

## Distribution and Prevalence of Human Onchocerciasis in Ardo-Kola and Yorro Local Government Areas, Taraba State, Nigeria

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### Abstract

Onchocerciasis is a chronic parasitic disease caused by the filarial nematode; *Onchocerca volvulus* and is transmitted by different species of blackflies. A study was carried out to assess the prevalence and distribution of human Onchocerciasis in Gonta, Shompa, Voding, Kasakuru and Kwanti-Nyavo communities of Ardo-kola and Yorro Local Government areas of Taraba State, Nigeria. Standard parasitological techniques of skin snip were used to collect data. A total of five hundred persons were examined comprising of 275(55.0%) males and 225(45.0%) females. Of these, 187(37.4%) were infected with *Onchocerca volvulus*. The male subjects are more infected (45.5%) than their female counterparts (27.5%) with statistically Significant difference in infection ( $\chi^2= 16.934$ ,  $P = 0.000$ ). Age-specific prevalence of infection was recorded in all age groups displaying a progressive increase with increase in age. Age group 41-50 shows the highest prevalence of infection 32(45.1%), Chi square analysis shows no significant difference in infection among age groups ( $\chi^2= 3.440$ ,  $P= 0.633$ ). Occupational-related infection showed that farmers appeared to be more infected (50.0%) followed by civil servants (38.2%) but without significant difference in infection among occupations ( $\chi^2= 2.397$ ,  $P=0.494$ ). Educational-related infection revealed that non-formal education appeared to be more infected (56.0%) followed by Tertiary education (37.7%) without any significant difference in infection ( $\chi^2= 4.350$ ;  $P = 0.226$ ). The risk of becoming blind and other clinical manifestations is eminent due to lack of access to mass drugs administration (MDA) in the study areas. Here is a case of re-emergence of Onchocerciasis that demand urgent attention.

**Keywords:** Onchocerciasis; Microfilaria; filarial nematode; blackflies; Taraba State; Nigeria.

### Introduction

Onchocerciasis (river blindness) is a chronic parasitic disease caused by the filarial nematode *Onchocerca volvulus* (*O. volvulus*), which can live in the human body for about 11-16 years (Cook and Zumla, 2003). It is transmitted through the bite of the blood sucking simulium black flies which breeds in fast-flowing rivers. The disease most adverse effect is blindness and thus the name river blindness (WHO, 2009).

Today, an estimated 18 million people are infected with river blindness worldwide, with about 270,000 persons permanently blinded and another 500,000 having severe visual impairment. The disease is thus a major leading cause of blindness in the world; fourth after cataract, glaucoma and trachoma (WHO, 2009).

The relationship between man and his environment is symbiotic. Although, it is generally believed that the environment influences human activities, these activities in turn influence the nature of the environment. Physical, social and economic factors are very important factors that determine the severity of Onchocerciasis in any given society. The breeding condition for the disease vector, the nature of social and economic activities determines the level of contact with the fly and therefore the intensity of bites received by an individual at any point in time (Hunter, 1980). Onchocerciasis is a disease of rural communities. Studies have shown that Onchocerciasis is more common among farmers, fishermen, hunters, nomads and others who are engaged in outdoor activities that bring them inconstant contact with the simulium fly (Hunter, 1980).

## Material and Methods

### Area of Study

Ardo-kola Local Government Area was created in 1992. Its headquarters is in Sunkani. The Local Government has an Area of 2,262 km<sup>2</sup> and a population of 86,921 at the 2006 census, and by 2011, the Local Government reported the population to be 101,480 (NPC, 2011). It lies between latitude 8° 30' N to 9° 10' N and longitude 10° 45' E to 11° 25' E. The major tribes in the Local Government Area are Kona, Mumuye, Wurkun, Hausa/Fulani, Yandang while maize, guinea corn, ground nuts, beniseed and cassava are produced by the inhabitants.

Yorro Local Government Area in Taraba State, Nigeria was created in 1991 and its headquarters in Pantisawa covering an area of 1,275 km<sup>2</sup> and a population of 89,410 at the 2006 Census and by 2011, the Local Government reported the population to be 103,890 (NPC, 2011). It lies between latitude 6°N and 8°N of the equator and longitude 10°E of Greenwich Meridian. The people here are Mumuye predominantly and they are farmers and hunters. Yam, ground nuts, maize, cassava, rice, and Bambara nuts are the products of their farms, while goats, sheep, and fowls are the animals reared in this area. The study was carried out in some selected areas of Ardo-kola and Yorro Local Government Areas of Taraba State suspected to be endemic for Onchocerciasis.

