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Full Length Research Article

EVALUATION OF ONCHOCERCIASIS STATUS OF SOME COMMUNITIES IN ZANGON KATAF LOCAL GOVERNMENT AREA OF KADUNA STATE

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ABSTRACT
Onchocerciasis is a disease of public health concern in Nigeria caused by the parasite *Onchocerca volvulus* and transmitted by a vector blackfly. The aim of the study was to evaluate the status of Onchocerciasis of some communities in Madakiya, Zangon Kataf Local Government Area of Kaduna State. A descriptive cross-sectional study was carried out in five communities of Madakiya with a total of 100 respondents participated during the study. Serological screening was carried out using Rapid Diagnostic Test (RTD) kit with sensitivity of 74.8% and a specificity of 98.6%. Descriptive statistics was used in analysing data with Statistical Package for Social Sciences (SPSS) version 20.00. All the participants (100) were negative with most of the respondents within the ages > 40 years with most involving in farming activities in the Area. Human activities such as the harvesting of crops, washing and swimming as some of the risk factor with no clinical symptoms. The findings of this study concluded that the rate of infection among participants was negative with most of the respondents been farmers within the age 40 years with most to had been bitten by blackflies and treated using Mectizan/Albendazole. There is need for mass testing of individuals in endemic areas and further ensure mass drug administration for complete treatment in order to break the transmission of the disease.

Keywords: Evaluation, Onchocerciasis, Status

INTRODUCTION

Blackflies are serious nuisance in many parts of the world because of their painful and annoying bites and sometimes the enormous numbers involved in attacks which can cause localized swelling, inflammation and intense irritation of the skin which can last for days or weeks and their activities are enhanced during cloudy and stormy weather. The distance that adult blackflies fly varies with the species and weather. In colder climates biting activity is less, whereas in the tropics, activity is all year round with heightened activity during rainy seasons (Service, 2008;WHO, 2010).The disease causal pathogen (*Onchocerca volvulus*) transmitted by blackflies is prevalent in 35 countries of the world of which 28 are in Africa and Nigeria accounts for one quarter of the global infection rate (CDC, 2010).

Based on their impact on the health and economic wellbeing of humans, blackflies are generally regarded as the second most medically important group of insects (Adler *et al*., 2004). Blackflies are carriers of several pathogens which causes diseases like river blindness in Africa and the Americas (Adler *et al*., 2017). Female blackflies feed on the blood of mammals, including humans, for the food ovary maturation. The males feed mainly on nectar. They are usually small, black or grey, with short legs, antennae and can be a common nuisance for humans. These stout-bodied flies are about 1–5 mm long, though mainly black, other colours like orange and yellow species can be seen ((Takaoka, 2016). Blackflies bite in daytime and out of doors. Some species prefer to feed only on certain parts of the body like the legs or the upper part of the body. For example, *Simuliumdamnosum* in West Africa mainly attacks the legs (WHO, 2010). When a female blackfly bites an infected person during a blood meal, it also ingests microfilariae which develops further in the blackfly and are then transmitted to the next human host during subsequent bites (WHO, 2017). The adult worms can live in the nodules for up to 15 years. Some nodules may contain numerous male and female worms (CDC, 2018).

Onchocerca volvulus is among the eight parasitic nematode (roundworm) species that account for most cases of filariasis in humans. This form of filariasis is known as Onchocerciasis or river blindness. *Onchocerca volvulus* is one of the three species responsible for most of the morbidity attributable to filariasis (the other two being *Wuchereria bancrofti* and *Brugiamalayi*, which cause lymphatic filariasis). *Onchocerca volvulus* occurs mainly in Africa, with additional foci in Latin America and the Middle East CDC, 2018). Onchocerciasis- or "river blindness" is a disease caused by the filarial worm *Onchocerca volvulus* transmitted by repeated bites of infected blackflies (*Simulium* sp.). Onchocerciasis can be treated with the drug Ivermectin (brand name, Mectizan®) over a prolonged period. Ivermectin kills the microfilariae produced in the subcutaneous tissue of an infected person. It doesn't kill the adult worms but prevents the production of microfilariae by the adult female worms and reduces the transmission of the disease. Ivermectin should therefore be taken once a year for 16 – 18 years to break transmission (WHO, 2017). It's at this gap that the research was aimed at evaluating the status of Onchocerciasis of some Communities in Zangon Kataf Local Government Area of Kaduna State.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional design was adopted using a purposive sampling technique to identify residents who were on or with prior Ivermectin therapy with the aid of community directed distributors of Ivermectin (CDDs).

Target Population and Description of Study Area

A target population refers to a group of individuals from which samples are taken for measurement. In this study, the target population include; male and female within the age range (0-45 years) with different occupation and residents of the Villages in Madakiya community of Zango Kataf L. G. A. of Kaduna State.

