Epidemiological evaluation of onchocerciasis along Ogun River System, southwest Nigeria

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ABSTRACT

Background & objective: Epidemiological studies were carried out to assess the prevalence and community microfilarial load (CMFL) of onchocerciasis after repeated annual treatment with ivermectin along Ogun river System, southwest Nigeria.

Method: Skin snips were taken from consented participants in 11 selected communities along the River system. The microfilarial load of the community was estimated.

Results: The prevalence and CMFL varied significantly in the communities ($p < 0.05$). The prevalence of onchocerciasis ranged from 19.1 to 45.6%, while the CMFL ranged from 0.11 to 1.03 microfilariae per skin snip. The CMFL recorded was <5 microfilariae per skin snip, i.e. recognized by WHO as threshold value in certifying the communities to be free of onchocerciasis as public health problem, thus, signifying the possibility of onchocerciasis elimination in the study area.

Conclusion: Efforts should therefore be intensified to achieve improved ivermectin coverage and compliance in annual ivermectin treatment in order to completely eliminate onchocerciasis as a public health problem in the studied communities.

Key words Ivermectin; microfilariae load; Nigeria; onchocerciasis; prevalence

INTRODUCTION

Onchocerciasis (river blindness) is a terminally blinding disease caused by *Onchocerca volvulus* and it is transmitted by members of *Simulium damnosum sensu lato* in west Africa[1,2]. Onchocerciasis is known to be endemic in many tropical countries and over 37 million people are infected worldwide[3]. The disease morbidity is more prevalent in riverine areas of west Africa where the *Simulium* vectors profusely breed[4].

The control of onchocerciasis in Africa is currently implemented through annual distribution of ivermectin by African Programme for Onchocerciasis Control (APOC). The distribution of ivermectin through community-directed approach has recorded a lot of success in the onchocerciasis endemic communities with drastic reduction in infection morbidity following annual regimental distribution of the drug[5,6]. Report from recent evaluation in Africa has also suggested the possibility of elimination of onchocerciasis after 15 years of annual repeated treatment with ivermectin in selected communities[7].

Nigeria probably has the highest burden of onchocerciasis in the world, accounting for about a third of the global prevalence[8]. All the states of the federation are endemic to the disease except Lagos State[3]. The annual treatment of endemc communities with ivermectin commenced in 1995, and the programme has been receiving staunch support from WHO/APOC having recognized the colossal number of the people affected by the disease. As part of the longitudinal studies on black fly migration and its epidemiological impacts along Nigeria-Benin border, the present study was carried out to assess the prevalence and the community microfilarial load of onchocerciasis after repeated treatment with ivermectin in the communities along Ogun River System in western area bordering Nigeria and Republic of Benin.

MATERIAL & METHODS

Study area

The study was carried out in the communities around Ogun River System along Nigeria-Benin border, south-

western Nigeria. Ogun River takes its source from Oyo State and traverse Ogun State before emptying its source in Lagos lagoon. Both Oyo and Ogun States share boundaries with Republic of Benin in south-western area of Nigeria.

Selection of the study communities

Eleven communities, namely Lisa, Alamutu, Olokemeji, Atakan, Idiata, Ogunleke, Oyee, Ago Iwafin, Igba Odun, Karimu and Aba Bio were selected along Ogun River System. The communities were around the fly collection points for entomological studies of the WHO/APOC cross-border blackfly migration project between Nigeria and Benin Republic where entomological evaluations have been conducted. Derived savanna is the predominant ecological zone along Ogun river system with patchy forest galleries. The populations along the river are mainly Yoruba by tribe and engage in farming activities. The detailed information on the location of the selected communities is given in Table 1.

Ethical clearance and mobilization of the communities

The Ministries of Health in Oyo and Ogun States were informed about the study. The communities were mobilized with the assistance of the State Coordinators of the Onchocerciasis Control Programme in both the states and the Health Personnel drawn from the two States' Ministries of Health. Informed consent was sought and obtained from the communities and subjects used for the study.

Enrolment of participants

The demographic data of all consented participants were taken in each community. However, some participants voluntarily withdrew after enrolment. The data of the participants consented to skin-snip were taken and recorded. Information on the consistence of annual ivermectin distribution was also gathered through key informants in each community. The study was carried out between October and November 2009.

Parasitological examination

Two skin snips were taken with cornosceleral punch from the upper lateral part of both buttocks below the iliac crest from each participant. The biopsies were immediately placed in microtitration plate containing normal saline. The identity of each participant was labeled on each microtitration plate. The emerged microfilariae were counted and recorded accordingly. After each skin snip, the cornosceleral punches were thoroughly sterilized in hot water for 10 min following sequential washing in sodium hypochlorite solution, distilled water and alcohol before they are reused. The communities were treated with ivermectin after the study.

