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FINAL REPORT

SURVEY ON ONCHOCERCIASIS IN COTE D'IVOIRE

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by

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1. EXECUTIVE SUMMARY

The prevalence, intensity and clinical manifestations of onchocerciasis were investigated in 13 village communities in the Alepe and Danane districts of Cote d'Ivoire. Both districts are secondary rain forest and are adjacent to the savannah areas under vector control by the World Health Organization Onchocerciasis Control Program.

Eleven hundred and thirty-four subjects were examined and the selection of patients was aimed at obtaining a cross-sectional view of the disease at all ages and in both sexes. The overall prevalence of infection in Alepe was 70.8%, increasing to 78.1% in individuals over 10 years of age. The overall prevalence in the Danane district was 74.2%, 83.5% in those over 10 years of age. These rates are comparable with those observed in the rain forest regions of Liberia. The intensity of infection was low (1-10 mf/mg) in 73.2% of infected individuals, moderate (11-20 mf/mg) in 15.69%, and high (greater than 20 mf/mg) in 11.2%. Sixty-six percent of all subjects had skin findings consistent with onchocerciasis while thirty-seven percent had palpable onchocercal nodules.

Ocular changes were detected in 162 (14.3%) subjects of whom 156 (96.3%) showed changes in the anterior segment of the eye. One individual with ocular changes was less than 10 years of age.

The overall blindness rate in Alepe was 4.8% and in Danane 5.2% representing a significant public health problem. Thirty-six percent of this blindness was attributable to onchocerciasis. It is a significant cause of blindness and of debilitating and disfiguring skin disease.

2. INTRODUCTION

Onchocerciasis is widely distributed in the Cote d'Ivoire and is most prevalent in the northern savannah areas, most of which is included in the vector spraying project being conducted by the World Health Organization Onchocerciasis Control Program. Onchocerciasis has been documented in the southern regions of the country, formerly rainforest but now secondary rain forest with extensive coffee, palm oil and cocoa plantations.

The Ministry of Public Health and Population has reported an increasing prevalence of blindness and itching due to onchocerciasis. These observations were confirmed by a survey conducted by the Ministry in August 1986 when 95

percent of the population of 31 villages were surveyed. This survey found a 40 to 60% prevalence of onchocerciasis, based on one skin snip, and a blindness (based on inability to correctly count fingers at 3 meters) prevalence of 0.7%. These observations form the background for this study of the current characteristics of onchocerciasis in two areas in southern and western Cote d'Ivoire.

The villages surveyed were selected by the Medical Director of the Rural Health Sector for each district and had been visited recently by the Minister of Public Health and Population and a World Health Organization Representative following reports of high blindness prevalences. The Onchocerciasis Control Program team was also in the Alepe area at the time of the survey.

The scope of work for this consultancy was as follows:

1. Visit study sites.
2. Estimate size and structure of populations at risk in target communities.
3. Prepare map of community.
4. Collect information on residents (age, occupation, previous history with onchocerciasis, other places of residence).
5. Determine infection rates and intensity of infection of the population sample through skin snips, and physical examination.
6. Determine blindness and visual impairment rates in same sample population.
7. Estimate proportion of visual impairment due to onchocerciasis and other causes.
8. Collect information concerning geographic origin of infection (Autochthonous vs. imported).

3. SURVEY TEAM

The survey team was composed of Drs. Newland and White with Dr. Guy Imboua-Bogui, the counterpart from Cote d'Ivoire, Chief of the Department of Epidemiology and Statistics of the National Insititute of Public Health (INSP) and the Director of Major Tropical Disease of the Ministry of Public Health and Population. Two ophthalmic nurse specialists, a laboratory nurse technician and two drivers made up the rest of the team. Additional help was obtained when available in each village to assist in form filling and local dialect interpretation.

4. STUDY SITES

Two areas in southern and western Cote d'Ivoire were surveyed (Fig. 1). The first was the Alepe district between the La Me and Komoe Rivers where six out of 32 villages were surveyed (Fig. 2). The second was an area in the Danane district that boardered the Cavally river and its tributaries. Seven of the 17 surrounding villages were surveyed (Fig. 3). Villages in these regions consist of collections of houses usually situated near a water source, often a tributary of the above rivers. The survey was conducted in the late rainy season.

5. STUDY POPULATION

The residents were mainly Ivoirians and a few migrants from neighboring countries (Burkina Faso, Mali and Guinea), who tend the surrounding plantations. The majority were plantation workers or farmers and their dependents. Their age range was less than 1 to 98 years and eleven hundred and thirty-four subjects were examined. Medical services are provided by the village clinics under the direction of the Ministry of Public Health and Population. In most villages there was a school where the examinations could be conducted.