Ardo-kola and Yorro falls within the Sudan savannah ecological zone of Nigeria with well-defined season (rainy and dry). Average rainfall is 180mm and temperature ranges from 28°C -38°C with an annual average of 27°C. The hottest months are March and April reading the temperature of 37°C -38°C respectively. The physical relief, surrounded most of the lands in the areas; the ranges do not exceed 1000m in height, with Gongo River which had its sources from the mountains.

The temperature and rainfall in area accounts for the vegetation cover, which are short trees and grasses that are sparsely distributed. The commonest trees in the areas include: shear butter, locust bean, Mahogany and baobab tree (TADP, 2000). The soils are purely sand-clay.

### Ethical approval

Before embarking on this research permission was sought from the local Government Chairman, the Director, Primary Health Care (PHC) Department and the District / community heads.

### Pre-survey Contact and Mobilization

After obtaining clearance from the Chairmen and Directors PHC, a pre-survey contact was carried out to some selected communities of Ardo-kola and Yorro local Government areas. During the visit, the village heads, primary Health Care workers, religious leaders was consulted and mobilized. The purpose, scope and the benefit of the study was explained to them. Furthermore, the cooperation and assistance require was solicited for successful commencement of the study.

### Sample Collection

A sample size of 500 persons determined using

$$N = \frac{P(1-P) \times \left(\frac{Z\alpha/2}{E}\right)^2 \times D}{E^2} \text{ where } N = \text{sample size,}$$

$Z\alpha/2 = 1.96$ ,  $P =$  assumed prevalence in the areas (50%),  $D =$  design effect which is 1 for random sampling and  $E =$  precision error which is 10% of the assumed prevalence (Suresh and Chendrashekera, 2012) was used for the study. A total of three hundred and two hundred person comprising of male and female of various age categories were examine from Ardo-Kola and Yorro local Government Area respectively.

### Parasitological technique

Parasitological examination involves obtaining skin snip from wrist or neck area of individual and observing the snip under microscope for presence of microfilaria. Skin snips was obtained by first cleaning skin using spirit swab and allows the area to dry; the sterile needle was then inserted almost horizontally lifting with a small piece of skin, the needle was then raised to cut off the skin with a sterile surgical blade which was then placed on the grease free slide. A drop of physiological saline was added to the skin on the slide and examined microscopically for microfilariae of *Onchocerca volvulus* using  $\times 10$  objective lens. When samples are positive, microfilariae was seen wriggling in the saline. Thus, microfilaria without sheath and caudal nuclei was classified as *Onchocerca volvulus* (Cheesbrough, 2005).

**Statistical Analysis**

The Statistical Package for Social Sciences (SPSS) version 20.0 was used. Descriptive statistics were used in presentation of data in tabula form while Chi Square test ( $\chi^2$ ) was used to compare the prevalence of Onchocerciasis among gender, age groups, and occupational groups. P-values less than 0.05 were considered as statistically Significant.

**Results and Discussion**

**Community Prevalence of Onchocerciasis**

Five communities in Ardo-kola and Yorro local Government Areas of Taraba State were

investigated for Onchocerciasis using Rapid Assessment method and Standard Parasitological Technique for diagnosis. Skin snips samples of 500 persons were examined microscopically for microfilaria of *O.volvulus*. Of these, 187/500(37.4%) were positive for *O.volvulus* (Table 1). The highest prevalence was recorded among people of Shompa community (42.0%), followed by Gonta(41.0%) then Kwanti-Nyavo (40%). Kasakuru community was the least with 30.0% infection rate. Chi square analysis did not show significant difference in infection among the communities surveyed ( $\chi^2 = 4.579, P=0.333$ ).

**Table 1:** Prevalence of *O. volvulus* Microfilaria based on Communities of Ardo-kola and Yorro Local Government Areas, Taraba State.

Communities	No. Examined	No. Positive (%)
Gonta	100	14(41.0)
Shompa	100	42(42.0)
Voding	100	34(34.0)
Kasakuru	100	30(30.0)
Kwanti-Nyavo	100	40(40.0)
Total	500	187(37.4)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant;  $\chi^2 = 4.579, P>0.005$ .

