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Public Health Analysis of Manifestation of Onchocerciasis in Rural Nigeria

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***Abstract:** Aspects of human infection with Onchocerca volvulus was investigated in 9 villages in Okigwe, Nigeria. 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 also palpation for mobile subcutaneous lumps and clinical manifestation were observed among 960 persons comprising of 511 males and 449 females.*

Keywords: onchocerciasis, Ivermectin, manifestation, prevalence, human infection, palpationand 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. The microfilariae which circulate in the skin are transmitted from man to man through repeated bites by infected female black flies of the genus *Simuliumdamnosum*.

The climate of the study area (Imo State, Nigeria) favors the breeding of *simulium* because many months of rain and geography of the area favor many breeding sites and create suitable vegetation habitats for adult resting as well as dispersal. It also encourages many months of farming and production of large quantities of various food types, though this exposes, the farming population to many months of bites of vectors. Black flies are wet season breeders in the Savanna region (Nwoke, 1992) and the human biting activities and populations are limited if not hindered during the months of November to February. During the rainy season, there is increased oxygen in the water which encourages the flies to emerge from pupae. Also during this period, there is increased dissolved oxygen, accompanied by increased nutrients and pre-emergent developmental stages with consequent increase in the adult biting population.

2. LITERATURE REVIEW

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[3; 11].There are at least 26 cytospecies of black flies [8] which are widely distributed in the savanna and rainforest areas of West and Central Africa. The common cytotypes are *Simuliumdamnosum* and *Simuliumnaevi* [2] [8]. 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 eventual blindness. Severe skin disease (Onchodermatitis) is one of the sequels of infection with onchocerciasis and its consequence makes this non fataldisease, a psychologically very devastating disease [17] [18]. 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 and Onchocerciasis are common near fast flowing river courses. Also based on the fact that blindness

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www.rajournals.in

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[11] .Local treatments are therefore misdirected towards consulting the oracle and appeasing the gods [12].*Simuliumdamnosum* complex is widely distributed in the tropical Africa and made up of several sibling species, several of which are important vectors. [13]

The vector control was supplemented by large scale distribution of ivermectin since 1989, the OCP 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. Also, abandoned arable lands were reclaimed for settlement and agricultural production, capable of feeding 17 million people annually. In 1995, the African programme for onchocerciasis control (APOC) was launched with the objective of controlling onchocerciasis in the remaining endemic countries in Africa, its main strategy has been the establishment of self-sustaining community directed treatment with ivermectin and where appropriate vector control with environmentally safe methods[18].

In 2010, nearly 76 million ivermectin treatments were distributed in APOC countries where the strategy of community directed treatment with ivermectin (CDTI) was being implemented. 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[7; 18].WHO recommends treating onchocerciasis with ivermectin at least once yearly 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; it is recommendations for the management of severe adverse events that may occur.APOC is the executing agency of WHO. The WHO Regional office for Africa supervises APOC's Management, while WHO headquarters provides administrative, technical and operational research support[7]

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. A tool to rapidly assess the onchocerciasis situation was developed by the UNICEF/UNDP/World Bank/WHO, special programme for Research and training in Tropical Disease (TDR) called 'REMO' or rapid epidemiological mapping of onchocerciasis could quickly and cheaply be identified and mapped. 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 are then quickly assessed for the presence of onchocerciasis by feeling for the sub-cutaneous worm nodules in 50 adults per village. The adult are aged at least 20 years old and have been resident in the community for at least 10 years. I f > or equal to 20 % of adults have nodules, mass treatment is required and this extrapolated to the local area. In communities where the nodules rate is less than 20 %, clinic-based treatment is applied[16].

3. AIM AND RESEARCH PROBLEMS

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. 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 also palpation for mobile subcutaneous lumps and clinical manifestation were observed among 960 persons comprising of 511 males and 449 females.