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Sample Size

The minimum sample size for the study was determined using the Cochran's formula Cochran (1977). An Onchocerciasis response to Ivermectin in villages around Gurara dam, Kaduna State, Nigeria by Ozovehe *et al.* (2016) was used to calculate the sample size. The formula is as follows:

$$N = \frac{Z^2 \times P (1-P)}{D^2}$$

Where; Z = Confidence interval at 95% = 1.96, P = Prevalence of 2.6% = 0.026, D = Acceptable margin of error = 0.05

$N = (1.96)^2 \times 0.026 \times (1 - 0.026) / (0.05)^2$

$N = 3.8416 \times 0.026 \times 0.974 / 0.0025$

$N = 38.9 = 39.$

To give a fair representation of the study population, the calculated sample size of 39 was increased to 100 persons.

Administration of Questionnaire and Informed Consent Form

Structured questionnaire was administered to selected number of participants from the community to assess the status of Onchocerciasis in the area. The questionnaire provides information about the life history, behaviours and practice of the individual. This helped in determining the risk factors associated with Onchocerciasis among the residents of the community infected with the disease and the blood samples were collected. Five questions constitute the second section of the questionnaire that elicited the risk factors associated with Onchocerciasis. The questionnaires were distributed for risk assessment and demographic factors.

Sample Collection and Transportation

A total of one hundred (100) blood samples were collected from the respondents using 1mL volume vacutainer syringes from each respondent respectively. The samples were packaged in an ice packed cooler at a temperature of 4^{o}C and were immediately transported for further analysis. Serological screening was carried out in 100 respondents consisting male and female across all the five villages in Madakiya that willingly participated during the study using Rapid Diagnostic Test kit (SD-BIOLINE) from medical store with a sensitivity of 74.8% and a specificity of 98.6%.

Serological Screening

The analysis was carried out using the SD-BIOLINE Onchocerciasis IgG4 rapid test kit. This test detects exposure to the parasite that causes Onchocerciasis, *Onchocerca volvulus* by detection of IgG4 antibodies to *O. volvulus* Ov-16 antigen, one of the parasite's antigens (Dieye*et al.,* 2017). It is very effective in low density areas and has a wider acceptability than other invasive methods.

Data Analysis

Data obtained were analysed using descriptive statistics-Frequency Percentage (Statistical Package for Social Sciences (SPSS) version 20.00) and presented Tables.

RESULTS

Table 1 showed the number of blood samples collected from the respondents screening of *Onchocerca volvulus* tested with Rapid Diagnostic Test kit (SD-BIOLINE) in each of the villages with Bodari (19), Aduwan Gida (23), Attat (23), Matsitga (15), U/Duniya (20) making the total of 100 with all the villages recording negative result.

Table 1: Number of Respondents Screened for Presence of *Onchocerca volvulus* using RDT kit.

Name of Community	Number of Blood Sample Collected for Screening of *Onchocerca volvulus*.	Result
Bodari	19	Negative
AduwanGida	23	Negative
Attat	23	Negative
Matsirga	15	Negative
U/Duniya	20	Negative
Total	**100**	**Negative**

Key: **U**=Ungwa

Table 2 shows the demographic factors of respondents based on age, sex, occupation and indigenization. From the table, 33% of the respondents were ≥ 40 years followed by 11-30 years age groups. As to sex, there were more males (56%) who responded than the female gender (44%). Occupation of the respondents showed higher number of farmers (36%), followed by civil servants (21%), students (13%) and pupils (19%), while (1%) were both farmers and civil servants. There were 79% that answer Yes and 21% that answer No as the indigence of the Area.

Table 2: Demographic Factors of the Respondents in the Study Community

Variables	Number Examined	Frequency (%)	Positive/ Negative
Age(Years)			
1-10	11	11(11.00)	Negative
11-20	20	20(20.00)	Negative
21-30	23	23(23.00)	Negative
31-40	13	13(13.00)	Negative
41 and above	33	33(33.00)	Negative
Total	**100**	**100(100)**	
Sex			
Male	56	50.7(50.7)	Negative
Female	44	49.3(49.3)	Negative
Total	**100**	**100(100)**	
Occupation			
Civil servant	21	21(21.00)	Negative
Trader	5	5(5.00)	Negative
Farmer	36	36(36.00)	Negative
Student	13	13(13.00)	Negative
Pupil	19	19(19.00)	Negative
Artist	1	1(1.00)	Negative
Multiple	1	1(1.00)	Negative
Not working	4	4(4.00)	Negative
Total	**100**	**100(100)**	
Indigenization			
Yes	79	79(79.00)	Negative
No	21	21(21.00)	Negative
Total	**100**	**100(100)**	

Table 3 shows the risk factors associated with Onchocerciasis that responded to treatment. The result revealed based on the questions asked on the clinical sign of Onchocerciasis, 81% responded negatively to the clinical sign of Onchocerciasis with about 14% responding positively to the clinical sign of Onchocerciasis. On the number of participants who had been bitten by blackflies, 31% of them said they had never been bitten by blackflies while 68% said they had been bitten by blackflies. On the treatment of respondents infected with Onchocerciasis, over three-quarters (79%) of them responded in the affirmative to ever being treated for Onchocerciasis and 21% responded negatively. As to what drug they were treated with, 69% responded to taken Mectizan/Albendazole while 31% of the participants respondent no on how they are been treated.

