



Rapid Epidemiological Assessment of Lymphatic Filariasis in Northern Taraba Focus, Nigeria

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Abstract: This study was undertaken to determine the prevalence of Lymphatic Filariasis in eleven (11) foci communities of northern Taraba state. Blood samples were collected by finger prick method to determine the presence of filarial antigen in serum using immunochromatographic card test. Questionnaires and physical examinations were used to assess clinical manifestations associated with the infection. The result showed that 101/336 (30.02%) were positive for *W. bancrofti* circulating filarial antigen. The circulating filarial antigen prevalence among the eleven communities differ significantly ($p < 0.05$). There was no significant difference between antigenaemia positive males (32.0%) and female (27.7%) ($\chi^2 = 0.491$ df1, $P > 0.05$). However, the antigenaemia prevalence among the age groups differs, with ages 51-60 years having the highest prevalence among male and ages 41-50 years among female respectively ($\chi^2 = 11.424$, df 6, $P < 0.05$). Chronic clinical manifestation observed include Hydrocoel (17.12%) and lymphoedema of limbs (20.08%). Female had significant proportion of those with lymphoedema (14.8%). The findings showed a high prevalence of the infection which is far above the World Health Organisation threshold level of $\geq 1\%$ prevalence as well as significant prevalence of clinical manifestations. Therefore integrated intervention programme is required in the study area.

Keywords: Epidemiology, Assessment, Lymphatic Filariasis, Immunochromatographic Card, Diagnosis, Clinical Manifestations, Prevalence

1. Introduction

Lymphatic filariasis (LF) is a neglected tropical disease caused by the following parasitic nematodes, *W. bancrofti*, *Brugia malayi* and *B. timori*. These parasites are transmitted by many species of mosquitoes in four genera, *Anopheles* spp, *Culex* spp, *Aedes* spp and *Mansoni* spp [1].

Recent Global Burden of Disease (GBD) showed an estimated LF prevalence rate of 2.78% [2]. It is estimated that there are about 1.2 billion people who are at risk of the disease in the 83 countries in which LF is endemic (20% of

the world population); and over 128 million people are infected [3]

About 76 million people in the world are estimated to be suffering from the hidden disease or subclinical renal, respiratory, lymphatic and genital complications associated with LF [4]. Of the 128 million people infected globally by LF, 91% of them are due to *W. bancrofti* while *B. malayi* and *B. timori* account for the other 9% burden [5].

A recent estimation of the impact of MDA during the past

13 years suggests >96.71 million cases were prevented or cured, yet as many as 36 million cases of hydrocele and lymphoedema remain. Of the total population requiring preventative chemotherapy, 57% live in the South-East Asia Region (9 countries) and 37% live in the African Region (35 countries) [6].

In Africa, 35 countries are endemic, and Nigeria is believed to bear the highest burden of LF, with an estimated 80 to 120 million people at risk [7] [2]. In endemic communities, LF is most prevalent in the rural and slum areas, predominantly affecting the poorest of the poor [8] [9].

However, recent work by [10] showed that 66 of the 72 countries are currently endemic and for a further 17 countries where LF is no longer endemic. The study highlighted a restricted and highly heterogeneous distribution in sub-Saharan Africa, with transmission more widespread in West Africa compared to east, central and southern Africa.

The clinical manifestations of lymphatic filariasis range from periodic reoccurring attacks of localized inflammation, tenderness and pain, often accompanied by fever, nausea and vomiting known as acute adenolymphagitis (ADL) to chronic symptoms including lymphoedema, elephantiasis and chyluria [11]. The visible manifestations of the disease are severe and disfiguring. Lymphoedema and elephantiasis of the limbs and/or genitalia, hydrocoel and scrotal pathology in men, recurrent infections associated with damaged lymphatics, chyluria or abnormalities of the renal functions occur in an estimated 44 million people [12]. The socio-economic and psychological burden of the disease are enormous and included direct cost of treatment, losses resulting from incapacitation and loss of labour [13].

Reduced productivity experienced by LF patients results in hundreds of millions of dollars in economic losses each year. Recognizing the economic impact, disability and social stigma caused by LF and the availability of strategies to prevent infections and manage morbidity, WHO Member States committed to the global elimination of the disease as a public health problem [14].

