



**UPDATED PROFILE OF CLINICAL MANIFESTATIONS OF ONCHOCERCIASIS  
AFTER REPEATED IVERMECTIN TREATMENT IN MIDDLE IMO RIVER  
BASIN, NIGERIA**

**Amaechi A. A.<sup>1\*</sup>, Iwunze J. I.<sup>1</sup>, Uzowuru D.<sup>1</sup>, Ebeh-Njoku A. U.<sup>1</sup>, Chimara O. U.<sup>1</sup>,**

**Alisi G. E.<sup>1</sup>, Nwokeji M. C.<sup>2</sup>, Tony-Nze C. P.<sup>3</sup>, Aderibigbe A.<sup>4</sup>,**

**Orimogunje I.<sup>5</sup> and Aremo O. H.<sup>6</sup>**

<sup>1</sup>Entomology and Parasitology Unit, Department of Zoology, Imo State University, Owerri, Nigeria.

<sup>2</sup>Department of Medical Microbiology and Parasitology, College of Medicine Imo State University Owerri, Nigeria.

<sup>3</sup>United African Company Ltd, Nigeria.

<sup>4</sup>Chemistry Department University of Lagos, Nigeria.

<sup>5</sup>Microbiology Department Federal University of Technology Akure, Nigeria.

<sup>6</sup>Department of Health Promotion and Education, Faculty of Public Health, University of Calabar.

\*Corresponding Author's Email: [amaechiaustin@gmail.com](mailto:amaechiaustin@gmail.com)

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**ABSTRACT:** *We conducted a cross-sectional survey on the impact of ivermectin after repeated treatment in five communities in Imo State, Nigeria. Rapid epidemiological mapping of onchocerciasis (REMO) carried out in 450 subjects in 1994 prior to the launching of mass drug administration were compared with re-examinations of 540 subjects in 2023. We found palpable nodule reduction from 47.2% to 12.2% and popular dermatitis decreased from 42.9% to 5.9%. Reductions in other clinical features were observed. Overall, a significantly higher proportion of males were infected than females ( $P < 0.05$ ). The implications of these results were discussed in line with the reported benefits of ivermectin therapy.*

**KEYWORDS:** clinical manifestations, ivermectin, prevalence, palpation.



## INTRODUCTION

Onchocerciasis or “River blindness” is a major debilitating and devastating endemic Neglected Tropical Disease (NTD) caused by *Onchocerca volvulus* whose vectors are *Simulium* flies (black flies). The disease causes much human suffering and constitutes a major obstacle to socio-economic development in all affected areas in Africa. The ultimate consequence which is blindness (WHO, 1985) or other ocular impairments, renders the sufferer highly unproductive resulting in a drain in the manpower resources, especially for agricultural purposes in the rural areas where fertile lands abound for farming. In West Africa both the Forest and Savanna areas are affected, thus including the whole of Nigeria (Kogi & Bulus, 2008; Dozie *et al.*, 2003). Most national onchocerciasis control projects (NOCP) are funded in the different states by WHO/World Bank/FAO/UNDP aiming at controlling onchocerciasis as a disease of public health with medical and socio-economic importance; and also ensuring that there is no resurgence of the disease in all the affected areas (WHO, 1988; NOCP, 1996).

The study area, Okigwe Local Government Area, Imo State Nigeria is one of the endemic areas where the disease is hyper endemic (Nwoke *et al.*, 1994). The climate of this area (Imo State, Nigeria) favors the breeding of *Simulium* species due to many months of rain and geography which favors many breeding sites and create suitable vegetation habitats for adult resting and dispersal. The high cost of vector control (Nwoke, 1987; Nwoke 1990) has forced African programmes for onchocerciasis control (APOC) to change strategy through the establishment of self-sustaining community-directed treatment with ivermectin (WHO, 1987). When ivermectin became available for use, against onchocerciasis, a new tool was urgently needed to ascertain the geographical distribution of the disease and to identify communities to treat. The tool which rapidly assesses the onchocerciasis situation rapid epidemiological mapping of onchocerciasis (REMO) was developed. REMO uses geographical information especially the pressure of river basins to identify communities likely to be at high risk of infection. A sample of 2-4% of villages in the area are then quickly addressed for the presence of onchocerciasis by feeling for the subcutaneous worm nodules in 50 adults per village. There was then the exigent need of the most current information about the disease to give clues towards the implementation of these control strategies.

