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Prevalence of Dracunculiasis in Parts of Akoko Land, Ondo State, Nigeria

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

Study was carried out on the prevalence of dracunculiasis (Guineaworm disease), in parts of Akoko area of Ondo State, Nigeria between 1999 and 2004. People were examined for the presence of papules, pre-emergent and emergent worms. Information on age, sex occupation, re-infection, were collected and recorded on data sheet. Prevalence of 8.5% representing 902 cases of dracunculiasis in a population of 10,614 people examined. Annual prevalence was observed to decrease sharply from 23.3% in 1999 to 0.2% in 2004. Prevalence was also significantly different ($P<0.05$) among the different age groups and sexes. Prevalence was 10.2% in males and 6.7% in females. In both sexes, prevalence among age groups 0-10 years old ranged from 0.1% to 3.0%. Farmers had the highest prevalence of 11.3% and the occupational related prevalence was found to be significantly different ($P<0.05$). Predilection sites of emergent guineaworm in infected individuals were the lower limbs with a prevalence of 98.2% and the upper limbs with a prevalence of 1.8%. The study stressed the provision of safe potable water, proper follow up of the control strategies on ground as the best sustainable control and eradication of dracunculiasis in the study area.

Keywords: Dracunculiasis; guineaworm prevalence; emergent guineaworms and predilection sites.

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1. INTRODUCTION

Dracunculiasis or Dracontiasis also commonly referred to as Guineaworm disease (GWD). The disease is caused by a parasitic nematode worm known as *Dracunculus medinensis* (guineaworm). It is the cause of serious morbidity and incapacitation. Provided humans are not re-exposed to infection the parasite does not persist for more than a year [1].

Crustacea (Copepoda) belonging to the genus *Cyclops* also known as water fleas serve as intermediate hosts of *Dracunculus medinensis.* Many species of *Cyclops* are known to inhabit stagnant ponds, wells and other unprotected water sources [2]. The mature female worm normally resides in the subcutaneous tissues. In this region, the body of gravid worm will produce a painful papule in the dermis which may form a blister within 24 hours or enlarge for several days before becoming a blister and then finally burst to produce a small shallow ulcer. The infected person will often look for water to wash the ulcer in order to alleviate the symptoms of the allergic reaction. When the affected body part comes in contact with water, the uterus of the female worm projects out from the ulcer cavity, after which milky white secretions containing hundreds of active juvenile worms pass into the water. The exposed end of the uterus dries up and shrivels to block the release of immature juvenile worms [3,4]. The process is repeated if the lesion is re-submerged in water until the entire brood of larvae is discharged from the female worm [5].In the aquatic environment, appropriate species of copepod will ingest the mobile larvae. These larvae migrate to the body cavity (haemocoel) of the *Cyclops* and within two weeks they undergo and complete the usual embryonic development to the infective stage [6].

Human beings acquire infection by consuming water containing *Cyclops* that is infected with the larvae of guinea worm*.* In the stomach, hydrochloric acid present in the gastric juice kill the *Cyclops*, the larvae survive the acid effect, become activated and then escape from the dead *Cyclops*. The larvae during migration, penetrate through the intestinal wall and finally to subcutaneous connective tissues Dracunculiasis is not a lethal disease [7].

Clinical manifestations and pathological features of dracunculiasis can become apparent in an infected person by the recognition of palpable swellings, sometimes moving worms, allergic symptoms and the formation of a blister or bleb. The first evident signs of guinea worm disease which appear when the gravid female is about to emerge from the subcutaneous tissue is the formation of papules and sometimes moving worm in the papules and it is this, which provokes the formation of blisters. In 60% of guineaworm infected cases the blister is usually the first sign and may increase in diameter before it finally bursts within 1-3 days. These allergic symptoms come in the form of urticaria, fever, giddiness, dysponea and infra-orbital oedema normally appear a day preceding the formation of blisters but vanish in a few hours. Itching and intense burning pain accompanies the blister formation and these sensations subside soon after the guineaworm patients immerse the bursted blister into cold water which induces the discharge of the larvae [8]. Complete expulsion of the worm from the affected body parts is within 2-4 weeks and the sore heals up rapidly thereafter if properly managed against secondary bacterial infections and in addition, 57% of all the observed dracunculiasis cases in Nigeria, expulsion process of guinea worm is mild and comes with minimum or no discomfort [9].

