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Research Article

Sero-prevalence of Lymphatic Filariasis in Six Communities of Talata Mafara Local Government Area, Zamfara State, Nigeria

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Abstract

Background and Objective: Lymphatic filariasis is a tropical disease caused by the parasitic filaroid nematode worms that are transmitted to humans by infected mosquitoes. It is the 4th leading cause of long-term and permanent disability. This study was conducted from May, 2017 to December, 2018 in order to determine the sero-prevalence of lymphatic filariasis in six communities of Talata Mafara Local Government Area, Zamfara state, Nigeria. **Materials and Methods:** Blood samples were sero-diagnosed to detect bancroftian infection using Rapid Diagnostic test. The participant's sterilized finger was punctured using lancet to collect blood (about 40-50 μ L) in a capillary tube and then transferred to the sample well of the test cassette. Then immediately 1-2 drops (about 35-50 μ L) of sample diluent was added to the sample well and the time was noticed. The result was read within 15 min. **Results:** An overall sero-prevalence of 37.8% was recorded. Shiyar Galadima had the highest sero-prevalence (43.1%) of infection among the communities. An analysis of the results using chi-square indicated that males (38.9%) aged between 51-60 years (63.6%) are significantly at higher risk of infection. The highest prevalence of 43.3% was occurred in farmers than those in the other occupational groups. **Conclusion:** The study area is endemic with lymphatic filariasis and therefore, sanitation, public enlightenment and mass drug administration are urgently needed in the study area, if the elimination of lymphatic filariasis is to be achieved by the year 2020.

Key words: Sero-prevalence, filariasis, *Wuchereria bancrofti*, Mafara, Zamfara, Nigeria

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Lymphatic filariasis is a parasitic disease caused by microscopic thread-like worms that belongs to the Nematode superfamily Filarioidea which inhabit the lymphatic vessels and lymph nodes of a human host^{1,2}. The parasites (*Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*) are transmitted by different species of mosquitoes³. The larvae of the parasites enter the human body at the time of the mosquito bite. They then travel to the lymphatic system, where they mature into adult worms. The adult worms can live for several years in the lymphatic system, where they mate and produce millions of live immature forms known as microfilariae that circulate in the blood⁴. The presence of these worms in the lymphatic system causes damage and blockage of the lymph channels thereby preventing the return of lymphatic fluid to the circulatory system. Such blockage results in the fluid accumulation in the tissues especially the legs and genitalia⁵. Symptoms of the infection in subcutaneous form include itching, urticarial, skin rashes, headache, muscle aches or pains, abdominal pain, high fever, nausea with or without vomiting and joint involvement or arthritis that may result to edema, the most common symptoms of filariasis that can lead to elephantiasis⁴. Elephantiasis is characterized by hardening and thickening of the skin and massive swelling of legs, arms, breasts or genitals².

Lymphatic filariasis is among the neglected tropical diseases being the second most common vector-borne parasitic disease after malaria, lymphatic filariasis was also ranked, the second leading cause of long-term and permanent disability after mental illness worldwide^{6,7}. An estimated 25 million men suffer with genital disease and over 15 million people are afflicted with lymphoedema⁸. In year 2000, more than 120 million people of all ages and sexes were infected with one or more of the lymphatic filariae worldwide³. Approximately, 80% of the infected individuals are living in the following ten (10) countries: Angola, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, India, Indonesia, Mozambique, Myanmar, Nigeria and the United Republic of Tanzania. About 947 million people in 54 countries worldwide are at risk of being infected with lymphatic filariasis. Enhanced strategies are now required in about 29 countries to achieve elimination targets and stop treatment^{3,9} by the year 2020.

Nigeria was rated as the third most endemic country with lymphatic filariasis in the world after India and Indonesia. It was reported that 22.1% of the Nigerian population is thought to be infected, with 66% people at risk of being

infected. The significant burden of lymphatic filariasis in Nigeria is caused by the *Wuchereria bancrofti*^{10,11}. The Cater Center¹² reported that, in Nigeria, lymphatic filariasis is transmitted by the same mosquito that transmits malaria. As Nigeria prepares to implement the Lymphatic Filariasis Elimination Programme (LFEP) there is need to have the necessary base line information on the distribution and nature of disease, but unfortunately readily available information of some areas that could be endemic is lacking and until data on the distribution of the disease is available that the elimination of the disease will be achieved in the country. It is in this light coupled with the absence of a comprehensive report on lymphatic filariasis in Zamfara state, that this study was conducted in order to determine its prevalence in Talata Mafara Local Government Area.

MATERIALS AND METHODS

Study area: The study was conducted at Talata Mafara Local Government Area of Zamfara state. Talata Mafara is located between latitude 12°21'00"-12°34'00"N and longitude 6°04'00"-6°04'00"E with an area of 1,430 km² and has estimated population^{13,14} of 306,606. The area is mainly populated by Hausa and Fulani tribes farming is their major occupation and they practice the same culture and religion^{15,16}. The mean annual rainfall in the area¹⁷ is 798 mm.