The objective of this study was to highlight both the prevalence and the nature of morbidity of the disease through the assessment and presentation of clinical manifestations of onchocerciasis and comment on the control measures currently going on in the area. The study will contribute to the incumbent work covered in the whole of Nigeria on onchocerciasis and discuss the medical and socio-economic importance of the disease and its vector in the area.



## MATERIALS AND METHODS

### Study Area

The study communities were all in the Imo River Basin of Nigeria located between Lat  $5^{\circ}40'1''-5^{\circ}57'1''N$  and long  $7^{\circ}10'1''-7^{\circ}26'1''E$ . They are drained by several fast flowing streams and rivers which empty into the major River in the area ie. The Imo River (Atlas of Imo State, 1984). The seasons of the area are well defined; a dry season (October to March) and a wet season (April to September). The climate and geography of the area has been described in detail (Dozie *et al*, 2003). Subsistence farming, fishing, hunting, wine tapping and petty trading are the main occupations of the inhabitants who are of Ibo ethnic origin.

### Pre-Study Visit

The pre-study visit to the Local Government Headquarters was made before the take off of the study. At the LGA headquarters, the intent and justification for the study was discussed with the officials including the Interim Management Committee (IMC), director of Health and the LGA oncho officer. Ethical approval for the involvement of the members of the community was also obtained from the health development. The permission of the village heads was also obtained.

### Subjects and Sampling Methods

Following the mobilization of the communities, 540 consulting individuals (279 males and 261 females) out of combined estimates (drawn by convenient sampling techniques). These populations were identified and enlisted. A personal data form was used to obtain information on bio-data and demographic details (age, sex, occupation, and name). All pregnant women and lactating mothers were excluded from the study.

### Clinical Examination

The subjects were palpated for the presence of nodules and their bodies were assessed for other clinical manifestations (signs and symptoms) of the disease (Nock *et al.*, 1998). These included onchodermatitis or rashes, skin depigmentation or leopard and lizard skins, acute and chronic skin lesions. Lymphatic complications or lymphadenopathy (hernia, hanging groin and elephantiasis) were also assessed for. Musculoskeletal pains were noted based on reports of backache, waste pain, muscle pain, chest pain, hip pain (Ukaga, 1997).

### Ocular Examination

Ocular examination was carried out to determine ocular onchocerciasis which included impairment of visions, partial or total blindness. The inability of individuals to count fingers at a distance of 3 meters and less was regarded as indicative of blindness (Uzoigwe *et al.*, 2012).

### Parasitological Examination

This consisted of 2 bloodless skin snips which were placed in microliter plates containing three drops of 0.85%, physiological saline solution. The plates were incubated for 24 hrs at room temperature and emerged microfilariae (MF) observed microscopically and counted.



The microfilaria load of each person was expressed as the number of MF per skin snip and the mean was calculated for all the skin snip positive cases. Simple percentages were used to estimate the prevalence of various parameters while the Chi-Square test was applied to compare the difference in prevalence of clinical manifestations between sexes, age groups and villages.

## RESULTS

Table 1 showed the baseline data on the hyperendemic communities sampled (nodule prevalence rates >39%). The 1994/95 pre-control baseline data showed a total of 450 persons were examined by parasitological (skin snipping) and REMO methods. Of these indices palpable nodules 47.2% and leopard skin 42.9% were the prevalent clinical manifestations found. Of the 540 assessed in 2020 by REA, 69 (12.5%) had at least one clinical feature of onchocerciasis with nodules and LS as 12.2% and 5.9%. The comparison between the pre and post control prevalences are shown in Table 2. The difference between these indices were significant for both periods ( $P < 0.05$ ).

