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The status of dracunculiasis in parts of Isieke community in Ebonyi local government area of Ebonyi state, Nigeria

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Abstract: Studies on guinea worm infections was undertaken between January and August, 1999 in seventeen villages of Isieke Community in Ebonyi L.G.A. of Ebonyi State, Nigeria. Of the 6,177 persons examined 416 (6.73%) had active cases of guinea worm while 4503 (72.0%) persons had ever been infected. Fever (70.9%) and severe pain (51.4%) were their predominant presenting symptoms. Disability associated with guinea worm infections in the area include crippling effect, lowered sexual activity and poor maternal attention (in females). Of the 416 active guinea worm cases, 204 (7.0%) and 212 (6.50%) were males and females respectively. Over 85% of all infected persons were within the first five decades of life. Ninety-three percentage of all the active cases emerged from the limbs. Infection varied significantly among different villages, age groups and occupational groups ($P<0.05$). Guinea worm infections in relation to sex and religion was independent ($P>0.05$). Infections in the area depend on the source of water supply. Pond water users recorded more infections than bore-hole/well users. Over 60% of persons examined, filtered their water before drinking. The roles of the Nigerian Guinea Worm Eradication Progamme, Global 2000 and the endemic communities towards the final eradication of the disease in Ebonyi State are highlighted.

Resumen: Se llevaron a cabo estudios sobre las infecciones de gusano guinea entre enero y agosto de 1999 en diecisiete aldeas de la comunidad Isieke en el área del gobierno local Ebonyi del estado Ebonyi, Nigeria. De las 6,177 personas examinadas 416 (6.73%) tuvieron casos activos de gusano guinea, mientras 4503 (72.0%) personas estuvieron infectadas. Los síntomas predominantes que se presentaron fueron la fiebre (70.9%) y dolor severo (51.4%). La discapacidad asociada con las infecciones de gusano guinea en el área incluyen un efecto de tullimiento, actividad sexual reducida y poca atención materna (en las mujeres). De los 416 casos activos de gusano guinea, 204 (7.0%) y 212 (6.5%) fueron hombres y mujeres, respectivamente. Más de un 85% de todas las personas infectadas estaban entre primeras cinco décadas de vida. Noventa y tres por ciento de todos los casos activos surgieron de las extremidades. La infección varió significativamente entre las aldeas, clases de edad y grupos ocupacionales ($P <0.05$). La infección de gusano guinea fue independiente del sexo y la religion ($P <0.05$). Las infecciones en el área dependen de la fuente de agua. Los usuarios de agua de estanques resultaron ser más infecciosos que los usuarios de pozos perforados. Más del 60% de las personas examinadas filtraron el agua antes de beberla. Se enfatizan los papeles del Programa Nigeriano para la Erradicación del Gusano Guinea, Global 2000 y las comunidades endémicas hacia la erradicación definitiva de esta enfermedad en el estado Ebonyi.

Resumo: Estudos de infestação de filária (*Dracunculus medinensis*) foram efectuados entre Janeiro e Agosto de 1999 em dezassete aldeias da communidade de Isieke em Ebonyi L.G.A. do Estado de Ebonyi, Nigéria. Das 6177 pessoas examinadas, 416 (6,73%) apresentavam casos activos de filaria enquanto 4503 pessoas (72,0%) nunca tinham sido infectadas. Os sintomas

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prevalecentes eram a febre (79,9%) e dores agudas (51,4%). A incapacidade associada com a infecção por filária, na área, incluíam um estropiamento, redução da actividade sexual e um empobrecimento do sentido maternal (nas mulheres). Dos 416 casos activos com filária, 204 (7,0%) e 212 (6,5%), eram machos e fêmeas, respectivamente. Mais de 85% de todas as pessoas infectadas situavam-se na faixa etária até os 50 anos. Noventa e três por cento de todos os casos activos emergiram nas pernas. A infecção variou significativamente entre as diferentes aldeias, grupos etários e grupos ocupacionais ($P<0,05$). As infecções por filária eram independents do sexo e da religião ($P<0,05$). As infecções na área estavam dependentes da fonte de abastecimento de água. Os utilizadores de água dos charcos registaram maior percentagem de infecções do que aqueles que se abasteciam dos poços perfurados. Mais de 60% das pessoas examinadas filtravam a água antes de a beber. O papel do Programa Nigeriano Global 2000 de irradicação final da doença provocada pela filária no Estado de Ebonyi é salientado.

Key words: Active cases, control, disability, dracunculiasis, ever-infected, Nigeria, predilection sites.

Introduction

Dracunculiasis (Dracontiasis) is a debilitating tropical disease caused by the largest nematode of man *Dracunculus medinensis* and transmitted by different species of Cyclopoid copepods. Dracunculiasis is a disease of poor rural communities where the population often has to obtain drinking water from ponds infested with water fleas called Cyclops. In remote rural areas far from medical facilities where over 75% of the population live, the disease has been reported to enervate large populations leading to low agricultural productivity, disability, incapacitation and absenteeism of civil servants and pupils from work and school respectively (Belcher *et al.* 1975; Brieger *et al.* 1989; Hopkins 1984; Nwosu *et al.* 1982). High susceptibility to tetanus through ulcers caused by the emerging worms in addition to habitual abortion in some pregnant women (St. George 1975) have been associated with guinea-worm disease. In west and central Africa, India and Pakistan (Muller 1971) dracunculiasis is widely distributed where it constitutes a major public health problem with about 15 million people infected, about 60% which are recorded in Nigeria.

