodermatitis, DPM = Depigmentation, M = Male, F = Female

Table 5: Prevalence of troublesome itching in individuals with onchocercal skin lesions and nodules

OSD and nodule no examined = n	Troublesome Itching		P value
	Present	Absent	
APOD			
(n = 1161)			
Present 127	96 (82.1)	(17.9)	< 0.001
Absent 1044	629 (60.2)	415 (39.8)	
CPOD			
(n = 1160)*			
Present 384	356 (92.7)	28 (7.3)	< 0.001
Absent 776	369 (49.6)	407 (52.4)	
LOD			
(n = 1157)*			
Present 607	344 (57.1)	258 (42.9)	< 0.001
Absent 555	378 (68.1)	177 (31.9)	
ATROPHY			
(n = 1161)			
Present 335	181 (54.0)	152 (46.0)	< 0.001
Absent 826	544 (65.9)	282 (34.1)	
DEPIGMENTATION			
(n = 1161)			
Present 148	105 (70.9)	43 (29.1)	< 0.001
Absent 1013	602 (61.2)	393 (38.8)	
NODULES			
(n = 1161)			
Present 247	168 (68.0)	77 (32.0)	< 0.001
Absent 914	559 (61.1)	355 (38.9)	

* Some cases had no response with respect to these OSD signs and were excluded from the analysis. OSD = Onchocercal skin disease

lichenified onchodermatitis), non-reactive (atrophy, depigmentation) onchocercal skin diseases and nodules. The prevalence of itching is highest with chronic papular onchodermatitis (92.7%) followed by acute papular onchodermatitis (82.1%) and least with atrophy (54.0%). Besides onchocercal skin diseases and nodules, other factors (non-onchocercal skin diseases) may also account for the itching experienced by the subjects.

The results presented in Table 5 were confirmed in a multivariate logistic analysis (Table 6). The Odds ratio for each category of independent variable obtained from the analysis indicated the odds of contracting troublesome itching when the effect of other variables was kept constant. The category with odds ratio one (1) was the reference category. The presence of reactive skin disease was the most important risk factor for troublesome itching (Odds Ratio = 18.56), followed by the presence of non-reactive depigmentation (Odds Ratio = 1.55) and palpable nodules (Odds Ratio = 1.36). After correcting in this multivariate model for the other variables listed in the table, there was statistically significant relationship in all variables except between the sexes ($P = 0.86$) although the risk of troublesome itching is slightly higher in the males than in the females.

Discussion

The overall nodule prevalence of 21.3% recorded in the survey indicates that Awlum community is mesoendemic (nodule prevalence range, 20 - 39%) for the non-blinding form of onchocerciasis. The result therefore is in conformity with the earlier observations of Nwaorgu, *et al* (1994) who established the same endemicity level using the skin snip microfilariae count technique. The endemicity of the disease may have been enhanced by the presence of the perennial Iyoku river and its associated rivulets which, while providing water for the domestic needs of the community, also serve as breeding sites for the black-fly (*Simulium* spp) complex, vectors of the causative agent (*Onchocerca volvulus*) of onchocerciasis. The endemicity may also have been acquired as a result of the invasion of the vectors from surrounding breeding sites in Oji River where substantial high levels of endemicity had been recorded (Nwaorgu, *et al* 1994). *Simulium damnosum* flies have been known to cover distance of about 100 kilometers in order to establish new colonies (Manson- Bahr, and Bell, 1991). The Iyoku river therefore appears to create a favourable environment for the consummation of the vector- host relationship.

Although there was no absolute control village, the results indicate that the endemicity level is related to the nearness of the river to the village. For example, Amofibite village which is farthest from the river and whose inhabitants least come into contact with the vector flies, had the least nodule prevalence rate and subsequently was hypoendemic.

More females (58.8%) were examined than males (14.2) Table 2. There was clearly an under-representation of males especially those between the ages of 20- 49 years while there was a high representation of their female counterparts. This may be due to the prevailing rural-urban drift of males in search of better means of livelihood while the females generally are left at home either to get married or to carry out domestic chores and consequently constituted about 3/5 of individuals examined.

At the community level 86.0% of the study population (n=1161) manifested the various onchocercal morphological reactive (APOD, CPOD, LOD) and non-reactive (atrophy, DPM) skin changes (Table 3). The endemicity of the OSDs appears to follow the same pattern as that obtained using the nodule palpation technique. The inter- village prevalence was statistically very significant ($p=0.0003$). The study further confirms the assertion that onchocerciasis is a cumulative disease (WHO, 1976, Imerbore, *et al*; 1980). The assertion is evidenced by the prevalence of

concomitant infections of OSDs with nodules (20.0%) which was widespread in the study villages. The reactive onchocercal cutaneous changes were generally common to varying degrees among all the age groups in the study population. In both groups (reactive and non-reactive) infections were more prevalent in the younger age groups.

