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Dracunculus medinensis Infection among Households in Idah and Ibaji Local Government Areas, Kogi State, Nigeria

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Abstract: A cross sectional survey was carried out to determine the prevalence and intensity of *Dacunculus medinensis* infection among the households in Idah and Ibaji Local Government Areas (LGAs), Kogi State, Nigeria. The results of parasitological examination of 4,426 and 5,161 subjects in Idah and Ibaji LGAs, respectively for active infection gave 0% prevalent rate in either of the two LGAs. However, the responses to the questionnaires on retrospective study of cases of dracunculiasis in the areas for the past one decade showed low prevalent rates both in Idah and Ibaji LGAs. Only one positive case (0.95) of the disease was recorded in two villages, viz.; Ugwoda and Ichekene in Idah LGA between 1990 and 1998 while four positive cases (3.6%) were recorded in only Odogwu village of Ibaji LGA within the same period (1990-98). The study also showed that the inhabitants were predominantly farmers (63.2, 52.6% Idah and Ibaji LGAs, respectively). Idah community depends mainly on River Niger (42.1%) and River Inachalo (57.9%) for their domestic use whereas Ibaji community depends on Rivers Otta (31.6%), River Ogodomu (42.1%) and River Otto (26.3%) all of which are tributaries to the River Niger. These water bodies were sampled for *Cyclops* species and it was only one pond in Odogwu village that was positive and two individuals of *Thermocylops nigerianus* were collected. The low prevalence of dracunculiasis suggests that the disease is gradually and naturally being eradicated from the two LGAs even without any observable planned intervention. However, further researches into the Suburbs and interior villages are recommended in case of recrudescence of this debilitating disease.

Key words: *D. medinensis*, dracunculiasis, prevalence, intensity, *Cyclops* species

INTRODUCTION

Dracunculiasis, also known as guinea worm disease is caused by large female of the nematode (Superfamily: Dracunculoidea; Order: Spirurida), *Dracunculus medinensis* which emerges painfully and slowly from the skin usually on the lower limbs (Cairncross *et al*., 2002). Currently, two major genera viz.; *Mesocyclops* (*M. margaretae*) and *Thermocyclops* (*T. cassus*, *T. incisus*, *T. inopinus* and *T. oblongatus* (Muller, 1991), serve as the intermediate hosts of *D. medinensis*. Humans become infected if they drink from unfiltered water supply, especially from ponds or open wells which contains infected *Cyclops* species.

Numerous studies have illustrated the predominant role of ponds in dracunculiasis transmission in various parts of Nigeria (Edungbola, 1980, 1983; Edungbola and Watts, 1984, 1990), Ghana (Scott, 1960; Lyons, 1972), Burkina Faso, Togo, Uganda (Henderson *et al*., 1988), Pakistan (Hopkins *et al*., 1995), India (Johnson and Joshi, 1982) and the present Uzbekistan (WHO, 1998). The disease is hardly contracted from flowing water sources (Muller, 1979; Cairncross and Tayeh, 1988).

In the early 1990s, about 3-5 million cases of dracunculiasis occurred worldwide each year. During the last 25 years, concerted efforts to eradicate the guinea worm have resulted in a reduction of >99% worldwide cases of the disease (Ghosh and Weintzen, 2006). By 1996, only 152,805 cases were reported, mostly from Ghana and Sudan. Presently, 9 countries which are endemic include Sudan, Ghana, Nigeria, Mali, Togo, Burkina Faso, Ethiopia, Niger and (Ivory Coast) Cote D'Ivoire (Ghosh and Weintzen, 2006). Recent statistics indicate that only 8,191 cases were reported during the first half of 2005 from these 9 nations. Many nations of the world are poised to eradicate guinea worm disease (dracunculiasis) as the only second disease in human history to be eradicated and the first to be wiped off the face of the earth without a vaccine or medicine. The former US President, Jimmy Carter once announced that

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cases of guinea worm disease have reached an all-time low with fewer than 5,000 estimated cases remaining worldwide. However, the last cases of an eradication campaign are the most difficult and expensive to eliminate. Although, infected cases become fewer and far between, surveillance of countries including the smallest communities in the most remote areas, needs to be intensified to prevent outbreaks and setbacks. The CDC (2005) now projects that the disease may be completely eliminated by 2009. Nigeria has maintained a zero-case status for 52 months as there has been no case of guinea worm reported to date in any part of the country. The last verifiable guinea worm case reported in Nigeria was in November 2008, putting it on target to meet international certification for eradication. In its bid to sustain the zero-case status and ensure total eradication of the disease, the Federal Government of Nigeria has recently offered a cash reward of ₦25,000 for every report of authentic new guinea worm cases in any part of the country, ahead of Nigeria's certification as a guinea worm free nation by the World Health Organisation (WHO) in June 2013.