The disease has long been recognized as a medical problem in Nigeria. The disease and its arthropod vectors (Cyclops) have been extensively recorded in South-western Nigeria (Brieger *et al.* 1997; Edungbola 1983, 1984; Kale 1977; Onabamiro 1954, 1956). Osisanya *et al.* (1986) investigated the morbidity of dracunculiasis in north-western villages in Sokoto State; while the epidemiology of the disease in Bauchi State has been documented (Fabiyi 1991; Onwuliri *et al.* 1988-90b). In Eastern Nigeria, the endemicity of the disease has been reported (Nwosu *et al.* 1982; Udonsi 1987a, b). Ebonyi State is a known endemic area of dracunculiasis in Nigeria (Hopkins 1998). Information on the current status of this disease in Ebonyi State is necessary. There is, therefore, need for a comprehensive epidemiological characterization of the disease in most agricultural zones of the State with a view to aiding in the current National Guinea-worm eradication programme in Nigeria. The present investigation is designed to assess the current status of the disease in parts of Isieke community, Ebonyi State Nigeria.

Material and methods

The study area

This study is on parts of Isieke community in Ebonyi Local Government Area of Ebonyi State. Ebonyi Local Government, the present area of coverage, is situated in eastern part of the former Enugu State of Nigeria. There are one hundred and seven villages in Ebonyi Local Government area. Ebonyi State occupies the area lying between co-ordinates $6^{o}15$ and $5^{o}36$ N and between $7^{o}30$ and $8^{o}18$ E.

The vegetation is typically of south rain forest region. Majority of the inhabitants are subsistence farmers and a few engage in other forms of work. They have swampy grasslands in some parts of the state, which are favourable for rice cultivation.

They also cultivate yams, groundnut and cassava. Two distinct seasons occur, the wet season which run through the September and the dry season which run through the remaining part of the year. Rainfall of between 200 cm and 250 cm, and a daily temperature range of 30°C are usually recorded. Most rural communities of Ebonyi State depend mainly on streams, well and ponds for domestic water supply. On the farmlands, practically no protected water sources are available. Some of these ponds harbour crustaceans for example, several species of cyclops *Thermocylops nigerianus, Mesocylops leukarti* etc., which are infected with larvae of *D. medinensis*. The area was chosen for this study because of the prevailing conditions which are conducive for the breeding of cyclops and for the transmission of dracunculiasis (Nwosu *et al.* 1982).

Guinea-worm survey

Between January to August 1999, covering a period of eight months, bi-monthly visit to the seventeen villages of Isieke community survey were conducted in order to ascertain the prevalence, distribution etc. of the disease. As in most Dracunculiasis investigations (Nwosu *et al.* 1982; Onwuliri *et al.* 1988-90a; Udonsi 1987a,b) the house to house case search and interview of people were adopted to determine among other things, the number of persons ever-infected and those with active cases. The people with Dracunculiasis blisters and ulcers were identified; their sexes, ages, occupations were recorded while the anatomical locations of the blister and ulcers were noted. The interview helped to determine the degree of infection, source and treatment of water supply, history of the disease and cases of re-infection, and duration of infection/disability. On the basis of previous experience in surveys of this nature, the cooperation of the Local Government Chairman and village heads were obtained to ensure a wider response from their subjects.

Roles of NGDOs

In terms of water provision in this endemic area it was observed during the study that both the Global 2000 Nigeria and Nigeria Guinea-worm Eradication Programme (NIGEP), as well as the State and Local Government areas are contributing in no small measure for the provision of safe water to the people. Efforts are made to supply bore-hole to all endemic villages by the State Government. However, this has not been fully implemented as some villages are without bore-holes. The Global 2000 Nigeria/NIGEP field officers are also helping out in terms of encouraging the villages to dig community wells. Consequently many villages who could not get the bore-holes are being encouraged to have their own community well for safe water supply. In addition some seasonal streams in some of the endemic communities have been developed by the field officers for year round provision of water to all the endemic communities. The field officers are also responsible for the monthly treatment of the village ponds with Abate.

The NGDOs also help in the training and retraining of village based health workers (VBHWs). They train one village based health worker in each village except in some large villages where there could be two or more trained VBHWs. These VBHWs are responsible for case treatment. It is the role of the Local Government to pay these VBHW little stipend monthly. There is also State, Local Government and village taskforces who see at each level the activities of guinea worm eradication programme in the area. The State Task Force (STF) on Guinea worm eradication function within the Ministry of Health of Ebonyi State. The STF supports training activities within the endemic LGAs, mainly for VBHW, and generally plays a supervisory role for staff at LGA level.

