

Incidence of Onchocerciasis and Vector Knowledge among Residents of Some Parts of Ondo State, Nigeria

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Abstract Onchocerciasis, cause by *Onchocerca volvulus* is a typical filarial nematode that is known to be primarily a parasite of humans. This study was carried out to determine the incidence of *O. volvulus* and knowledge of its vector in Ido-ani and Akure the capital of Ondo State, Nigeria. Skin snips were collected from individuals in Idoani and microscopically examined for presence of microfilariae while structured questionnaires were administered on respondents in Akure. The result showed that 75% of the skin snips collected from Ido-ani had *O. volvulus* microfilariae, while 76% of the respondents consented to being aware of onchocerciasis, more than half (56%) of whom are aged 21-30 years. Forty eight percent (48%) were able to identify black flies while only 42% were aware that black fly cause a disease known as river blindness, and 21% respondent neither had knowledge of the disease nor its vector. Findings of this study underscores the urgent need for the intensification of awareness campaigns in order to educate the population about Onchocerciasis and ways of preventing the infection.

Keywords Onchocerciasis, *Onchocerca volvulus*, Idoani, Akure, Ondo State

1. Introduction

Onchocerciasis also known as river blindness is one of the neglected tropical diseases and a major public health problem especially in West Africa. In Africa, it has been estimated that approximately 85 million people are at risk of this infection while approximately 20 million people are infected with *O. volvulus*, the etiologic agent of the disease. The parasite is considered to be the fourth leading cause of blindness globally while the disease is second to polio as a cause of long term disability and disfiguring of skin in endemic area (Thylefors and Alleman, 2006). Blindness is not the only clinical manifestation of the disease, others include dermatitis, dermal nodules, pruritus and systemic complications. The blindness is as a result of direct invasion of the eye by microfilariae (Ogbodo and Emeh, 2006).

In Nigeria, the most populous nation in Africa with approximately 200 million people, it is estimated that 17 million people are at risk of the disease while 7 – 10 million are infected. Consequently, Nigeria has been estimated to account for nearly 40% of the world's prevalence of onchocerciasis (Oyibo and Fagbenro, 2003; Dori *et al.*, 2012).

Onchocerciasis is caused by the parasite *O. volvulus*, a filarial nematode (roundworm) that is primarily a

parasite of humans. The adult worms can live up to fifteen years in the subcutaneous tissues of the human host, where they mate and produce microfilariae, the characteristic tiny, thread-like larvae (Whitworth, 2001).

The parasite is transmitted from human to human through the bites of a blackfly vector of the genus *Simulium* (WHO, 2011). *Simulium* blackflies breed in fast-flowing rivers and streams, increasing the risk of infection to people living around such habitats. When a female *Simulium* blackfly bites an infected person during a blood meal, microfilariae are transferred to the person from the fly. Over the course of one to three weeks, the microfilariae develop inside the blackfly to form infective larvae that can be passed on to other people when the blackfly takes another blood meal. In the human host, the larvae migrate in the subcutaneous tissue, form nodules and slowly mature into adult worms, thus completing the life cycle (WHO, 2011).

Among the treatment and preventive approaches focused to control onchocerciasis, the broad spectrum drug Ivermectin is recommended. Also, removal of nodules from infected people and control of vector blackflies minimize re-infection.

Transmission of *O. volvulus* still occurs in many areas such as in Nigeria. The present study was designed to assess level of knowledge and understanding of the role of blackfly in onchocerciasis transmission among the people in Akure, the capital city of Ondo State and the status occurrence of onchocerciasis in Idoani community, Ose Local Government Area of Ondo State, where blackfly populations have been documented.

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2. Materials and Methods

Study area

The study was conducted in Akure, the capital of Ondo State and Idoani, a rural settlement of the state. Akure lies on the latitude $7^{\circ} 30'N$ and longitude $5^{\circ} 13'E$ while Idoani lie on the latitude $7^{\circ} 28'N$ and longitude $5^{\circ} 86'E$ and respectively in the rain forest ecological zone of Nigeria (Figure 1). Both town share overlapping ecological niches, similar climate which is made up of two distinct wet and dry seasons. The wet months are from April to October while the dry season covers the months of November to March. The mean annual rainfall is in excess of 2000 mm while temperature and humidity are $30^{\circ}C$ and between 60% and 80% respectively.

Study population and design

Skin snip samples were randomly collected from 32 persons and questionnaire were administered to 100 persons in Idoani and Akure respectively.

