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Knowledge, attitude and perception of people infected with human onchocerciasis in endemic areas of Delta State, Nigeria

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ABSTRACT: Onchocerciasis is one of the Neglected Tropical Diseases (NTDs) in Nigeria. The rate of spread of tropical diseases to higher altitudes is on the increase, due to climate change and global warming. This is why this research was conducted to determine knowledge, attitude and perception of those suffering from human onchocerciasis in reported endemic communities of Delta State, Nigeria. The study was carried out in two phases. The first phase involved the collection and examination of samples using standard parasitological protocols. Those who volunteered to participate were included in the study. The second phase examined the knowledge, attitude and perception of the infected and was carried out with the aid of a structured questionnaire. The results showed that out of the 1,201 persons, comprising of 826 (68.8%) males and 375 (31.2%) females examined, 138 were positive for the microfilaria of *Onchocerca volvulus*. The infected consisted of 101 (12.2%) males and 37 (9.9%) females. Most of the infected persons neither knew the name of the disease nor its vector. Rather, they associated the disease to low income and self-esteem. Comprehensive epidemiological surveys of onchocerciasis in remote areas should be carried out and all the affected population treated by the application of a holistic medical approach. People need to be more informed about the biology and local autecology of the vector and parasite of onchocerciasis. This requires proper health education in the public and schools to minimize the risk of disease transmission in the study area.

Keywords: Attitude, knowledge, lichenification, *Onchocerca volvulus,* perception.

INTRODUCTION

Onchocerciasis, also known as “river blindness” is an insect-borne disease caused by *Onchocerca volvulus*, a nematode worm (WHO, 2018). Though, the disease is known to be widespread in the country, the distribution and complications are inadequately documented especially in the rain forest zone (Nwoke *et al.,* 1994; Nmorsi *et al.,* 1996). Since the commencement of the Africa Programme for Onchocerciasis Control (APOC), free doses of Ivermectin has been distributed annually to many communities in Delta State through the Community Directed Treatment with Ivermectin (CDTI). However, the targeted end of intervention by APOC is in 2015 (Mbanefo *et al.*, 2010). As APOC is gradually preparing to wind up, Adeleke *et al.* (2011) noted that the intense biting of the black flies without protection threaten the possibility of recrudesce, even in areas where Ivermectin distribution had been successful, since the drug does not kill the adult.

According to Global Burden of Disease Study estimate, there were 20.9 million prevalent *O. volvulus* infections worldwide in 2017: 14.6 million of the infected people had skin disease and 1.15 million had vision loss. More than 99% of infected people live in 31 African countries. The

disease also exists in some foci in Latin America and Yemen. In 2017, more than 142 million people were treated in Africa where the strategy of CDTI was implemented, representing approximately 69.6% coverage of the number of people who require treatment globally (WHO, 2018). Evidence showed that more than 120 million people were at risk of onchocerciasis infection in Africa region, of whom 26 million people were infected and over 265,000 people were blind. People who live in fertile land, extensive agricultural farming area, and people who live and settle near to river banks were more vulnerable for onchocerciasis infection (Lagatie *et al*., 2016).

The disease has impacts on socioeconomic and mental health of infected individuals. Prolonged itching of the skin leads to low productivity and absence from work (Onojafe *et al*., 2020; Oyene *et al*., 2003). Chronic skin illness also needs high medical costs. Stigmas and discriminations related to onchocerciasis affect sexual health of infected individuals and hinder social relation and personal confidence (Onojafe *et al*., 2016; Njim and Aminde, 2017). Studies showed that age, sex, educational status, occupation, residence distance from the river, and residence at river banks were predictors of onchocerciasis infection (Dana *et al*., 2015; Njim and Aminde, 2017).

In the recently published Nigeria master plan for Neglected Tropical Diseases (NTDs) 2013 – 2017 (FMoH, 2012), onchocerciasis was one of foremost diseases sited as being neglected in this country. According to the report, climate change, global warming caused by the greenhouse effects, and the resulting increase in global temperatures are possibly causing tropical diseases and vectors to spread to higher altitudes in mountainous regions, and to higher latitudes that were previously spared. This therefore calls for more investigation regarding the knowledge, attitude and perception of those suffering from human onchocerciasis in the state.

MATERIALS AND METHODS

Study area

The study area was made up of three contiguous local government areas namely, Aniocha North, Aniocha South and Oshimili North, in Delta State, Nigeria. It is bounded by Edo State to the North, Ika North east and Ika South Local Government Areas to the West, Oshimili South Local Government Area and the River Niger, to the East, Oshimili South Local Government Area to the South East and Ukwuani Local Government Area to the South west.

Ethical consideration

Ethical permit for the study was first obtained from the Department of Animal and Environmental Biology, Delta state University, Abraka, on the 6th of September, 2010. A similar permit was also obtained from Delta State Ministry of Health, Asaba, on the 18th January, 2011. The purpose of the research was explained to individuals that volunteered to participate in the study.