Unprecedented and unplanned urbanization, overcrowding and deteriorating sanitary conditions in both urban and rural areas is believed to be exacerbating the transmission of this mosquito borne disease in Nigeria. [15]. More epidemiological and socio-economic information is needed on the disease distribution and intensity in endemic areas in Nigeria.

In view of the current elimination program which assumes no differences within the parasite population in West Africa, further studies are required in order to formulate appropriate strategies should there be genetic variability in *W. bancrofti* that may affect the success of MDA programs [16].

This study was therefore designed to determine the status of the infection in eleven communities of Northern Taraba focus despite the on-going preventive chemotherapy, called Mass Drug Administration (MDA), and provide epidemiological data where there are reported cases of clinical manifestation and active transmission of the infection in the study area.

2. Materials and Methods

The state lies approximately between Latitude 6°25' and 9°30'N and Longitude 9°30' and 11°45'E. It is bordered on the West by Nassarawa and Plateau state, South East by Bauchi and Gombe States, North East by Adamawa State and South west by Benue state. Taraba state is boarded to the East by the Federal Republic of Cameroon which is an international boundary. The state has a land area of about 60, 291 sq.km with a total population of 2, 300,736 persons based on the 2006 National Census Figures [17]. About 43, 453 km² of Taraba state is plain land, while 12, 929 km² is highland. The remaining 3, 909km² is wetland. Great majority of the people in the state are living in rural settlement consisting of hamlets and villages, the majority of the inhabitants live in rural agricultural areas with farming as the major occupation. The L. G. A has numerous streams transverse villages/communities and draining into the major river Benue. Communities rely mainly on the streams and river for water supply. Domestic water is usually stored in and around homes in drums, clay pots and all sorts of metal and plastic containers which provide permanent breeding sites for mosquitoes and ecological associates.

2.1. Ethical Clearance and Permission

The study received ethical clearance certificate from an institutional health research committee and ethical approval of Taraba state Ministry of Health. Also additional permission were sought and obtained from Local Government chairmen, Primary Health Care (PHC) department, Districts heads, Village heads, and key informants before the study commenced.

2.2. Rapid Assessment Method

On the schedule day, informed oral consent of individuals who gathered at the agreed venue (Village head compound, school or church premises) were sought and obtained after the explanation of the procedures and the benefit of the study and were examined for chronic clinical signs and symptoms of filariasis [18] [10]. Clinical symptoms, Lymphoedema of limbs, breast and Scrotal Elephantiasis were recorded in personal data form containing the patient's name. Female examination was restricted to the legs, arms and breast because of cultural inhibitions in most communities. Individuals with Lymphoedema of the limbs were classified according to the international society of lymphology as recommended by [19] as follows:

Grade 1 Lymphoedema: Lymphoedema without skin changes/thickening and fold. Oedema was reversible on elevation.

Grade 2 Lymphoedema: Lymphoedema with changes in skin texture but without folds. Oedema is not spontaneously reversible on elevation.

Grade 3 Lymphoedema: Lymphoedema with deep folds, with dermatosclerosis of Papillomatous lesion with knobs. Oedema was Irreversible.

2.3. Method of ICT Filariasis Test Kits (CTK Biotech Ink. San Diego, USA)

Finger prick method was used between 9:00 and 18:00 GMT at a designated venue agreed upon by members of the community [20]. Blood sample was carried out according to manufacturer's instruction. Briefly, the patient's left index finger was cleaned with methylated spirit and then punctured using a sterile lancet. The pipette dropper enclosed in the ICT kit was used to suck 60ul of blood and applied into the sample well in the device (cassette) making sure that air bubbles were removed, a drop of sample diluents was added immediately and the specimen migrated by capillary action across the cassette and read after 15 minutes. The test was read as positive if the test line "T" and control line 'C' were seen in the viewing window. Any visible line on the test area

indicated a positive test result even if it was lighter or darker than the 'C' line. The test was regarded as negative if only the 'C' line was seen and invalid if no line is seen on in the "C" line.