Active health education is being carried out in all communities and villages where the disease is endemic by national dracunculiasis eradication programme. Health education may be defined as planned learning experience and social actions (including community mobilization) to enable people to gain an understanding and control over conditions that affect their health and the health status of others. The ultimate goal is to improve quality of life and prevent unnecessary death, disease, and disability, to facilitate and promote safe water practices.

Results

Prevalence of guinea worm infections

Between January and August 1999, studies were carried out in seventeen villages of Isieke Community on the prevalence of guinea worm in-

Table 1. Prevalence of Dracunculiasis in relation to sex in the study area.

Village	Male		Female		Both sexes	
	No. Examined	No. (%) Infected	No. Examined	No. (%) Infected	No. Examined	No. (%) Infected
Abarigwe	151	5 (3.3)	102	6 (5.8)	253	11 (4.3)
Ekebeligwe	123	9 (4.4)	93	7 (7.5)	216	16 (7.4)
Ekwbwligwe Isieke	163	10 (6.1)	278	5 (1.8)	441	15 (3.4)
Enyigbuchiri	104	9 (8.6)	201	9 (4.4)	305	18 (5.9)
Ephenyim	221	19 (8.6)	217	14 (6.4)	438	33 (7.5)
Ezzaofu	100	2 (2.0)	196	4 (4.0)	296	6 (2.0)
Izenyi	137	5 (3.6)	165	9 (5.4)	302	14 (4.6)
Ndiechi	99	3 (3.6)	180	17 (9.4)	279	20 (7.1)
Ndiefi	305	27 (8.8)	202	3 (1.4)	507	30 (5.9)
Ndienyim	337	46 (13.6)	344	69 (20.0)	681	115 (1.6)
Ndioke	124	5 (4.1)	132	2 (1.5)	256	7 (2.7)
Ochakwu	192	0 (0.0)	200	0 (0.0)	392	0 (0.0)
Oguzoronweya	189	4 (2.1)	72	8 (11.1)	261	12 (4.6)
Ojiegbe	103	4 (3.8)	96	1 (1.0)	199	5 (2.5)
Ulenwu	249	39 (15.6)	459	41 (8.9)	708	80 (1.1)
Ndiofia	212	1 (0.4)	104	2 (1.9)	316	3 (0.9)
Ozibo	105	16 (15.2)	222	15 (6.7)	327	31 (9.4)
Total	2914	204 (7)	3263	212 (6.5)	6177	416 (6.7)

fection in the area. During this period a total of 6,177 persons were examined for guinea worm infections. Of these, 416 persons had active cases of guinea worm giving a prevalence of 6.73%. Infections varied among villages with Ozibo having the highest prevalence of 9.48% followed by Ephenyim village (7.35%), Ekebeligwe (7.41%) while there were no active cases in Ochakwu village. A chi-square analysis showed that there were significant variations in infection rate among villages ($P < 0.05$). Table 1 summarizes the prevalence of guinea worm infection in relation to sex in the seventeen villages of Isieke community of Ebonyi State.

Sex related prevalence of guinea worm infection

Infection rate of guinea worm in relation to sex in the seventeen villages sampled are depicted in Table 1 in Isieke Community of Ebonyi Local Government. Of the 6,177 persons examined during the study 2,914 and 3,263 were males and females respectively. Of the males examined, 204 persons had active guinea worm cases giving an infection rate of 7%. On the other hand, an infection rate of 6.50%, was recorded for 212 females examined. In the male category, the highest number of 46 persons had active cases of guinea worm in Ndieyim village, followed by 39 males recorded in Ulenwu. In the female category the highest proportion of 69 persons with active cases were recorded in Ndienyim village, followed by 41 persons, in Ulenwu. Altogether a chi-square analysis showed that there was no significant difference in relation to sex of persons infected in the study area ($P > 0.05$).

Distribution of persons

During this study, of the 6,177 persons examined in seventeen villages of Isieke Community, 416 are active cases of guinea worm emergence. There were active cases in all the villages except Ochakwu village. In the seventeen villages also there has been guinea worm cases in the previous years, of which 4,503 persons had ever been infected. This observation showed that over 72% of all the persons examined during this work has ever been infected at one time or the other. More people had ever been infected in Ulenwu (600), followed by Ndienyim (529) with Ndioke (98) as the least (Table 2).

Age and sex distribution

Of all the 4503 persons who had ever been infected with guinea worm in the study area, 924 persons belong to the 21-30 age cohort, while 455 persons were over 70 years of age. Persons in all the various age groups had ever been infected at one time or the other. Individuals in the first four decades of life had more active cases than those

within the first five decades of life and above. This could be related to people's awareness of the disease. Of all the 3075 males examined, 20 (6.5%) had active cases while 2091 (68%) had ever been infected. Males in the various age cohorts are found to be infected. It was also observed that 78.6% of all the males examined were persons below 50 years of age. On the other hand, of the 3102 females examined 216 (6.96%) had active cases while 2412 (71.76%) had ever been infected in the study area. But males and females were found with active cases as well as ever being infected in the study area (Table 3). Table 3 also shows that 82.33% of 3102 females examined were within the age bracket of 0-50 years.