Table 2 shows the prevalence of *O.volvulus* infection based on Local Government Areas. 300 persons were examined in Ardo-kola Local Government Area out of which 104/ 300(34.7%) were infected. Of the 200 individuals investigated

in Yorro Local Government Area, 83/200(41.5%) were positive for *O.volvulus*. However, infection rate between the two Local Government Areas was not statistically significant ( $\chi^2 = 2.393, P=0.122$ ).

**Table 2:** Prevalence of *O.volvulus* microfilaria based on Local Government Area

LGA	No. Examined	No. Positive (%)
Ardo-Kola	300	104(34.7)
Yorro	200	83(41.5)
Total	500	187(37.4)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant; L.G.A = Local Government Area.

$\chi^2 = 2.393, P>0.005$ .

**Sex and Age Related Prevalence of Onchocerciasis**

Table 3 shown the prevalence of *O. volvulus* microfilaria based on sex, 275 males were examined out of which 125/275(45.5%) were confirmed to be infected and out of 225 females

examined 62/225 (27.6%) were confirmed to be positive for *O. volvulus* infection. Chi Square analysis showed that there is significant difference in infection between gender ( $\chi^2 = 16.934; P=0.000$ ).

**Table 3:** Prevalence of *O. volvulus* microfilaria based on sex

Communities	Sex	No. Examined	No. Infected (%)
Gonta	Male	60	27(45.0)
	Female	40	14(35.0)
Shompa	Male	62	30(46.9)
	Female	38	12(33.3)
Voding	Male	64	24(37.5)
	Female	36	10(27.8)
Kasakuru	Male	41	19(46.3)
	Female	59	11(18.6)
Kwanti-Nyavo	Male	48	25(52.1)
	Female	52	15(28.8)
Total	Male	275	125(45.5)
	Female	225	62(27.6)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant;  $\chi^2 = 16.934$ , P<0.005

Age-related prevalence is shown in table 4. *O. volvulus* infection was recorded in all the age group. The highest prevalence was recorded in age group 41-40 (45.1%) followed by age range

31-40(38.7%), 21-30 (38.7%), 11-20(34.6%) 1-10(32.5%) and 50 + (32.0%) respectively. There was no significant differences in infection based on chi square analysis ( $\chi^2 = 3.440$ , P=0.633).

**Table 4:** Prevalence of *O. volvulus* microfilaria based on age

Age groups (yrs)	No. Examined	No. Positive (%)
1-10	83	27(32.5)
11-20	104	36(34.6)
21-30	111	43(38.7)
31-40	106	41(38.7)
41-50	71	32(45.1)
50+	25	08(32.0)
Total	500	187(37.4)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant;  $\chi^2 = 3.440$ , P>0.005

**Prevalence in Relation To Occupation and Educational Level**

Occupational – related prevalence is shown in table 5. The rate of infection was most prevalent among farmers 116(46.4%) followed by Traders

41(34.5%) and Students 19(24.1%). The least prevalence infection was among the civil servants 11(21.2%).However, chi square analysis showed that infection among the different occupation do not differ from each other ( $\chi^2 = 2.397$ , P=0.494).

**Table 5:** Prevalence of *O. volvulus* Microfilaria Based on Occupation

Occupation	No. Examined	No. Positive (%)
Farming	250	116(46.4)
Civil Servant	52	11(21.2)
Student	79	19(24.1)
Trading	119	41(34.5)
Total	500	187(37.4)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant;  $\chi^2 = 2.397$ , P>0.005.

The result in table 6 shows the prevalence of *O. volvulus* microfilaria based on education. Infection was highest among those with non-formal education 80(40.0%) followed by primary education 61(38.1%), secondary education

32(33.7%) and the least prevalence was among those with Tertiary education 14(31.1%).There was no significant differences in infection among the different educational levels ( $\chi^2 = 4.350$ ; P=0.226).

**Table 6:** Prevalence of *O. volvulus* Microfilaria Based on Level of Education

Education	No. Examined	No. Positive (%)
Non –formal	200	80(40.0)
Primary	160	61(38.1)
Secondary	95	32(33.7)
Tertiary	45	14(31.1)
Total	500	187(37.4)

Keys: No= Number, (%) =Percentage, (P>0.005) = No statistically significant;  $\chi^2 = 4.350$ ; P>0.005

### Discussion

The result of this study showed that onchocerciasis is endemic in Ardo-kola and Yorro Local Government areas and active transmission could be going on. The endemicity of the disease may have been enhanced by the fast or rapidly flowing and well oxygenated river Gongo which while providing water for the domestic need of the communities, also serve as breeding sites for the black fly –*simulium* species. This agrees with the work of Akogun and Onwuliri (1991) and Elkanah *et al.* (2010).

