



Burden, knowledge and perception of lymphatic filariasis in resource - poor communities in north central Nigeria

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Abstract

A number of vector-borne diseases are known to affect humans in tropical and sub-tropical regions of the world. Lymphatic filariasis is one of such debilitating disease caused by a nematode, *Wuchereria bancrofti*. The present study assessed the prevalence of lymphatic filariasis by screening individuals with filariasis test strip and clinical examination. A sample of 765 consenting individuals were screened for filarial antigenemia using filariasis test strip and clinical examination and interviewed for knowledge and perception of filariasis using a structured questionnaire. Overall antigenemia prevalence was 8.8% and the disease prevalence varied among villages with Shonga (16.7%) having the highest and Tada (1.6%) the least infected. In relation to age group, 40–49 years had the highest (49.3%) while 0–9 years did not record any infection. Among the respondents infected, a greater number (43.3%) believed that the disease was caused by stepping on charm, 45.4% of those unaffected also believed in the same cause. A greater number of the respondents (28.4%) believed that avoiding sexual intercourse with affected individuals can help prevent the disease. A majority (67.2%) of the study participant had a misconception about its preventive measure. Misconceptions on the preventive measures included sacrifice to appease the gods and avoiding sexual intercourse with affected individuals. This study showed filarial antigenemia was above the threshold of 2% in the study area with misconception on the disease transmission and therefore this area warrants strategies to prevent transmission.

Keywords Burden · *Wuchereria bancrofti* · Vector-borne · Edu L.G.A · Test strip

Introduction

Lymphatic filariasis (LF) is a debilitating neglected tropical disease, inflicting social and economic burden in tropical and subtropical countries. This vector borne disease is spread through the bite of infective mosquitoes of some species of *Anopheles*, *Aedes*, *Ochleretatus* and *Mansonia*

genera (Okorie et al. 2013, 2015). *Wuchereria bancrofti* is the parasite that causes about 90% of LF infection globally (WHO 2023). The adult *W. bancrofti* worms reside in lymphatic vessels of the infected humans, where they produce millions of larvae (microfilariae) that circulate in the blood stream. The vector mosquito during their blood meal picks up the microfilariae, while inside the vector, the microfilariae develops to infective larvae which may subsequently be transmitted to new human host during the bite of infected mosquitoes (Ahorlu et al. 1999; Amaechi 2014; Amaechi et al. 2017). Lymphatic filariasis has been identified as the second leading cause of permanent and long-term disability (Zeldenryk et al. 2011). An update in 2023 shows that over 882 million people in 44 countries worldwide remain threatened by Lymphatic filariasis and require preventive chemotherapy to stop the spread of this parasitic infection (WHO 2023). Nigeria is ranked third for Lymphatic filariasis with over 25 million infected individuals and about 120 million at risk of the infection (Oluwabiyi et al. 2016; Adekunle et al. 2016). The disease is present in all six geopolitical zones

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of the country and is endemic in 574 Local Government Areas (LGAs) out of the 744 LGA present in Nigeria. Nigeria accounted for 14.3% of the global population of people that require LF treatment. Nigeria has the highest burden of LF in Africa where it is considered a high-burden country of LF (Amanyi-Enegela et al., 2022). Nearly one in four Nigerians are infected with *Wuchereria bancrofti*. An estimated 40 million people worldwide have the clinical manifestation such as lymphoedema in the limbs and hydrocele (Jaiyeola et al. 2022). The World Health Organization (WHO) recommends a strategy of LF elimination as a public health problem by annual mass drug administration with antifilarial drugs and morbidity management and disability prevention among clinical cases (WHO 2013). Mapping of LF in a given area is recommended either by antigenemia or Mf to assess the burden of the disease. We report here the burden of LF in five villages in Nigeria, community knowledge and perception on the disease and transmission for developing LF elimination strategies and improving compliance of the people in mass drug administration. Obtaining current estimates of disease burden in any endemic community provides a guide to programme planning and subsequent implementation. Therefore, adequate mapping by testing participants in communities for circulating filarial antigens using filarial test strip is necessary. In order to achieve community participation that is necessary for increasing success of elimination strategies, a deeper understanding of the relevant social-ecological system is required (Wynd et al. 2007). Any strategy intended to impact on a given community will have to consider the range of people's knowledge and perceptions and how these are rooted in local settings. Also, poor knowledge leads to poor participation, and poor participation leads to low coverage and persistence in transmission of the disease. Poor resource communities are places where the people lack basic facilities such as good roads, lack electricity and pipe borne water, inadequate health facilities and other basic infrastructures (Amaechi et al. 2017). The results of this study in poor resource communities are expected to strengthen LF elimination programme of the country.