Infection rates, symptoms and distribution of guinea worm

In an endemic area of guinea worm infection, several symptoms are found amongst infected patients, these range from fever, nausea, loss of appetite, vomiting, diarrhea, severe pain and wound respectively. In the 71 and above age cohort there were no symptoms of nausea, loss of appetite, vomiting and diarrhea. Similarly, there wee no cases of vomiting and diarrhea in the 31-40 age bracket (Table 4).

Table 5 summaries the guinea worm infections in relation to sex and disability. Of the 6,177 persons examined, 4,919 (79.63%) were infected. These include both active cases and ever infected

Table 2. Distribution of persons with guinea worm active cases and those ever infected.

Village	Estimated population	Number examined	Number ever infected	Number of active cases
Abarigwe	1378	253	132	11
Ekebeligwe	2781	216	120	16
Ekebeligwe Isieke	3552	441	357	15
Enyigbuchiri	317	305	264	18
Ephenyim	4755	438	303	33
Ezzaofu	920	296	186	6
Izenyi	2781	302	144	14
Ndiechi	2781	302	112	20
Ndiefu	3055	507	435	30
Ndienyim	830	681	529	115
Ndioke	6433	256	98	7
Ochakwu	790	392	231	0
Oguzoronweya	4282	261	243	12
Ojiegbe	3992	199	107	5
Ulenwu	4282	708	600	80
Ndiofia	6567	316	309	3
Ozigo	3654	327	313	31
Total		6177	4503	416

Table 3. Age and sex distribution of active cases and those ever infected up of 1999 in parts of Isieke community.

Age Groups (Years)	Male			Female			Total		
	No. Examined	No. (%) Active cases	No. (%) Ever infected	No. Examined	No. (%) Active cases	No. (%) Ever infected	No. Examined	No. (%) Active cases	No. (%) Ever infected
0-10	472	63 (13.3)	433 (91.7)	623	40 (6.4)	354 (56.8)	1095	103 (9.4)	787 (71.8)
11-20	562	35 (6.2)	309 (54.9)	425	37 (8.7)	293 (68.9)	987	72 (7.2)	602 (60.9)
21-30	541	26 (4.8)	435 (80.4)	526	48 (9.1)	489 (92.9)	1067	74 (6.9)	924 (86.6)
31-40	372	36 (9.6)	263 (70.7)	578	23 (3.9)	468 (80.9)	950	59 (6.2)	732 (76.9)
41-50	472	19 (4.0)	155 (23.6)	402	29 (7.2)	363 (90.3)	877	48 (5.4)	518 (69.0)
51-60	226	9 (3.9)	123 (54.4)	109	15 (13.7)	70 (31.9)	335	24 (5.9)	193 (57.6)
61-70	127	7 (5.5)	104 (81.8)	219	9 (4.1)	189 (86.3)	346	16 (4.6)	293 (84.6)
71+	300	5 (1.6)	269 (89.6)	220	15 (6.8)	186 (84.5)	520	20 (3.8)	455 (87.5)
Total	3075	200 (6.5)	2091 (68.0)	3102	216 (6.9)	2412 (71.7)	6177	416 (6.7)	4503 (72.8)

Table 4. Prevalence and symptoms of guinea worm infection in the various age groups in the study area.

Age Group	No. Examined	No. (%)* Infected	Number (Percentage)** symptoms						
			Fever	Nausea	Loss of appetite	Vomiting	Diarrhea	Severe pain	Wound
0-10	1095	890 (81.2)	64 (62.1)	37 (35.9)	7 (6.8)	4 (3.8)	3 (2.9)	1 (0.9)	0 (0.0)
11-20	987	674 (68.2)	62 (86.1)	14 (19.4)	21 (29.1)	16 (22.2)	2 (2.7)	52 (72.2)	39 (54.1)
21-30	1067	998 (93.5)	34 (45.9)	8 (10.8)	59 (79.7)	12 (16.2)	4 (5.4)	42 (56.7)	26 (35.1)
31-40	950	790 (83.1)	56 (72.9)	3 (5.0)	17 (28.8)	0 (0.0)	0 (0.0)	40 (67.8)	25 (42.3)
41-50	877	566 (65.5)	35 (72.9)	2 (4.1)	10 (20.8)	3 (6.2)	2 (4.1)	42 (87.5)	15 (31.2)
51-60	335	217 (64.7)	17 (70.8)	14 (58.3)	13 (54.1)	20 (83.3)	17 (70.8)	15 (62.5)	13 (54.1)
61-70	346	309 (89.3)	16 (80.0)	5 (25.0)	7 (35.0)	6 (30.0)	5 (25.0)	12 (60.0)	7 (35.0)
71+	520	475 (91.3)	11 (68.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	10 (62.5)	14 (87.5)
Total	6177	4929 (79.6)	295 (70.9)	83 (19.9)	134 (32.2)	56 (13.9)	33 (7.9)	214 (51.4)	139 (33.4)

* Based on both active and ever infected persons.
** Expressed as a (%) of infected persons.