1.1 Problem Background

Dracunculiasis is the most common parasitic infection in Akoko area of Ondo State. The disease has ravaged the area for over two decades and has inflicted untold hardships to the people [10-12]. The impact of such hardships on agricultural productivity, educational standard and indeed the economy of the people cannot be quantified [13,14].

The status of guinea worm infection in Ondo State was serious, that Nigeria Guinea worm Eradication Programme (NIGEP) classified the State among the holo-endemic (wholly-endemic) States on the National level. The comparative number of guinea worm cases in Ondo State with the National and South West zonal cases is shown in Table 1. From the Table 1, the number of cases in 1988 in the Nation was 653,620 and in the Southwest zone, it was 217,219 while in Ondo State it was 97,391 representing 30.2% and 90.1% of the total number of cases in Nigeria and Southwest zone respectively. The table 1 further revealed the topmost position of Ondo State in Nigeria from 1988 to 1993, and in the Southwest zone between 1988 and 1996 [15].

Table 1. Comparative cases of dracunculiasis in Ondo State with National and Zonal cases from 1988-1996

Year	Number of cases			Infection rate (%) and position			
	National	Southwest	Ondo State	National		Ondo State	
				(%)	Position	(%)	Position
1988	653,620	217,219	197,391	30.2	1st	90.1	1st
1989	640,470	164,774	148,730	23.1	2nd	90.3	1st
1990	394,732	91,278	780,032	19.8	2nd	85.5	1st
1991	270,404	48,439	40,422	15.0	3rd	83.5	1st
1992	102,917	79,361	73,319	71.2	1st	92.4	1st
1993	75,752	14,029	11,429	15.1	1st	81.5	1st
1994	39,774	4,760	768	1.9	12th	16.1	2nd
1995	16,374	1,403	62	0.4	16th	4.4	3rd
1996	12,282	1,458	31	0.3	19th	2.1	4th

Source: NIGEP 1996 [15]

Table 2. Guinea worm cases in parts of Akoko Land from 1993-1995

Local government	Towns	1993	1994	1995	Total
NorthEast	Auga	271	76	98	445
	Iboropa	191	37	15	243
	Ise-Akoko	98	15	0	113
Total		560	128	113	801
	Ogbagi	555	11	0	566
NorthWest	Oke-Agbe	455	2	0	457
	Arigidi	349	1	0	350
	Erusu	329	0	0	329
Total		1688	14	0	1702
	Supare	1258	56	9	1323
SouthWest	Okia-Oka	34	218	14	266
	Oba Akoko	405	20	0	425
Total	1697		294	23	2014

Source: NIGEP [15,16,18]

The monthly surveillance reports in Ondo State by NIGEP showed that three local government areas in Akoko were holoendemicfor dracunculiasis. The affected towns in each local government area which are focused upon in this study are shown in table 2 above. In each local government, the total guineaworm cases from 1993 through to 1995 were high in the South West with 2014 guineaworm cases followed by the North West with1702 cases and least was n the North East with 801cases. Table 2 further revealed that guinea worm cases were higher in 1993 than in 1994 and then in1995 [16-18].

2. MATERIALS AND METHODS

2.1 The Study Area

The study was carried out from 1999 to 2004 in parts of Akoko area Ondo State, Nigeria (Fig. 1). Information on population structure was obtained from the National Population Commission Office, Akure, Ondo State while information on the land area was obtained from the State Ministry of Lands and Housing Akure, Nigeria. House settlement pattern in each town are the linear types with few scattered types which are approximately 250-300 households, some made up of about 8-10 individuals per house. The inhabitants are mostly Yoruba speaking people mixed with few other tribes but the main dialect is Akoko.

The predominant occupation of the adult men folk is peasant farming with the main farm produce being yams, maize, cassava and vegetable. Majority of the women folk lived mainly polygamous setting and tend to stay at home to look after the family fortunes and their young children. Younger children are carried to the farm by their parents and when they attain the age of 6 or 7 years, they start elementary schools, the farthest of which was never more than 3-4 km away. After the school hours the elder children aged 10-16 years, usually go to assist their parents in the family farms.

Farmlands are either within or slightly far away from the communities.

The proportion of civil servants in each Local Government is very low; these consist mainly of Local Government Staff, Public Health Care Workers and Teachers. Most of these civil-servant groups still engage in daily farming activities after the normal closing hours and at weekends.