The high incidence of the disease could also be attributed to conducive environmental condition and human factors in the community which promote the transmission of disease. Similar observation was made by Anosike *et al.* (2005) and Elkanah *et al.* (2011) who all agreed that the variation observed among the communities surveyed could be due to different ecological condition that favors the breeding of vectors.

The occurrence of Onchocerciasis has been established in different parts of Nigeria by various researchers (Wyatt, 1971; Ogunba, 1982; Akinboye *et al.*, 2010; Rebecca *et al.*, 2008). Its rate of occurrence as reported by these researchers varies from one geographical area to another with highest endemicity of 83.0% recorded in Ovia North East Local Government Area of Edo State (Akinbo and Okaka, 2005).

The overall prevalence of 37.4% recorded is below 83.0% reported by Akinbo and Okaka (2005), 68.0% reported by Okolo *et al.* (2004) in Achi, Oji River local Government, Enugu State, 65.0% reported by Elkanah *et al.* (2014) in central Taraba State, Nigeria and 59.9% recorded by Elkanah *et al.* (2016) in Gwata and Dangwu communities of Yorro local Government Area of Taraba State, Nigeria. Above 34.6% recorded by Ogidi (2000) in Dass and Tafawa Balewa Local Government Councils Area, Bauchi State, 33.62% and 9.73% reported by Reuben (2012) in Maro

and Kasuwan Magani wards in Kajuru Local Government Area of Kaduna State, Nigeria.

The high prevalence of Onchocerciasis observed among individuals in these communities could be attributed to their occupational dispositions of which majority of the inhabitants are farmers. Furthermore, their proximity to various breeding sites of the vectors might have accounted for the prevalence.

The age-related prevalence is consistent with previous studies (Anosike *et al.*, 2005; Okon *et al.*, 2010) which showed that prevalence rises with age. The high prevalence of *O. volvulus* recorded in 41-50(45.1%) years age bracket call for concern as this indicate the productive age group in Africa traditional settings is between 31-50 years (Elkanah *et al.*, 2011). Onchocerciasis was more common in males (45.5%) than female (27.6%) subjects. The study findings also support the works of other researchers in different parts of Nigeria but differ with the work reported in Ovia North East Local Government Area of Edo State, Nigeria with 93.0% Onchocerciasis prevalence in females and 74.5% in males (Akinbo and Okaka, 2005). Wogu and Okaka (2008) reported Onchocerciasis infection in Okpuje Owan Local Government Area of Edo State with 27.5% infection in male and 20.0% in female which also agreed with the study findings. This finding is in line with the research of Akinbo and Okaka (2008) on the epidemiology of human Onchocerciasis among farmers in Ebonyi State. This suggests that males stand at risk of being infected by the disease, because the bread winners of their families, they are often exposed to the bite of black flies either at the farm or when they go fishing.

In this study, infection is more prevalent among farmers than other occupation; this could be as a result of farmers frequently exposure to the bite of black flies during farming activities than Traders,

Students and Civil servants (Elkanah *et al.*, 2016).

### Conclusion

Onchocerciasis is a pernicious disease affecting millions of people around the world. A lot of researches have been conducted on the prevalence of human Onchocerciasis and how to combat it, yet, the disease still constitutes a major public health threat. The result of the study showed that Onchocerciasis is endemic in Ardo-kola and Yorro Local Government Areas with a prevalence of 34.7% and 41.5% respectively. Consequently, this research has come up with the following recommendations:

- i. There should be more awareness that cases of Onchocerciasis be reported to the hospital for immediate treatment rather than relying on herbalist and spiritual homes.
- ii. There should be awareness on proper covering of the body and the danger of building near rivers.
- iii. It was evident from the study that, there is active transmission of Human Onchocerciasis in these communities, with chances of prevalence increasing over time, there is need for further research on the molecular aspect of Onchocerciasis in Ardo-kola and Yorro Local Government Areas of Taraba State, Nigeria.

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