Epidemiological investigation on human Onchocerciasis

An epidemiological study on human onchocerciasis involved was carried out in two phases. The first phase involved two stages. Stage one was the collection of skin snips from individuals while the stage two was microscopic examination of the skin snips for microfilariae of *Onchocerca volvulus*. The second phase examined the knowledge, attitude and perception of the infected and was carried out with the aid of a structured questionnaire titled 'Epidemiology Field Form' which was later evaluated.

Personal data

On the scheduled days, volunteers who arrived at the appointed places for examination were registered with the aid of the epidemiology field form. Two field workers were recruited specifically as field assistants in each local government area to help to enter personal information about the individuals on the Epidemiology Field Form, showing sex, age, occupation, community/village, and questions relating to their perception of black flies and onchocerciasis.

Parasitological analysis

Microfilariae detection in the study population was carried out by the following methods:

Skin snip biopsy

The area to be skin snipped was first, carefully swabbed with methylated spirit (Botto *et al.,* 1999) and two bloodless skin-snips were taken from each subject from the left iliac crest and shoulder with the aid of a corneo-sclera biopsy punch (2 or 4 mm bite), manufactured by surgitrac co. Ltd, 1902, Global trade center, 15, Wingkin Road, Kwai Chung, Hong Kong. This is because the iliac crest is recognized as having the greatest diagnostic potential for *O.volvulus* in Nigeria (Ufomadu *et al.*, 1988).

The skin snips were separately placed in polystyrene microtitration plates with U-shaped wells (96 wells each) containing 3 drops of 0.95% physiological saline solution. The corneo-sclera punch was cleaned with cotton wool soaked with methylated spirit and allowed to dry before and after use to avoid transmission of other skin or blood infections. When filled, the wells were covered with cello

tape to prevent evaporation and spilling of the contents in transit (Ufomadu *et al.*, 1988).

Microscopic examination

Skin snips collected in the field were incubated at room temperature before microscopic examination within 24 hours (Rahmah *et al.*, 2001). However, microfilarial suspensions which could not be examined within twenty-four hours after collections were preserved by the addition of a drop of 10% formalin into each micro titration, pending microscopy (Person *et al*., 2006). The microfilarial suspensions together with the skin snips were sucked up with a Pasteur pipette into a clean slide and the wells were washed up so as to release microfilariae which may adhere to the wells. The specimen removed were teased out in physiological saline and examined under low power (x40 objective) for microfilariae of *O. volvulus*. They were identified characteristically freeing themselves from the edge of the smear. Subjects were considered to be infected if more than 1 microfilariae are found in the two skin snips. The microfilariae were counted in each specimen and the averages of the two specimens were recorded as the microfilarial score (Brown and Shannon, 1989).

Assessment of knowledge, attitude and perception of those suffering from human onchocerciasis

A questionnaire was developed to obtain information on demographic characteristics, disabilities, activities of daily living and impact of onchcerciasis on occupation. It also elicited information on the impact of the disease on social life, religious and leisure activities as well as interaction with family members, friends, work mates and the community. Feelings regarding illness and marital problems were also considered (Person *et al.*, 2006). The questionnaire was modified from previously validated survey instruments and pre-tested. The researcher and his team administered the questionnaire. Face validity of this instrument was assessed by an independent group to ascertain that the questionnaire detected psychological and socio-economic impact of onchocerciasis on the people. A sample of the questionnaire is shown in Appendix I.

Data analysis

In addition to measures of dispersion, that is, standard deviation, mean and standard error, chi square analysis was employed to test for significance differences between the rates of Onchocercal infection among the subjects in the three local government areas. Graphs and tables were applied to present different aspects of the results where necessary.

RESULTS

Prevalence of human onchocerciasis in the study area

A total of forty one communities situated in three different but contiguous local government areas of Delta State were studied for human onchocerciasis. Human onchocerciasis was reported in thirty one of these communities. The general prevalence of the disease in the three local government areas of Delta State, Nigeria, is presented in Table 1. Out of the 1,201 examined persons, 138 were positive for *Onchocerca volvulus* - the onchorercal parasite. Thus, the overall prevalence of human onchocerciasis in the study area was therefore 11.5%. The highest infection rate was recorded in Aniocha North (12.5%), followed by Oshimili South (11.5%) and lastly Aniocha South (10.7%). Chi-square analysis indicates that the pattern of distribution of the disease was not significantly different ($p>0.05$) in the three local government areas (Table 1).

Table 2 shows the prevalence of human onchocerciasis in the eleven communities of Aniocha North Local Government Area. 344 persons were examined for the onchocercal parasites, of which 43 or 12.5% were positive. Eight communities in the samples were positive for the presence of onchecercal parasite, with Philip's camp (21.9%), Ugbodu (20.6%) and Ugboba (20%) recording among the highest while Idumugo, Obamkpa and Ukwu-Nzu had no infection. Infection rate was significantly different ($p<0.05$) among the sampled communities in Aniocha North Local Government Area (Table 2).