6. SAMPLING TECHNIQUE

Each village was divided into several clusters based at the center of the village. One cluster was then randomly selected and all families in the cluster were examined until the required number for the sample was obtained. If the required total was not met then the remainer were chosen from an adjacent cluster.

7. METHODS

Patient identification and demographic data was first obtained. Each person was then given a physical examination with special attention given to the palpation and location of onchocercal nodules and to the assessment of skin lesions or changes consistent with onchocercal dermatitis. Skin snips were taken, using a Holth corneo-scleral biopsy punch, from the hip and calf bilaterally. The skin snips were incubated overnight in 0.1 ml of tissue

culture medium in flat bottomed microtitre plate wells. After counting microfilaria the positive skin snips were weighed using a Mettler electronic balance. Microfilaria density was expressed as mf/mg skin. The average microfilarial density for each subject is the geometric mean of the microfilarial count from the 4 sites divided by the skin snip weight of the 4 sites.

Visual acuity was tested using an illiterate E chart. Pupils were dilated in all patients with vision worse than 6/18, permitting a fundus examination by indirect ophthalmoscopy. A detailed ocular examination was performed using a Topcon SL5D photo slit lamp and microfilaria counts were estimated in the cornea and the anterior chamber. The presence of uveitis, keratitis and limbitis was also recorded.

8. RESULTS

The age distribution of the study population is shown in Table 1. The male:female ratio in Alepe was 1.1:1 and in Danane it was 1.2:1. Of the 604 males examined 73.7% were skin snip positive compared to 70.6% of females positive.

8.1 Prevalence of Infection

8.1.1 Alepe District.

Out of 32 villages in the Alepe district, 6 villages were surveyed (Table 2). The total estimated population of the 6 villages was 13,960. Six hundred and forty-nine individuals were examined (4.6%).

The prevalence of infection ranged from 62.3 - 85.0% taking all ages with an average of 70.9%. The prevalence of infection in individuals above age 10 ranged from 71.8 - 90.3% with an average of 78.1%.

8.1.2 Danane District.

Seven villages out of 17 near the Cavally River in the Danane district were surveyed (Table 3). Their estimated population was 5,259. Four hundred and eighty five were examined (9.2%).

The prevalence of infection in these villages ranged from 60.5 - 88.3 % with an average of 74.2% for all ages while the prevalence of infection in those greater than 10 years old ranged from 75.9 - 98.0% with an average of 83.5%.

8.2 Intensity of Infection

Microfilaria densities were grouped in three categories; low, moderate and high density representing counts from 1 - 10 mf/mg, 11 - 20 mf/mg and greater than 20 mf/mg respectively.

8.2.1 Alepe District. The range of average mf density among those infected was from 1 - 65.9 mf/mg. There were 354 (77%) individuals with low mf density, 66 (14.3%) with moderate mf density and 40 (8.7%) with high density (Table 4).

8.2.2 Danane District. The range of average mf density among those infected was from 1 - 66.9 mf/mg. There were 246 (68.3%) individuals with low mf density, 62 (17.2%) with moderate mf density and 52 (14.5%) with high mf density (Table 5).

The majority of the subjects surveyed in both districts were Ivoirians. Sixty-two subjects were migrants and had lived in the region from less than a year to 8 years. Their previous places of residence were Burkina Faso, Guinea and Mali. This group consisted mainly of young adult males and females with their children. Many of the children had been born in Cote d'Ivoire. The intensity and other characteristics of infection among migrants examined were lower and lighter than the native residents (Fig. 4).

Housewives made up 31.5% of population surveyed while farmers were 350 (30.9%), students 136 (12%), children not in school 151 (13.3%) and others 140 (12.3%). Eighty-five percent of housewives were skin snip positive compared to 81% of farmers 55% of students and 38.4% of children not in school.

8.3 Clinical Findings

The skin findings in onchocerciasis are varied depending on the clinical stage of the disease, complications thereof or results of treatment. Those findings however are not exclusively secondary to onchocerciasis. The skin findings elicited, which are characteristic of onchocerciasis included edema, atrophy (shiny and dry skin), excoriation, lichenification, superinfection, ulceration, pigmentary changes or severe dermatitis (sowda). The presence and location of onchocercal nodules was also elicited.

In the Alepe district a total of four hundred and thirty two patients (66.5%) had some of the skin findings described above. Nodules were palpable in 212 subjects (32.6%) examined in the district. In the Danane district 317 subjects (65.4%) had skin findings, while nodules were palpable in 208 subjects (42.9%) (Table 6).

