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Evaluation of different Onchocerciass manifestation by age and gender among residents in selected endemic villages in Okigwe Local Government Area of Imo State, Nigeria

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ABSTRACT

Aspects of human infection with *Onchocerca volvulus* was investigated in 9 villages in Okigwe LGA of Imo State, Nigeria between January 2010 and December 2011. The objectives were to compare the prevalence of different manifestations of Onchocerciasis according to gender and age, with view to determine if there had been a change in prevalence of Onchocerciasis among residents of some communities in Okigwe Local Government Area of Imo State. A cross sectional survey method was adopted for the study, blood free skin snips were collected from randomly selected consenting adults aged 5-62 years. Palpation for mobile subcutaneous lumps and clinical manifestation were observed among 960 persons comprising 511 males and 449 females. The commonest lesions observed were poor vision 17 %, nodules 15 %, leopard skin 20 %, lizard skin 15 %, and hanging groin 3 %. Musculo-skeletal pain (MSP) was recorded as one of the major complaints by 30 % of the subjects. The result showed that Onchocerciasis clinical manifestations are still prevalent, however nodules prevalence reduced among the sampled population (69.8 %).

***Keywords*:** Onchocerciasis; Ivermectin; manifestation; prevalence; human infection; palpation; *Onchocerca volvulus*

1. INTRODUCTION

Onchocerciasis commonly called River Blindness is a chronic, neglected Tropical Disease (NTD) caused by a filarial worm known as *Onchocerca volvulus*. The parasite is a nematode that belongs to the family filaridiae. The adult worms live in sub cutaneous nodules where the viviparous female produces millions of embryos known as microfilariae, which circulate in the skin. Transmission of Onchocerciasis from man to man is through repeated bites by infected female black flies of the genus *Simulium damnosum*. In Nigeria and other West African countries, the microfilariae are predominantly found in the lymphatic channels of the skin around the pelvic region and upper arm (Nwoke, 1987). There are at least 26 cytospecies of black flies which are widely distributed in the savanna and rainforest areas of West and Central Africa (Dunbar, 1976, cited by Iwuala, 1998). The common cytotypes are *Simulium damnosum* and *Simulium naevi* (Bassey 1992; Iwuala 1998). The disease is

essentially a chronic process characterized by episodes of acute manifestations each of which probably leads to some tissue damage.

The cumulative effects of these processes over the years result in disfiguring lesions of skin, lymph nodes, visual impairment and eventually blindness. Severe skin disease (Onchodermatitis) is one of the sequels of infection with Onchocerciasis and its consequence makes this non fatal disease, a psychologically very devastating disease (WHO 1995b; TDR 2005). The disease is a clinical syndrome partly or entirely characterized by dermatologic, Ophthalmologic, Lymphatic and sometimes systemic manifestations. Onchocerciasis is one of the leading causes of blindness in the tropical world. The distribution of the disease depends on the presence of an efficient vector.

The immature stages of the vector develop in fast flowing and well oxygenated rivers. As a result, black fly which is the vector of Onchocerciasis is common near fast flowing river courses. Also based on the fact that blindness is a major manifestation of the disease, Onchocerciasis is commonly called river blindness. No wonder then many villagers in endemic communities still implicate their enemies and gods of the rivers as the cause of their infection (Nwoke, 1987). Local treatments are therefore misdirected towards consulting the oracle and appeasing the gods (Nwoke, et al 1987). Nwoke, (1990) noted that *Simulium damnosum* complex is widely distributed in the tropical Africa and made up of several sibling species, many of which are important vectors.

The climate of the study area Okigwe Local Government Area, Imo State, Nigeria provides suitable vegetation and habitants which favors the breeding and dispersal of *Simulium* because *of the* many months of rain and other geographical factors. During the rainy season, there is increased dissolved oxygen in the water, accompanied by increased nutrients and these encourage pre-emergent developmental stages as well as the emergence of adult flies from the pupae with consequent increase in the adult biting population. Black flies are therefore wet season breeders (Nwoke, 1992).