2.2 Survey Method

Prior to the survey, contact was established with officers from the Ondo State Ministry of Health, in Endemic and Parasitic Disease Unit, Health Management Board of Local Government Areas, the State Water Sanitation (WATSAN), the facilitators and village appointed trainees of the Nigerian Guinea Worm Eradication Programme. Through them, contact with people in the area was established, information was obtained on the status of infection in each area, intervention types used, available water sources, socio-economic activities of the people, campaign strategies directed at the containment of guinea worm infection, the education of the masses with respect to their knowledge and awareness of the infection and it's mode of transmission. Using standardized questionnaire, information relating the infection rate with age, sex, occupation, were obtained from each person.

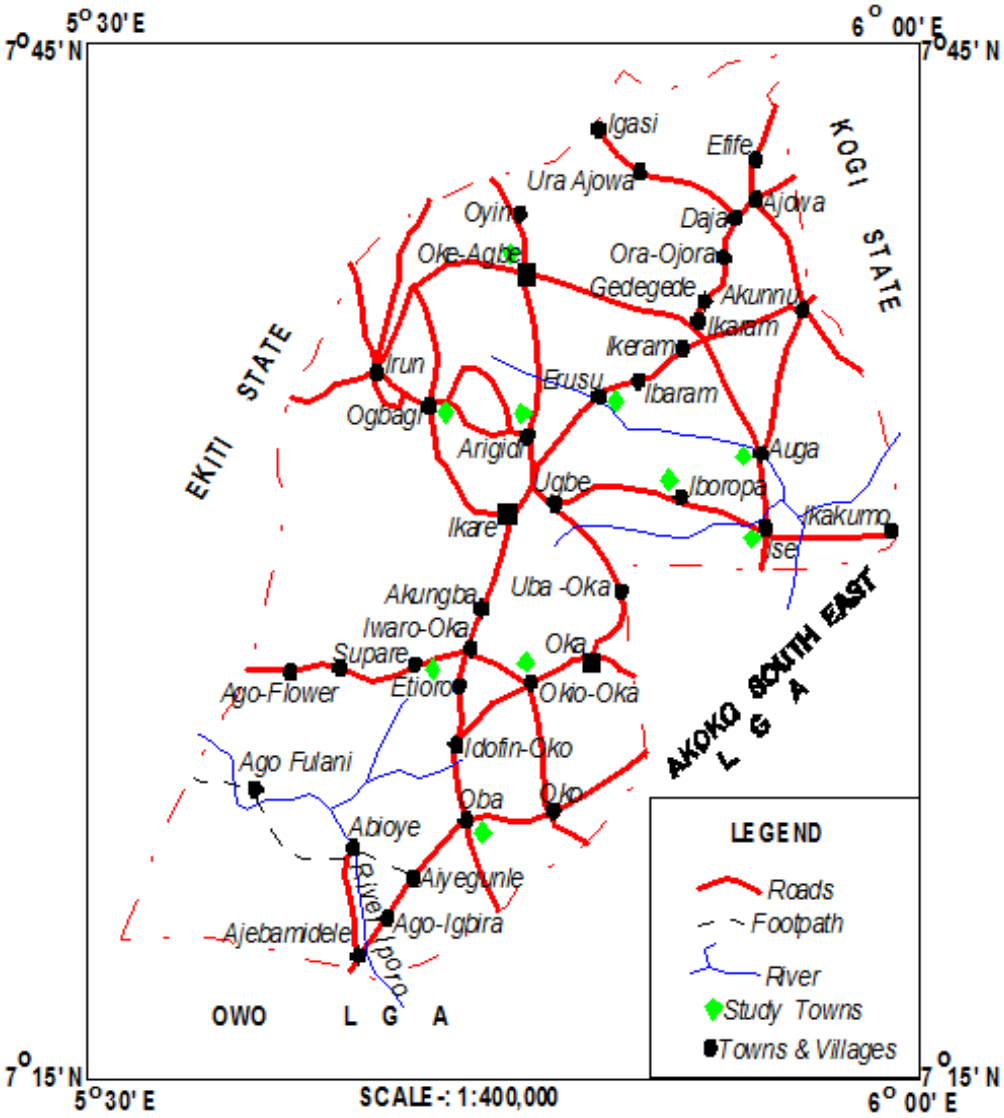

Fig. 1. Map of Akoko land showing study areas of Dracunculiasis

Evidence of infection was based on cases of active transmission. Infection was diagnosed by examining each person for the presence of papules, blisters, oedema, purulent discharges, chronic ulcer, pre-emergent worm, emergent worm, abscesses and other diagnostic features associated with dracunculiasis. Predilection sites of emergent worms in infected persons were observed and recorded in order to know the most predilection site.