In Nigeria, various prevalent rates of infection have been reported from rural areas of Kwara, Anambra, Calabar, Oyo and some villages in Kogi State in the past years (Adeyeba, 1985). Also, cases of dracunculiasis were well documented in Idah, Ibaji and Yagba areas of Kogi State in the 1960s (Abolarin, 1981). The research of Onabamiro (1951, 1952) revealed that of the thirty species of *Cyclops* identified in Nigerian ponds and streams, *Thermocyclops nigerianus* was susceptible intermediate host to *D. medinensis* naturally. The study also showed that three species of *Cyclops* viz., *Mesocyclops leukarti*, *T. inopinus* and *Microcyclops varians subaequalis* could be successfully infected with *D. medinensis* experimentally. Although, dracunculiasis is not known to be solely responsible for mortality, it is a real burden in terms of morbidity, incapacity and suffering for those affected.

From literature and hospital records there were no cases of patent or active dracunculiasis as well as information about the intermediate host (*Cyclops* species) in Idah and Ibaji Local Government Areas (LGAs). The present research was designed to determine the prevalence and intensity of the disease in the two LGAs. The baseline data obtained in this study would be useful for the control of dracunculiasis.

MATERIALS AND METHODS

Before the commencement, the purpose of the research work was explained to the medical directors of the General Hospital and Heads of the Primary Health Care (PHC) Units as well as the members of the 105 and 112 households surveyed in Idah and Ibaji Local Government Areas (LGAs), respectively. Having obtained the consent of the subjects, questionnaires were administered to them soliciting for such information as current cases and/or the status of dracunculiasis in the past one decade. The questionnaires were directly administered to a total of 4,262 and 5,161 individual members of the 105 and 112 households examined for dracunculiasis in Idah and Ibaji LGAs, respectively. Each subject was guided in filling the questionnaire to furnish such information as age, sex, residence, occupation, source of water supply and patent and/or past cases of the disease.

Sample collection

Specimens of *Dracunculus medinesis*: Sterile screw-capped containers were used for the collection of specimens from subjects which usually consisted of the posterior segments or ruptured female *D. medinensis* or fluid exuding from the ulcer blister containing a large number of larvae. About 1 mL of normal saline was added to each container immediately and was brought to the laboratory for analysis. The analysis and identification were carried out in accordance with the method described by Cairncross *et al*. (2002).

Specimens of *Cyclops* species: Sampling for the intermediate host of *D. medinensis* (*Cyclops* species) were carried out randomly at 5 contact sites of each of the water-bodies within Idah metropolis and its suburbs viz., Ede-Alaba, Angwa, Ofukolo, Ofiji, Inachalo, Ichekene and interior villages namely, Aloko-Ina and Ugwoda. Similarly, water-bodies in 4 villages namely, Ejule-Ojebe, Odogwu, Unale, Enweli and the Local Government headquarters of Ibaji LGA, Onyedega were sampled for *Cyclops* species. This was done by taking vertical zooplankton hauls using a 150 μm mesh size net and preserved immediately in 4% formalin. The zooplankters collected were identified in the laboratory in accordance with the criteria of Jeje and Fernando (1986).

RESULTS AND DISCUSSION

The prevalence and intensity of *Dracunclulus medinensis* infection among the households in Idah and Ibaji Local Government Areas (LGAs) are shown in Table 1 and 2, respectively. A total of 4,246 (male = 2,115; female = 2,131) and 5.161 (males = 2,727; females = 2,434) individual members of the households were examined in Idah and Ibaji LGAs, respectively. The results showed that none of the subjects (0%) was infected with *D. medinensis* in either of the two LGAs.