Materials and methods

Description of the study area

The study was conducted in Edu Local Government Area (LGA) in Kwara State, north central part of Nigeria. Edu Local Government Area is located within latitude 9°5'0"N and longitude 4°57'0"E. The L.G.A has an area of 2542 Km square and a population of 201,469 (National Population Commission 2007). Kwara state is one of the 36 states in the Federal Republic of Nigeria, a tropical country on

the west coast of Africa with Ilorin as the State capital. The state covers an area of about 36,825 square kilometers with Islam and Christianity being the major religion. Majority of the inhabitants live in rural agricultural areas and engage in peasant agriculture. Five villages out of ten were randomly selected. The five selected villages were Kpiledgi, Shonga, Kpututa, Tada, and Bindofu. The five villages selected have homogenous characteristics. Residents of these villages lack basic infrastructure such as tarred roads and good drainage systems. Most of the houses are made of mud with thatched roofs and surrounded by vegetation. The people are majorly Nupes with few yorubas and other tribes. The inhabitants are mainly peasant farmers and fishermen and live in small farming settlements. Edu L.G.A has a lot of rivers such as Rivers Niger, Asa, Aluko, Awun and streams that provide breeding ground for vectors of some filarial diseases and therefore this research was conducted from January to June, 2023.

Census and mapping

Before the commencement of the study, meetings were held in all the five study villages to explain the purpose and procedures of the study. Five villages (Kpiledgi, Shonga, Kpututa, Tada and Bindofu) out of a total of fifteen were randomly selected for the study. The five villages comprised those that were randomly selected after throwing wrapped papers containing the names of the fifteen villages in the Local Government Area. Participants were drawn from every second house systematically selected from each village. All household members of the selected houses formed the study participants. All the selected participants from the five villages were properly recruited at the Local Government health centre through the assistance of the community health workers.

Determination of Sample size.

No previous study on lymphatic filariasis has been conducted in the study areas. A prevalence of 50% was assumed based on preliminary reports from Kwara State Ministry of Health, Nigeria. The precision of 5% (0.05) is most suitable for the assumed prevalence and a minimum participants were people who had resided at least one year in the area. All individuals aged five years and above who had spent at least one year in the community were eligible to participate in the clinical and parasitological study. A minimum sample size of 500 participants was calculated using the method described by Sarmukaddam and Garad (2004) for the five selected villages.

A total of 765 participants in all were recruited for the exercise.

Ethical clearance

The ethical clearance for the survey was obtained from the Ethics Review Committee of Kwara State Ministry of Health Ethical Committee and Informed consent was obtained from the health director for local government and all the participants after the explanation of the procedures and the likely benefits of the study. The purpose of the study was explained to the village chiefs and traditional leadership councils obtaining their permission and consent, all participating individual (5 years of age and older) were asked to gather at the village Primary Health Care (PHC) Centre and randomly selected. Before clinical examination and testing could be carried out, the objectives of the survey were briefly explained based on the language of the community and each consenting individual were able to provide demographic data. The participants were assigned identification numbers and their names, age, occupation and marital status was taken.

Collection of blood samples

Finger-prick samples were taken once during the study period, from volunteers aged over five years and above living in the five villages. The samples were taken between 2100 and 2400 h. This time period was chosen because of the nocturnal periodicity of *W.bancrofti* microfilariae. Briefly, the finger of the volunteer was disinfected with 70% alcohol before puncturing it with a sterile lancet, which was disposed immediately after each use. One hundred microlitres of blood were then taken using a heparinized capillary tube. Blood was transferred from the capillary tube to the pad on the Filariasis test strip (FTS). Four drops of assay diluents was added into the square assay diluents well to enhance the efficacy of antigen-antibody binding and so improves the sensitivity of the test strip. The results of each filariasis test card were read after 10–15 min. A positive result shows two pink lines appearing on the cards window and a negative result showed when a single line is seen (Amaechi et al. 2017). The result is immediately recorded on the data sheet.

Rapid assessment for hydrocoele and lymphoedema

The positive subjects were examined for clinical manifestations by trained medical personnel. Examination for Lymphatic filariasis involved the search for lymphoedema and hydrocoele. A non-tender, soft fluid filled mass around the scrotal region was an indication of hydrocoele. For the examination of lymphoedema, participants were asked to lift up their clothing to expose their legs or swollen limbs with different degree of swelling.

