Lymphatic filariasis in six rural villages of yauri local government area, Kebbi state, Nigeria

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Abstract

The elimination target deadline of 2020 set by the global program for the elimination of lymphatic filariasis (GPELF) is at hand. Mass Drug Administration (MDA) with Albendazole and ivermectin has been going on in yauri LGA for over five years. Apart from the baseline mapping conducted by the state ministry of health in 2010 to identify communities eligible for MDA, no comprehensive research has been carried out on the disease in the area. This study conducted between June and December 2016 was aimed at determining if transmission been halted so that MDA can be stopped. A total of 432 volunteers were tested using onsite filariasis IgG/IgM Combo Rapid test kit and Night blood samples. Clinical manifestations and entomological studies were also conducted. Thirty one participants, 31 (7.18%) tested positive for ICT and 11 (2.55%) for microfilaria of *W. bancrofti*. Infection rate was slightly higher in zamare village for ICT (P=0.053) and significantly Higher for mf in the same village (P<0.05). Infection rates were higher in males than females, age group 0-9, married than singles and famers than other occupations. However the differences were not statistically significant. No case of chronic physical manifestation was observed. Out of 181 mosquitoes dissected, 1(0.55%) *Culex quinquifasciatus* was found with microfilaria of *W. bancrofti*. It was concluded that active transmission of the disease is still going on in Yauri LGA and those who live in Zamare village are at greatest risk of infection. Aggressive sensitization to increase MDA compliance and vector control are recommended.

Keywords: lymphatic filariasis, ICT, *W. bancrofti*, yauri, kebbi state

Introduction

Lymphatic filariasis, also known as elephantiasis is a mosquito-borne parasitic disease that damages the Lymphatic system leading to severe disfigurement, pain and disability. Three nematodes- *Wuchereris bancrofti*, *Brugia malayi and Brugia timori* cause this infection. *W. bancrofti* is the commonest in Africa [1], Nigeria Inclusive [2].

The disease is transmitted from human to human by the infective bite of certain species of mosquitoes. In Africa, the most common vector is Anopheles. And in the Americas, it is *Culex quinquifasciaties* and Aedes species while mansonia species transmit it in Asia and the pacific region [3].

Infection with Lymphatic filariasis can be asymptomatic, acute or chronic. Majority of infections are asymptomatic showing no external sign of infection [4]. Acute manifestations include fever, chills headache, skin lesions [5]. Swellings, warmth, redness and pain [6]. When it develops into chronic condition, it leads to Lymphoedema, hydrocele, breast oedema [7]. It can also lead to chyluria, [8] and tropical pulmonary eosinophilia [9].

The disease is a public health problem in endemic areas mainly in Asia, Africa, America and the Pacific [10]. In 2000, over 120 million people were infected, more than 1.3 billion people at risk and over 40 million people lived with chronic disease in 81 countries [10]. Currently, due to the success of elimination programme, 856 million people are threatened in 52 countries and 36 million are living with morbidity [11].

In 2000, Nigeria was the third most endemic country globally after India and Indonesia and most endemic in Africa [14]. Currently Nigeria is the second most endemic country worldwide after only India and still the most endemic in Africa [13]. According to [14], There is a heterogenous distribution of the disease risk areas across Nigeria, with large portions of northern Nigeria having more environmentally suitable conditions for the occurrence of the disease. Efforts have been going on worldwide to eliminate the disease by 2020 and almost all endemic countries rely on the single-dose two drug regimen recommended for its elimination [15]. To this end this study assessed the extent and severity of the infection in Yauri LGA to determine if transmission has been halted.