2.4. Statistical Analysis

Data obtained were entered in to computer, Microsoft Excel and Epi- info Version 7.0 was used for analysis. 2-way ANOVA to compare and test for differences in infection among communities. Chi square analysis was used to determine if significant difference exist in the prevalence of antigenaemia by sex, age grouping and occupation. The result was considered significant at $p < 0.05$. Frequency distribution tables and percentage prevalence were estimated using standard formulae.

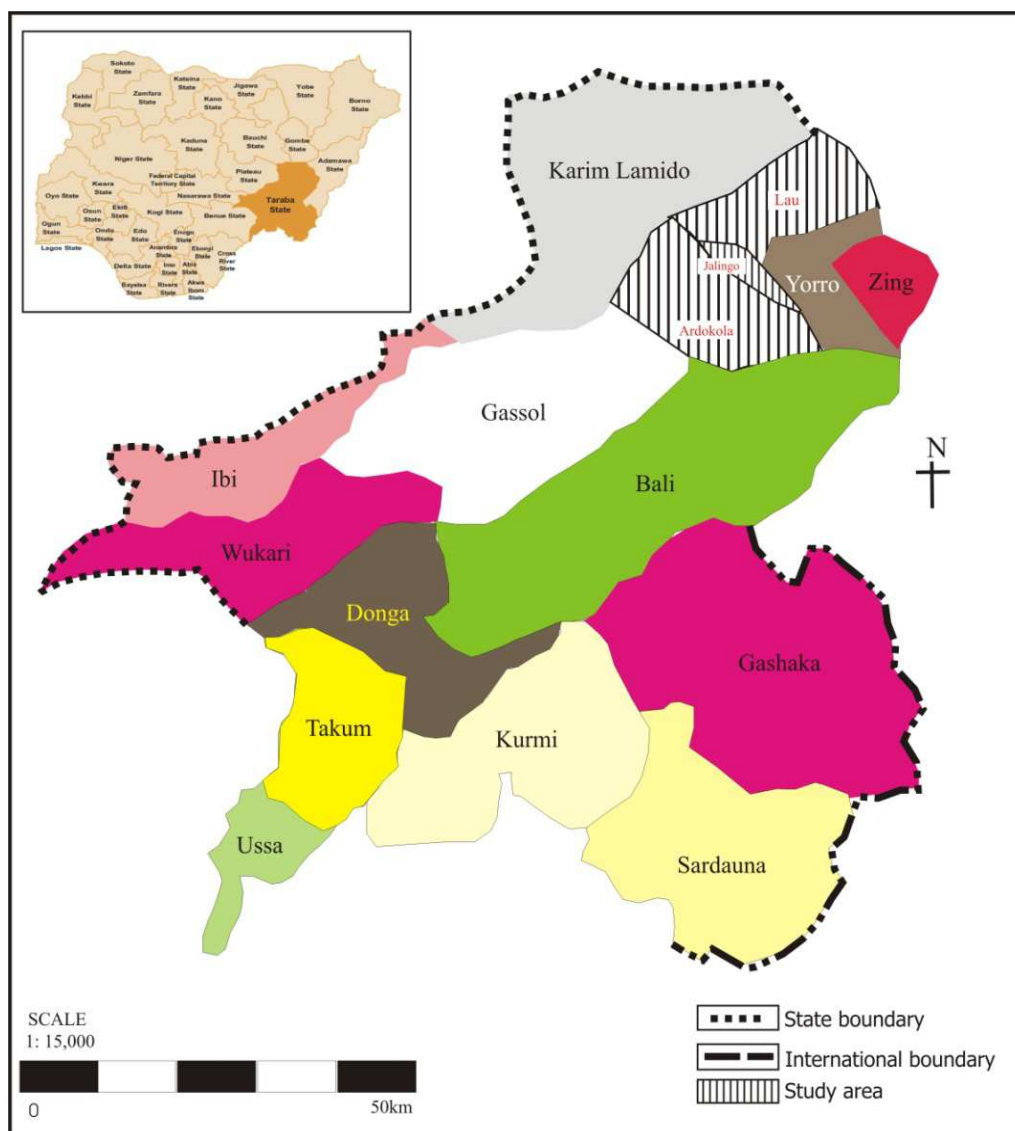


Figure 1. Map of Taraba State of Nigeria Showing the Study Location.