Data collection

In order to obtain relevant data from volunteers included in this study, a well structured questionnaire was designed and administered to all volunteers. The questionnaire sought information on the age, sex, occupation, knowledge on the blackfly vector including density, seasonal variation, the disease caused and protective measures against bites of the black flies.

Skin Snips

Skin snips (biopsy) samples were taken from the lower legs of individuals included in the study. The site of the collection on their skin was cleaned with 100% alcohol soaked swab. Thereafter, a portion of the skin was elevated with the point of a lancet and 2-3 mm in diameter was cut out with a sterile razor blade. Many samples of such blood free biopsy materials were collected from different patients. Each biopsy sample was placed in 0.25ml normal saline contained in a very small laboratory bottle and left for 4 hours to allow the microfilariae to migrate out of the tissues. After 4 hours, the microfilariae were examined using an inversion microscope. A new lancet, blade and cotton wool was used for individual volunteers, to avoid transmission of other infectious diseases.

Permanent slides of microfilariae were prepared by transferring the fluid (saline) containing skin snip to a slide and allowing the fluid to evaporate. When the slide was thoroughly dry, the microfilariae were fixed in methanol and then stained with Giemsa, after which it was covered with cover slip and examined under the x100 power of the light microscope.

Statistical analysis

The data collected were analysed using Statistical Package for Social Sciences (SPSS) for windows version 21.0. Chi square test was used to compare prevalence rate with respect to sex. P-value < 0.05 were considered significant.

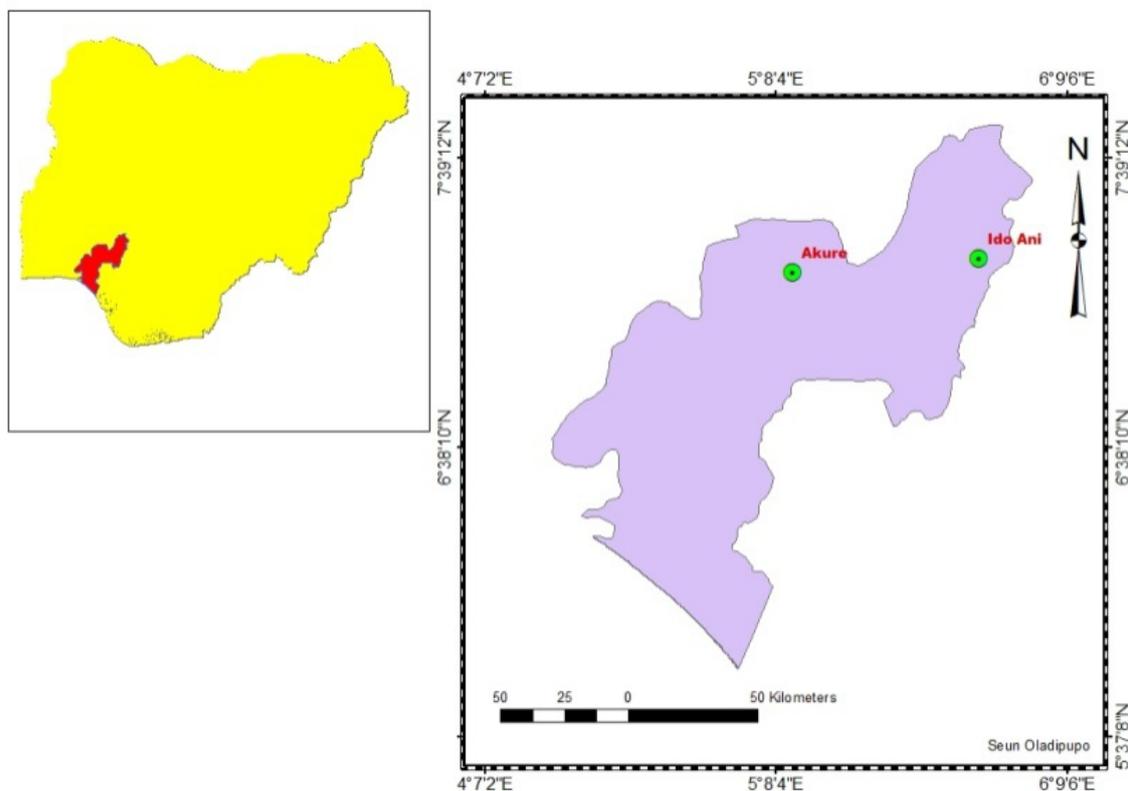


Figure 1. Map of Ondo State showing the location of Akure and Idoani

Ethics

Permission to carry out the research was sought and obtained from the Ondo State Ministry of Health before the commencement of the study. Informed consent was also sought and obtained from the communities and individuals involved in the study.