The age/sex specific prevalence rates of onchocerciasis in the villages surveyed are given in Table 7. The highest prevalence was observed in females aged 50-54 and in males ages 45-49.

The age/sex distribution of onchocercal nodules are given in Table 8. Nodules were generally palpable in older age group and located in the hip (iliac crest, greater trochanteric and sacrococcygeal) region. There was no difference in the nodule distribution in the sexes.

8.4 Ocular Findings

The ocular manifestations of O. volvulus infection were seen in a total of 162 (14.3%) cases (Table 6). These manifestations included microfilariae in the anterior chamber and cornea, punctate keratitis and sclerosing keratitis, uveitis, limbitis, optic nerve and retinal changes. In Alepe 100 (15.4%) individuals were found to have one or more of these changes, and in Danane 62 (12.8%). All except one were over 10 years of age and the ocular changes were confined to the anterior segment of the eye in 129 (79.6%) of cases, posterior segment of the eye in 6 (3.7%) of the cases, and in both segments in 27 (16.7%) of the cases.

The overall prevalence of blindness, defined as less than 3/60 vision in best eye, was 4.8% in Alepe and 5.2% in Danane (Table 9). More than one third of the blindness was attributable to O. volvulus infection, the other causes being cataract and glaucoma. Cataract was the main cause of low vision (defined as less than 6/18 vision in best eye) in both districts (66.7%).

The causes of unilateral visual impairment (blind or low vision) in a total of 49 eyes were cataract (38.8%), trauma (10.2%), onchocerciasis (20.4%), glaucoma, measles, toxoplasmosis and refractive errors.

Of the 62 immigrants there were 1.7% with ocular manifestations of O. volvulus. None was visually impaired although one 6 year old girl, who was born in Cote d'Ivoire, had severe punctate keratitis in association with 2 head nodules. She was referred for urgent surgical excision of the head nodules. Otherwise the ocular disease characteristics were similar to those in the local individuals.

9. DISCUSSION

There is growing concern about the changing topography of the land which is being transformed into vast plantations and secondary rainforest and that this is responsible for an increase in onchocerciasis in the southern and western

regions of Cote d'Ivoire. This is a problem the current study was not able to address. However, our findings suggest that onchocerciasis is hyperendemic and that the prevalence and intensity of infection is similar to that found in the rainforest in neighboring Liberia.

Another concern is whether the migrant population from the savannah region is contributing to the increasing prevalence of infection. The characteristics and intensity of onchocerciasis in the migrant population examined were indistinguishable from that seen in the local inhabitants. It is, of course, recognized that with such a small sample population it is not possible to accurately assess the effect of the migrants on onchocerciasis in these two regions. This effect could possibly be determined by a study with carefully matched patients.

The overall prevalence of blindness in the two regions surveyed is 4.9% and this represents a significant public health problem. Of particular concern is that onchocerciasis is responsible for more than a third of the blindness.

It is difficult to characterize onchocercal ocular pathology as specifically savannah or rainforest. Savannah disease causes more blindness and is usually seen in the anterior segment of the eye. The majority of cases with ocular disease had anterior segment pathology, including microfilariae in the anterior chamber, punctate and sclerosing keratitis, and there were few cases of retinal pathology frequently seen in rainforest infection. The overall picture of the ocular disease in these regions, however, was comparable to that seen in the rainforest.

Significantly there was minimal pathology in children less than 10 years of age except in 1 case, a six year old child from Burkina Faso. The remaining migrants had ocular disease no different from the indigenous population.

10. ACKNOWLEDGEMENTS:

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Alepe and Danane Districts and to Dr. Alexis Dirabou and Dr. Akoa Amanama of the Department of Rural Health in Abidjan and in Danane. We also acknowledge the valuable assistance of Mr. Monney Lucien, Mr. Watara and Mr. Ouatara in the field work. The Ocular Onchocerciasis Research Unit of the W.H.O. Onchocerciasis Chemotherapy Project and the Division of Geographic Medicine, Dept. of Medicine, Case Western Reserve University made available the equipment used in the clinical examinations. We are also grateful to Mr. Arthur Fell and his staff at USAID/REDSO, Abidjan for their assistance with the survey and to Ruth Render for preparing the report.