Questionnaire administration

Collection of data was done using structured, closed ended, interviewer administered pre-tested questionnaires. Ten interviewers, five males and five females who are fluent in the local language (Nupe) spoken in the five villages were recruited and trained to administer the questionnaires. Equal allocation of one hundred and fifty three subjects were selected from each of the five villages to make a sample size of seven hundred and sixty five (Fig. 1).

Statistical analysis

Data collected were analyzed using Statistical Package for Social Sciences (SPSS) (Version 20) and presented as frequency tables and percentages. Chi-square test was used to test for significance of relationship between variables ($p < 0.05$).

Results

Age and gender wise prevalence of filarial antigenemia in Edu Local Government Area.

An overall prevalence of antigenemia in the study areas was 8.8% (Table 1). Antigenemia prevalence was significantly higher among males (13.0%) than females (5.3%) (Table 1).

Gender-Related Prevalence of clinical signs in Edu Local Government Area.

Amongst individuals positive for filarial antigenemia, 31.1% of the males manifested signs of hydrocoele, while 22.2% of the males had lymphoedema. For the infected females, 36.4% had the manifestation of lymphoedema (Table 2).

Prevalence of antigenemia in the studied villages of Edu Local Government Area.

Village prevalence of antigenemia in the study areas indicate that Shonga (16.7%) village recorded the highest prevalence, followed by Kpiledgi village (12.6%). The least antigenemia prevalence was recorded in Tada (1.6%) village (Table 3).

Age-wise prevalence of antigenemia amongst the study subjects.

The age range 40–49 years were found to record the highest antigenemia prevalence (49.3%) followed by the age range 30–39 years (31.3%) (Table 4).

Respondents' knowledge on the cause of Lymphatic filariasis.

The findings of this research revealed that there were more subjects who had misconception about the cause of Lymphatic filariasis. Misconceptions included stepping on