4. MATERIALS AND METHODS

4.1. Study Area and Population

The study area is Okigwe local Government Area (LGA) in Imo State, Nigeria. Imo State is one of the 36 States of Nigeria located in southeastern part of Nigeria. Okigwe is located in the Northern part of the State, Imo State covers an estimated area of about 5,100 square kilometers with a population about 2.4 million persons from the 1991 National Population Census. The state has a total number of 27 local government areas. There are one hundred and fifteen (115) villages in Okigwe, all these villages has been receiving Ivermectin since 1995[7]. The area is hyper endemic for Onchocerciasis withmany fast flowing streams because of its hilly nature; densely populated with Ibo ethnic group who are mainly farmers, fishermen and petty traders. They are mostly living in villages and their houses are predominantly made with mud walls and thatched roofs.The study village was mainly selected based on hyper-endemecity with onchocerciasis.

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www.rajournals.in

The sample population for this research work consists of 960 volunteers take from the nine villages in accordance with the age of persons eligible to take the drugs Ivermectin. The reason for this population selection was that these nine villages have base line information according to Carter Center and also they have available people who are heavily infected with microfilariae loads on the skin and who possess the symptom of ocular and non-ocular complications of Onchocerciasis. The age bracket considered was in accordance with the age of persons eligible to take the drug from 5 years above. These villages combined have an estimated population size of between 1,570 and 1,875, gotten from the data record from the treatment register 1999–2011 population. Male and female was used for this research whose ages range from 5 -62^{+} years. 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.

4.2. 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 include palpation for mobile subcutaneous lumps on the skin to find out if there is any mobile nodule or Onchocercal skin changes such as skin dermatitis, leopard skin, lizard skin, elephant skin, skin folds (hanging groin) ocular manifestation. Blood free skin snaps 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 24hrs, microfilariae that emerged were observed with the aid of an inverted microscope at 40x. A standard format was used to record the observation. 960 persons volunteers were examined, 511 males and 499females.Free blood skin snipped for microfilariae of *O.volvulus*, skin palpation for mobile nodules and other Onchocercal features was done. Each person was examined privately in good light for clinical signs and symptoms of Onchocerciasis. A gross examination of the eye was conducted in good light by an optometrist with a magnifying lens and pen touch 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 associated with micro filarial load investigated. The criteria used to assign subjects as musculo-skeletal pains (MSP) patients included report of chromic backache, waste pain, muscle pain, chest pain, and hip pain [14;15].

4.3. Data Analysis

The data was analyzed using graphs, tables, frequencies and percentages and 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.

5. RESULTS

Table 1 shows the age and gender distribution of the sampled population in the villages of OkigweLGA. From the skin snipmethod Onchocercal Mf prevalence increase with age. Mf was rare in age group 0–15, (7 %) but highestin age group 56–62^{+}(26 %).Table 2 shows the prevalence of age specific of Onchocerciasis in the sampled communities in Okigwe LGA

There was significant difference between the proportion of infected males (18.4 %) and females (16.9 %),($p<0.05$). From the clinical examination acute skin dermatological conditions were not observed in all the villages surveyed, however only 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. Leopard skin was found also related with advancing age and highest among age group 46-55 and age group 56-62$^{+,}$ males were found to be more affected 48(5 %) than females 42(4.4 %).Lizard skin was observed among 68(15 %) out 960 persons examined; males and females were equally affected 34(3.5 %) table 3.Also hanging groin was observed among 13(1 %), it was found to be very scanty among males 10(1.0 %) and females 3(0.3 %),(see table 3).During the palpation of examination for mobile subcutaneous lumps, onchocercal nodules were observed in 70(7 %) of the subjects examined. Although it 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^{+}, more males 40 (4.3 %) had nodules than females 30(3.1 %). According to the gross examination of the eyes conducted by an optometrist there was no blindness found in the sampled

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www.rajournals.in

villages. However 76(8 %) of persons reported poor vision as shown in table 3. Distribution of poor vision in the age groups was found to be in older age bracket 56–62^{+}. Also males were found to be more affected 11(4.4 %) than females 34(3.5 %).Over 960 examined 170(18 %) had positive skin snips, with microfilaria prevalence which varied in the different communities. The highest intensity was obtained in Umulolo(42 %mf) and the least in Umuokpara(11 % mf).