Materials and methods

Study area

The study was conducted in Yauri Local government area of Kebbi state. Yauri is located in southern part of Kebbi state between longitude 4º and 6˙ East and latitude 12º and 10˙ North and covers an area of about 156 sq km [16]. It is surrounded by river Niger and other water bodies. It has a mean annual temperature of 21º-38ºc, with highest temperature being experienced in April. Mean annual rainfall is 500mm with bulk of the rain falling between may and September [17]. The three major ethnic groups are Kambari, Tsarkawa and Dukkawa, other groups are Hausawa, Gungawa, Zaburmawa. Yorubas,

igbos and people from middle belt are also found there. The main occupation of the people is farming and fishing, few are traders and civil servants. Majority of the people are poor, living in Cracked mud huts virtually unprotected from mosquitoes. Untidy environment, irrigated farms and broken clay pots and canoes that support mosquito breeding are common sights.

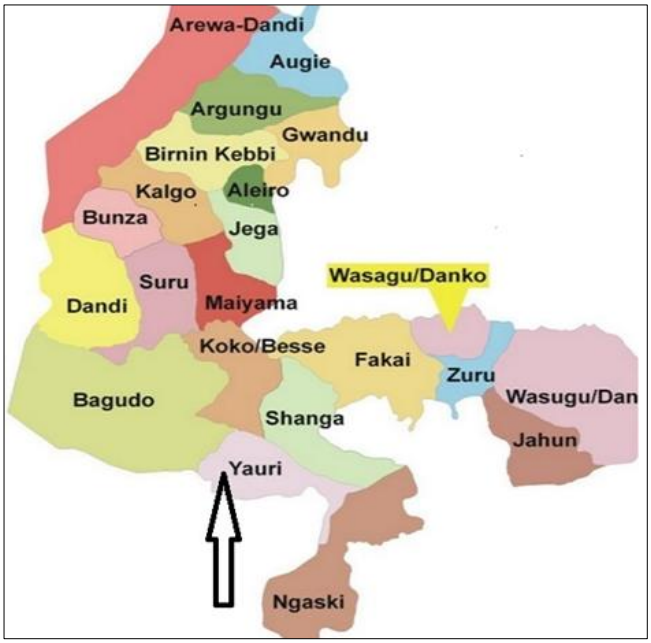

Fig 1: Map of Kebbi state showing Yauri LGA

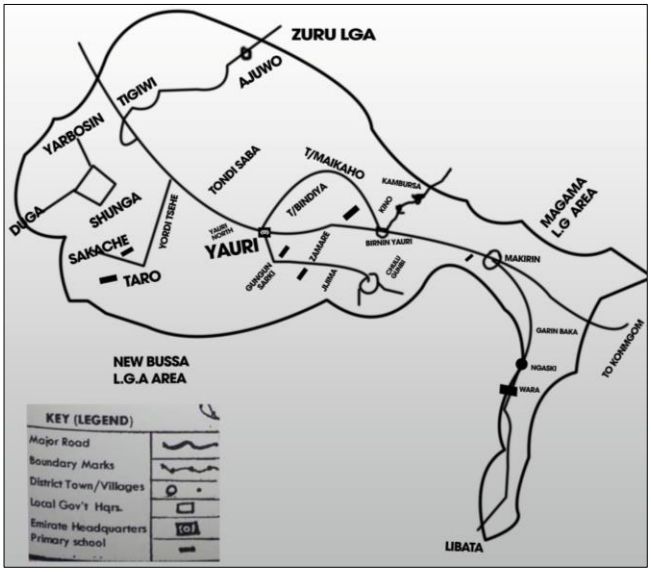

Fig 2: Map of Yauri LGA showing the study villages

Consent and approval

Before the commencement of the study, ethical permission was obtained from Yauri Local government secretariat. Consent was also obtained from the village heads of the six villages and health focal personnel's and they were all involved in the study.

Sampling method/study design

Six villages were randomly selected from the local government area by simple balloting technique. The study was cross-sectional and participation was purely voluntary. The age allowed was five years and above.