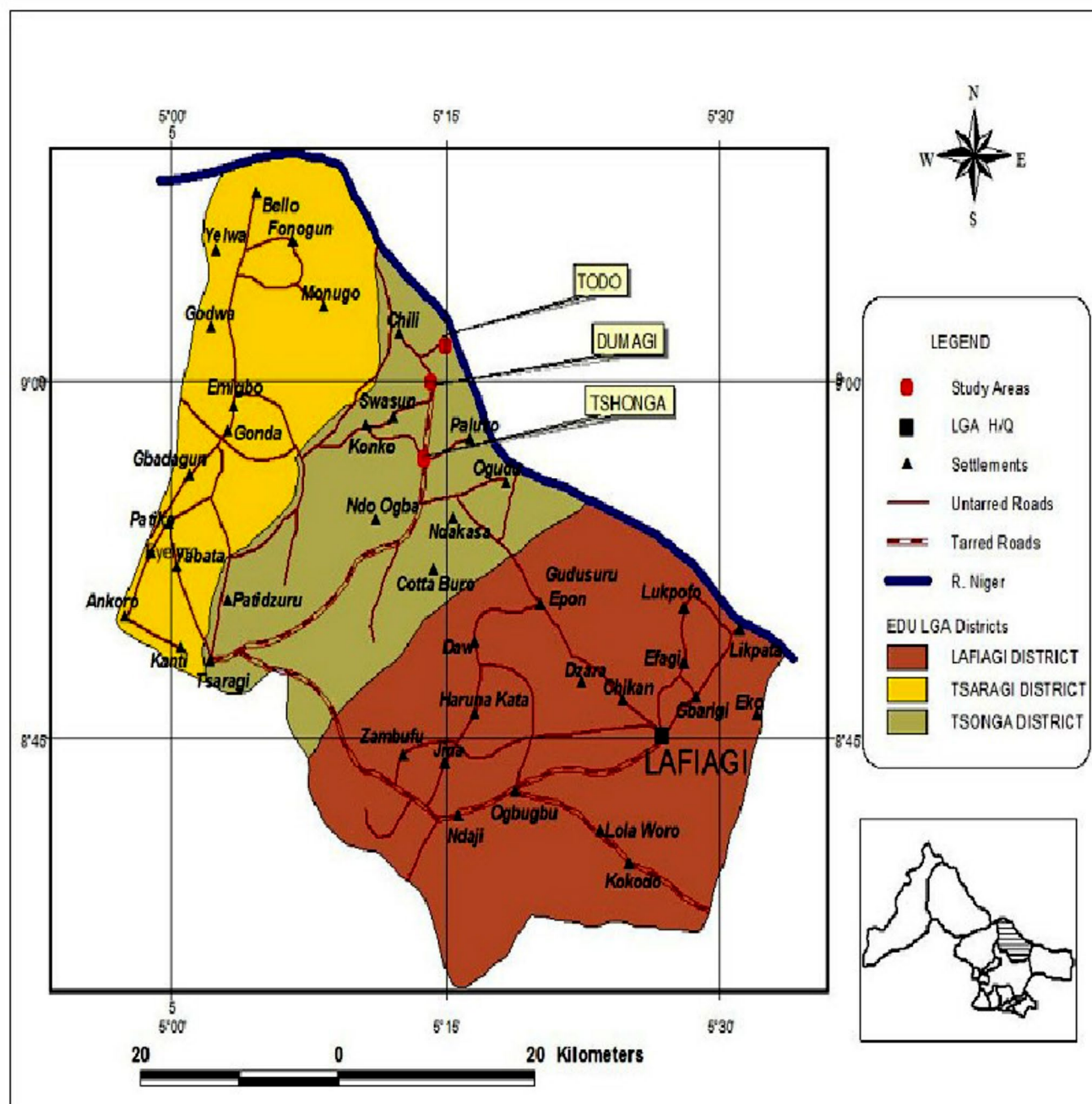


Fig. 1 Map showing Edu du Local Government Area. Source: Google Map

charms (43.3%), sexual intercourse (23.9%), eating contaminated foods (4.5%) amongst others (Table 5). A few respondents (20.9%) correctly identified mosquito bite as the cause of Lymphatic filariasis (Table 5).

Respondents' awareness on the various methods of prevention of Lymphatic filariasis.

Participants who were positive of the infection had a low awareness of the correct methods of preventing the infection. Wrong prevention strategies reported included sacrifice to appease the gods (37.3%), avoiding sexual

intercourse (28.4%), staying away from infected people (9.0%) amongst others (Table 6).

Discussion

Mapping the geographical distribution of a disease is a key step prior to the implementation of any public health intervention (Eneanya et al. 2019). Nigeria is one of the countries considered to be implementing Mass drug administration

Table 1 Age and gender specific prevalence of filarial antigenemia in Edu Local Government Area

Age group(yrs)	Male		Female		Total	
	Number examined (%)	Number Infected (%)	Number examined (%)	Number infected (%)	Number examined (%)	Number infected (%)
0-9	33	0(0.0)	42	0(0.0)	75	0(0.0)
10-19	48	3(6.3)	41	1(2.4)	89	4(4.5)
20-29	50	2(4.0)	49	1(2.0)	99	3(3.0)
30-39	53	14(26.4)	73	7(9.6)	126	21(16.7)
40-49	64	20(31.3)	68	13(19.1)	132	33(25.0)
50-59	35	3(8.6)	50	0(0.0)	85	3(3.5)
60-69	41	2(4.9)	56	0(0.0)	97	2(2.1)
70+	23	1(4.3)	39	0(0.0)	62	1(1.6)
Total	347	45(13.0)	418	22(5.3)	765	67(8.8)

$X^2_{cal}= 10.43$, $X^2_{tab}= 12.058$, $df= 7$, $P> 0.05$

Table 2 Gender-related prevalence of clinical signs in Edu Local Government Area

Gender	Number +ve	Number with hydrocoele(%)	Number with lymph-oedema (%)
Males	45	14(31.1)	10(22.2)
Females	22	0	8(36.4)
Total	67		

$X^2_{cal}= 12.6$, $X^2_{tab}= 4.67$, $df=1$, $P< 0.05$

Table 3 Prevalence of antigenemia in the different villages of Edu L.G.A

Village	Number examined	Number positive
Kpiledgi	143	18(12.6)
Shonga	186	31(16.7)
Kpututa	144	3(2.1)
Tada	127	2(1.6)
Bindofu	165	13(7.9)
Total	765	67(8.8)

(Figure in parenthesis is % out of total examined)

Table 4 Age-wise antigenemia prevalence amongst the subjects

Age group (years)	Number ex	Number +ve (%)	No with hydrocoele	No with lymph-oedema
0-9	75	0	0	0
10-19	89	4(6.0)	1(1.1)	0
20-29	99	3(4.5)	0	0
30-39	126	21(31.3)	5(4.0)	7(5.6)
40-49	132	33(49.3)	8(6.1)	11(8.3)
50-59	85	3(4.5)	0	0
60-69	97	2(3.0)	0	0
70+	62	1(1.5)	0	0
Overall	765	67(8.8)	14(1.8)	18(2.4)