Ethical clearance: Before commencement of the study, an approval from State Health Research Ethics Committee and permission from the Ministry of Health were obtained, so as to have a better access to the community members and to ensure consent of their leaders and confidentiality of the participants for the study.

Determination of circulating filarial antigen: This study was conducted from May, 2017 to December, 2018 to determine the sero-prevalence of lymphatic filariasis in six communities of Talata Mafara Local Government Area, Zamfara state, Nigeria. Blood samples from 307 volunteers were sero-diagnosed for determination of circulating filarial antigen using *Aria filariasis* IgG/IgM Combo Rapid test for the simultaneous detection and differentiation of IgG and IgM anti-lymphatic filarial parasites (*W. bancrofti* and *B. malayi*) in human serum, plasma or whole blood, following the manufacturer's instructions¹⁸. The test cassette was labelled with the participant's ID number and then placed on a clean flat surface. The participant's left finger was sterilized with methylated spirit and then punctured using a sterile lancet

to collect blood (about 40-50 µL) in a capillary tube and then transferred to the sample well of the test cassette by making sure that, there are no air bubbles. Then, immediately 1 drop (about 35-50 µL) of sample diluent was added to the sample well. The result of each cassette was read within 15 min. The test result whether positive or negative was recorded on the questionnaire that corresponds to the participant's ID number.

Questionnaire administration: Questionnaires containing volunteer's socioeconomic data and test result (whether positive or negative) were used to obtain some descriptive information about the volunteers as described by Boynton¹⁹. The questionnaires were labelled to correspond to the volunteer's test cassette ID number and then administered to each volunteer that provided the blood for the test.

Statistical analysis: Prevalence of infection was calculated using the equation:

$$\text{Prevalence of infection} = \frac{\text{Total No. of infected}}{\text{Total No. of examined}} \times 100$$

Association between parasitism and wards, gender, age and occupation were screened by Chi-square test of goodness of fit. The p-value less than 0.05 were considered significant.

RESULTS

Sero-prevalence of lymphatic filariasis with respect to wards: The overall sero-prevalence of 37.8% was found in the study area. However, the prevalence of infection varied among the wards. Shiyar Galadima ward was found to have the highest sero-prevalence 22 (43.1%), while the least prevalence 13 (25.5%) was occurred in Ruwan-bore ward. The occurrence of the infection is not significantly associated ($p > 0.05$) with the settlement of the communities (Table 1).

Sero-prevalence of lymphatic filariasis with respect to gender: The results obtained with respect to gender of the people indicated that, males were found to be significantly ($p < 0.05$) more infected 72 (38.9%) than their female counterparts with 44 (36.1%) (Table 2).

Sero-prevalence of lymphatic filariasis with respect to age group: In age-related sero-prevalence of infection, people at age group of 51-60 were recorded with the highest

prevalence 7 (63.6%) of infection than their counterparts at other age groups, the least prevalence 13 (27.7%) was found at age group of 21-30. Chi-square analysis revealed significant association ($p < 0.05$) between infection and different age groups (Table 3).

Sero-prevalence of lymphatic filariasis with respect to occupation: The sero-prevalence of infection is statistically significantly ($p < 0.05$) associated with the occupation of the people in the study area. The highest sero-prevalence 26 (43.3%) and 38 (43.2%) of infection was occurred in students and farmers, respectively than in other occupational groups, however, the least prevalence 9 (23.7%) was recorded in those participating in civil service (Table 4).

Table 1: Sero-prevalence of lymphatic filariasis with respect to wards

Wards	No. of examined	No. of positive	Prevalence (%)
Garbadu	51	20	39.2
Jangebe	52	21	40.4
Kagara	51	21	41.2
Makera-taketsaba	51	19	37.3
Ruwan-bore	51	13	25.5
Shiyar Galadima	51	22	43.1
Total	307	116	37.8

NS: Not significant, χ^2 : 2.759, df: 5, $p = 0.737^{NS}$

Table 2: Sero-prevalence of lymphatic filariasis with respect to gender

Gender	No. of examined	No. of positive	Prevalence (%)
Male	185	72	38.9
Female	122	44	36.1
Total	307	116	37.8

Significant value, χ^2 : 6.759, df: 1, $p = 0.009^$

Table 3: Sero-prevalence of lymphatic filariasis with respect to age group

Age groups	No. of examined	No. of positive	Prevalence (%)
1-10	94	35	37.2
11-20	70	33	47.1
21-30	47	13	27.7
31-40	39	11	28.2
41-50	28	10	35.7
51-60	11	07	63.6
61-Above	18	07	38.9
Total	307	116	37.8