All the data that were obtained were subjected to statistical analysis of variance (ANOVA). The means were compared at 95% level of significance ($p \leq 0.05$) using the New Duncan Multiple Range test.

3. RESULTS

The total prevalence of guinea worm disease, in the three local government areas of Akoko land, between 1999 and 2004 is shown in Table 3. Of the 10,614 persons examined for guinea worm disease, 902 (8.5%) persons were found infected. Prevalence was 23.3%, 18.6% and 10.1% in year1999, year 2000 and in year 2001 respectively. A sharp decrease in prevalence was observed in year 2002 (2.7%), year 2003 (0.6%) and by year 2004, it had dropped to 0.2%.

The overall age and sex prevalence of infection in Akoko (Table 4) showed that in both sexes, total prevalence among age groups 0-10 years old ranged from 0.1% to 3.0% while it ranged from 4.3% to 6.2% among those aged 11 to 20 years old. From age 21 to 40 years prevalence was 8.3% to 12.6%. The highest prevalence in both sexes was 13.0% and this was among the age groups of 46 years old and above. Prevalence was higher in males than in females. Out of 5455 males that were examined, 557 (10.2%) were infected while out of the 5159 females that were examined, 345 (6.7%) of them were infected. In males, prevalence increases with age in the separate age groups. For example, among the 0-5years age category, prevalence was 0.3% while it was 4.6% and 5.7% respectively among the 6-10 and 16-20 years of age. Also from age groups 21-35 years old, prevalence ranged from 10.0% to 13.6% while the highest prevalence of 15.6% was observed among the age groups 36-40 years old. There was a significant ($P \leq 0.05$) difference in prevalence between the different age groups and sexes. Prevalence in the older age groups 41-45 years old and ≥ 46 years old ranged from 13.7% and 14.4% respectively. There was a significant ($P \leq 0.05$) difference in prevalence between the different age groups and sexes.

In females, prevalence increases with age. In females aged 6-10 years old and 41-45 years old, prevalence increased from 1.2% to 9.7%. The highest prevalence of 11.3% was observed in females aged 46 years and above. Females aged 0-5 years old were found not infected with guineaworm disease and only in males was the disease found cut across the different age groups.

The occupational related prevalence of dracunculiasis in Fig. 2, revealed that the prevalence in farmers was significantly different ($P \leq 0.05$) from other members of occupational groups. There were 3865 farmers examined and only 438 persons had guineaworm infection showing a prevalence of 11.3%. Students had a prevalence of 6.6% (158 infected cases from 2431 students that were examined). In traders prevalence was 5.6% and this represent 199 cases of guineaworm diseased persons from a sampled population of 2117. Only 107 (4.8%) of the 2219 civil servants examined had guineaworm infection.

Fig. 3 shows the predilection sites of emergent guineaworm in infected persons. These sites in affected individuals were mainly the upper limbs and lower limbs of the infected persons. Of the 902 infected persons 16 (1.8%) of them had guineaworm emerged from their upper limbs while 886 persons (98.2) had guineaworm emerged from their lower limbs. Mostly implicated sites of the lower limbs were the ankles and feet where worm emerged from 561 persons (62.2%) of the total number of cases found to be infected. In the lower limbs, the thighs and legs are the most predilection sites for guineaworm infection and of the 902 guinea worm cases in the community, 325 (36.0%)of them had the worms emerging from the thighs or legs.

4. DISCUSSION

The result from this work revealed two salient observations about the prevalence of dracunculiasis in Akoko Area of Ondo State. Firstly, there was a high prevalence of the disease from 1999-2001. The high prevalence that was observed in 1999-2001 in this study shows that there was a resurgence of dracunculiasis in the study area because as shown in Table 1, the Nigeria Guineaworm

Eradication Programme (NIGEP) had observed in 1996 only 31 guineaworm cases in the whole of Ondo State. The implication here is that all the study towns in this study must have attained a non-endemic status before 1999 when this study began. Therefore the reason for the observed resurgence could probably be due to the non-functional status of most of the wells and boreholes that existed in all the areas in 1999. During the dry seasons, some of these water sources dry up because of their shallowness. Again, increasing population caused insufficient availability of water to sustain the people. The quest and rush for water by these increasing population led to damage of hand pumps, useful components of wells and boreholes. Poorly constructed water sources like these are responsible for causing people to lean back on their abandoned pools of water thereby increasing the population at risk and prevalence status of guinea worm infection in agreement with the studies of [19,20].