Overall prevalence increases with age (Table 3). Chronic skin changes were found among the study subjects. The commonest skin manifestation was leopard skin. This condition was observed among 66(11.3%) out of 540 examined. It was found to be related to old age and highest among the age group 41-50 years. Lizard skin was found among 61 persons. Males 10.2% and females 12.3%. (Table 4). Hanging groin (2.0%) was observed in more males (2.4%) than females (1.1%). During the palpation for modules 32(5.9%) were found to be positive. Although onchocerca nodules were present, there was a considerable reduction compared to the baseline study. It was highest in age group 51+; more males (6.8%) than females (4.6%) had nodules. According to a gross eye examination there was no blindness. However, 19(3.5%) and poor vision. Distribution of poor vision in the age groups were found to be in older age brackets 41 and above. Males 4.3% had more effect than females (2.7%). Other features were itching (8.0%), onchodermatitis (1.7%) and musculoskeletal pains (10.0). Overall, a significantly higher proportion of males were infected than females ( $P < 0.05$ ).

**Table 1: Onchocerciasis Baseline Data, Rapid Assessment Result 1994/95 (REMO)**

S/N	Villages	No Examined	Nodules      Leopard Skin		Remark
			Prevalence (%)		
1	Amano	50	55	19	Hyperendemic
2	Amuro	50	46	17	Hyperendemic
3	Umulolo	50	55	19	Hyperendemic
4	Ihube	50	52	9	Hyperendemic
5	Aku	50	52	9	Hyperendemic

**Table 2: Comparison between Previous (REMO 1994/1995) and Present Surveys**

	<b>Pre-Ivermectin Treatment (REMO 1994/1995)</b>	<b>Post ivermectin treatment (2020) (current study)</b>	<b>Remarks</b>
Study sites	9 villages in the Imo River Basin, Nigeria	5 villages in the River Basin, Nigeria	The 5 villages used were close to Imo River
Sample size	450	540	Increased to reflect post treatment status
Methods	-Clinical and physical examination  -Skin snip microscopy	-Clinical and physical examination  -Skin snip microscopy	Molecular tools required to ascertain the true status
Onchocerciasis endemicity	-Hyperendemic	-Hypo endemic	Reduced endemicity
Number of years of CDTI	-	From 1994 till date (>20yrs)	Included two years of bianual distribution
Nodules (%)	47.2%	12.2%	Considerable reduction
Leopard skin(%)	42.9%	5.9%	Considerable reduction

**Table 3: Overall Age-Related Prevalence of Onchocerciasis in the Communities**

Age	← Villages →											
	Amano		Amuro		Umulolo		Aku		Ihube		Total	
	No Ex	No(%) +ve	No Ex	No(%) +ve	No Ex	No(%) +ve	No Ex	No(%) +ve	No Ex	No(%) +ve	No Ex	No(%) +ve
05-10	7	1(5.9)	33	1(3.0)	26	1(3.8)	13	0(0.0)	15	0(0.0)	94	3(3.2)
11-20	7	0(00.0)	13	2(15.4)	17	2(11.8)	4	1(25.0)	3	1(33.0)	44	6(13.6)
21-30	17	4(23.5)	25	3(12.0)	31	3(9.7)	13	3(23.1)	13	4(30.8)	99	17(17.2)
31-40	15	3(20.0)	23	3(13.0)	24	2(8.3)	19	2(10.5)	19	3(15.8)	100	13(13.0)
41-50	18	3(16.7)	31	2(6.5)	23	3(13.0)	16	(12.5)	23	5(21.7)	111	15(13.5)
50+	13	3(23.1)	25	3(12.0)	29	5(17.2)	15	2(13.3)	10	2(20.0)	92	15(16.3)