Table3 shows the prevalence of human onchocerciasis in fifteen communities of Aniocha South Local Government Area. A total of 432 persons were examined in the communities surveyed; with 46 (10.7%) being infected. The highest prevalence of 20.7% was observed at Ewulu followed by Umute with 20% while Olodu had as low as 4% but Azagba-Ogwashi, Ashama and Egbudu-Aka had the least prevalence of 0%. Chi-square calculated indicates that the pattern of distribution of human onchocerciasis differ significantly ($p<0.05$) between the communities of Aniocha South Local Government Areas (Table 3).

Result of the survey in the fifteen sampled communities of Oshimili North Local Government Area is shown in Table 4. Out of the 425 people examined, 49 (11.5%) were infected. The highest prevalence rate was recorded at Aganike camp (23.3%), followed by Asoko (20%). The lowest prevalence rate of 12.0 and 12.9% were recorded at IIlah and Animwalo, respectively while Azagba-Ogwashi, Ashama and Egbudu-Akah recorded zero. There was significant difference ($p<0.05$) in the pattern of distribution of human onchocerciasis between the communities of this local government area.

Table 1. General pattern of distribution of Human Onchocerciasis in the study area.

LGA	No of communities sampled	No of individuals examined	No infected (%)
Aniocha North	11	344	43 (12.5)
Aniocha South	15	432	46 (10.7)
Oshimili North	15	425	49 (11.5)
Total	41	1201	138 (11.5)

Table 2. Distribution of human Onchocerciasis among the eleven communities of Aniocha North LGA.

Communities	No examined	No infected	Percentage (%) of infection
Aniofu	28	2	7.1
Idumuje – Ugboko	33	5	15.2
Idumugo	31	0	0
Issele – Azagba	38	7	18.4
Obamkpa	32	0	0
Okofia Camp	31	5	16.1
Philip's Camp	32	7	21.9
Uburubu	28	4	14.3
Ugboba	30	6	20
Ugbodu	34	7	20.6
Ukwu – Nzu	27	0	0
Total	344	43	12.5

Table 3. Distribution of human Onchocerciasis among the fifteen communities of Aniocha South LGA.

Communities	No examined	No infected	Percentage (%) of infection
Abugba	26	5	15.2
Azagba – Ogwashi	28	0	0
Adonta	25	3	12
Ashama	32	0	0
Egbudu – Akah	29	0	0
Ejeme – Aniogor	28	3	10.7
Ejeme – Unor	30	5	16.7
Ewulu	29	6	20.7
Isheagu	27	5	18.5
Nsukwa	33	3	9.1
Ogbu	30	4	13.3
Olodu	25	1	4
Otulu	29	3	10.4
Uku – Oba	31	2	6.5
Umute 1	30	6	20
Umute 2	30	3	10
Total	432	46	10.7

Gender-related prevalence of human onchocerciasis in the study areas

Table 5 shows the general gender-related prevalence of human onchocerciasis in the study area of Delta State. A total of 1,201 persons were examined during the survey, out of which 826 (68.8%) were males and 375 (31.2%) were females. 101 (12.2%) and 37 (9.9%) of the males andfemales were infected respectively. Chi-square calculated indicates that there was no significant

Table 4. Distribution of human Onchocerciasis among the fifteen communities of Oshimili North LGA.

Communities	No examined	No infected	Percentage (%) of infection
Achala – Ibusa	28	4	14.3
Aganike camp	30	7	23.3
Akwukwu – Igbo	26	0	0
Animwalo	31	4	12.9
Asoko	30	6	20
Atuma	30	4	13.3
Ebu	29	5	17.2
Ibusa	28	0	0
Illah	25	3	12
Ngegwu	30	4	13.3
Okpanam	26	0	0
Ubgolu	28	4	14.3
Ugwu – Ozala	28	4	14.3
Ukala – Okpunor	29	0	0
Ukala – Ukute	27	4	14.8
Total	**425**	**49**	**11.5**

Table 5. General gender – related prevalence of human Onchocerciasis in the study areas.

Communities	Gender	No examined	No infected	Percentage (%) of infection
Aniocha North	M	201	29	14.4
	F	143	14	9.8
Aniocha South	M	296	35	11.8
	F	136	11	8.1
Oshimili North	M	329	37	11.3
	F	96	12	12.5
Total	M	826	101	12.2
	F	375	37	9.9