However, their human biting activities and population are limited, if not hindered during the dry months of November to February. Onchocerciasis is endemic in parts of Sub-Sahara Africa, the Arabian Peninsula and South America (WHO 1987). Of all the countries in the world, Nigeria has the greatest number of persons with onchocerciasis, accounting for over 33 % of the global prevalence (WHO, 1987; Edungbola, 1991). In Nigeria there are currently about 7million infected people with over 120,000 cases of blindness, while 40 million people are living at the risk of infection in endemic areas (WHO, 1987; GRBP 1998).

The socio-economic impacts of Onchocerciasis in endemic communities are better imagined than seen. Due to debilitation and blindness which are mostly common among the working age group, the sufferer is unable to maintain for long any type of economic productive activity. Such permanent disability like total blindness or serious visual impairment arising from Onchocerciasis infection withdraws the affected individual potential supply of labor years requiring vision. Low population densities and even dessertation of many agriculturally fertile river valleys in the savanna zone of Nigeria have been attributed mainly to the effect of river blindness (Bradley, 1976).

Onchocerciasis therefore constitutes a major public health problem and an obstacle to socio-economic development in the endemic communities, hence there is need to control this debilitating disease. However, there is no vaccine or medication to prevent infection of *O. volvulus.*

The control of Onchocerciasis in West Africa was initiated by the combined efforts the World Health Organisation, World Bank and the United Nation Development Programme (UNDP) through the establishment of Onchocerciasis control programme (OCP). The

programmes had relied exclusively on vector control as the sole method available for the campaign against human Onchocerciasis. This involved the mass spraying of rivers (breeding sites of vectors) with biodegradable insecticides and larvicides in the endemic regions. The method recorded a huge success, reducing the spread of the disease and eliminating it as a public health problem in more than 90 % of the 764,000 km^2 covered by the original seven country OCP areas when it was started in 1974 (WHO, 1985).

The draw backs to the continued wide spread use of insecticides were the effects of insecticides and larvicides on the environment, the growing concern on the emerging resistance of the flies to the insecticides and the problem of polluting the natural sources of fresh water to the rural communities. Other identified hindrances included the vast expanse of area to be covered, as well as the high technology needed, such as the use of airplanes and helicopters in spraying, and the fact that black flies could easily be re-introduced to these areas from other countries not included in the OCP. Cost effect analysis did not favor the extension of the OCP to other endemic African countries, of which Nigeria is a major source (WHO, 1989; TCC, Annual report, 1998).

Consequently the vector control was supplemented by large scale distribution of ivermectin since 1989 and the OCP has relieved 40 million people from infection, prevented blindness in 600,000 people, and ensured that 18 million children were born free from the threat of the disease (WHO, 1985). Between 1974 and 2002, therefore onchocerciasis was brought under control in West Africa. Additionally, abandoned arable lands were reclaimed for settlement and agricultural production, capable of feeding 17 million people annually.

Furthermore In 1995, the African programme for Onchocerciasis control (APOC) was launched with the objective of controlling Onchocerciasis in the remaining endemic countries in Africa and its main strategy being the establishment of self-sustaining community directed treatment with ivermectin and where appropriate, vector control with environmentally safe methods (WHO, 1987). In 2010, nearly 76 million ivermectin treatments were distributed in APOC countries where the strategy of community directed treatment with ivermectin (CDTI) were being implemented. However, at least 15 million additional people need to be reached in the next few years as the programme has now shifted from control to elimination (GRBP, 1998; WHO, 2002).

WHO recommends treating Onchocerciasis with ivermectin at least once a year for about 10 to 15 years, where *O. volvulus* co-exists with Loa-loa, another parasitic filarial worm that is endemic in Nigeria and other African Countries. This recommendation is for the management of severe adverse events that may arise. APOC is the executing agency of WHO and is supervised by the WHO Regional office for Africa, while WHO headquarter provides the administrative, technical and operational research support (GRBP, 1998).