**Table 4: Overall Onchocerciasis Clinical Features among Age and Gender**

Age group (yrs)	Sex	No Exam ined	MSP	Poor Vision	Nodules	Leopard skin	Lizard skin	Hanging groin	RO	SCE	Itching
05-10	M	61	0	0	0	0	0	0	0	0	0
	F	43	0	0	0	0	0	0	0	0	0
11-20	M	21	0	0	0	0	0	0	0	0	0
	F	13	0	0	0	0	0	0	0	0	0
21-30	M	51	3	2	0	4	3	0	2	0	0
	F	48	2	0	0	5	0	0	1	0	4
31-40	M	47	7	4	3	7	5	1	1	0	7
	F	53	3	2	3	3	7	0	0	0	5
41-50	M	52	11	3	5	13	7	4	1	0	3
	F	59	5	1	3	7	12	1	1	0	7
51+	M	47	14	3	11	13	8	3	2	0	10
	F	45	9	4	7	14	19	2	1	0	7
Total	M	279	35 (12.5)	12 (4.3)	19 (6.8)	37 (13.3)	29 (10.4)	08 (2.9)	06 (2.2)	0 (0.0)	20 (2.9)
	F	261	19 (7.3)	07 (2.7)	13 (4.6)	29 (11.1)	32 (12.3)	03 (1.1)	03 (1.1)	0 (0.0)	23 (8.8)
Grand Total		540	54 (10.0)	19 (3.5)	32 (5.9)	66 (12.2)	61 (11.3)	11 (2.0)	09 (1.7)	00 (0.0)	43 (8.0)

**Key:**

MSP =Musculoskeletal palm

SCE = scrotal/clitoral enlargement.

RO = Rashes/onchodermatitis

**DISCUSSION**

The result of the study showed considerable decline in the prevalence and profiles of clinical features of onchocerciasis with the baseline data (pretreatment). The observed significant reduction following post treatment/intervention with ivermectin was indication of drug efficacy (ongoing activities by the CDTI) in curbing the spread of the disease in these areas.

Since ivermectin has been reported to reduce the prevalence of skin microfilariae (Nwoke & Dozie, 2001; Emuka et al., 2004), the drug was expected to affect clinical signs and symptoms by halting the progression and preventing the development of new lesions. The observation on significant reduction in the severity of the two morbidity indicators (dermatitis



and nodules) shows that clinical improvement is evident after repeated doses with ivermectin (Newell, 1997; Kogi & Bulus, 2008). Few infections recorded among age groups contradicted high and well spread infection among all age groups reported pre-control. This showcases the microfilarial density (Katoli et al., 1995), and inability of vectors to pick microfilariae (Taylor et al., 1990). It also gave insight that ivermectin may have acted as a preventive measure by hindering new infection, since the cure is yet to be reported to confer any form of immunity.

The sex-related prevalence was high in males than in females which indicated that males had more exposure to the vector either through occupational activities or by residential proximity to the breeding sites (Nwoke, 1987; Bassey, 1992). In this study and those of Anosike et al. (2001) prevalence and clinical signs of onchocerciasis increased with advancing age due to continuous buildup of infection acquired early in life.

The post treatment results also appeared to be more effective in females than in males as shown by the clinical manifestations. What probably seems accountable for this could be a more compliant attitude by females and their eagerness to receive treatment because of the more adverse social effect on them (Ukpai and Ezeji, 2003). This success story is good evidence of the beneficial impact on the African programme for onchocerciasis control (APOC).

We believe that with sustained light coverage  $\geq 80\%$ , health education and self-protection the level of mf will be reduced drastically to the level the disease will no longer be a public problem.

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### REFERENCES

- Anosike JC, Onwuliri COE, and Onwuliri VA. 2001. The prevalence and intensity and clinical manifestations of *Onchocerca volvulus* infection in Toro LGA of Bauchi State Nigeria. *International Journal of Hygiene and Environmental Health* 203: 459-464.
- Atlas of Imo State Nigeria 1984. Department of Land Survey and Urban Development, Ministry of Works and Transport 1<sup>st</sup> ed. Government Press Owerri.
- Bassey A. 1992. Updated on onchocerciasis *Africa Health* 14(3): 27-8
- Dozie INS, Onwuliri COE, and Iwuagwu FO. 2003. Onchocerciasis in imo State, Nigeria. Clinical and epidemiological studies of anterior segment lesions. *Nigerian Journal of Parasitology* 24: 89-94.
- Emukah EC, Osuala E, Miri EE, Onyeama J, Amadiogwu S, Korve K and Richards FO. 2004. A longitudinal study of impact of repeated mass ivermectin treatment of clinical manifestation of onchocerciasis in the Imo State Nigeria. *Journal of Tropical Medicine and Hygiene* 70(5):556-610.