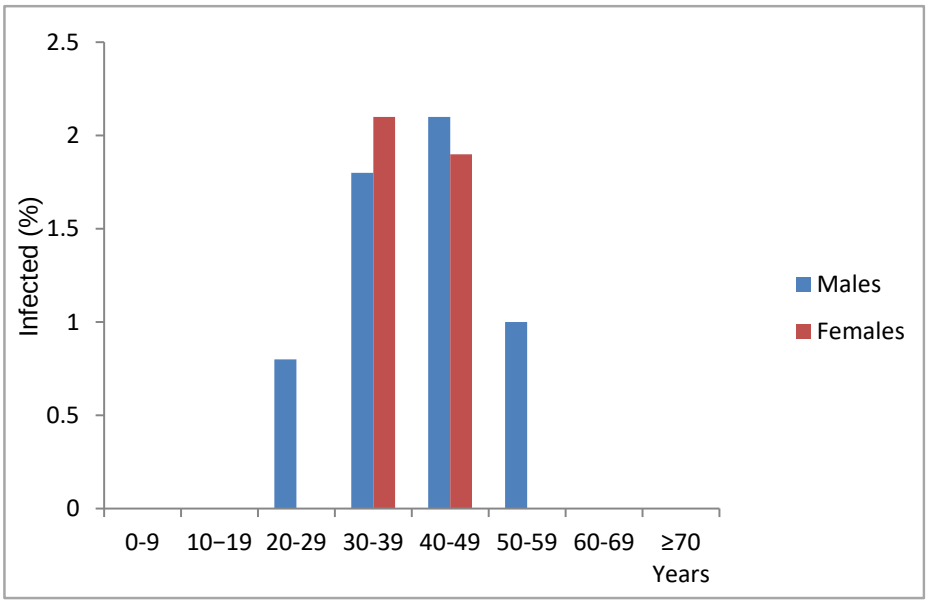

Figure 1. Those who knew the disease by name.

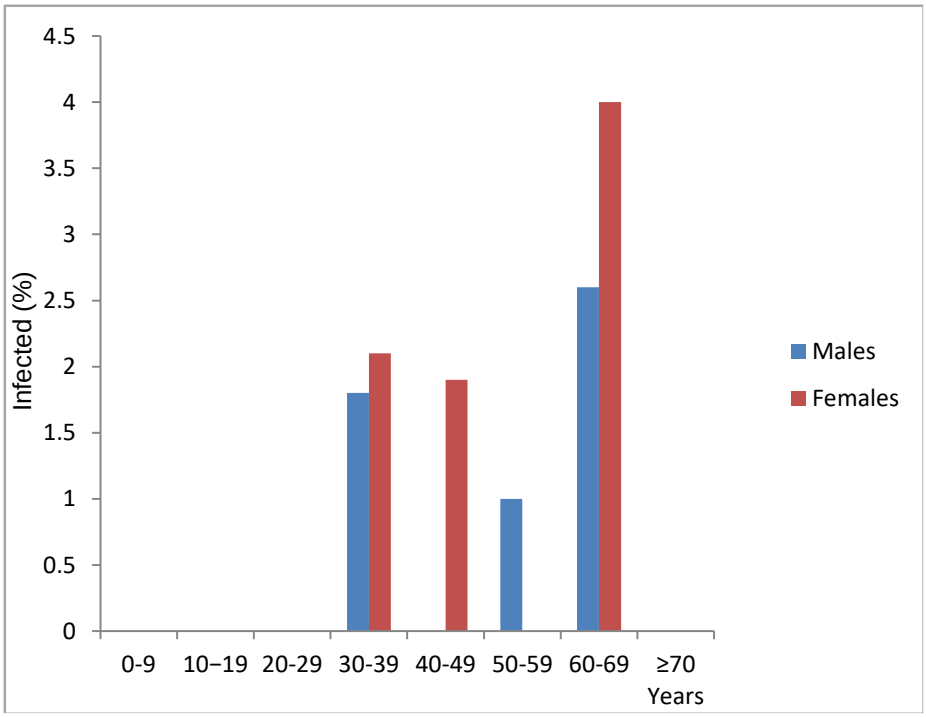

Figure 2. Those who visited hospitals because of the disease.

difference (p>0.05) in the gender-related prevalence of the disease in the studied area (Table 5).

Knowledge, attitude and perception of those infected with human *Onchocerca volvulus* according to gender and age in the study area

Figure 2 to 6 are representations of data on impact of onchocerciasis based on gender and age groups in the study area. Generally, only very few of the infected population claimed to know the name of the disease. Among those of 20 – 29 years, 0.8% males claimed to have an idea of the disease. 1.8% males, 2.1% females of 30 – 39 years; 2.1% males, 1.9% females of 40 – 49 years; and only 1% of males (50 – 59 years) have knowledge of the disease in question. A peak of 2.1% was respectively recorded for males at 40 – 49 and females 30 – 39 years as shown in Figure 1.

Similarly, only few of the infected claimed to have visited hospital. This included 1.8% males, 2.1% females (30 – 39 years), 1.9% females (40 – 49 years), 1% females as well as 2.6% males and 4% females (50 – 59 years) had visited hospital for treatment. No individual between 0 – 29 years was recorded to have visited hospital. The peak of 2.6% (males) and 4% (females) is at 60 – 69 years as presented in (Figure 2).

The infected that have used native and/or alternative medications as shown in Figure 3 included 4.7% (females) of 20 – 29 years; 2.6% males and 4.3% female (30 – 39 years); 15.8% males and 5.8% females (40 – 49 years); 17.3% males as well as16% females (50 – 59 years) have applied native medications. Others in this category are 7.9% males, 8% females (60 – 69%) and 2.2% males 7.7%, females 70 years and above. The peak for both the males (17.3%) and females (16%) was at age group 50 – 59 years.