3. Results

A total of 24 (75%) of the 32 subjects examined were positive for onchocerciasis infection (Table 1). It was observed that females had a highest level of infection, 17 (77.3%) compared to male, 7 (70%). However, the gender related difference in prevalence was not significant between gender ($P > 0.05$). Certain clinical manifestations of onchocerciasis were recorded, including a > 32 year old woman with total blindness (Plate 1) and several individuals with lizard skin (Plate 2).

Table 1. Gender distribution of individuals infected with Onchocerciasis in Idoani

Gender	No. Examined	No. Infected	% infected
Male	10	7	70.0%
Female	22	17	77.3%
Total	32	24	75.0%

$X^2 = 0.028$, $df = 1$, $P = 0.867$ (X^2 – Chi Square and P -P value)



Plate 1. Eye blindness



Plate 2. Lizard skin



Plate 3. Breeding site for the vector at Idoani

Generally, 100 respondents were recruited into this investigation, out of which 76 representing 76% (Table 2) were aware of the diseases referred to as onchocerciasis. Majority (76%) of the individuals in this category belong to the 21 – 31 age range (Figure 2).

Table 2. Education classification of respondents

Education	No. of Respondents	No. Respondent Aware	% Respondent Awareness
Secondary	24	11	45.8%
Tertiary	71	64	90.1%
No formal	05	01	20.0%
Total	100	76	76.0%

$X^2 = 4.672$, $df = 2$, $P = 0.097$ (X^2 – Chi Square and P -P value)
(Secondary:– 6 -12 years of education. Tertiary:– more than 12 years of education)

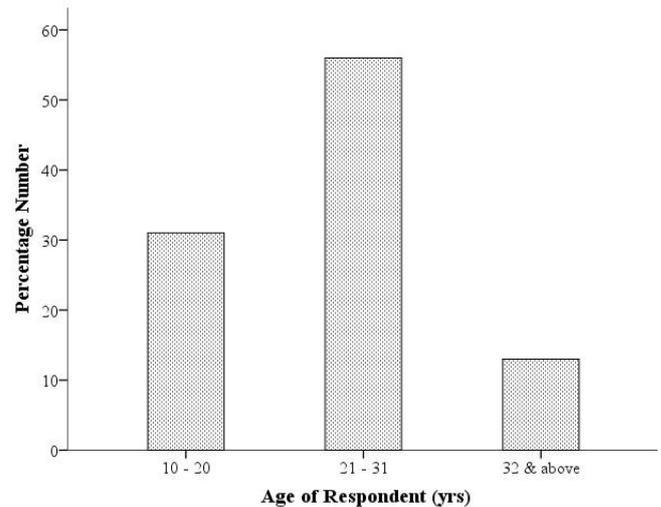


Figure 2. Age distribution of respondents who have knowledge of or are aware of Onchocerciasis

Also the study revealed that respondents who are students or graduates of tertiary institutions constitute the major percentage (90.1%) of those that have knowledge of the disease (Table 2). There was no significant difference ($P > 0.05$) in awareness. Regarding the ability of the respondent to identify black fly, about half of the respondents (48%) are able to identified black flies.

More than half (59%) of the respondents choose raining season as the biting season of the vector. Sixty one percent (61.0%) thought that river sides are the preferred biting site of black flies while 19% chose farm. It was also observed that majority of the respondents (47%) indicated 'anytime' as the biting periods of the insect. Sixty four percent (64%) respondents stated preferred biting part of the body to be any exposed part and 33% indicated leg. Figure 3 summarizes black fly bite reaction, swelling + pain + itching (31%), swelling + itching (20%) and itching (12%). It is noteworthy that forty eight percent (48%) was able to recognise black fly as the causative agent of river blindness.