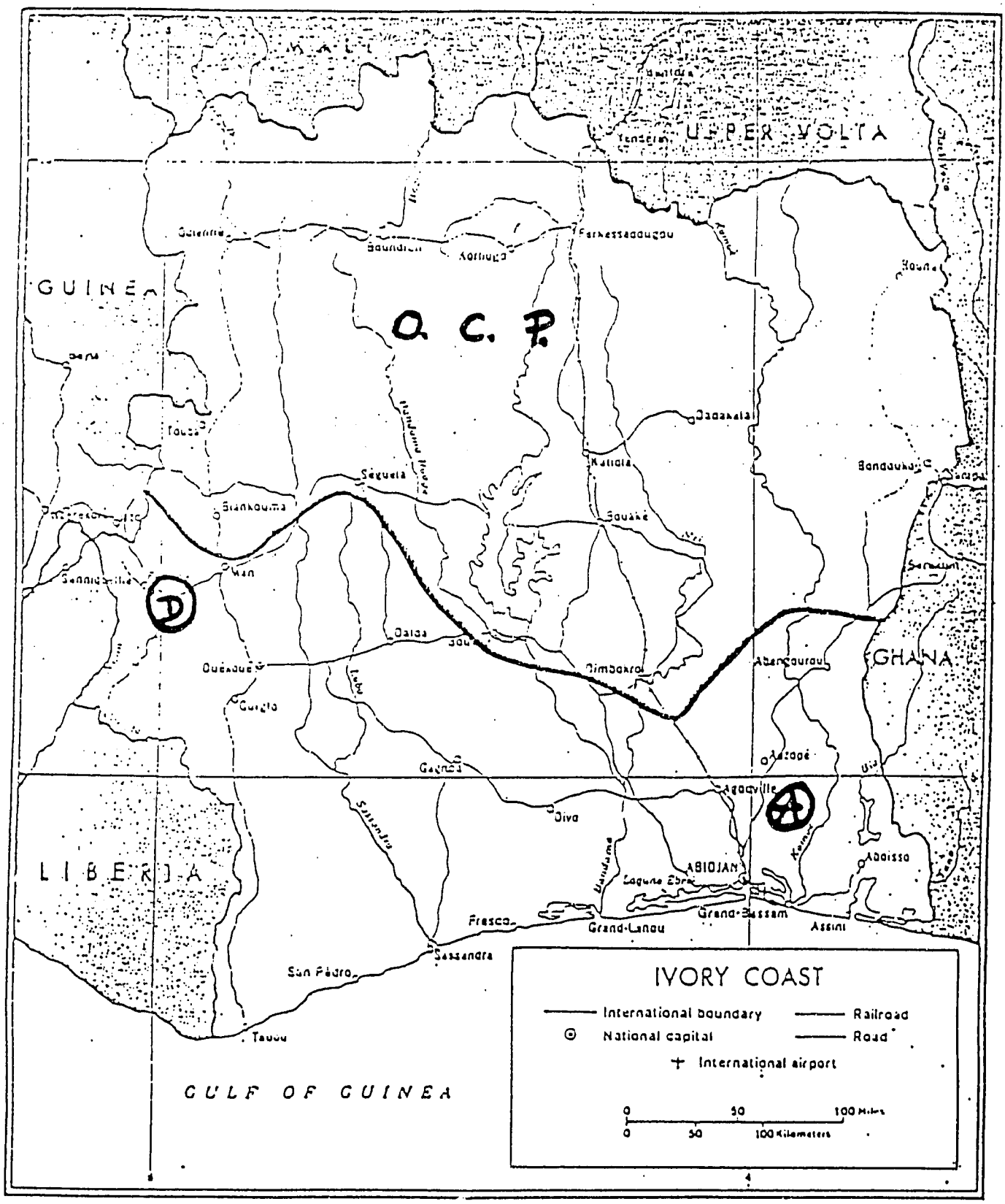

Fig. 1 (A) = Alepe district

(D) = Danane district

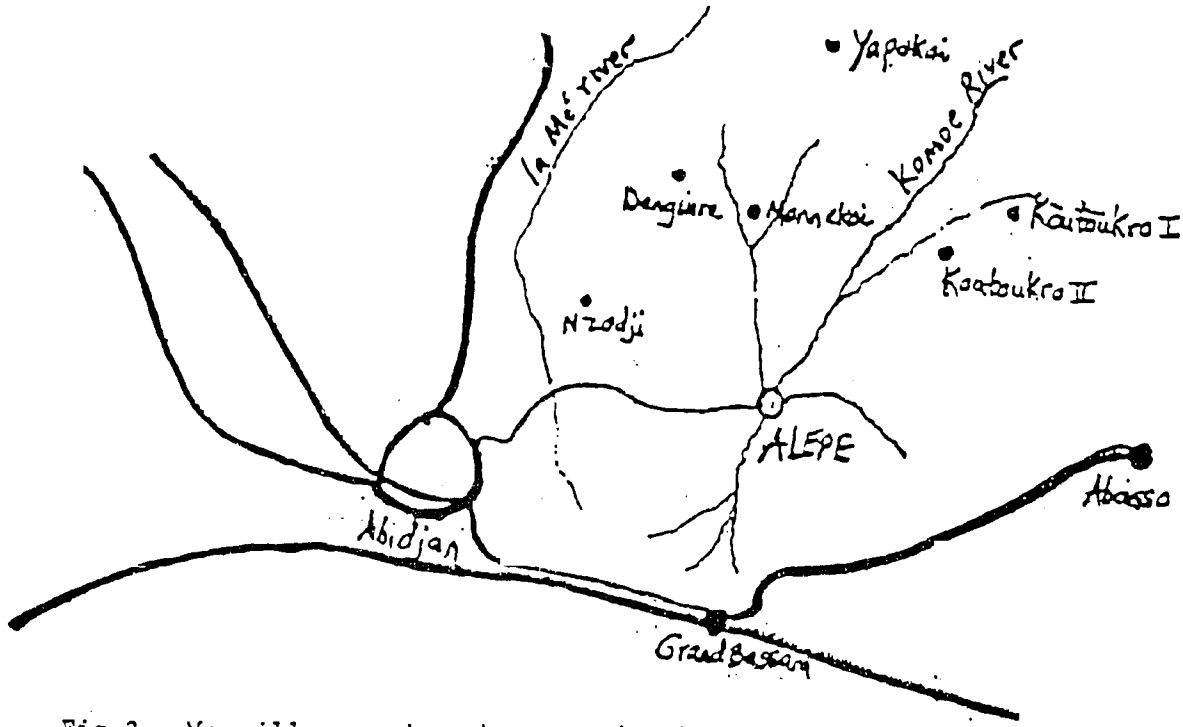

Fig. 2. Map illustrating the area in the Alepe district and the