Table 3: Risk Factors Associated with Onchocerciasis and Responses to Treatment.

S/N	Risk Factors	Frequency (%)
1.	Clinical nodule sign of Onchocerciasis	
	Yes	14(14.00)
	No	81(81.00)
	No response	5(5.00)
2.	Have you ever been bitten by	
	Blackflies before?	68(68.00)
	Yes	31(31.00)
	No	1(1.00)
	No response	
3.	Have you been treated for	
	Onchocerciasis?	
	Yes	79(79)
	No	31(31)
4.	How were you been treated?	
	Mectizan/Albendazole	69(69)
	No response	31(31)

Key: S/N = Serial number

DISCUSSION

The study revealed a negative Ov16 RDT from the respondents who participated in the study and tested for the presence of parasite with a negative finding among children. In epidemiological implications, they are usually considered 'serological markers' of recent transmission of *O. volvulus* (Rodriguez-Perez *et al*., 1999). This is likely to indicate that MDA has been very effective in the affected LGA. However, still of interest is the fact that the finding from a few inhabitants interviewed indicated that Ivermectin distribution had not taken place in the studied communities for over a year. It further suggests possible transmission interruption in the areas, though this needs to be monitored too. The serological negative exposure observed among the adult population ought to have been of little consequence in the elimination of Onchocerciasis as it may also imply that they had been infected prior to initiation of MDA activities but the drugs have been active since they were OV16 negative and admitted taking the drugs, even though the RDT was carried out in July (rainy season month), and January (dry season month) to ascertain whether there was exposure but still were negative. Epidemiological surveys supported by APOC have shown zero prevalence in the studied area following 12-16 years of Ivermectin treatment (FMOH, 2017), this may perhaps be the reason for the negative result seen in the OV16 RDT.

The demographic features revealed that most of the respondents are greater than 40 years old, mostly involve in farming activities which agrees with the work of Osue*et al*. (2013) who reported more of the elderly in their research in a Local Government Area close to the study area. There were also more males involve in the study than females; the reason being that men are known to do most of the farm work while the women do the planting. At the time of the research, most of the men were located in the bush, cultivating their lands and their occupation has shown that majority of the respondents are farmers.

On the risk factors, the clinical signs due to the presence or absence of nodules were not found due to the species of blackflies present there, which is the forest species believed to carry *O. volvulus* that induces less ocular infection, severe dermal pathology, low microfilarial loads and less palpable nodules (Murdoch *et al*., 2002). However, it is possible that some nodules have been missed because small nodules are not easily detected or nodules located in areas where they are uncommon to occur, such as deep tissues. WHO (1987) have noted that patients from forested areas tend to have fewer of the most severe ocular manifestations (blindness rates of<2%) than patients from the savannah zones (blindness rates of up to 15%)? This is perhaps the reason why no cases of blindness were seen due to the presence of the forest blackflies and also why the seroprevalence was zero, when patients were tested with RDT kit. The knowledgeable individuals believed that the blackflies bites occur mostly on the farm and riverside. This implies that the respondents believed that swimming, washing and fishing in the river would expose individuals to high risks of Onchocerciasis which is in agreement with the studies of Adeleke*et al*. (2010). And all these activities were observed during the field studies. Some individuals who admitted to taking Ivermectin with Albendazole opined that they had never been tested for Onchocerciasis but were given these drugs. Mass treatment with Ivermectin is an effective and safe means of reducing the prevalence of most parasitic disease in predominantly poor communities with endemic diseases (Crump and Omura, 2011).Respondents also admitted that the community directed treatment volunteers distributing the drugs have not come for the past year. Furthermore, it is recommended by WHO that since Ivermectin does not kill the adult worms but suppresses the production of microfilariae by adult female worms, Ivermectin has to be taken for 16-18 years to break transmission completely (WHO, 2015). Ivermectin distribution in Madakiya is yet to reach the stipulated years recommended by the WHO to break transmission. Though the species of blackflies carrying *O. volvulus* in the study area are mostly the forest strain and the *O. volvulus* causes severe itching with less ocular blindness and nodules, it should be noted that parasites can evolve. If it doesn't cause significant blindness now, the question arises. The residents are at risk of the parasites relapsing and giving room for the microfilariae to grow and be picked up by the blackflies and transmitted to others who are not infected due to break in therapy.

Conclusion

The findings of this study conclude that the rate of infection among the participants was negative with an indication of negative Serological test from samples collected from the participants. Most of the respondents are greater than 40 years old, mostly involve in farming activities in a Local Government Area. At the time of the research, most of the respondents were found to had been bitten by blackflies but have had treatment using Mectizan/Albendazole with most respondent witnessing no clinical signs of an infection.

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