$X^2_{cal}= 162.39$, $X^2_{tab}= 40.77$, $df= 7$, $P< 0.05$

(MDA) in only part of the geographical area considered in need of treatment (Deribe et al. 2021). The present research work presents a baseline data for Lymphatic filariasis in villages of Edu LGA, Kwara State, north central Nigeria,

Table 5 Respondents' knowledge on the cause of lymphatic filariasis

Cause	Affected (n= 67)	Unaffected (n=698)
Heard of LF		
Causes/mode		
Stepping on charm	29(43.3)	317(45.4)
Sexual intercourse	16(23.9)	211(30.2)
Mosquito bite	14(20.9)	95(13.6)
Working in the sun	0	3(0.4)
Eating contaminated food	3(4.5)	18(2.6)
Lack of personal hygiene	1(1.5)	27(3.9)
Curse from the gods	2(3.0)	4(0.6)
Trekking long distance	0	7(1.0)
Stressful work	1(1.5)	16(2.3)
Do not know	1(1.5)	0
Total	67	698

$X^2_{cal}= 23.45$, $X^2_{tab}= 13.02$, $df=9$, $P<0.05$

Table 6 Respondents' awareness on various methods of prevention of lymphatic filariasis

Preventive measures	Affected(n= 67)	Unaffected(n= 698)
Sleeping under mosquito net	4(6.0)	54(7.7)
Taking anti-filarial drugs	1(1.5)	12(1.7)
Keeping the environment clean	5(7.5)	78(11.2)
Spraying with insecticide	1(1.5)	26(3.7)
Avoiding sexual intercourse	19(28.4)	162(23.2)
Stay away from infected people	6(9.0)	102(14.6)
Sacrifice to appease the gods	26(37.3)	215(30.8)
Aviod mosquito bites	1(1.5)	21(3.0)
Avoid eating with affected person	5(7.5)	28(4.0)

$X^2_{cal}= 2.12$, $X^2_{tab}= 10.061$, $df= 8$, $P> 0.05$

an area where MDA had previously been carried out. This is focused at repositioning ongoing elimination strategy in the area. An overall filarial antigenemia prevalence as determined by the presence of microfilariae in the villages investigated was 8.8%. There was variation in the filarial antigenemia prevalence in the different villages investigated. Previous studies have implicated poor rural communities as more prone to Lymphatic filariasis infection (Okorie et al. 2015; Okonofua et al. 2014, 2021; Aniaku et al. 2021). The overall filarial antigenemia prevalence of this present work is lower than the findings of Aniaku et al. 2021 who reported a 41.8% prevalence in Igbo-Eze north of Ebonyi State, south eastern Nigeria. Another researcher reported a prevalence of 20.3% in Imobi, Ogun State, south western Nigeria (Okonofua et al. 2021). The present result was however higher than the prevalence of 4% and 2.4% reported in Ado-Odo/ Ota LGA and in Abeokuta respectively (Okorie et al. 2015). A similar mean result of 8.2% was reported by Okorie et al., 2013 in all geographical zones of Nigeria. The filarial antigenemia prevalence rate that was obtained in this study could be attributed to the suitability of environmental factors in the study areas such as the presence of suitable vector breeding sites (such as the unpolluted water bodies within the villages) and the daily human activities such as occupational (farming and fishing) disposition of the participants in the study areas. Being a rural agrarian community most of them live in mud houses with no ceilings which could have created easy access for the mosquito vectors to penetrate. The presence of fresh water habitats with little pollution in the villages studied, provides ideal environment for the mosquito vector to proliferate. Moreso, easy entry into houses of the habitants allow the mosquito vector to have direct contact with the individuals especially at night. To achieve elimination of LF in these areas, these prevailing factors should be adequately considered.

Secondly, poor knowledge about the disease might have affected their attitude towards prevention and control especially in relation to the mosquito vector. As observed in the present study, poor understanding of disease aetiology and prevention practices are thought to influence health seeking behavior in a given location (Amaechi et al. 2016; Hafizu et al. 2023). Infection was significantly higher in males (13.0%) than in females (5.3%) which might be attributed to attitudinal differences such as wearing shorter sleeves and pants and sometimes exposing the whole body thereby allowing the mosquito vector to have direct contact and so transfer the parasite. It is also assumed that males are more susceptible to filarial infection due to genetic and hormonal factors. Males often engage in social activities like drinking and gathering in public spaces increasing their risk of mosquito bite. Among the five villages studied, Shonga experienced the highest rate of filarial antigenemia prevalence.