3. Results

A total of 336 individuals consisting of 181 males and 155

females from 11 communities of Northern Taraba state were examined using rapid Immuno Chromatographic Card Test to detect Circulating Filarial antigen (CFA) of *W. bancrofti*.

The overall prevalence in the study area was 101/336

(30.05%). The CFA prevalence among the 11 communities differed significantly (ANOVA, $p < 0.05$). The highest antigeaemia prevalence of 47.6% was observed in Nwagbala while, Sembe (18.2%) showed the least prevalence (Table 1).

Gender related prevalence showed that males have higher prevalence (32%) than the females (27.7%). However, there was no significant difference between males and females prevalence in the study area ($\chi^2 = 0.491$, df 1, $P > 0.05$).

The prevalence increase with age in both sexes (Figure 2). There was statistically significant difference in the prevalence among the age groups ($\chi^2 = 11.424$ df 5, $P < 0.05$).

Grades of Lymphoedema were observed in the study area. The number of patients with Grade 1 is higher than Grade 2 and 3 respectively (Table 3).

Chronic clinical manifestation of the disease observed include Hydrocoel and Lymphoedema. A total 31/181 (17.12%) of male who participated in the study had

hydrocoel. The prevalence in relation to Lymphoedema showed that female have 50/336 (14.8%) higher than male 27/336 (8.03%) Table 3.

Table 1. Distribution of *W. Bancrofti* Antigenaemia in 11 Communities of the Study Area.

Community	No. examined	No. positive	% positive
Dankodi	21	9	42.8
Garin Bako	58	15	25.8
Janibanbum	53	11	20.7
Jauro Ishaya	28	10	35.7
Jauro Votto	22	7	31.8
Lube	47	13	27.6
Murbai	25	9	36.0
Nwagbala	21	10	47.6
Sembe	11	2	18.2
Sobai	20	4	20.0
Vango	30	11	36.6
Total	336	101	30.05

Table 2. Sex-related *W. Bancrofti* Antigenaemia According to Communities in the Study Area.

Community	Male		Female		Total	
	No. examined	No. +ve (%)	No. examined	No. +ve (%)	No. examined	No. +ve (%)
Dankodi	14	7 (50.0)	7	2 (28.6)	21	9 (42.8)
Garin Bako	26	10 (38.5)	32	5 (15.6)	58	15 (22.8)
Janibanbum	26	4 (15.3)	27	7 (25.9)	53	11 (20.7)
Jauro Ishaya	14	3 (21.4)	14	7 (50.0)	28	10 (35.7)
Jauro Votto	10	1 (10.0)	12	6 (50.0)	22	7 (31.8)
Lube	20	8 (40.0)	27	5 (18.5)	47	13 (27.6)
Murbai	15	6 (40.0)	10	3 (30.0)	25	9 (36.0)
Nwagbala	11	4 (36.4)	10	6 (60.0)	21	10 (47.6)
Sembe	9	2 (22.2)	2	0 (0.0)	11	2 (18.2)
Sobai	13	3 (23.1)	7	1 (14.2)	20	4 (20.0)
Vango	23	10 (43.5)	7	1 (14.3)	30	11 (36.6)
Total	181	58 (32.0)	155	43 (27.7)	336	101 (30.05)