Figure 4 showed the distribution of infected person who claimed that the disease negatively affected their personal and family integrity. This includes 6.2% males, 3.2% females (10 – 19 years); 6.5% males, 11.6% females (20 – 29 years); 14% males, 10% females of those 30 – 39 years. Others are 25% males and 13.5% females of 50 – 59 years; 32 7% males, 32.3% females (50 – 59 years); 14.5% males, 20% females (60 – 69 years) and 4.4% males and 11.5% females (70 years and above). The peak of 32.7% (males) and 32.3% (females) was recorded at 50 – 59 years in both.

Responses on the negative effect of the disease on job/occupation are 5.3% females and 4.8% males (10 – 19 years); 6.5% males and 10.9% females (20 – 29 years); 14% males and 10.6% females (30 – 39 years) and 26.3% males, 13.5% females (40 – 49 years). Others are 32.7% males, 32.3% females; 14.5% males, 20% females (60 – 69 years) as well as 4.4% males and 11.5% females of 70 years and above as shown in Figure 5.

The data on whether disease waste money and on the negative impact of the disease on the social lives of the

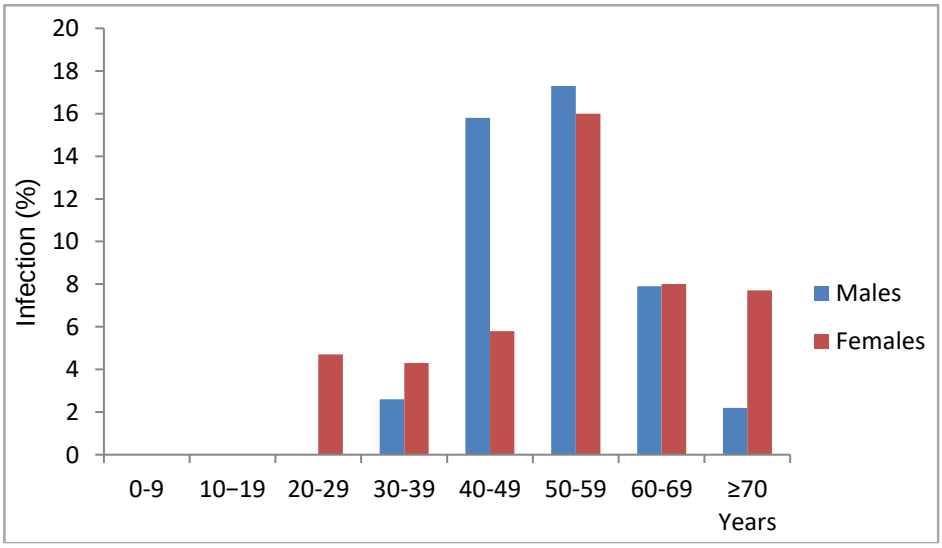

Figure 3. Those who used native/alternative medications.

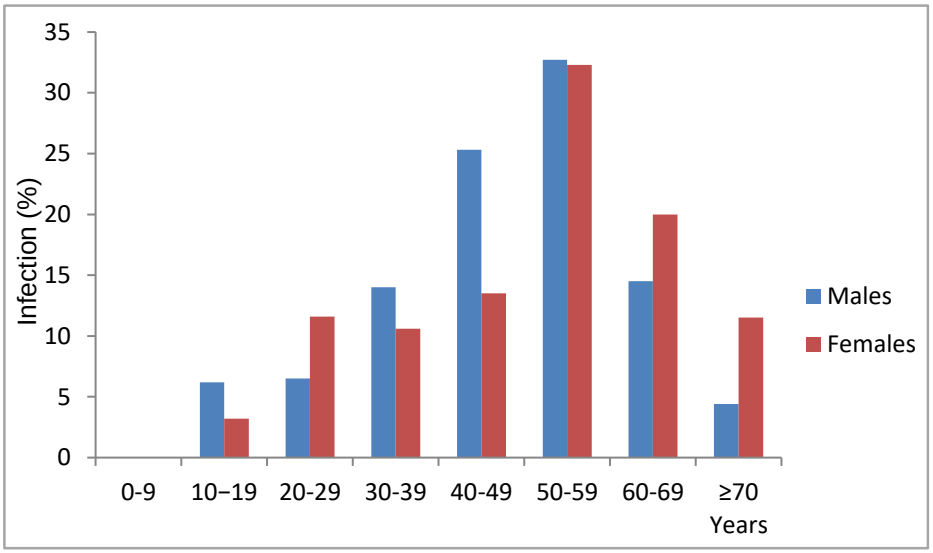

Figure 4. Those who felt that their personal/family integrity was negatively affected as a result of the disease.

infected are presented in Figures 6 and 7. The results are very similar to those of the negative effect of the disease on job/occupation. The peak of 32.7% (males) and 32.3% (females) at 50 – 59 years was obtained for the three afore mentioned socio-economic determinants.

DISCUSSION

Prevalence of human Onchocerciasis in the study area

This study reveals that human onchocerciasis caused by *Onchocerca volvulus* infection existed in the study area, which comprised of three contiguous local government areas of Aniocha North, Aniocha South and Oshimili North in Delta State, Nigeria. Onchocerciasis has been reported to be widespread in Nigeria. All the states of the Federation are endemic for the disease, except Lagos State (Sam–Wobo *et al.*, 2012). Other reported cases of the disease in Delta State include Nmorsi *et al.* (2001) and Emina and Okaka (2004).