The difference is not unlikely to be associated with poor environmental conditions that enhances mosquito vector breeding and personal protection against mosquitoes which was found to be almost absent. Significant variation in prevalence among the villages studied could also be attributed to differences in the socio-economic status, local environmental and ecological conditions that favors mosquito breeding. The filarial antigenemia prevalence did not follow a definite pattern with age. Individuals within the age bracket 40–49 years recorded the highest filarial antigenemia prevalence. This is similar to the findings of Elkanah et al. 2017 in Taraba State, who recorded the highest prevalence amongst individuals in the age bracket of 41–50 years. It is understandable that people of this age range tend to travel more in order to seek greener pastures. In doing so, they are exposed to bites of infected mosquitoes in the new areas they found themselves. Participants that were infected in the study area were seen manifesting symptoms such as hydrocele and lymphoedema. Lymphoedema was seen more though not significantly different. The public health importance of hydrocele and lymphoedema as observed in this study often have severe personal and social consequences for the affected individuals. Individuals having these symptoms were often stigmatized which could lead to psychosocial trauma. For proper health promotion campaign that is targeted at reducing any vector-borne disease, information on the knowledge, attitude and practices towards any disease is indispensable for the formulation and implementation of effective and sustainable control programme against the disease (Ahorlu et al., 1999; Omodu and Ochoga, 2011). This study revealed that majority of the inhabitants are unaware of the infection, this goes to show that information about this neglected tropical disease in the communities studied is quite low. This finding is similar to that of Jaiyeola et al., 2022 in a community in Oyo State, south western Nigeria. Contrary to our findings, Kouassi et al. 2017 in Conakry reported a high knowledge amongst inhabitants of that area about Lymphatic filariasis. Our result also revealed a wrong understanding of the causal agent of the infection. A good number attributed the cause to stepping on charm, sexual intercourse, eating contaminated food and other wrong reasons. This misplaced perception on the cause of the disease might be linked to socio-cultural belief of the people. Very few (20.9%) attributed the cause of the infection to mosquito bite. Our findings on misconception about the cause of LF is similar to previous studies in Benue, Kogi and Oyo (Omodu and Ochoga, 2011; Amaechi et al., 2016; Jaiyeola et al., 2022) where majority of the populace attributed the cause of LF to stepping on charm, lack of personal hygiene, sexual intercourse and other wrong reasons. Inadequate information about prevention measures towards LF was observed in the present study. Wrong perception about a disease might

affect patients seeking appropriate care at the right time. This can in turn aggravate the health situation and worsen the already poor economic status of the individual. Quite a good number (37.3%) felt that since the disease was associated with stepping on charms, the best way to prevent its occurrence was to appease the gods of the land. Very few (10.5%) correctly associated the infection to mosquito bites and other related measures geared at avoiding mosquito bites. The role of mosquitoes in the transmission of filarial parasites is poorly understood in the villages under the present study. This might be an obstacle in the course of creating awareness on the need to minimize mosquito contact which is targeted at prevention on the disease. The knowledge and perception about the disease amongst the participants in this present study reflects a very poor level of sensitization in this local government area. Therefore, intensive health education advocacy at the various village level through the various community health worker is strongly advocated.

Conclusion

A cross sectional community survey showed that the overall antigenemia prevalence in Edu Local Government Area is more than the threshold of 2% for initiating interventions to halt transmission in the entire LGA. This area should be included for filariasis elimination. The socio-behavioural aspects of the community is also favourable for transmission. Misconceptions on the transmission of filariasis prevails which may be addressed by strong advocacy in community preparation for mass drug administration.

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Author contributions ECA and FPO conceptualized and designed the study. AAA and AAA carried out the field work. PCN and CCN wrote the first draft. OOE analyzed the data. All the authors read through and made inputs.

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Declarations

Ethics approval and consent to participate Permission was sought for and received from Kwara State Ministry of Health, Ilorin (MOH/KS/EU/777/115). The community leaders were informed and approval given to carry out the research work. Permission was granted based on the agreement that patient anonymity will be maintained and that every finding will be treated with utmost confidentiality for the purpose of this research only. Informed consent of the participants was also sought and approval given before being included in the study. For minors (children below 16 years), consent was received from their parents/caregivers before their inclusion in the study.

Conflict of interest The authors declare that they have no conflict of interest.

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