Table 5. Distribution of guinea worm infection in relation to sex and disability in seventeen endemic villages of Isieke.

Sex	Number examined	Types (%) of disability			
		No. (%)* infected	Crippling effect	Poor maternal attention	Lowered sexual activity
Male	3075	2291 (74.5)	1185 (51.7)	0 (0.0)	173 (7.5)
Female	3102	2628 (84.7)	179 (6.8)	1201 (45.7)	167 (6.3)
Total	6177	4919 (79.6)	1364 (27.7)	1201 (24.4)	340 (6.9)

* Based on both active cases and ever infected persons.

persons in the study area. Of these 1364 (27.73%), 1202 (24.42%), and 340 (6.91%) opined that they had crippling effect, poor maternal attention and lowered sexual activity respectively. In the male category, 118 (51.72%) and 173 (7.55%) had crippling effect and lowered sexual activity. On the other hand, 179 (6.81%) females, 1202 (45.70%) as well as 167 (6.35%) had crippling effect, poor maternal attention and lowered sexual activity respectively. Analysis of the predilection sites based on the 416 persons with active cases showed that 92.79% of all the cases observed emerged from the limbs (Table 6).

Guinea worm infections

Table 7 depicts the prevalence of guinea worm infections in relation to water supply in the study area. Sources of water supply in the area are mainly from streams, ponds, well, stagnant pools and bore-holes. Of the 6177 examined, 2082 and 1342 depend mainly on ponds and well respectively. A chi-square analysis reveal that guinea worm infections in the study area is dependent on the source of water supply ($P < 0.05$). Infection was significantly higher in persons that depend on pond water than any other group of person that

Table 6. Prevalence of dracunculiasis in relation to predilection sites.

Location	Number of cases	*%
Foot	108	25.9
Knee	73	17.5
Ankle	52	12.5
Shin	32	7.6
Calf	31	7.4
Thigh	27	6.4
Toe	24	5.7
Wrist	19	4.5
Sole	17	4.0
Upper arm	16	3.8
Groin	4	0.9
Palm	3	0.7
Umbilicus	3	0.7
Buttocks	2	0.4
Scrotum	1	0.2
Face	1	0.2
Chest	1	0.2

* % of affected persons (416).

depend on other sources of water supply. On the other hand, infection was significantly lower in persons that depend on borehole and well water. As shown in Table 8, people in the endemic community studied are quite aware of different methods of water treatment before use. Such water treatments include boiling, sedimentation as well as filtration. Filtration here is mainly by the use of cloth filters given free of charge from Global 2000 and NIGEP staff. Of the people examined during the study 3736 (60.48%) agreed that they filter their water. However, 1574 (25.84%) agreed that they did not treat their water before drinking. Of the 1574 persons who did not treat their water before drinking comprises mainly (86.15%) of traders and farmers.

Table 7. Prevalence of dracunculiasis in relation to source of water supply.

Source of water	Number examined	Number (%) infected	
Streams	930	43	(4.6)
Ponds	2082	305	(14.6)
Well	1342	28	(2.0)
Stagnant ponds	906	38	(4.1)
Bore Hole	86	2	(2.3)
Total	6177	416	(6.7)

Table 8. Methods of water treatment in relation to various occupational groups in the villages studied.

Occupation	Boiling	Sedimentation	Filteration	Non-treatment
Students				
Pupils	321	16	1402	18
Teachers	367	24	1076	99
Civil servants	29	36	923	101
Traders	19	30	101	428
Farmers	7	18	234	928
Total	743	124	3736	1574
% of water treatment*	(12.0)	(2.0)	(60.4)	(25.4)

* Based on the totals

Table 9 summaries the occupational-related prevalence of guinea worm infection in the endemic villages of Isieke Community. Infections varied among various occupational groups with farmers (8.76%) being higher than others, followed closely by students and pupils (6.62%) with palm wine tapers (3.13%) as the least. A chi-square analysis showed that infection was significantly higher in farmers than any other occupational group ($P < 0.05$). As shown in Table 10 the type of religion was related to guinea worm infection. Although guinea worm infection was found in people of various religions, it was statistically not significant ($P > 0.05$).

Table 9. Occupational related prevalence of dracunculiasis in the study area.

Occupation	No. examined	No. infected	% infection
Farmers	2672	234	8.7
Students/Pupils	1504	98	6.6
Traders	1445	62	4.2
Civil servants	428	18	4.2
Palm wine tapers	128	4	3.1
Total	6177	416	6.7

Table 10. Prevalence of dracunculiasis in relation to cultural practices in the study area.