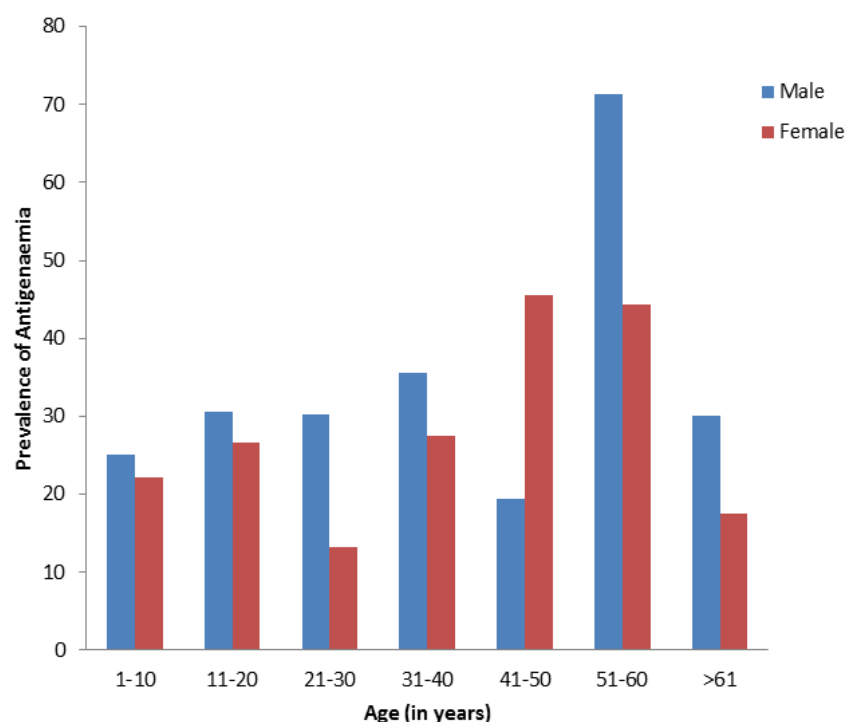


Figure 2. Prevalence of Antigenaemia According to Age and Sex in the Study Area, 2013.

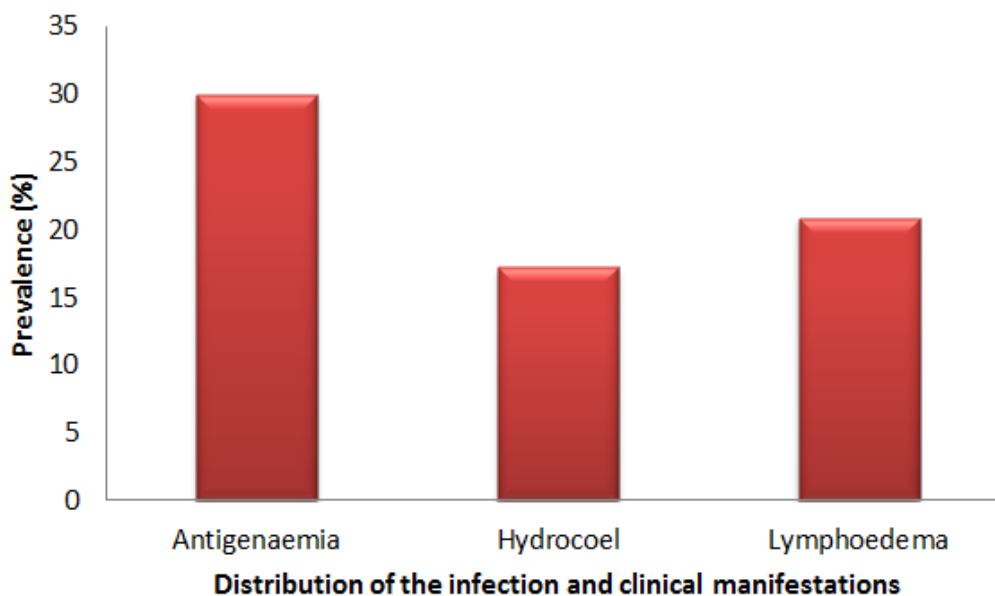


Figure 3. Prevalence of the Infection and Clinical Manifestations in the Study Area.

Table 3. Distribution of Grades of Lymphoedema in the Study Area According to Sex.