Table 1: Prevalence and intensity of *Dracunculus medinensis* infection among 105 households in Idah LGA

Age group	Male (♂)					Female (♀)					Total (♂ and ♀)				
	No. examined	No. of +ve	Prev. (%)	95% CL	GMI	No. examined	No. of +ve	Prev. (%)	95% CL	GMI	No. examined	No. of +ve	Prev.	95% CI (%)	GMI
5-9	68	0	0	-	-	95	0	0	-	-	163	0	0		-
10-14	292	0	0	-	-	486	0	0	-	-	778	0	0		-
15-19	567	0	0	-	-	665	0	0	-	-	1,232	0	0		-
20-24	288	0	0	-	-	152	0	0	-	-	440	0	0		-
25-29	150	0	0	-	-	186	0	0	-	-	336	0	0		-
30-34	279	0	0	-	-	140	0	0	-	-	419	0	0		-
35-39	242	0	0	-	-	100	0	0	-	-	342	0	0		-
40-44	90	0	0	-	-	136	0	0	-	-	226	0	0		-
45-49	64	0	0	-	-	62	0	0	-	-	126	0	0		-
50+	75	0	0	-	-	109	0	0	-	-	184	0	0		-
Total	2,115	0	0	-	-	2,131	0	0	-	-	4,246	0	0		-

Table 2: Prevalence and intensity of *Dracunculus medinensis* infection among 112 households in Ibaji LGA

Age group	Male (♂)					Female (♀)					Total (♂ and ♀)				
	No. examined	No. of +ve	Prev. (%)	95% CL	GMI	No. examined	No. of +ve	Prev. (%)	95% CL	GMI	No. examined	No. of +ve	Prev.	95% CI (%)	GMI
5-9	124	0	0	-	-	180	0	0	-	-	304	0	0		-
10-14	255	0	0	-	-	371	0	0	-	-	626	0	0		-
15-19	287	0	0	-	-	504	0	0	-	-	791	0	0		-
20-24	488	0	0	-	-	350	0	0	-	-	838	0	0		-
25-29	210	0	0	-	-	385	0	0	-	-	595	0	0		-
30-34	720	0	0	-	-	156	0	0	-	-	876	0	0		-
35-39	451	0	0	-	-	125	0	0	-	-	576	0	0		-
40-44	125	0	0	-	-	324	0	0	-	-	449	0	0		-
45-49	28	0	0	-	-	39	0	0	-	-	67	0	0		-
50+	39	0	0	-	-	-	0	0	-	-	39	0	0		-
Total	2,727	0	0	-	-	2,434	0	0	-	-	5,161	0	0		-

Table 3 and 4 show the responses to questionnaire on occupation of the subjects in Idah and Ibaji LGAs, respectively. These revealed that the inhabitants were predominantly farmers (63.2, 52.6%: Idah and Ibaji, respectively). Idah community depends mainly on River Niger (42.1%) and River Inachalo (57.9%) (Table 5) while Ibaji community depends on River Otta (31.6%), River Ogodomu (42.1%) and River Otto (26.3%) (Table 6). The result of surveys of these water bodies for *Cyclops* species in Idah LGA was also negative (0.0%) but in Ibaji LGA, only two individuals of *T. nigerianus* of a Cyclops species were collected from a pond in Odogwu village.

The results of responses to questionnaire on cases of *D. medinensis* infection in the past one decade in Idah and Ibaji LGAs are shown in Table 7 and 8, respectively. These showed that only one case (0.95%) was reported in 1992 in Ugwoda village of Idah LGA while four cases (3.6%) were reported in Odogwu village of Ibaji LGA.

The zero prevalence of active infection and low rate of past infection recorded in the present research could be attributed to none availability of the right species of intermediate host (*Cyclops*) in the water supplies of the inhabitants of the two LGAs. Besides, majority of the water bodies within the communities are fast flowing water sources (*R. Niger* and its tributaries) and deep ponds (e.g., Ichekene and Odogwu) and these are rarely implicated in transmission of the parasite (Muller, 1979; Cairncross and Tayeh, 1988). However,

Table 3: The results of questionnaires on occupation types in Idah LGAs, Kogi State, Nigeria

Occupation	Farming	Public service	Skilled work	Overall total
Total number	2,682.0	1,117.0	447.0	4,246.0
Percentage	63.2	26.3	10.5	100.0