Types of Religion	No. examined	No. infected	% infection
Christianity	1378	63	4.5
Traditionalist	1689	112	6.6
Moslems	932	87	9.3
Atheist	1532	96	6.2
Others	646	58	8.9
Total	6177	416	6.7

Discussion

The present study shows that dracunculiasis is endemic in parts of Isieke community of Ebonyi State, Nigeria. The results indicate a lower prevalence of dracunculiasis in parts of Isieke community than recent figures obtained elsewhere in Nigeria (Edungbola 1983; Nwosu *et al.* 1982; Onwuliri *et al.* 1988-90a, b; Osisanya *et al.* 1986; Udonsi 1987). The low prevalence is probably due to the earnest efforts being made by Global 2000 Nigeria, Nigeria Guinea worm eradication programme (NIGEP), the assistance given by the Health Department of Local Government and the State government to ensure total eradication of the disease as soon as possible. In spite of the close proximity of the villages and the similarities of the local topography and environmental climatic conditions, the prevalence of dracunculiasis varied in different villages. These differences, apparently are largely

due to variations and degree of exposure to the contained source of water. In Ozibo for instance, the inhabitants are more exposed to infections because apart from the fact that they do not have any good sources of water, their ponds have not been systematically treated with abate for long and hence have not received enough filters for filtration of their water. Consequently, the level of endemicity of dracunculiasis in this village was a relatively high (9.48%) compared to other villages.

Although higher prevalence rates in males than in females have been reported (Osisanya *et al.* 1986). The present study showed no significant difference amongst sex. Both males and females work collectively in the farms and sharing the same sources of drinking water. Analysis of the data on age-related distribution of dracunculiasis showed that infection was higher with age. And this agrees with other reported patterns in most endemic areas (Nwosu *et al.* 1982). This pattern may be related to the higher exposure to sources of water infected with cyclopoid copepods. However, the gradual decrease of infection with age could indicate incredible awareness of the older individuals to causative agents of the disease, especially as they benefit more from health talks on dracunculiasis from the mass media as well as the guinea worm field officers.

Results from the analysis of age and sex distribution of active cases and those ever-infected in the study area showed that persons in all various age-groups had ever been infected at one time or the other. Also individuals in the first four decades of life had more active cases than those within the fifth decade of life and above. This could be related to people's awareness of the disease. It is also reported that both male and female were found with active cases as well as ever infected. Both sexes are exposed as they work together in farms and take water from the same source and have suffered from the disease at one time or the other. Re-infection is a common feature of dracunculiasis (Johnson & Joshi 1980; Reddy *et al.* 1969). Chandler & Read (1961) reported that in the Deccan (South India) few people suffer from infection for more than four years, after which immunity develops from infection. In the present investigation, however, it was observed that patients suffered as long as 10, or in some cases up to 20 years and in one case almost continuously for 39 years. Reddy *et al.* (1969) reported that in Kurnool District, Andhra Pradesh, South India, some people suffered for more than 50 years and some were infected up to 100 times. The present observation is, therefore, in agreement with Fairly (1924); Rao (1942); Scott (1960) and Okoye *et al.* (1995) that one infection does not give rise to immunity and that patients are quite susceptible to subsequent infections.

The presence of various mild clinical symptoms such as fever, nausea, loss of appetite, vomiting, diarrhea, severe pain and wound is interesting. In this study it was shown that in the 71 and above age cohort there were no symptoms of nausea, loss of appetite, vomiting and diarrhea but instead fever, severe pain and wound were experienced. This could be as a result of advanced age and successive infections of the body reducing the appearance of these symptoms. It was also observed that there were no cases of vomiting and diarrhea in the 31-40 age bracket. Also in the age cohort of 0-10, people had no septic wounds.

Undoubtedly, guinea worm infections are endemic in parts of Isieke Community Ebonyi State and are associated with a number of disabilities. These included crippling effect, poor maternal attention and lowered sexual activity. Males were observed to suffer crippling effect and lowered sexual activity while the females had crippling, poor maternal attention and lowered sexual activity. The marked disability in guinea worm infection is due to swelling effect of the legs as well as painful ulcers due to emerging new worms several months after the first worm emergence. The occurrence of guinea worm disease in young adults has always been associated with serious economic implications since most people affected belong to the productive age groups of 15-55 years.

During this study, it was observed that the limbs were the preferred sites of worm emergence. Muller (1971), Kale (1977), and Okoye *et al.* (1995) associated this feature to geotactic response that ensures the survival and perpetuation of *D. medinensis*. The result also agree with earlier reports of Macpherson (1981) that adult worms more commonly emerge from the legs to liberate the larvae. This is conducive to the spread of the infection since the villagers wade into the middle of the ponds in search of 'cleaner' water. The occurrence of these blisters on the legs and hands has important socio-economic implication in a population where subsistence farming is the major means of livelihood.

Generally, the prevalence of guinea worm infection was significantly different ($P < 0.05$) in the various occupational groups with farmers and students/pupils mostly affected. This is due to the extent of exposure in the fields since farmers and students/pupils frequently come in contact with copepod infected water sources and drink from it more often than any of the other occupational groups. As noted by Udonsi (1987a) the use of the water to dilute palm-wine (a fermented palm sap) which is drunk as a social and recreational habit increase transmission rate. Therefore, provision of domestic water may not, however, eliminate this aspect of transmission since palm-wine tapers continue to use the pond and stream water infected with copepods to dilute the palm-wine. Onwuliri *et al.* (1988-90a) also reported that the variation infections rates amongst various occupational groups is apparently related to differences in the degree of exposure as stated earlier. Civil servants and traders are already well informed by their level of education not only on the danger of drinking from the ponds but also on the methods of water treatment which included filtering and boiling. These two occupational groups apart from awareness are also viable to make use of filters since filters are given free from NIGEP. In contrast palm-wine tapers are less exposed to the infection. This is because, the community main occupation is farming and only few tap wine, instead they hire the palm-wine tapers from their neighboring communities who later leave for their villages.