When ivermectin became available for the treatment of Onchocerciasis in 1987, a new tool was urgently needed to determine the geographical distribution of the disease, and to identify which communities to treat. To this effect, UNICEF/UNDP/World Bank/WHO developed a Special programme for research and training in Tropical Disease (TDR) called Rapid Epidemiological Mapping of Onchocerciasis (REMO) which rapidly and cheaply identified onchocerciasis situations. REMO uses geographical information, particularly the presence of river basins to identify communities likely to be at high risk of infection. A sample representing 2-4 % of villages in the area were then quickly assessed for the presence of Onchocerciasis by testing for sub-cutaneous worm nodules in 50 adults per village.

Adult who were aged at least 20 years old and must had been resident in the community for at least 10 years were selected. Identification of 20 % or more adults with

nodules required mass treatment and this was applied to the local area. In communities where the nodules rate was less than 20 %, clinic-based treatment was applied (WHO, 1998).

2. MATERIAL AND METHODS

2. 1. Study Area

Okigwe Local Government Area is one of the 27 LGA making up Imo State of Nigeria. It is located in the Northern part of Imo State with an estimated area of about 5,100 square kilometers. There are one hundred and fifteen (115) villages in Okigwe, and these villages have been receiving Ivermectin since 1995 (According to Global 2000). The climate is typical of a tropical rainforest region with moderate rainfall, rich vegetation, high temperature and humidity.

There are many fast flowing streams because of its hilly nature which favor the breeding and development of black flies, the vector of Onchocerciasis. Okigwe LGA is densely populated with Ibo ethnic group as the major race. The people are mainly farmers, fishermen, clay mining, molding and petty traders. They are mostly living in villages and their houses are predominantly made with mud walls and thatched roofs. The study villages were mainly selected based on hyper-endemecity with Onchocerciasis and the estimated infected population size ranged between 1,570 and 1,875 according to the data record 1999-2011 treatment register obtain from Cater Center.

2. 2. Study population

The sample size for this research work consisted of 960 volunteers 511 males and 499 females taken from the nine villages in accordance with the age of persons eligible to take the drugs Ivermectin. The age bracket considered was between 5 years and 62+ and both males and females were used for this research. This age range was chosen because people less than 5 years of age are not allowed to take the drug Ivermectin because of side effect. Also pregnant women and lactating mothers were excluded from the research because they belong to the exclusion criteria.

2. 3. Data Collection

The study was a cross-sectional survey and experimental research. All the data collected in these nine villages were based on the standardized data collection tools diagnosed for this study.

Clinical examination included palpation for mobile subcutaneous lumps on the skin to identify mobile nodule or Onchocercal skin changes such as skin dermatitis, leopard skin, lizard skin, elephant skin, skin folds (hanging groin) and ocular manifestation. Blood free skin snips were taken from the volunteers using 5ml syringes and needles with scalpel blade. Each skin biopsy was placed in a microtitre plate (flat bottom containing 96 wells), containing some drops of normal saline and incubated for 24 hrs.

Microfilariae that emerged were observed with the aid of an high powered microscope at 40 x. A standard format was used to record the observation. Each person was examined privately in a well illuminated place for clinical signs and symptoms of Onchocerciasis. A gross examination of the eye was also conducted with a magnifying lens and pen touch by an optometrist who classified any ocular impairment in the anterior segment into itching, redness, anterior uveitis; punctuate opacity, sclerosing keratitis and blindness. Poor visions were determined by the smelly chart. Musculo-skeletal pain were noted and their association

with micro filarial load investigated. The criteria used to assign subjects as musculo-skeletal pains (MSP) patients included report of chronic backache, waist pain, muscle pain, chest pain, and hip pain (Pearson 1988, Nwoke 1992, Ukaga 1997.

2. 4. Data Analysis

The data was analyzed using graphs, tables, frequencies and percentages, while statistical test of significance was carried out using Chi-square test. (Epi-info, 2003) CDC Atlanta and SPSS Version 6 Packages were used for computer analysis of data, fishers' exact test and frame work.