The overall prevalence of human onchocerciasis in the study area was 11.5%. The pattern of distribution was not significantly different ($p>0.05$) in the three local

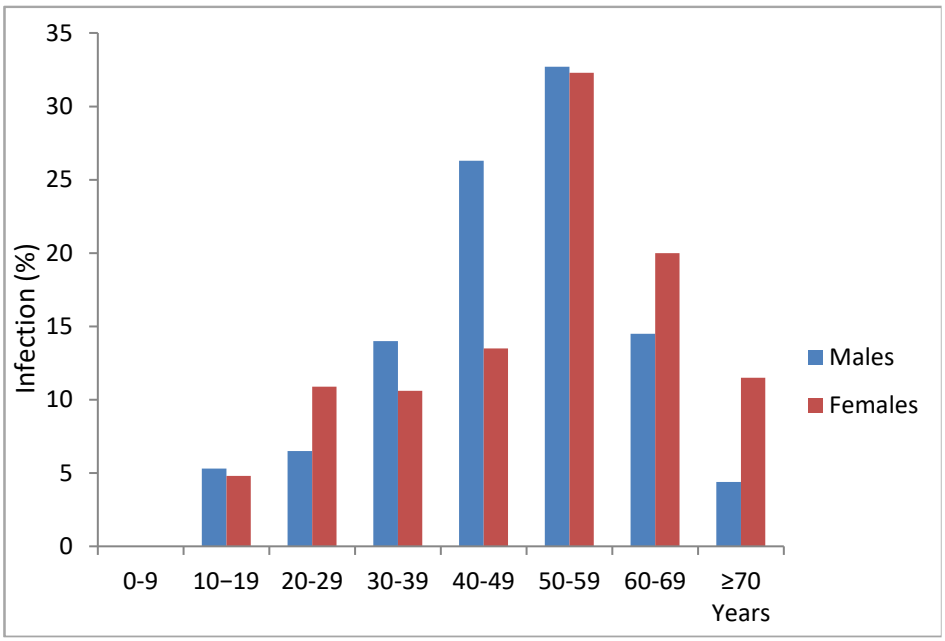

Figure 5. Those who felt that their job and/or occupation was negatively affected as a result of the disease.

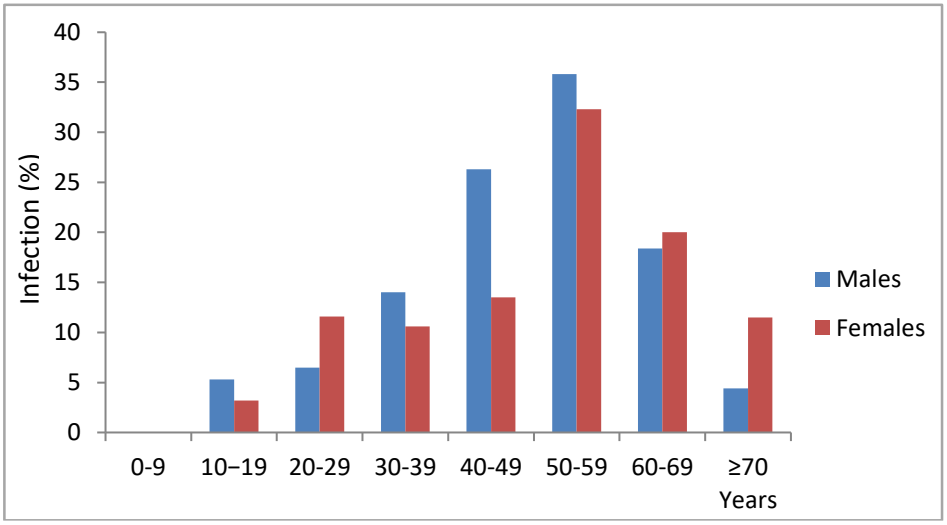

Figure 6. Those who felt that the disease was associated with waste of money.

government areas. Based on accepted epidemiological classifications of levels of outbreak as sporadic, hypoendemic, mesoendemic or hyperendemic, in relation to standardized microfilarial prevalence of less than 10%, 10% - 29%, 30% - 59%, 60% and above respectively (by Onchocerciasis Control Programme (OPC)); as adopted by Akinbo and Okaka (2010) in Ovia Local Government Area of Edo State, Nigeria, the area under study is hypoendemic. *Onchocerca volvulus* microfiliarial rate in the present study is lower than what was obtained in a rural farm settlement in Aniocha North Local Government Area in Delta state with a prevalence of 41.1% (Nmors *et al.*, 2002) and a rural community of Okuetolo in Delta State, where infection rate was as high as 91.9% (Emina and Okaka, 2004).