It was also observed that although guinea worm infection was found in people of various religions, it was not statistically different. This could be due to equal exposure and undoubtedly the indulgence of drinking from the source of contaminated water. The prevalence of guinea worm infection in relation to source of water supply showed that guinea worm infection in the study area is dependent on the source of water supply. This agrees with earlier report that "guinea worm is the only Disease exclusively transmitted by drinking water (and therefore) can be eradicated simply by providing safe water sources (Bourne 1986)". This is similar to the situation in India (Johnson & Joshi 1980), Ghana (Belcher *et al.* 1975), Burkina Faso (Steib & Mayer 1988) and elsewhere in Nigeria (Edungbola 1983, 1984; Fabiyi 1991; Kale 1977; Nwoke 1992; Onwuliri *et al.* 1988; Udonsi 1987a, b). This is not unexpected considering the fact that over 80% of infected persons drink untreated water. Generally, treatment of water is not accepted to the rural people who regard boiling water for example as a waste of time, energy and financial resources.

Our observations on guinea worm infections in parts of Isieke community of Ebonyi LGA showed that actually the level of endemicity of guinea worm infections has drastically reduced in the past ten years. This could be attributed to the effort of the Nigeria guinea worm eradication programme as well as Global 2000 who have constantly and consistently been providing all the necessary logistic support, Abate (Temophos) and drug in the past one decade. In the rural communities NIGEP has trained several village based health workers (VBHW) at least one person per village who takes care of guinea worm eradication activities in these endemic areas. The VBHW take care of case detection and reporting, case containment as well as treatment of guinea worm cases.

Furthermore, the NIGEP/GLOBAL 2000 deployed field officers in the area who are responsible to effective supervision of guinea worm activities. The field officers are also responsible for pond enumeration and systematic pond treatment with Abate as well as distribution and replacement of worn out nylon filter cloths. They provide first aid kits to village based health workers. Health education of the endemic rural communities is also a major role of the field officers and village based health workers.

As noted by Kappus *et al.* (1991), Brieger *et al.* 1989, 1997), the provision of filters, Abate, prompt reporting and containing of cases as well as water supply provision (Udonsi 1987a) were sufficient strategies to achieve guinea worm eradication goals in Ebonyi Sate. The encouragement received by VBHW and field officers in providing hand-dug wells, bore-holes, Community Filtration Units (CFU) is also worthy of mention. Also members of endemic villages have created more than 400 hand dug wells as in the past few years in order to rid themselves of dracunculiasis (Hopkins 1998). This is just one way that eradicating dracunculiasis has helped increase the self-reliance of some affected communities and generated ancillary benefits in the control of other water borne diseases. Global 2000 has also established community-based health education, Village Task Force (VTF) and surveillance by village volunteer in all the remote villages (Cairncross *et al.* 1996). Consequently, guinea worm infections in the study area would soon be a

thing of the past considering the present effort being made by Global 2000/NIGEP as well as the State and Local Governments. However, to ensure long term sustainability of the eradication efforts, these endemic villages and the Local Government should work hand in hand in identifying more areas of needs by the VBHWs and field officers. The involvement of these in guinea worm eradication is paramount. There is need for the Government to be more serious in affairs regarding guinea worm eradication than leaving it only to the NGDOs.

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References

Belcher, D.W., F.K. Wurapa, W.B. Ward & I.M. Lourie. 1975. Guinea worm in southern Ghana: its epidemiology and impact on agricultural productivity. *American Journal of Tropical Medicine and Hygiene* **24**: 243-249.

Bourne, P.G. 1986. Water and sanitation for all. *Search Journal (Emory University School of Medicine MPH Student Journal* **1**: 41.

Brieger, W.R., S. Watts & M. Yacoob. 1989. Guinea worm, maternal morbidity and child health. *Journal of Tropical Pediatrics* **35**: 285-288.

Brieger, W.R., S. Otusanya, J.D. Adeniyi, J. Tijiani & M. Banjoko. 1997. Eradicating guinea worm without wells: unrealized hopes of the Water Decade. *Health Policy Planning* **12**: 354-362.

Cairncross, S., E.I. Braide & S.Z. Burgri. 1996. Community participation in the eradication of guinea worm disease. *Acta Tropica* **61**: 121-136.

Chandler, A.C. & C.P. Read. 1961. *Introduction to Parasitology*. John Wiley and Sons Inc, New York and London.

Edungbola, L.D. 1983. Babana parasitic disease project 11. Prevalence and impact of dracontiasis in Babana district, Kwara State. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **77**: 301-315.