Table 4: The results of questionnaires on occupation types in Ibaji LGAs, Kogi State, Nigeria

Occupation	Farming	Public service	Skilled work	Overall total
Total number	2,716.0	1,901.0	544.0	5,161.0
Percentage	52.6	36.8	10.5	100.0

Table 5: The responses to questionnaires on sources of water in Idah LGAs, Kogi State, Nigeria

Name of water body	River Niger	River Inachalo	Total
Total number of subjects depending on the source	1,787.0	2,459.0	4,246.0
Percentage depending on the source	42.1	57.9	100.0

Table 6: The responses to questionnaires on sources of water in Ibaji LGAs, Kogi State, Nigeria

Name of water body	River Otta	River Ogodomu	River Otto	Total
Total number of subjects depending on the source	1,629.0	2,173.0	1,359.0	5,161.0
Percentage depending on the source	31.6	42.1	26.3	100.0

Thermocyclops nigerianus encountered in a pond in Odogwu village was incriminated as the intermediate host of dracunculiasis which agreed or corroborated with the report of four positive cases (3.6%) of the disease in that village between 1990 and 1998. The research of Onabamiro (1951, 1952) showed that of the thirty species

Table 7: The responses to questionnaires on a decade retrospective study of cases of dracunculiasis in Idah LGAs, Kogi State, Nigeria

	In the past one decade (*D. medinensis*)	
Area name	Positive cases	Negative cases
Ugwoda	1992 (1, 0.95%)	No
Ichekene	No	Yes
Aloko-Ina	No	Yes
Ede	No	Yes
Angwa	No	Yes
Ofukolo	No	Yes
Inachalo	No	Yes

Table 8: The responses to questionnaires on a decade retrospective study of cases of dracunculiasis in Ibaji LGAs, Kogi State, Nigeria

	In the past one decade (*D. medinensis*)	
Area name	Positive cases	Negative cases
Odogwu	1990 (1)	No
	1991 (1) 3.6%	No
	1998 (2)	No
Unale	No	Yes
Enweli	No	Yes
Onyedega	No	Yes
Ejule-Ojebe	No	Yes

and subspecies of *Cyclops* identified in Nigerian ponds and streams only *T. nigeranus* was found to be naturally infected with *D. medinensis*. The research also showed that the other three species *Mesocyclops leuckarti*, *T. inopinus* and *Microcyclops varians subaequalis* could be successfully infected experimentally.

Globally, in the past 25 years, there had been general reduction of dracunculaisis of >99% due to concerted efforts to eradicate the disease (Ghosh and Weintzen, 2006). Although, there was no such observable effort at eradicating dracunculiasis in the present study areas, the disease appeared to be gradually and spontaneously eradicated.

CONCLUSION

The study revealed that the prevalence of active *Dracunculus medinensis* infection was zero (0%) in both Idah and Ibaji Local Government Areas (LGAs). Also, a decade retrospective study carried out through questionnaires showed low prevalent rates of the disease in Ugwoda village (0.95%, Idah LGA) and Odogwu village (3.6%, Ibaji LGA). With the zero (0%) prevalent rates of active infection of *Dracunculus medinensis* and low rates of past infection recorded in Idah and Ibaji LGAs, it may be safe to state that the disease is not of significant public health problem in the areas surveyed.

RECOMMENDATIONS

- More elaborate survey should be conducted to vet the elimination of the causative organism of dracunculiasis in the two LGAs
- Surveillance system should be put in place by the government to monitor and detect any recrudescence of the diseases especially in rural areas
- Water supply from the ponds especially that of Odogwu village which was positive for cyclops (*Thermocyclops nigerianus*) should be thoroughly treated or filtered before using
- Basic health education on aetiology of dracunculiasis infection to be instituted by the government
- Provision of safe water supply by the government to the communities should be effectively implemented
- Regular searching for patients with active cases and proper management of cases
- Ensuring that patients avoid contact with ponds
- Killing or removing cyclops in ponds
- With political will, government could effectively implement these recommendations through Primary Health Care (PHC) delivery which would go a long way to alleviate the poor situation of the rural populace who are mostly affected and they lack the wherewithal to arrest the situation on their own

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