Sample collection (serological test)

The immunochromatographic card test (ICT) kit used in this study is the Onsite filariasis IgG/Igm Combo Rapid test. It is based on the detection of Circulating filarial Antibody (CFA). After collecting demographic data, ICT was performed following manufacturer's instructions on the kit. The participants left index finger was cleaned with cotton wool soaked in methylated spirit and punctured with sterile lancet. Sufficient fresh blood to fill a 100µl capillary tube was obtained and transferred to the sample well on the test cassette. One or two drops of sample diluents (buffer) were added and the time noted on the cassette. ICT result was read after 15 minutes. Positive result is when two or three pink lines appear on the test window. Negative result is when only one line, the C line (control) appear. If C line did not appear at all, the test is invalid. Test result was recorded on both cassette and individual data sheet.

Parasitological examination

Night blood samples were collected from the subjects between 10.00pm and 2.00am. Finger-prick blood was collected using disposable sterile lancet [18]. Thick blood smears were made from about 20µl of blood samples. The thick films were air dried, fixed in methanol, stained with giemsa and examined under microscope [19] Micofilariae were identified based on scientific morphological features and sizes, they were counted and recorded on the data sheet.

Clinical examination

The search for chronic clinical manifestation was conducted with the help of a trained medical personnel. All consented males were examined in private rooms in good light for the presence or absence of hydrocele [20]. Limbs and female breasts were also examined for the presence or absence of lymphoedema and breast oedema. Acute stage symptoms (Adenolymphangitis) were diagnosed by taking history of periodic fever/chils that lasted 4-7 days.

Entomological studies

Houses were randomly selected in each village for mosquito collection. Light traps and pyrethrum spray (Baygon) were used for mosquito collection which was done between 4.00am and 6.00am. Light traps were set outside while pyrethrum spray was done inside the houses. Collections were separated by sex and males were discarded while females were identified into species and dissected [21]. All observations were recorded on the data sheet.

Data analysis

Data was analyzed using SPSS package version 21.0. Chi-square analysis was employed to determine association between infection rate and variables. Entomological data was presented in tables and percentages. Infection rate and infectivity rates were calculated. *P* values<0.05 was considered statistically significant.

Result

A total of 432 individuals were tested from the study area. The overall prevalence rate detected by ICT and mf were 31(7.18%) and 11 (2.55%) respectively, all the villages were ICT positive with highest seroprevalence recorded in zamare village 10(14.93%).

Microfilaria of *W. bancrofti* was isolated from three villages, zamare village still recorded highest prevalence 6(8.96%). Statistical analysis revealed significant variation of mf prevalence.(x^2=17.581, P=0.004) while the variation was not significant by ICT rate (x^2=10.934, P=0.53).

Gender - related infection rate revealed that males 23(8.01%) were more infected than females 8(5.52%) by both ICT detection and mf. However there was no significant variation statistically (P > 0.05).

Infection rate did not show any age-related pattern, it fluctuated. Highest ICT infection rate was recorded in 0-9 years age group while highest mf rate was at 50-59 years age group. Statistically variations in both were not Significant (P>0.05). Married participants were more infected than singles by both methods of detection and in both cases (P>0.05). Farmers showed higher infection rate than other occupational groups by both ICT 9(10.78%) and MF 4(3.92). There was no statistical significant association in infection rate in both cases (P>0.05). Infection rate by highest educational status attained showed that those who had secondary educational status, 8(8.799) were more infected than others while those with primary education status had the least infection 4(4.82%). There was no significant association between infection rate and educational status (x^2=1.157, P=0.763). Correlation between ICT and MF revealed moderate positive association (r=0.581, P=0.000).

Clinical examination result revealed that apart from 31(7.78%) participants who complained of periodic fever/chills, no case of chronic manifestation associated with lymphatic filariasis was observed in the area. Correlation co-efficient between infection rate and fever revealed strong positive ICT association (r=1.000, P=0.000).

A total of 181 female mosquitoes were dissected, 69(38.12%) were *A.gambia*, 92(50.83%) *C. quinquifasciatus* and 20 (11.05%) were *A. egypti* species. Parity status revealed that 52(28.70%) were nulliparous, 55(30.41) parous and 74(40.92%) were gravid. Only 1(0.55%) *C. quinquifasciatus* caught from zamare village was found harboring one L_3 larva of *W. bancrofti* in its thorax. Overall infection rates and infectivity rates were 0.55% and 0.55% respectively.