Table 1: Age and gender distribution of the sampled population in the villages of Okigwe LGA

		AGE GROUPS																		
S/No	Village	05 -15			16-25			26-35			36-45			46-55			56-62+			
		M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	
1	Aku	10	11	21	0	0	0	10	4	14	10	14	24	11	13	24	10	7	17	100
2	Amano	14	12	26	0	0	0	14	5	19	15	5	20	12	6	18	9	8	17	100
3	Amuro	14	15	29	0	0	0	6	15	21	12	7	19	10	8	18	7	6	13	100
4	Ezeogii	11	9	20	0	0	0	5	12	17	12	12	24	12	10	22	9	8	17	100
5	Ihube	16	11	27	0	0	0	12	6	18	12	13	25	11	10	21	4	5	9	100
6	Umulolo	8	7	15	6	5	11	7	6	13	9	8	17	10	8	18	14	12	26	100
7	Umudiaba	13	11	24	8	7	15	9	7	16	10	9	19	13	11	24	13	9	22	120
8	Amachara	12	9	21	8	10	18	7	9	16	14	11	25	15	13	28	3	9	12	120
9	Umuokpara	14	10	24	10	9	19	13	11	24	8	10	18	9	8	17	10	8	18	120
	Total	**112**	**95**	**207**	**32**	**31**	**63**	**83**	**75**	**158**	**102**	**89**	**191**	**103**	**87**	**190**	**79**	**72**	**151**	960

Table 2: Prevalence of age specific of Onchocerciasis in the sampled communities in Okigwe LGA

		AGE GROUPS																	
S/ No	Village	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

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www.rajournals.in

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**

The prevalence and intensity of infection increased from 14 % in subjects below 15 years of age up to 23 % in subjects below 25 years, then fall at 20 % in subjects below 35 years of age and up to a peak of 26 % at the age of 62.

Table 3 : 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 %)**

6. DISCUSSION

The definitive diagnosis of onchocerciasis is by demonstration of mf in the skin snips. Because there was no base line mf prevalence, data in same of the villages studied, it was not possible to compare between mf prevalence in 1994 with mf in 2012. However from studies done in the past, in this area Okigwe LGA, there was reported decline in onchocerciasis prevalence following Ivermectin distribution[6; 10;12].

RA Journal of Applied Research
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www.rajournals.in

The prevalence of clinical signs of onchocerciasis was low in the studied communities compared with baseline information in 1994; this is a good testimony of the impact of annual Ivermectin treatment in the studied villages and is similar to other findings [4;5;6].

Ivermectin treatment from my study has shown beneficial impact to 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[3; 9; 15] which showed higher infestation rates in males than females. In this study it agrees with previous studies [13;14; 15] that the prevalence and intensity of infection increased with advancing age and is due to a continues build up of infection acquired early in life.

However, it is not an encouraging development since continued disease prevalence despite over 18years treatment is worrisome, if these trends of declining coverage continue; onchocerciasis will not be eliminated in the studied villages.

Some researcher who worked in the middle belt of Nigeria has found evidence of possible elimination of Onchocerciasis following Ivermectin mass drug administration with high coverage [1]. This study in Kaduna State Nigeria is first evidence of the potential elimination of onchocerciasis with 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).

Okigwe LGA and the entire Imo State need to begin to re-focus their attention to the low coverage issues in order to end the onchocerciasis scourge in the State. The current trend towards failure despite the huge resources invested by APOC and the Carter Center should not be allowed.

7. CONCLUSION

Human onchocerciasis has been recognized among the neglected Tropical Disease (NTD) which have resulted to their control and elimination 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 confirmed the existence of clinical manifestation of onchocerciasis in some part Okigwe LGA of Imo State Nigeria. There is need for effective control and elimination onchocerciasis to the level that it is no longer a public health problem. The following recommendations were made.

- The Okigwe LGA and Imo State should immediately increase the no of 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.

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www.rajournals.in

- Imo state ministry of health and LGA should provide adequate funding to enable capacity building, supervision, monitory 0f CDTI.
- The national onchocerciasis control program should begin to think of onchocerciasis elimination rather than endless control.

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