Community	No examined	No. with Lymphoedema	Sex	Grades of Lymphoedema		
			No. (%)	1	2	3
Dankodi	21	10	M 3 (14.28)	2	1	0
			F 7 (33.3)	4	2	1
Garin Bako	58	15	M 2 (3.4)	2	0	0
			F 13 (22.4)	12	0	1
Janibanbum	53	9	M 5 (9.4)	3	2	1
			F 4 (7.5)	4	2	1
Jauro Ishaya	28	11	M 2 (7.1)	2	0	0
			F 9 (32.1)	6	2	1
Jauro Votto	22	7	M 3 (13.6)	0	2	1
			F 4 (18.2)	3	0	1
Lube	47	4	M 2 (4.2)	1	1	0
			F 2 (4.2)	1	1	0
Murbai	25	6	M 1 (4.0)	1	0	0
			F 5 (2.0)	2	1	2
Nwagbala	21	9	M 5 (23.8)	1	2	2
			F 4 (19.0)	2	2	0
Sembe	11	3	M 1 (9.0)	1	0	0
			F 2 (18.0)	1	1	0
Sobai	20	3	M 3 (15.0)	2	1	0
			F 0 (0.0)	0	0	0
Vango	30	0	M 0 (0.0)	0	0	0
			F 0 (0.0)	0	0	0
Total	336	77 (20.8)	M 27 (8.03)	15	9	4
			F 50 (14.8)	35	11	7
			M + F = 77	50	20	11

4. Discussion

Nigeria is believed to be the third most endemic country in the world after India and Indonesia [21]. This study provides the prevalence and the burden of Lymphatic filariasis in Northern Taraba focus. The overall prevalence of 30.05% among individuals in the eleven (11) communities despite the ongoing of MDA in some of the communities has further confirmed that Bancroftian Filariasis is widely distributed in Taraba state.

The prevalence observed in the study area here agreed with the work carried out in Brazil [22] and Kuwait. [23]. However, the prevalence of CFA in the present study was much higher than that of 6.45% observed in Benue state of Nigeria [24] and 21.13% recorded in Afikpo North Ebonyi State Eastern Nigeria [25]. The high endemicity in these communities may be as a result of the availability of mosquito breeding sites and deteriorating sanitary conditions [26].

In the current study, the age related prevalence of CFA, there was an increase of prevalence by age. This is consistent

with the observation in North central Nigeria [27]. However, contrast the findings was observed in Benue state, Nigeria [19] who recorded higher antigenaemia prevalence among the 40 – 49 years. The ICT procedure was easy to use in the field and also very specific in detecting CFA compared to thick blood film preparation which is not convenient because of night blood collection [28].

Clinical examination and data collection procedures for the search of hydrocoel and Lymphoedema were convenient, simple and cost effective. The prevalence of hydrocoel encountered in this study is similar to those reported in other parts of Nigeria [9] [22]. Our findings support the recommendations for the use of hydrocoel and Lymphoedema as rapid community indicator for lymphatic filariasis endemicity [5] [11]. In the current study women formed a significant proportion of those affected with the disease probably because majority of them are farmers. Studies from other endemic areas have also reported that vast majority of Lymphoedema cases are women [24]. The study also revealed that 98% of Lymphoedema patients suffered from episodes of ADL attack. This is consistent with similar observation in other parts of the world [29]. The long period of exposure required before infection developing to potency could be responsible for the gradual increase of morbidity with age that is observed. Most affected people were the middle aged and elderly. The frequent attacks among farmers could be due to farming activities which often increased chances of sustaining the frequency of ADL attacks as observed by [30].

5. Conclusion

This study provided a rapid analysis of the status of the infection and its associated clinical manifestations in the study area. The high prevalence of LF in the study which is far above WHO threshold of $\geq 1\%$ despite the ongoing Mass Drug Administration of Ivermectin and Albendazole in the state demand an urgent attention. We therefore recommend a more comprehensive and integrated method in the control of the infection in order to achieve the goal of eliminating the disease by the year 2020.

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Availability of Data and Materials

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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Authors' Contributions

ESO, EDS, KSL AGI. SAB and MAA contributed to study design and the first and subsequent manuscript drafts. ESO, EDS and ADE implemented the study and data analysis. ESO, KSL, AGI and SAB wrote the manuscript. All of the authors read and approved the final version of the manuscript.

Competing

There is no competing interest.

Consent for Publication

Not applicable in this section.

Consent from Participants for Publication

Not applicable to this study.

Ethics Approval and Consent to Participate

Ethics approvals were obtained from an institutional health research committee and ethical approval of Taraba state Ministry of Health. Also additional permission were sought and obtained from Local government chairmen, Primary Health Care (PHC) department.

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