Table 1: Village Prevalence and Intensity of Lymphatic filariasis in Yauri LGA

Villages	No. Ex.	ICT Positive	Prev.	MF Positive	Prev.
Chulugumbi	73	1	1.37	0	0.0
Gungun Sarki	71	3	4.22	0	0.0
Jijima	75	5	6.67	0	0.0
Tondi	74	6	8.11	2	2.7
Yauri North	72	6	8.33	3	4.17
Zamare	67	10	14.93	6	8.96
Total	432	31	7.18	11	2.55

Table 2: Gender-related Prevalence and intensity of LF in Yauri LGA

Villages	No. Examined (Male)	ICT Positive (%)	MF Positive (%)	No. Examined (Female)	ICT Positive (%)	MF Positive (%)
Chulugumbi	51	1(1.96)	0(0.0)	22	0(0.0)	0(0.0)
Gungun Sarki	57	3(5.26)	0(0.0)	14	0(0.0)	0(0.0)
jijima	52	4(7.69)	0(0.0)	23	1(4.35)	0(0.0)
Tondi	31	5(16.13)	1(3.23)	43	1(2.33)	1.(2.33)
Yauri North	39	2(5.13)	2(5.13)	33	4(2.12)	1(3.03)
Zamare	57	8(14.04)	5(8.77)	10	2(20.0)	1(10.0)
Total	287	23(8.01)	8(2.79)	145	8(5.52)	3(2.07)

Table 3: Age-related Prevalence and intensity of LF in Yauri LGA

Age group	No. examined	ICT positive	Prev.	MF positive	Prev.
0-9	27	3	11.11	0	0.0
10-19	116	8	2.61	3	2.59
20-29	114	10	6.89	2	1.75
30-39	79	4	5.06	2	2.53
40-49	35	2	5.71	1	2.86
50-59	33	3	9.09	2	6.06
60-69	21	1	4.76	1	4.76
70-79	0	0	0	0	0.0
Total	432	31	7.18	11	2.54

Table 4: Prevalence of Lymphatic filariasis according to marital status

Marital status	No. Examined	ICT Positive	Prev.	MF Positive	Prev.
Single	171	11	(6.43	3	(1.75)
Married	261	20	(7.66)	8	(3.06)
Total	432	31	(7.18)	11	(2.55)

Table 5: Occupation-based Prevalence of Lymphatic filariasis in Yauri LGA

Occupation	No. Ex.	ICT Positive	Prev.	MF Positive	Prev.
Civil Servant	17	0	0.0	0	0.0
Farming	102	11	10.78	4	3.92
Fishing	26	2	7.69	1	3.85
House wife	54	2	2.70	1	1.85
None	17	1	5.88	0	0.0
Student	99	6	6.06	3	3.03
Trading	18	0	0.0	0	0.0
Pupil	87	9	10.34	2	2.29
Others	12	0	0.0	0	0.0
Total	432	31	7.18	11	2.55

Table 6: Prevalence of Lyphatic filariasis according to educational level in Yauri LGA

Education	No. Ex.	ICT Positive	Prev.	MF positive	Prev.
None	240	18	7.5	08	3.33
Primary	83	4	4.82	0	0.0
Secondary	91	8	8.79	3	3.29
Tertiary	18	1	5.56	0	0.0
Total	432	54	12.5	11	2.55

Table 7: Intensity of Lymphatic Filariasis infection in each village of Yauri LGA Sampled

Village	No. Ex.	MF Positive	Sum	Mean Intensity (MF/ML)
Chulugumbi	73	0	0	0.00
Gungun Sarki	71	0	0	0.00
Jijima	75	0	0	0.00
Tondi	74	2	3	2.00
Yauri North	72	3	6	3.00
Zamare	67	6	10	2.75
Total	432	11	19	2.66