location of villages surveyed for onchocerciasis.

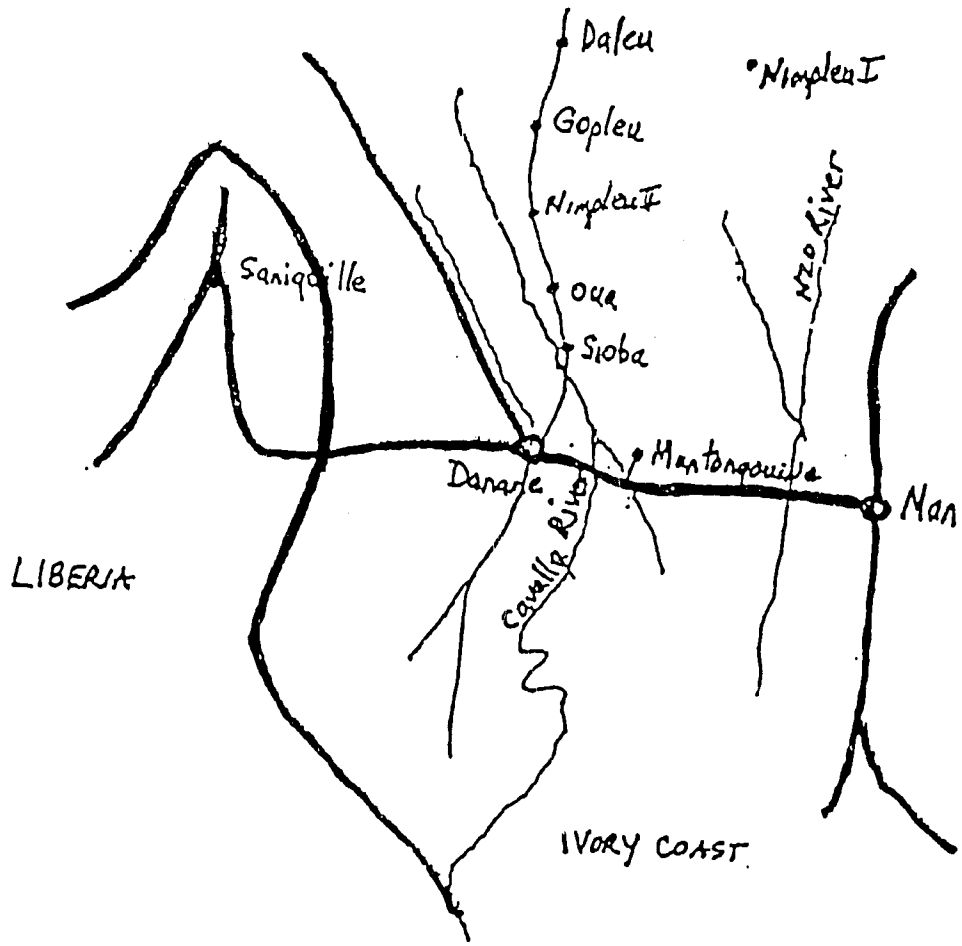

Fig. 3. Map illustrating the area in the Danane district and the location of villages surveyed for onchocerciasis.