Onchocerciasis is a focal disease that depends on the presence of a specific ecology, including among others, fast-flowing waters and the characteristics of the vectors

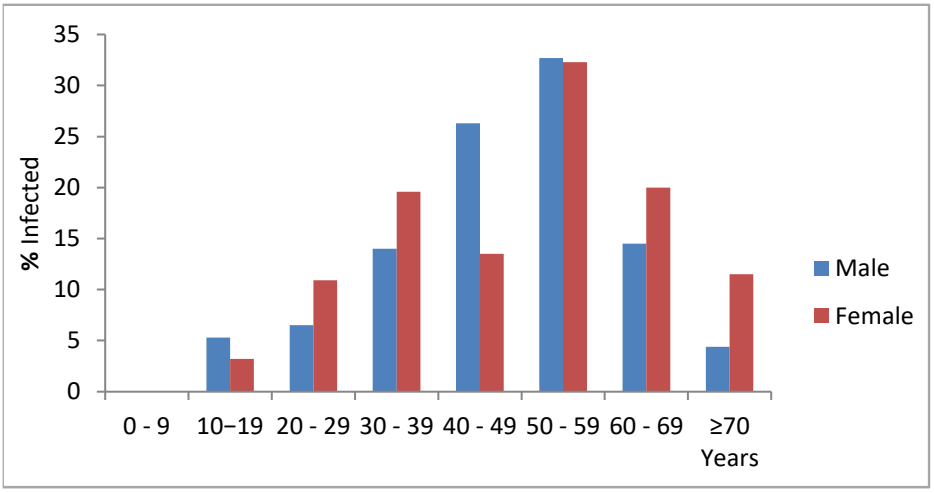

Figure 7. Those who felt that the disease has had negative impact on their social lives.

involved in the transmission (De sole *et al.,* 1991). Thus, the infection rate observed in the study area in Delta State is due to the presence of vector black fly and the fact that most endemic communities are located close to relatively fast flowing rivers (0.51 – 0.95 m/s) such as Rivers Ohe, Namormai and Otor, as well as other tributaries which favour the breeding of *Simulium* vectors. In addition to this, is the presence of bushes made up of trees, herbs and shrubs near many homes, whose twigs and canopies provide desirable resting shades for the vector.

In Aniocha North Local Government Area, the general prevalence of human onchocerciasis was 12.5% (hypoendemic). The disease occurred in eight of the eleven communities that were sampled. Infection rates in Philip's camp, Ugbodu, Ugboba, Issele-Azagba, Okofia camp, Idumuje-Ugboko and Uburubu were hypoendemic (21.9, 20.6, 20, 18.4, 16.1, 15.1 and 14.3%) respectively, while it was sporadic in the remaining communities.

In Aniocha South Local Government Area, the general prevalence of the disease was 10.7% (hypoendemic). It occurred in 12 of the 15 sampled communities. Infection rates in Ewulu, Umute, Isheagu, Ejeme-Unor, Abugba, Ogbu, Adonta, Ejeme-Aniogor and Otulu were hypoendemic (20.7, 20 18.5 16.7 15.2, 13.3, 12, 10.7 and 10.4%) respectively, while it was sporadic in the remaining communities.

In Oshimili North Local Government Area, the general prevalence of human onchocerciasis was 11.5% (hypoendemic). The disease occurred in eleven of the fifteen communities that were sampled. Infection rates in Aganike camp, Asoko, Ebu, Ukala-Ukute, Achala-Ibusa, Ugbolu, Ugwu-Ozala, Ngegwu and Illah were hypooendemic (23.3, 20, 17.2, 14.8, 14.3, 14.3, 14.3, 13.3 and 12%) respectively, while it was sporadic in the remaining communities.

Gender-related human Onchocerciasis in the study area

More of males volunteered to participate in this study than females. Males accounted for 68.8% while females 31.2% of the total population examined. Hence, it could be noted that the females were not fully disposed as the males to participate in this survey. Factors responsible for this could be associated with cultural (where females are traditionally expected to be more conservative or reserved compared to males), and also inadequate health education. This finding is in line with that of Abdulahi and Oyeyi (2003) in Tudun Wada and Doguwa Local Government Areas of Kaduna State, where more males than females were examined in a similar survey. Although, religious factors such as purdah often also contributes to the reluctance of females in northern Nigeria to participate in surveys of this nature.

In spite of the obvious numerical bias in favour of examined males over females in this survey, the general picture of human onchocerciasis in the study area of Delta State showed that there was no significant difference between the proportion of infected males and females ($p>0.05$). This finding agrees with that of Okonkwo *et al.* (2010) where infection rate between males (38.9%) and females (26.7%) were not significantly different ($p>0.05$) among farmers in Ebonyi State. The finding of this study corroborate well with that of other researchers in other parts of Nigeria as referenced above in onchocercal gender-related infection, but at variance with the work recorded in Ovia North East Local Government Area of Edo State, Nigeria with 93% prevalence of onchocerciasis in females and 74.5% in males (Akinbo and Okaka, 2010).

Gender-related prevalence of the disease in Aniocha North Local Government Area showed similar result with that of the overall in the study area. Prevalence in males

(14.4%) was higher than females (9.9%). In the communities of Aniocha North, prevalence in males was higher in Aniofu, Issele – Azagba, Okofia Camp, Philip's camp and Ugbodu. Females recorded higher prevalence in Idumuje-Ugboko, Obomkpa and Uburubu.