Significant value, χ^2 : 34.000, df: 6, $p = 0.000^$

Table 4: Sero-prevalence of lymphatic filariasis with respect to occupation

Occupations	No. of examined	No. of reactive	Prevalence (%)
Farming	88	38	43.2
Trading	51	13	25.5
Civil Service	38	9	23.7
Students	60	26	43.3
Unemployed	70	30	42.9
Total	307	116	37.8

Significant value, χ^2 : 24.948, df: 4, $p = 0.000^$

DISCUSSION

The results of this study revealed the overall sero-prevalence of 37.8% in infection with bancroftian filariasis in Talata Mafara Local Government Area indicating that the study area is endemic and also the active transmission is still occurring. The overall prevalence of infection obtained in the present study was lower compared to that of Obi *et al.*²⁰, who reported an overall prevalence of 73.0% in their study titled, Endemicity of lymphatic filariasis in three LGA of Imo state, Nigeria. The presence of infection in Talata Mafara communities could be attributed to the fact that majority of them are farmers that are living in rural areas where they are in close proximity to the water bodies that favour their farming activities. Conversely, these water bodies provide suitable mosquito breeding sites. Another contributing factor may be the presence of microfilariaemic individuals in addition to poor environmental and hygienic conditions within the communities that permit close proximity to various mosquitoes breeding sites (e.g., abundant tires, unused plastic and glass containers, broken mud pots, dirty and contaminated gutters etc.), thus, exposing the inhabitants to the mosquito vectors. These observations agreed with that of Obadiah *et al.*¹⁰ and Badaki *et al.*²¹.

The highest sero-prevalence of infection recorded in the community of Shiyar Galadima ward could be attributed to the lifestyle of the inhabitants and environmental factors that influence the population of mosquitoes due to the fact that Shiyar Galadima ward is more rural than the other five wards. This is in addition to being them in close proximity to the pond that retains stagnant waters which provide breeding sites for the mosquitoes. Similar observations were made by Obadiah *et al.*¹⁰ and Eneanya *et al.*²² in their studies conducted elsewhere. Gender-related sero-prevalence of infection indicated that males had the highest prevalence of 38.9% in infection with lymphatic filariasis than their female counterparts. This finding is in line with that of Obi *et al.*²⁰ and Parija and Garg²³. The significantly higher prevalence rate in males may be due to the fact that they are more exposed to the mosquitoes during their various outdoor activities. In the communities where this study was conducted, females are strongly restricted in the houses according to their culture and religion, they usually wear clothes (hijab) that do not expose their bodies, they are not allowed to play, swim and rest or do other work outside homes, this minimizes their exposure to mosquito bites. Dogara *et al.*²⁴ and Badaki *et al.*²¹ made similar observations in their studies. The significantly highest sero-infection rate of 63.6% obtained in age bracket 50–61 years is in conformity with the findings of

Obadiah *et al.*¹⁰. The fluctuation of the prevalence rate of infection observed among the age groups is inexplicable, but could be depend on the type of activities that exposes each group vulnerable to the mosquito bites. For example, subjects within the age of 1-20 years are considered school age children who expose themselves to different play grounds from where they may be biting by mosquitoes. The other age groups (21-above years) within these communities considered themselves as responsible adults who are expected to engage in different occupational activities especially farming. Therefore, the exposure to mosquitoes by these age groups is largely depends on the social and cultural activities of the communities. These observations corresponded to that of FMOH¹¹ and Okorie *et al.*²⁵. In the occupation related prevalence, the highest sero-prevalence of infection obtained in students mostly known as Almajirai and farmers than other occupational groups in the study area is not surprising, because (students) Almajirai within these communities are the most vulnerable group to mosquito bites, by the fact that majority of the Almajirai schools are poorly constructed, students are sleeping in open rooms without doors and windows. This maximizes the mosquito chances to access students (Almajirai) during the day and night. On the other hand, farmers are engaged in farming activities that prone them to the frequent mosquito bites more than any other occupational groups in the study area. These observations are supported by LeAnne and Christopher²⁶, who reported that occupation and socioeconomic status are important risk factors as filariasis affects primarily persons of the lowest socioeconomic level.

CONCLUSION

It is evident from the results of this study that Talata Mafara Local Government Area is endemic with bancroftian filariasis. It is further indicated that, males, students and farmers were at higher risk of the infection. Therefore, sanitation, public enlightenment and mass drug administration are urgently needed in the study area, if the elimination of the infection by National Lymphatic Filariasis Elimination Programme (NLFEP) is to be achieved by the year 2020.

SIGNIFICANCE STATEMENT

This study discovered that Talata Mafara Local Government Area of Zamfara state is endemic with lymphatic filariasis and active transmission is still going on, it further identified the categories (males, students and farmers) that are

at significant risk of infection with *W. bancrofti*. These results could be beneficial to National Lymphatic Filariasis Elimination Programme (NLFE) and relevant authorities for effective elimination of the disease in the area, since to my knowledge no similar study was conducted in the present study area. Other researches are encouraged to identify the major vectors (mosquitoes) responsible for the disease transmission and more areas that need intervention.

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