Data analysis

The microfilarial load of each subject was estimated as the mean number of microfilariae per skin snipped. The mean microfilarial load was calculated for all skin-snip positive participants. The community microfilarial load was obtained as the mean microfilarial load for participants aged 20 yr and above. The variation in prevalence and community microfilarial load was assessed using *t*-test.

RESULTS

The results revealed significant variation in the prevalence of onchocerciasis in the communities studied (t=7.189; 95% CI = 19.27–36.59, p = 0.001) (Table 2). The prevalence of infection ranged from 2.2 to 38.9% with an overall prevalence of 27.71%. With the exception of Aba Bio and Karimu, all other studied villages had prevalence above 20%. Olokemeji had the highest prevalence (38.9%) while the lowest was found at Aba Bio (2.2%).

The CMFL similarly showed significant inter-village variations at the study area (t=7.310; 95% CI= 0.34–0.64; p = 0). All the communities had less than one microfilariae per skin snip except Ago Iwafin which had the CMFL of 1.03 of microfilariae per skin (Table 2). The information gathered through key informants in each community showed that all the communities had not been treated with ivermectin for two years.

DISCUSSION

The prevalence of over 20% observed virtually in all

Table 1. The location of the studied communities for the prevalence of onchocerciasis along Ogun River System

Villages	Latitude (N)	Longitude (E)	Nearest river	Station of location
Lisa	7.21	3.29	Oyan	Ogun
Alamutu	7.42	3.29	Oyan	Ogun
Olokemeji	7.42	3.52	Ogun	Ogun
Atakan	7.42	3.49	Ogun	Ogun
Idi Ata	7.52	3.55	Ogun	Oyo
Ogunleke	7.51	3.56	Ogun	Oyo
Oyee	7.61	3.20	Ofiki	Oyo
Ago Iwafin	7.61	3.22	Ofiki	Oyo
Igba Odun	7.92	3.23	Ofiki	Oyo
Karimu	7.98	3.23	Ofiki	Oyo
Aba Bio	8.20	3.23	Ofiki	Oyo

Table 2. The prevalence and community microfilarial loads of onchocerciasis in the communities along Ogun River System

Villages	No. examined	No. (+)ve	Crude prevalence (%)	Standardized prevalence (%)	CMFL
Lisa	47	9	19.1	19.2	0.39
Alamutu	91	27	29.7	24.7	0.57
Olokemeji	163	63	38.7	38.9	0.61
Atakan	89	29	32.6	28	0.57
Idi Ata	96	37	38.5	31.4	0.42
Ogunleke	121	20	16.5	22.2	0.40
Oyee	90	41	45.6	32.1	0.43
Ago Iwafin	55	22	40.0	36.5	1.03
Igba Odun	47	11	23.4	26.1	0.50
Karimu	164	35	21.3	18.2	0.39
Aba Bio	105	2	1.9	2.2	0.11

the study communities showed that many people still harboured *Onchocerca* microfilariae in the communities along Ogun River system. Despite the relatively high prevalence, the community density of the infection as determined by CMFL was very low in all the studied communities. The low CMFL is expected as ivermectin had been known to lower the density of microfilariae in the treated communities[7–10]. The CMFL lower than 5 microfilariae per skin snip has been estimated as threshold value in certifying a community to be free of onchocerciasis as a public health problem[11,12]. These results obtained in the present study thus showed that the density of the microfilariae is below threshold value in the studied communities.

The low CMLF obtained has many implications on the transmission and control of onchocerciasis in the area. The low density of microfilariae in human hosts usually reduces the vectorial potential of the *Simulium* vectors as the flies need to ingest relatively high number of microfilariae to ensure continuous transmission of infection[2]. It has been observed that few out of hundreds of microfilariae ingested by the flies from human host usually survive encapsulating effect of peritrophic membrane of the fly[13]. Moreover, an intensive mass distribution of ivermectin with high coverage and compliance could in subsequent annual regimental distribution of the drug exterminate the remaining microfilariae in human hosts.

The significant variation in the prevalence and CMFL of onchocerciasis in the studied communities may plausibly be due to the difference in treatment coverage and compliance of the people in the communities. Earlier observation in other part of Nigeria had also reported differential variation in community microfilariae load reduction along

Lower Cross River Basin after five years of treatment[3]. Information obtained in the course of this study showed that ivermectin distribution has been inconsistent for many years in the communities. The inconsistent drug distribution and apathy to its usage could as matter of time lead to the increase in microfilarial load on individuals and jeopardize the success being recorded in the control of onchocerciasis in the affected communities.

CONCLUSION

The low density of CMFL observed in all the communities signifies the possibility of elimination of onchocerciasis as public health problem in the communities along Ogun River System. An improved and consistent ivermectin coverage coupled with overwhelming compliance in drug usage is required to completely eliminate onchocerciasis as public health problem in the studied communities.

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