- Katoli CR, Tne L, Merriweather A and Unisel TR. 1995. Determining the prevalence of *O. volvulus* infection in vector population by polymerase chain reaction screening of pools of black flies. *Journal of Infectious Diseases* 172: 1414-1417
- Kogi E and Bulus W. 2008. The impact of mass treatment on the prevalence of onchocerciasis by Rapid Epidemiological Assessment in Galadimawa Kaduna State Nigeria. *Science World Journal*. 3(1).
- Newell ED. 1997. Effects of mass treatment with ivermectin with only partial complaints on prevalence and intensity of *O.volvulus* infection in adults and untreated 4 and 5 years old children in Burundi. *Tropical and International Health* 2(9):912-916.
- Nock IH, Ripiye P and Galadima MM. 1998. Diagnostic value of nodules and Leopard Skin in Community Assessment of human Onchocerciasis endemicity. *Nigerian Journal of parasitology*. Pp 19-24.
- NOCP 1996. Federal Ministry of Health and Social Services. National Onchocerciasis Control Programme Review National Plan of Action for the Control of Onchocerciasis (River blindness) in Nigeria 1997-2002.
- Nwoke BEB. 1997. Studies in the field epidemiology of human Onchocerciasis on the Jos Plateau Nigeria II. The Clinical and historical changes due to mazzoti-test. *NJB* 7(2).
- Nwoke BEB. 1990. Socio-economic aspect of human Onchocerciasis in Africa present Appraisal *Journal of Hygiene Epidemiology Microbiology and Immunology* 32619-28.
- Nwoke BEB, Edumgbola LD, Mencia BS, Njoku AJ Abanobi OC, Nkwogu EU, Nduka FO, and Oguariri RM. 1994. Human Onchocerciasis in the rainforest zone of South eastern Nigeria .I. Rapid assessment for community diagnosis in the Imo River Basin, Nigeria, *Nigeria Journal of Parasitology*. 15:46-58
- Nwoke BEBE and Dozie INS. 2001. Operational Research and its success in Onchocerciasis control in Nigeria. *Nigeria Journal of Parasitology* 22 (1 & 2): 3 -10.
- Taylor HR, Pacque M and Green BM. 1990. Impact of Mass Treatment of Onchocerciasis with Wemictin on its transmission of infection. *Science* 250:116-118.
- Ukaga CN 1997. Onchocerciasis Musculoskeletal pains in Women. *Africa Health March* 19 (8): 16.
- Ukpai OM and Ezeji JC. 2003. Social Implication of onchocercal dermatitis among females in Endemic Communities in Okigwe LGA of Imo State Nigeria. *Nigeria Journal of Parasitology* 24:59-64
- Uzoigwe NR, Ajayi AA, Anyanwu GI and Onyeka JOA. 2012. Changes in prevalence of parasite intensity following ivermectin Therapy against River-Blindness in women community of Nasarawa state Nigeria. *Nigeria Journal of Parasitology* 33(2): 157-161
- WHO. 1955 WHO Expert Committee. Third Report Technical Report Series 752. *Geneva*
- WHO. 1987. Who is the expert committee on Onchocerciasis. WHO Tech. Report Series No 752. *WHO Geneva*.
- WHO. 1988. WHO publication by UNDP/World Bank/ WHO special programme for Research and Training in Tropical Disease and the Onchocerciasis control programme in West Africa. *Tropical Medicine and Parasitology* 39(4):329-486.