Table 8: Number of Mosquitoes Dissected and their parity status in Yauri LGA

Villages	No. of Mosquitoes dissected	Parous (%)	Parous (%)	Gravid (%)	No. With mf (Infection Rate%)	Infecting rate (%)
Chulugumbi	30	8(26.67)	10(33.33)	12(40.00)	0(0.00)	0(0.00)
Gungun Sarki	30	11(36.67)	11(36.67)	8(26.67)	0(0.00)	0(0.00)
Jijima	30	9(30.00)	10(33.33)	11(33.67)	0(0.00)	0(0.00)
Tondi	30	8(26.67)	8(26.67)	14(46.67)	0(0.00)	0(0.00)
Yauri North	31	10(32.23)	5(16.13)	16(51.61)	0(0.00)	0(0.00)
Zamare	57	6(20.00)	11(36.67)	13(43.33)	1(3.33)	1(3.33)
Total	181	52(28.7)	5.5(3.038)	74(40.9)	1(0.55)	1(0.55)

Table 9: Specie composition of dissected mosquitoes in Yauri LGA

Village	*A. gambiae* (%)	*C. quinquifasciatus* (%)	*A. egypti* (%)	Total
Chu/gumbi	11(36.67)	15(50.00)	3(10.00)	29
Gungu Sarki	9(30.00)	13(43.33)	3(10.00)	25
Jijima	12(40.00)	17(56.67)	4(3.33)	33
Tondi	13(43.33)	19(63.33)	0(0)	32
Yauri-North	11(35.48)	10(32.26)	3(9.68)	24
Zamare	13 (43.33)	18(60.00)	7(23.33)	38
Total	69(38.12)	92(50.83)	20(11.05)	181

Discussion

The overall seroprevalence of 7.18% obtained in this study is lower than 10.0% [22], 21.0% [23], and 38.72% [24] in Sokoto state, India and Zamfara states respectively. It is however higher than 1.7% [25] in Rwanda and WHO's threshold of 1% serepositivity for MDA in a given community [26]. Mf prevalence of 2.55% is higher than 1.6% [27], 1.5% [28] and WHO's 1.7% threshold for Bancroftian filariasis [29]. This result is an indication of significant transmission of the disease in the area. This is probably due to environmental factors which favour mosquito breeding and also non-compliance to MDA by some inhabitants.

Significant higher infection in Zamare village is not surprising as it is situated directly at the bank of River Niger with suitable environmental factors for mosquito breeding. Slightly higher infection in males than female is expected as Yauri women engage in outdoor activities as males, both are almost equally exposed to mosquitoes. Many reports also recorded slightly higher infections in males than females [30, 31]. Infection did not follow any age-related pattern as it fluctuated. CFA was highest in 0-9 years age group and mf in 50-59 age group. This is because CFA is detected early in life while mf takes time to

establish. Again in northern Nigeria, many boys sleep outside their houses and in Islamic schools with no protection from mosquitoes. Similar age-related result was report by [32] and [33]. Highest infection rate was recorded among people with secondary education status, farmers and married persons, however the infection rate was not significant. It seems they are equally exposed to the vector bites. The mean mf intensity of 2.66mf/ml of blood is lower than 10.4m/ml [1], 30.6 mf/ml and 23.9mf/ml [34] in Ado OTA and Abeokuta south respectively of Ogun state. This indicates low worm load, probably the effect of MDA in the study area.

The absence of chronic clinical signs (hydrocele, lymphoedema, etc) is inexplicable and requires further study. However similar finding was reported by [34] in Ogun state. One *C. quinquifasciatus* habouring one mf of *W. bancrofti* caught in the area further confirms the active transmission of lymphatic filariasis in the study area.

Conclusion

From the results obtained in this study, it is concluded that active transmission of lymphatic filariasis exist in Yauri LGA of Kebbi state and aggressive sensitization of the inhabitants to increase compliance to MDA as well as environmental sanitation is required to meet up with the 2020 elimination target.

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