Table 1.

Age Distribution of Study Population

DISTRICT	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50+
ALEPE	101 (15.5%)	166 (25.7%)	99 (15.2%)	79 (12.2%)	77 (11.9%)	127 (19.5%)
DANANE	92 (19%)	75 (15.5%)	106 (21.9%)	80 (16.5%)	57 (11.8%)	75 (15.5%)
TOTAL	193 (17.0%)	242 (21.3%)	205 (18.1%)	159 (14.0%)	134 (11.5%)	202 (17.8%)

Table 2.

Number of Subjects Examined and Prevalence of Infection by Village

ALEPE DISTRICT

VILLAGE	Number Examined				Prevalence	
	Est. Pop.	Total	Females	Males	All Ages (%)	10+ years old (%)
N'ZODJI	3,911	204	105	99	155 (76)	146/180 (81.1)
DANGUIRA	6,921	273	133	140	170 (62.3)	153/213 (71.8)
KOUTOUKRO I	1,179	60	23	37	51 (85)	48/55 (87.3)
KOUTOUKRO II	1,179	40	15	25	32 (80)	32/40 (80.0)
MONNEKOI	263	36	18	20	29 (80.6)	28/31 (90.3)
YAPOKOI	507	36	16	20	23 (66.9)	21/29 (72.4)
TOTALS	13,960	649	308	341	460 (70.9)	428/548 (78.1)

Table 3.

Number of Subjects Examined and Prevalence of Infection by Village

DANANE DISTRICT

VILLAGE	Number Examined				Prevalence	
	Est. Pop.	Total	Females	Males	All Ages (%)	10+ years old (%)
MANTONGOUINE	2,001	119	53	66	72 (60.5)	83/83 (75.9)
DALEU	694	77	46	31	62 (80.5)	53/62 (85.5)
GOPLEU	393	60	28	32	53 (88.3)	50/51 (98.0)
NIMPLEU II	600	64	32	32	54 (84.4)	51/55 (92.7)
OUA	487	53	19	34	39 (73.6)	36/45 (80.9)
SIOBA	369	52	24	28	38 (73.1)	35/45 (77.8)
NIMPLEU I	715	60	20	40	42 (70)	40/52 (76.9)
TOTALS	5,259	485	222	263	360 (79.2)	328/393 (83.5)

Table 4.

Intensity of Infection in those Positive by Village of Residence

ALEPE DISTRICT

VILLAGE	No. Positive	Microfilaria Density 1 -10 mf/mg(%)	11-20 mf/mg(%)	20+ mf/mg(%)	Overall (G. Mean)
N'ZODJI	155	119 (76.8)	22 (14.2)	14 (9.0)	2.32
DANGUIRA	170	141 (82.9)	22 (14.1)	7 (4.1)	1.51
KOUTOUKRO I	51	36 (70.6)	8 (15.7)	7 (13.7)	3.95
KOUTOUKRO II	32	23 (71.9)	8 (25.0)	1 (3.1)	2.49
MONNEKOI	29	15 (51.7)	5 (17.2)	9 (31.0)	5.00
YAPOKOI	23	20 (87.0)	1 (4.3)	2 (8.7)	1.51
TOTAL	460	354 (77.0)	66 (14.3)	40 (8.7)	2.13

Table 5.

Intensity of Infection in Those Positive by Village of Residence

DANANE DISTRICT

VILLAGE	No. Positive	Microfilaria Density 1 -10 mf/mg(%)	11-20 mf/mg(%)	20+ mf/mg(%)	Overall (G. Mean)
MANTONGOUINE	72	67 (93.1)	5 (6.9)	0 (0.0)	1.12
DALEU	62	35 (56.5)	14 (32.5)	13 (21.0)	4.58
GOPLEU	53	28 (52.8)	14 (26.4)	11 (20.8)	6.03
NIMPLEU II	54	35 (64.8)	7 (13.0)	12 (22.2)	4.93
QUA	39	26 (66.7)	8 (20.5)	5 (12.8)	3.01
SIOBA	38	29 (76.3)	8 (21.1)	1 (2.6)	2.16
NIMPLEU I	42	26 (61.9)	6 (14.3)	10 (23.8)	3.06
TOTAL	360	246 (68.3)	62 (17.2)	52 (14.5)	3.0