The general result of the gender-related prevalence of human onchocerciasis in Aniocha South Local Government Area is also similar to that of the overall in the study area and Aniocha North Local Government Area. Prevalence of the disease was higher in males (11.8%) than the females (8.1%). In the communities of Aniocha South, males also recorded higher prevalence in Abugba, Ejeme-Aniogor, Isheagu, Ogbu, Olodu,Ukwu-Oba and Umute; while females recorded higher prevalence inAdonta, Ejeme-Unor, EwuluOtulu andNsukwa. The gender-related prevalence of onchocerciasis in Oshimili North Local Government Area differed from the overall and that of the other two local government areas under study. The females rather had a higher prevalence (12.5%) than the males (11.3%). In a similar survey, Biu and Bitrus (2009) also obtained a higher prevalence in females (92.9%) than males (85.8%) in 2002 in Borno State, Nigeria, when they reviewed clinical records of onchocerciasis between 2000 and 2006 in the state. Their results indicated that of the 1191 patients reviewed in the survey prevalence was generally higher in females 50.9% than males (49.1%). In the current survey, prevalence in females was higher in Aganike camp, Atuma, Illah, Ngegwu, Ugwu-Ozalla and Ukala-Ukute. Males recorded higher prevalence in only Achala-Ibusa and Ebu.

High infection rates of human onchocerciasis among communities near major breeding sites of blackflies have been recognized as feature of onchocercal nematodes. Some factors which have been identified to be responsible for high prevalence are transmission potential of vector flies and increased frequency of exposure of inhabitants to infective vector flies especially during outdoor activities such as fishing, farming or hunting (Rasheed, 2008, Adeleke *et al.,* 2011; Sam-Wobo *et al.*, 2012). Idling/playing or waiting outdoors also predisposes individuals to bites of vector flies. Generally, in this study, it was observed that frequent contact with infective flies also occurred when launderings, washing (of bikes or other vehicles) and bathing are done in water pools outdoors.

Knowledge, attitude and perception of those suffering from human Onchocerciasis in relation to gender and age

Generally, only few infected persons knew the name of the disease they suffered from. Worst still, very few knew that infected black flies transmit this filarial worm. This finding is in line with Adeleke *et al.* (2011) that reported very poor knowledge of the *Simulium* species as vector of onchocerciasis along the Osun river system. This ignorance is attributable to inadequate health awareness campaigns especially in the rural communities and parity of the study of the parasite and its vector in primary and post primary schools.

The percentage of infected males (0.7) and females (0.8) that visited hospitals for checkup and possible treatment was grossly low. The poor health seeking behavior of onchocerciasis patients could be due to fear of stigma and embarrassment of scratching itches at (sometimes very sensitive) parts of the body in the public. This view is perfectly in line with that of previous workers. For instance, Mbanefo *et al.* (2010) explained that embarrassment and recklessness resulting from the uncontrollable itching could cause several untold socio-economic consequences. Many of the infected persons attested to having patronized native medications (ranging from local herbal soaps to concoctions) at one time or the other for succor. Most of them were not too sure of the efficacy of these native medicines and so could not account for their curative potentials. All they could bet for was temporary relief or reprisal from itching and/or pains. A few of them also claimed to have resorted to religious rituals and faith in supernatural forces in order to attract divine intervention.

On the psychosocial disposition of people infected with onchocerciasis, they generally claimed that the disease had negatively impacted on their personal and/or family integrity. In the same vein, they also felt that the disease affected their social lives negatively. Mbanefo *et al.* (2010) recalled the view of the World Health Organization (WHO) in stating that onchocerciasis has not caused a single death, but the socio-economic and psychological impact of its clinical symptoms were enormous. They explained further that the ugly appearance of the skin lichenification and depigmentation was not a pleasant site to behold, hence the consequent low self-esteem, social seclusion and marital problems suffered by the victims, especially women. Egwunyenga (2014) adequately summarized this when he noted that onchocerciasis generally disfigured its victims, creating psychological impact such as ostracism, anguish, low self-esteem, disabilities and decreased productivity.

Many of the infected adults held to the view that they suffered huge financial waste as a result of the infection. They generally contended that the discomfort that accompanied the disease were 'associated with diminished income generating capacity (Thylefors and Alleman, 2006). This means that although onchocerciasis may not cause death, it bears several grave psychological and socio-economic implications that are suffered by its patients and their care keepers (WHO, 2002).

Conclusion

This study revealed the prevalence of human onchocerciasis

in the various study areas. The prevalence of human onchocerciasis in these areas is attributed to the presence of *Simulium* vectors as well as some fast flowing rivers and streams in the area. Poor knowledge of the biology and autecology of the black flies also poses as a threat to the effective control of onchocerciasis. People need to be more informed about the biology and local autecology of the vector and parasite causing onchocerciasis. This requires proper health education in the public and schools so as to minimize the risk of disease transmission within the study area. The Community Delivery Treatment with Ivermectin (CDTI) programme of APOC should be sustained and mass orientation carried out in endemic areas to educate the populace on its relevance.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

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