Table 6: Odds ratios for the risk of troublesome itching according to different risk factors (all odds adjusted for the other risk factors listed)

Risk factor	odds ratio	95% confidence interval	chi square*	p value
Age (years)				
< 20 years	1	0.76		
≥ 20 years	0.97	1.25	0.03	0.86
Gender				
Male	1	0.65		
Female	0.84	1.08	1.84	0.18
Palpable nodules				
Absent	1	1.00	3.85	0.05
Present	1.36	1.86		
Reactive skin diseases				
Absent	1	10.98	2.08	0.00
Present	18.56	31.72		
Depigmentation				
Absent	1	1.04	4.82	0.03
Present	1.55	2.31		

* Yates corrected chi – square values.

The highest prevalence of reactive skin changes was found between the ages of 5 and 49 years. This situation appears to contrast from the report of WHO (1995) multi-country study which put the higher prevalence of OSDs at between the ages of 20 and 50 years. The age variation may be attributed to either early exposure of villages to the vector bites or the different ecological settings inherent in the WHO study. In Awhum, women generally do not have house-helpers and often go to the river to wash or to fetch water with their babies strapped to their backs. The high prevalence of LOD and CPOD recorded in the study and also the low prevalence of APOD is in conformity with the findings of other investigators (Duke, 1990; Duke and Taylor, 1991; WHO, 1995). APOD was observed more among the female (59.0%) than the male (41.0%) population and was most prevalent in the 0-19 years age-bracket, that is children and adolescents, and thereafter the infection declined appreciably. While this observation generally conforms with that of the UNDP/WORLD BANK/ WHO report (1995), it is noted also that at the tender age of 0-4years the child is still under the care of the mother and its movements generally restricted

and consequently reduces the exposure potential to the bite of the black flies. The APOD prevalence of 15.4% recorded for the 0-4 years age group may therefore be ascribed to exposure to vector bites and partly to congenital transmission of the disease. The significant relationship between CPOD and age/ sex may be due to the increased activities, type of clothing, hormonal effects and immuno-suppression such as may be recorded during pregnancy, (Manson- Bahr and Bell, 1991).

Atrophy was generally low in prevalence. However, only individuals ≤ 50 years were examined for the infection to avoid confusion from the characteristic senile atrophy. Atrophy was absent in the 0-9 year group but thereafter appears to increase with age with the females being more disposed to the infection than males, a pattern which conforms with the report of the multi country study by the Pan. African group on onchocercal skin diseases (WHO 1995). The higher prevalence of depigmentation in older than younger subjects in this study is an indication that depigmentation is associated with longstanding onchocercal infection. (Mackenzie, *et al* 1987; Anosike and Onwuliri, 1995). An analysis of the prevalence rate of the different OSDs by age and sex seem to indicate a relationship. For example, APOD and CPOD appear to have the same pattern of distribution with their peak prevalence between the same age group (0-19) years. It would therefore seem likely that untreated APOD will, after a period of time give rise to CPOD. If CPOD remains untreated, the infection rate increases, the papules aggregate and itching ensues inducing thickening and wrinkling (lichenification) or "lizard skin". The results of the present study indicate that the presence of troublesome itching is associated with the reactive, non-reactive onchocercal skin diseases and nodules; itching being highest with CPOD, APOD and least with atrophy. The strong and statistically significant relationship indicates that most of the reported troublesome itching could be attributed to reactive and non- reactive OSDs and nodules although non-onchocercal skin diseases may also contribute to the itching experienced by the subjects. A multivariate logistic analysis, for instance, shows that at the individual level, the presence of reactive skin disease was the most important risk factor for troublesome itching (Odds ratio=18.56), age and gender (Odds ratios = 1.97,0.84) respectively have no significant contributions as far as troublesome itching is concerned.

Conclusion: The study establishes that Awhum community is mesoendemic for the non- blinding form of onchocerciasis. Onchocercal skin diseases are common in the community affecting

about 20% of the entire population (n = 5064). The most prevalent of the onchocerciasis-induced skin lesions are lichenified onchodermatitis (affecting 11.9%), chronic papular onchodermatitis (7.5%), atrophy (6.6%), depigmentation (2.9%), and acute papular onchodermatitis (2.5%). Troublesome itching is common with patients manifesting reactive onchocercal disease while non-onchocercal skin infections do not contribute significantly to troublesome itching.

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