IVORIAN SURVEY: 1987

Prevalence and intensity of infection, and status of residency

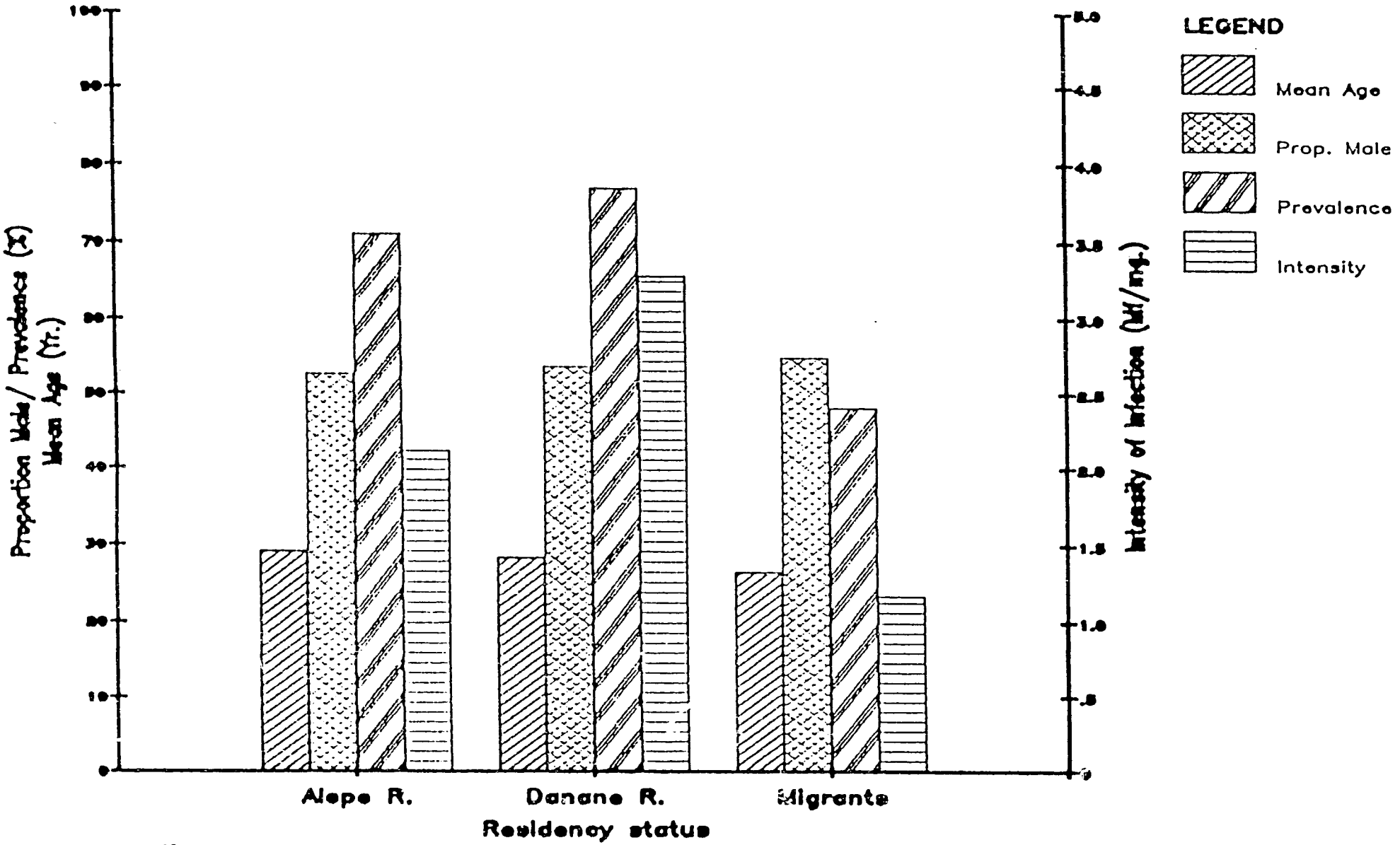

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Table 6.