Secondly, it was observed that there was a steady decrease in prevalence from year 2002-2004. This could probably due to the urgent intervention of the State Government in collaboration with donor agencies Carter Foundation Global, in 2000. These concerted and aggressive efforts, brought into the community safe potable water through the proper construction of more wells and boreholes sunk deep enough to last through the dry seasons and to sustain the increasing population. Again, the steady decrease in prevalence could also be attributed to increased sensitization of the indigenes in the areas to the perception and aetiology of dracunculiasis. This observation is in line with the views of [21] in the same Akoko area.

The variation in prevalence observed among the different age groups and sexes was not significant probably due to equal exposure of both males and females to water containing *Cyclops* infected with guineaworm larvae. This is in agreement with the observations of [22-24]. There was no active transmission among 0-5 years age group in both sexes which could probably be due to the long period of breast-feeding and the regular consumption of concoctions and decoctions of different plant materials. Long period of breast-feeding usually 18 months, with relatively small volumes of contaminated water swallowed could be responsible for the low prevalence observed in these infants. In addition, local herbs prepared with boiled water could be important in killing most of the *Cyclops* and guineaworm larvae which these children ingest.

Table 3. Annual prevalence of Dracunculiasis in Akoko between 1999 and 2004

Year	Number examined	Number infected	Infection rate (%)
1999	1540	359	23.3
2000	1460	271	18.6
2001	1992	203	10.1
2002	1959	53	2.7
2003	1950	12	0.6
2004	1713	3	0.2
Total	10614	902	8.5

Table 4. Age and sex prevalence of Dracunculiasis in Akoko land

Age groups (Yrs.)	Number examined	Number infected	Infection rate (%)	Number examined	Number infected	Infection rate (%)	Number examined	Number infected	Infection rate (%)
0-5	380	1	0.3	378	-	0.0	753	1	0.1
6-10	501	23	4.6	490	6	1.2	991	29	3.0
11-15	544	31	5.7	497	14	2.8	1041	45	4.3
16-20	533	37	7.0	566	31	5.5	1099	68	6.2
21-25	520	52	10.0	478	31	6.5	998	83	8.3
26-30	538	66	12.3	466	37	8.0	1004	103	10.3
31-35	502	68	13.6	533	48	9.0	1035	116	11.2
36-40	584	91	15.6	581	55	9.5	1165	146	12.5
41-45	683	93	13.6	629	61	9.7	1312	154	11.7
>46	661	95	14.4	555	62	11.2	1216	157	13.0
Total	5446	557	10.2	5168	345	6.7	10614	902	8.5