Edungbola, L.D. 1984. Dracunculiasis in Igbon Oyo State, Nigeria. *Journal of Tropical Medicine and Hygiene* **87**: 153-158.

Fabiyi, J.P. 1991. Geographical distribution of dracontiasis in Bauchi State, Nigeria. *Discovery and Innovations* **3**: 72-76.

Fairley, N.H. 1924. Studies in dracontiasis. IV: The clinical picture - an analysis of 140 cases. *Indian Journal of Medical Research* **12**: 351-367.

Hopkins, D.R. 1984. Eradication of dracunculiasis. pp. 93-114 *In*: P.G. Bourne (ed.) *Water and Sanitation*. Orlando, F.L. Academic Press.

Hopkins, D.R. 1998. Perspectives from the dracunculiasis eradication programme. pp. 38-41. *In*: *Global Disease Elimination and Eradication as Public Health Strategies*. *Bulletin of World Health Organization* No. **276**.

Johnson, S & V. Joshi. 1980. Dracontiasis in Western Rajasthan, India. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **35**: 151-161.

Kale, O.O. 1977. The clinico-epidemiological profile of guinea worm in Ibadan district of Nigeria. *American Journal of Tropical Medicine and Hygiene* **26**: 208-214.

Kappus, K.D., D.R. Hopkins, E. Ruiz-Tiben, R. Imtiaz, J. Anderson, Azam & A. Attiq. 1991. A strategy to speed the eradication of Dracunculiasis. *World Health Forum* **12**: 220-225.

Macpherson, C.N.I. 1981. The existence of *Dracunculus medinensis* (Linnaeus 1758) in Turkana, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **75**: 680-681.

Muller, R. 1971. *Dracunculus* and Dracunculiasis. *Advances in Parasitology* **9**: 73-151.

Nwoke, B.E.B. 1992. Behavioural aspects and their possible uses in the control of dracontiasis (guinea worm) in Igwun river basin area of Imo State, Nigeria. *Angewante Parasitologie* **33**: 205-210.

Nwosu, A.B.C., E.O. Ifezulike & A.O. Anya. 1982. Endemic dracontiasis in Anambra State of Nigeria: Geographical distribution, clinical features epidemiology and socio-economic impact of the disease. *Annuals of Tropical Medicine and Parasitology* **76**: 187-200.

Okoye, S.N., C.O.E. Onwuliri & J.C. Anosike. 1995. A survey of Predilection sites and degree of disability associate with Guinea worm *(Dracunculus medinensis) International Journal of Parasitology* **25**: 1127-1129.

Onabamro, S.D. 1954. The diurnal migration of cyclops infected with the larvae of *Dracunculus medinesis* (Linnaeus) with some observations on the development of the larval worms. *West African Medical Journal* **3**: 180-194.

Onabamiro, S.D. 1956. The effects of hetrazan (Banocide: diethyl carbamazine larval form of *Dracunculus medinensis*. *West African Medical Journal* **5**: 64.

Onwuliri, C.O.E. E.I. Braide, & J.C. Anosike. 1988-90a. Dracunculiasis in Bauchi State, Nigeria. *Nigeria Journal of Parasitology* **9-11**: 27-31.

Onwuliri, C.O.E., C.M. Adeiyongo & J.C. Anosike. 1988-90b. Guinea worm infections in Oju and Okpokwu local government areas of Benue State, Nigeria. *Nigeria Journal of Parasitology* **9-11**: 27-32.

Osisanya, J.O.S., E.I. Eluzie & F.I. Okoro. 1986. Dracontiasis: Pattern of morbidity in a north-western village in Sokoto State, Nigeria. *Transactions of the Royal Society of Tropical Medicine & Hygiene* **80**: 293-294.

Rao, S.R. 1942. Some epidemiological factors of guinea worm disease as noticed in a recent survey of the Osmanabad district. *Journal of Indian Medical Association* **11**: 328-337.

Reddy, G.V.M., I.L. Nagara & G. Paravathi. 1969. Epidemiological studies on guinea worm infections. *Bulletin of World Health Organization* **40**: 521-529.

Scott, D. 1960. An epidemiological note on guinea worm infection in north-west Ashanti; Ghana. *Annals of Tropical Medicine & Parasitology* **54**: 32-43.

St. George, J. 1975. Bleeding in pregnancy due to retroplacental situation of guinea worm. *Annals of Tropical Medicine and Parasitology* **69**: 383-386.

Steib, K. & P. Mayer. 1988. Epidemiology and vectors of *Dracunculus medinensis* in north-west Burkina Faso, West Africa. *Annals of Tropical Medicine and Parasitology* **82**: 189-199.

Udonsi, J.K. 1987a. Control of endemic dracontiasis by provision of water supply in rural communities of Imo State, *Nigeria Public Health* **100**: 63-70.

Udonsi, J.K. 1987b. Dracontiasis in Igwum River Basin, Nigeria: Its distribution, epidemiology and transmission dynamics. *Tropical Medicine and Hygiene* **38**: 304-308.