Prevalence of Onchocercal Physical and Ocular Disease by Village

DISTRICT	VILLAGE	SKIN DISEASE (%)	PALPABLE NODULES (%)	OCULAR DISEASE (%)
	N'ZODJI	129 (62.9)	57 (27.8)	38 (18.5)
	DANGUIRA	179 (65.6)	74 (37.1)	31 (11.4)
	KOUTOUKRO I	46 (76.7)	27 (45.0)	14 (23.3)
ALEPE	KOUTOUKRO II	28 (70.0)	22 (55.0)	2 (5.0)
	MONNEKOI	27 (75.0)	18 (50.0)	13 (36.1)
	YAPOKOI	23 (63.9)	14 (38.9)	2 (5.6)
	TOTAL	432 (66.5)	212 (32.6)	100 (15.4)
	MONTONGOUINE	58 (48.7)	37 (31.1)	9 (7.6)
	DALEU	57 (74.0)	37 (48.1)	20 (26.0)
	GOPLEU	46 (76.7)	33 (55.0)	10 (16.7)
DANANE	NIMPLEU II	44 (68.8)	30 (46.9)	10 (15.6)
	OUA	38 (71.7)	23 (43.4)	6 (11.3)
	SIOBA	32 (61.5)	21 (40.4)	2 (3.8)
	NIMPLEU I	42 (70.0)	27 (45.0)	5 (8.3)
	TOTAL	317 (65.4)	208 (42.9)	52 (12.8)

TABLE 7.

Age/Sex Specific Prevalence Rate of Onchocerciasis in Villages Surveyed

Age range (yrs)	Number examined M	Number examined F	% mf Positive M	% mf Positive F
0 - 9	46	31	10.9	9.7
5 - 9	50	66	52.0	45.5
10 - 14	87	44	69.3	56.8
15 - 19	46	64	69.6	75.0
20 - 24	53	60	71.7	76.7
25 - 29	48	44	81.3	70.5
30 - 34	35	44	88.6	79.6
35 - 39	43	37	88.4	89.2
40 - 44	36	26	91.7	88.5
45 - 49	37	35	94.6	91.4
50 - 54	39	25	84.6	100
55 - 59	32	18	87.5	88.9
60+	52	36	90.4	75.0
Total	604	530	73.7	70.6

TABLE 8.

Age/Sex Distribution of Onchocercal Nodules

Age Range	No. Examined		LOCATION (%)											
			Head/Neck		Trunk		Hip		Leg		Arm		Any Location	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0 - 4	46	31	0	0	0	3.2	4.3	0	0	0	0	0	4.3	3.2
5 - 9	50	66	0	4.5	0	0	6.0	1.5	0	0	0	0	6.0	6.1
10 - 14	87	44	0	0	0	0	9.1	9.1	1.0	0	0	0	9.1	9.1
15 - 19	46	64	2.2	0	0	0	10.9	12.5	0	0	0	0	13.0	12.5
20 - 24	53	60	0	0	7.5	3.3	26.4	23.3	0	3.3	0	0	28.3	30.0
25 - 29	48	44	0	0	2.1	0	41.7	31.8	4.2	0	3.1	0	45.8	31.8
30 - 34	35	44	0	0	5.7	2.3	40.0	40.9	0	0	0	0	40.0	40.1
35 - 39	43	37	0	0	7.0	8.1	51.7	70.3	4.6	2.7	0	0	58.1	70.3
40 - 44	36	26	0	3.8	5.6	7.7	52.8	76.9	2.8	7.7	0	0	58.3	76.9
45 - 49	37	35	0	2.9	6.2	2.9	56.8	65.7	5.4	0	0	0	62.2	65.7
50 - 54	39	25	0	0	10.3	4.0	71.8	84.0	2.6	0	0	4.0	71.8	84.0
55 - 59	32	18	0	0	6.2	0	56.2	77.8	0	5.6	0	0	59.4	77.8
60+	52	36	0	0	22.1	11.1	63.5	77.8	11.5	5.6	3.8	0	67.3	77.8
Total	604	530	0.2	0.9	5.8	2.8	34.2	36.0	2.5	1.5	0.5	0.2	36.5	37.5

TABLE 9.

Prevalence of Visual Impairment by Cause

	ALEPE		DANANE	
Cause	BLIND (%)	LOW VISION (%)	BLIND (%)	LOW VISION (%)
ONCHOCERCIASIS	10 (1.5)	9 (1.5)	10 (2.4)	4 (0.8)
CATARACT	8 (1.2)	32 (5.3)	8 (1.9)	18 (4.4)
GLAUCOMA	2 (0.3)	1 (0.15)	2 (0.4)	0
TRAUMA	4 (0.6)	0	2 (0.5)	0
OTHER	9 (1.4)	11 (1.8)	5 (1.2)	1 (0.2)
TOTAL	31 (4.8)	52 (8.0)	25 (5.2)	23 (4.7)