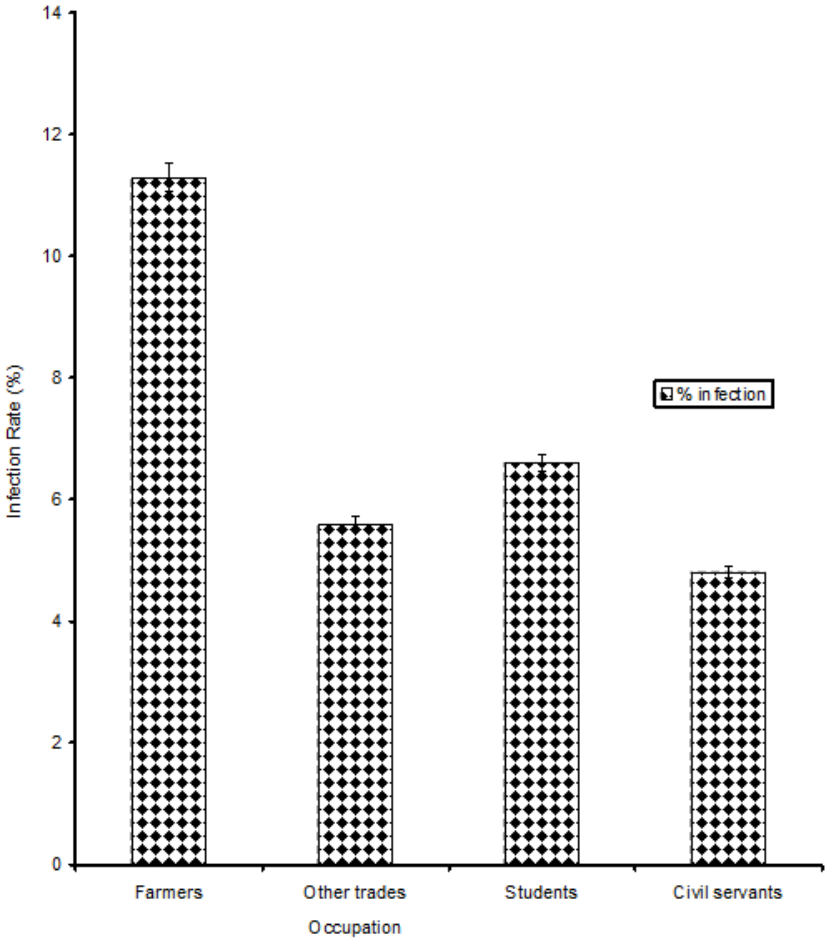

Fig. 2. Prevalence of dracunculiasis by occupation in the study area

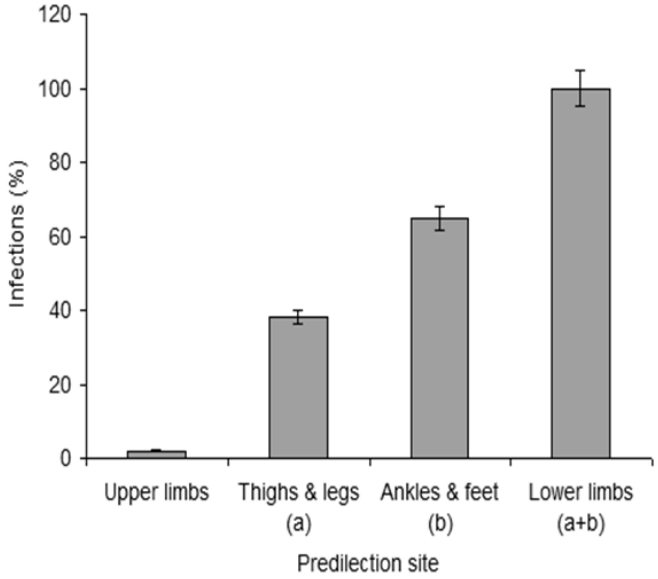

Fig. 3. Predilection of site of emergent worm

Infection rate, which was found to be high in farmers and traders could be due to physical exhaustion because members of these occupational categories habitually consume water collected from stagnant ponds or other unprotected water sources along their way to the farms. Similarly physical exhaustion resulting from school recreational activities and the long walk back home from school could be responsible for the prevalence that was observed among the students. The low prevalence observed among the civil servant cadre is in agreement with [25] who advanced that low prevalence among civil servants could be due to their sound knowledge and perception of the mode of transmission of dracunculiasis.

The lower limbs were observed to be the highest predilection sites of emerging guinea worm in this study. This could be due to the reasons advanced by [26,27] that the occurrence of blisters on the lower limbs is probably due to a geotactic response, which is believed to be a biological phenomenon of *Dracunculus medinensis*. The pronounced propensity of these parasitic worms for the most dependable anatomical parts of the body (upper and lower limbs) has been said to have very serious socio-economic implications especially in communities where subsistence farming is the major source of livelihood [28]. These anatomical sites have been observed as areas where complications usually occur (29], though complications could also arise due to secondary bacterial infection of the lesions caused by poor management especially unhygienic methods of treatment [30-32].

5. CONCLUSION

This study highlighted reasons for the resurgence of dracunculiasis such as poverty, inadequate monitoring of control strategies and the provision of safe potable water. These amenities play important role in the elimination of this eradicable scourge (dracunculiasis). The only reliable control strategy for the disease is the provision of safe potable water. The supply of rural water projects for the provision of safe potable water in endemic areas such as Nigeria, are benefits derived from various international agencies. The disadvantage of over reliance or dependency on foreign support is that the foreign agencies themselves may experience financial shortfalls which could thus lead to resurgence as observed in this study.

Dracunculiasis is a major preventable cause of agricultural loss among farmers as well as academic backwardness resulting from school absenteeism among students. Dracunculiasis is also the cause of various socio-economic problems. It is recommended that in order to prevent future resurgence in the study area, safe potable water must be provided. In addition, such water so provided must be deep enough to survive the dry season periods in order to prevent people from leaning back on the surrounding water pockets such as ponds and ditches. Proper education on the mode of transmission of dracunculiasis must be done in order to sensitize members of the community. Regular maintenance must be carried out on all the existing structures previously used for control of the disease in the area. This will probably prevent disease resurgence and eliminate water borne diseases such as dracunculiasis, schistosomiasis and it will alleviate the burden of people in rural areas who are constantly threatened by the vicious trinity of poverty, ignorance and diseases.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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