3. RESULTS

Prevalence of microfilariae (mf) infection in the sampled villages was 170 (18 %), (Table 1). The highest gender prevalence was observed in Umulolo (male (31.5 %, and female 28.3 %) (Table 2). From the skin snip method, it was observed that Onchocercal mf prevalence increased with age. Mf was rare in age group 0-15, (7 %) but highest in age group 56-62^{+} (26 %) (Table 3). There was a significant difference between the number of infected males (18.4 %) and females (16.9 %), (Table 2) at ($p < 0.05$). From the clinical examination, acute skin dermatological conditions were not observed in all the villages surveyed, however chronic skin changes such as skin depigmentation (leopard skin, lizard skin and hanging groin) were observed in low numbers.

The commonest skin changes associated with Onchocerciasis in the studied communities which may also occur in advanced age was leopard skin. This condition was observed among 90 (20 %) out of 960 persons examined. Incidence of leopard skin increased with age and was highest among age groups 46-55 and 56-62$^{+,}$ while males were found to be more affected 48 (5 %) than females 42 (4.4 %). Similarly lizard skin was observed among 68 (15 %) persons, with males and females being equally infected 34 (3.5 %) (Table 5). In addition, hanging groin was observed only in 13 (1 %) person, it was found to be very scanty among males 10 (1.0 %) and females 3 (0.3 %), (Table 5). The findings further showed that 136 persons had Musculo-Skeletal Pains (MSP) with greater incidence recorded among the males 72 (7.5 %) than females 64 (6.7 %) (Table 5).

MSP was highest in Amano 44 % (Table 5). During the palpation examination for mobile subcutaneous lumps, onchocercal nodules were observed in 70 (7 %) of the individuals examined. Although it was present but there was a considerable reduction in nodule prevalence compared to the base line in 1995. It was highest in age group 56-62^{+}, males 40 (4.3 %) and females 30 (3.1 %). The highest prevalence was observed in Amauro community (20 %) Table 5. According to the gross examination of the eyes conducted by an optometrist there was no blindness found in the sampled villages. However 76 (17 %) of persons reported poor vision, (Table 4). Individuals with poor vision was found to be highest in age bracket 56-62^{+}. Also males were found to be more affected 42 (4.4 %) than females 34 (3.5 %).Over 960 examined 170 (18 %) had positive skin snips, with microfilariae prevalence which varied in the different communities. The highest intensity was obtained in Umulolo 30 (30 % mf) and the least in Umuokpara 10 (8 % mf) (Table 1).

Table 1. Prevalence of MF in sampled villages in Okigwe LGA, Imo State (n = 960).

S/No.	Village	No Examined	No. mf +ve	% mf +ve
1	Aku	100	18	18
2	Amano	100	17	17
3	Amuro	100	23	23
4	Ezeogii	100	23	23
5	Ihube	100	19	19
6	Umulolo	100	30	30
7	Umudiaba	120	12	10
8	Amachara	120	18	15
9	Umuokpara	120	10	8
	Total	960	170	18

Out of 960 individuals examined, 170 (18 %) were with microfilaria prevalence which varied in the different communities. The highest intensity was obtained in Umulolo 30 (30 %) and the least in Umuokpara 10 (8 %).

Table 2. Overall Prevalence of MF by Gender in the sampled villages.

S/No.	Village	Sample		No. mf + ve		% mf + ve	
		M	F	M	F	M	F
1	Aku	51	49	11	7	21.6	14.3
2	Amano	64	36	11	6	17.2	16.7
3	Amuro	49	51	10	13	20.4	25.5
4	Ezeogii	49	51	13	10	26.5	19.6
5	Ihube	55	45	10	9	18.2	20.0
6	Umulolo	54	46	17	13	31.5	28.3
7	Umudiabia	66	54	9	3	13.6	5.6
8	Amachara	59	61	7	11	11.9	18.0
9	Umuokpara	64	56	6	4	9.4	7.1
Total		511	449	94	76	18.4	16.9

Table 3. Prevalence of Onchocerciasis in different age groups in the sampled communities.