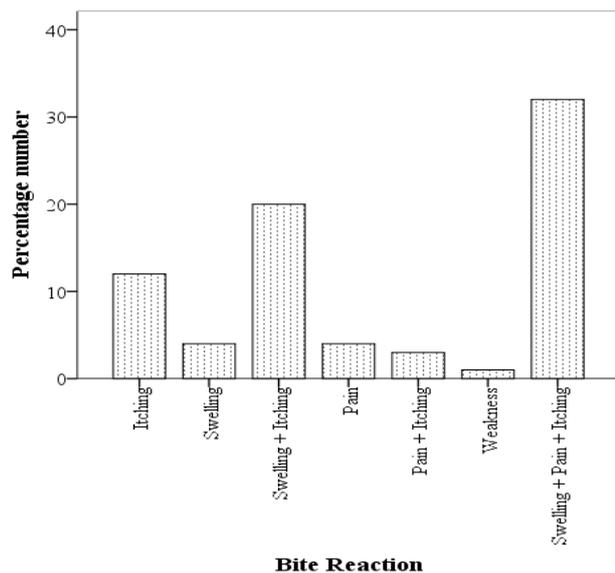


Figure 3. Knowledge on symptoms of black flies bite

4. Discussion

About two third of the people examined were infected with *Onchocerca*, one of whom was totally blind. This is in agreement with the fact that the disease is still in Nigeria, the most endemic country for onchocerciasis in the world, harbouring about 60 percent of all cases in West Africa and 30 to 40 percent of all cases in the world (Babatimehi, 2008). The National Onchocerciasis Control Programme (1993) also reported that the disease is present at varying degrees in all states of the Nigerian federation and over fifteen thousand Nigerian rural communities including Ido-ani in Ose LGA of Ondo.

In this study area, both male and female engage in socio-economic activities (such as fetching water from the breeding site, farming, fishing and hunting) and can be exposed to black fly biting. In line with this, no statistical differences in infection were detected. This agrees with many other researchers' report. Respondents aged 31 years and above, constituting 13% of the respondents appear to be less informed about the disease in comparison with other age groups. This finding agrees with the earlier report by Agbolade *et al.*, (2010), and points to the fact that the age-old problem of ignorance on the transmission of parasitic

infection. It is obvious that ignorance could be considered still a major issue that is yet to be adequately addressed.

Formal Education appeared to be one of the medium for the awareness of the disease. As a result of the formal education that most of the respondents had, the study showed that 90.1% of the respondents have already acquired tertiary education (more than twelve years of education) are aware of the disease. Despite the fact that more than half of the respondents know about the disease, only 38% of the respondents could identify the insect to be blackfly.

The impressive knowledge of the respondents that *S. damnosum* bite mostly along the river course or farmlands close to the river (61% and 19% respectively) corroborates earlier observations that people working close to the river are at the high risk of *Simulium* bite (Abdullahi and Oyeyi, 2003; Okonkwo *et al.*, 2010). The larvae of the insect primarily survive the coldest season in natural flowing waters ranging in size from small upland streams to wide rivers. In this study, many of the respondents (47%) have the prior knowledge that *Simulium* can bite at anytime. Previous studies in Nigeria had documented a bimodal biting activity for *S. damnosum* complex (Agbolade *et al.*, 2010). Like many other species of black flies, it has definite daily biting activity periods. It was also reported that under sunny periods, gnats are most active in the morning and again during the evening; biting activity generally is highest between 7 to 10 a.m. and again at 4 to 7 p.m. Under cloudy, cooler conditions, biting may occur throughout the day with peaks during early afternoon (Bechinski and Klowden, 2005). The respondents indicated that black fly thrive more during raining season and this agrees with the report of Atting *et al.*, (2005).

On the site preferred by the black flies for biting, 64% of respondents sampled indicated that the flies will bite any exposed part of the body while 33% ticked the legs. This is in line with report from different countries of the world which recorded that irrespective of the posture, the legs and any exposed part of the body nearest to the ground are the preferred biting sites for *Simulium* sp. (Atting *et al.*, 2005).

Host victims of insect bite respond in various ways. In the case of the blackfly, the body reactions recorded in this study going by the responses of respondents was skin swelling + pain + itching (31%), and swelling + itching (20%). This is slightly different from the findings of Agbolade (2010) who reported itching to have a high percentage and followed by swelling + itching. The clinical manifestations of onchocerciasis are intense itching, lizard skin, hanging groin and elephantiasis. High parasite load usually lead to blindness. In this study, 42% of respondents have the knowledge that river blindness is also known as onchocerciasis, while some respondents ticked elephantiasis, skin depigmentation, colour blindness, malaria and some respondents know nothing about the disease caused by black flies.

Conclusively, the study revealed that onchocerciasis is of a public health importance in Idoani, Ondo State, Nigeria and there was lack of knowledge on the cause and vector of

onchocerciasis in the study area. Consequently, it is leading to blindness and other skin diseases in the area. Therefore, awareness campaign should be intensified in order to educate the people on its occurrence and prevention.

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