S/No	Village	Age Groups																			
		05 – 15			16-25			26-35			36-45			46-55			56-62+				
		No. Sampled	No. Mf +ve	% mf	No. Sampled	No. mf +ve	% mf	No. Sampled	No. mf +ve	% mf	No. Sampled	No. mf +ve	% mf	No. Sampled	No. mf +ve	% mf	No. Sampled	No. mf +ve	% mf		
1	Aku	21	2	10	0	0	0	14	4	29	24	3	13	24	4	17	17	5	29		
2	Amano	26	1	4	0	0	0	19	4	21	20	5	25	18	4	22	17	3	18		
3	Amuro	29	4	14	0	0	0	21	5	24	19	7	37	18	3	17	13	4	31		
4	Ezeogii	20	1	5	0	0	0	17	4	24	24	5	21	22	9	41	17	4	24		
5	Ihube	27	2	7	0	0	0	18	6	33	25	4	16	21	4	19	9	3	33		
6	Umulolo	15	1	7	11	4	36	13	5	38	17	4	24	18	5	28	26	11	42		
7	Umudiaba	24	1	4	15	1	7	16	2	13	19	3	16	24	1	4	22	4	18		
8	Amachara	31	3	10	18	3	17	16	3	19	25	5	20	28	1	4	12	3	25		
9	Umuokpara	24	0	0	19	1	5	24	3	13	18	3	17	17	1	6	18	2	11		
	Total	**217**	**15**	**7**	**63**	**9**	**14**	**158**	**36**	**23**	**191**	**39**	**20**	**190**	**32**	**17**	**151**	**39**	**26**		

Table 4. Prevalence of onchocercal symptoms among village members.

S/No.	Villages	MSP		Poor vision		Nodules		Leopard skin		Lizard skin		Hanging groin		Total
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1	Aku	15	47	3	9	4	13	7	22	3	9	0	0	32
2	Amano	16	44	5	14	5	14	5	14	5	14	0	0	36
3	Amuro	14	28	8	16	10	20	12	24	6	12	0	0	50
4	Ezeogii	16	34	10	21	7	15	8	17	6	13	0	0	47
5	Ihube	16	33	7	14	6	12	10	20	10	20	0	0	49
6	Umulolo	16	25	12	19	12	19	13	21	10	16	0	0	63
7	Umudiaba	15	25	10	17	10	17	10	17	10	17	5	8	60
8	Amachara	15	21	15	21	10	14	15	21	10	14	5	7	70
9	Umuokpara	13	28	6	13	6	13	10	22	8	17	3	7	46
Total		136	30	76	17	70	15	90	20	68	15	13	3	453

Table 5. Onchocercal Clinical Features among age and gender.

Age Groups	**SEX**	**No. Sampled**	**MSP**	**Poor vision**	**Nodules**	**Leopard skin**	**Lizard skin**	**Hanging groin**
05-15	M	112	0(0%)	0(0)	0(0%)	0(0%)	0(0%)	0(0%)
	F	95	0(0%)	0(0)	0(0%)	0(0%)	0(0%)	0(0%)
16 – 25	M	32	0(0%)	1(3%)	0(0%)	0(0%)	0(0%)	0(0%)
	F	31	0(0%)	1(3%)	0(0%)	0(0%)	0(0%)	0(0%)
26 – 35	M	83	12(14%)	7(8%)	5(6%)	11(13%)	5(6%)	0(0%)

	F	75	8(11%)	6(8%)	6(8%)	9(12%)	6(8%)	0(0%)
36 – 45	M	102	16(16%)	11(11%)	12(12%)	11(11%)	11(11%)	1(1%)
	F	89	11(12%)	8(9%)	8(9%)	11(12%)	7(8%)	0(0%)
46 – 55	M	103	21(20%)	11(11%)	12(12%)	13(13%)	7(7%)	4(4%)
	F	87	18(21%)	9(10%)	6(7%)	10(11%)	10(11%)	1(1%)
56 - 62+	M	79	23(29%)	12(15%)	11(14%)	13(16%)	11(14%)	5(6%)
	F	72	27(38%)	10(14%)	10(14%)	10(14%)	11(15%)	2(3%)
All		**960**	**136(14%)**	**76(8%)**	**70(7%)**	**90(9%)**	**68(7%)**	**13(1%)**

4. DISCUSSION

The prevalence of clinical signs of onchocerciasis was low in the studied communities compared with baseline information in 1995.The finding agrees with the earlier work carried out in Okigwe by Nwoke (1995), Dozie (2005), and Emukah (2004). This low prevalence is a good testimony of the impact of annual Ivermectin treatment in the studied villages and is similar to the findings of (Nwoke 1995; Dozie 2005; Emukah 2004).

Ivermectin treatment from the study has shown beneficial impact on individuals who are receiving the drug. The lower prevalence and intensity of infection obtained in the study when compared with pre-treatment with Ivermectin is attributed to on-going control activities in the sampled villages with Ivermectin executed through the Community Directed Treatment with Ivermectin (CDTI) strategy.

The sex-related prevalence was high in males than in females, which is an indication of males been more exposed to the vectors of the disease either through involvement in some occupational activities or by living in close proximity to the breeding sites. Similar observations have been made in previous studies in the forest zone (Nwoke et al 1994, Abanobi et al, 1999) which showed higher infestation rates in males than females. In this study it was observed that onchocercal mf prevalence increased with age, these agrees with previous reports of (Anosike and Onwuliri (1995), Anosike et al (2001), Dozie and Nwoke (2002) that the prevalence and intensity of infection increased with advancing age and is due to a continuous build up of infection acquired early in life.

Information obtained from Cater Center (Global 2000) which is in charge of river blindness revealed that in Okigwe LGA, there has been continues onchocerciasis control programme for over 18yeatrs, and yet the disease is still prevalent. This is not an encouraging development. The prevalence could be attributed to non-coverage of the entire Okigwe LGA. The implication is that the disease could be transferred from one community to another.

Some researchers who worked in the middle belt of Nigeria have found evidence of possible elimination of Onchocerciasis following Ivermectin mass drug administration with high coverage (Tekle et al, 2012). The study carried out in Kaduna State, Nigeria was the first evidence of potential elimination of onchocerciasis with Mass Drug Administration (MDA). This is possible in areas where sustained high coverage greater than or equal to 80 % of the total population is maintained for more than 15 years. This success story is a good evidence of the beneficial impact of the multinational African Programme for Onchocerciasis Control (APOC). If the control programme is carried out in the entire Okigwe LGA, onchocerciasis prevalence would be eliminated.

5. CONCLUSION

Human onchocerciasis is one of the Neglected Tropical Diseases (NTD) which has been one of the major challenges facing Nigeria and other developing countries. The lunching of WHO, African Programme for Onchocerciasis Control (APOC) in 1995 and the establishment of self-sustaining Community-Directed Treatment with Ivermectin (CDTI) in Nigeria and most other endemic Africa countries has shown that treatment with ivermectin has a significant impact on the microfilarial load of *Onchocerca volvulus.* This effect causes the elimination of skin microfilariae thereby making it very difficult for the vector flies, *Simulium* to pick up skin microfilariae during blood meal. Though clinical Onchocerciasis is reduced in the studied villages but the presence of skin mf is suggestive of the continued disease transmission and Onchocerciasis is not yet eliminated in the studied villages.

Recommendation

This study has confirmed the existence of clinical manifestation of Onchocerciasis in some part of Okigwe LGA Imo State, Nigeria. There is need for effective control and elimination of Onchocerciasis to a level that is no longer a public health problem. Therefore the following recommendations were made.

- That Okigwe LGA and Imo state in general should immediately increase the number of Community Directed Distributors (CDDs) working in each village and possibly select them using the kindred system.

- That Okigwe LGA should embark on extensive community mobilization, awareness and health education to ensure effective CDTI.
- The Okigwe LGA Onchocerciasis control coordinator should ensure that the freely donated Ivermectin is delivered to the endemic villages.
- Imo State Ministry of Health and LGA should provide adequate funding to enable capacity building, supervision,and monitory of CDTI.
- The National Onchocerciasis Control Program should work towards Onchocerciasis elimination rather than embarking on endless control of infection.

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