Biotechnology

Assessment of Bancroftian filariasis status seven years after mass medicine administration in kalgo local government area of Kebbi State, Nigeria

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Received 16 Feb 2023; Accepted 22 Mar 2023; Published 7 Apr 2023

Abstract

Background: Kalgo Local Government Area of Kebbi State was declared eligible for Mass Medicine Administration (MMA) with Ivermectin and Albendazole in the year 2010 after baseline mapping. MMA started in the LGA in 2011. This study is aimed at evaluating its current status to see if the MMA was successful.

Methodology/Principal findings: A total of 401 volunteers were tested using onsite filariasis 1gG/1gM Combo Rapid test kit and night blood samples in six rural villages. Clinical manifestations and entomological studies were also conducted. Only one participant, 1 (0.25%) tested positive for rapid (CFA) test and none, 0 (0.00%) for microfilaria of *W. bancrofti*. The positive participant is in the age range 30-39, a farmer, married, male and hails from Bangana village. Statistical analysis reveals no significant association between infection rate and the above variables. Overall prevalence of clinical manifestations was 3.24% with lymphedema, hydrocele, fever/chills constituting 0.49%, 1.25% and 1.49% respectively of the total population. The age group 70+ had the highest (33.33%) prevalence of clinical manifestations, followed by 60-69 (27.27%). 177 female mosquitos (Anopleles & Culex sp) were dissected and no microfilaria of *W. bancrofti* was observed.

Conclusion/significance: it was concluded that infection level has been reduced to a point where community wide drug treatment can be discontinued, continued surveillance and maximizing bed-net coverage are still required to guard against importation of the infection from surrounding endemic LGA's and States until Nigeria achieves elimination Nationwide.

Keywords: CFA, microfilaria, lymphoedema, hydrocele, kalgo LGA

Introduction

Lymphatic filariasis is a debilitating but preventable disease that not only affects patients and their families but also communities and health care systems [1]. The disease is caused by infection with the parasitic worm *Wuchereria bancrofti* in Africa (*Brugia malayi and B. Timori* in Asia-Pacific) and is transmitted by Anopheles, Culex, Acdes and Mansoni mosquitoes [2], infection with the parasite leads to disabling lymphedema, hydrocele and acute adenolymphangit is (ADL) [3] as well as less-evident morbidity such as adenopathy, lyphangitis, haematuria and proteinuria [3]. Infection is usually acquired in childhood while the visible manifestations appear later in life [4].

In 2000, over 120 million people were infected, more than 1.3 billion at risk and over 40 million people lived with the chronic disease in 81 countries [5]. In 2020, 863 million people in 50 countries were living in areas that require preventive chemotherapy to stop the spread of infection [6]. Lymphatic filariasis can be eliminated by stopping the spread of the infection through preventive, chemotherapy with safe medicine combinations repeated annually. According to [6], 8.6 billion cumulative treatments have been delivered to stop the spread of infection since 2000. Due to successful implementation of WHO strategies, at the end of 2021 Preventive Chemotherapy (PC) to eliminate the transmission of the infection was considered required in only 44 out of 72 endemic countries [7]. Nigeria is one of over 70 countries endemic for lymphatic filariasis with an estimated 134 million people at the risk of infection [8]. Mass Medicine Administration started in the Federal Capital Territory (FCT) and in many states including Kebbi State in 2011.

Materials and methods

Study area

This research was carried out in Kalgo LGA, which is located between latitudes $12^0 07^{'}$N and $12^0 29^{'}$N and longitudes $3^0 12^{'}$E and $4^0 10^{'}$E. It is bounded by Birnin Kebbi LGA in the North, Maiyama LGA in the East, Bunza LGA in the South and Arewa LGA in the West.

The LGA has a mean annual temperature of 21^0c 0 38^0c, though it sometimes fluctuates. The highest temperatures are recorded in April and May. The harmattan season runs through November to February, while the hot season starts from March to May. The mean annual rainfall is about 500mm and the bulk of the rains fall between June and September with an average of 190mm in August [9]. The ethnic composition of the people is mostly Hausa, Fulani and Zabarmawa. A significant number of the people are farmers. The LGA is blessed with a number of Rivers and vast Fadama land for cultivation of rice, millet, guinea-corn, maize, groundnuts and fishing.

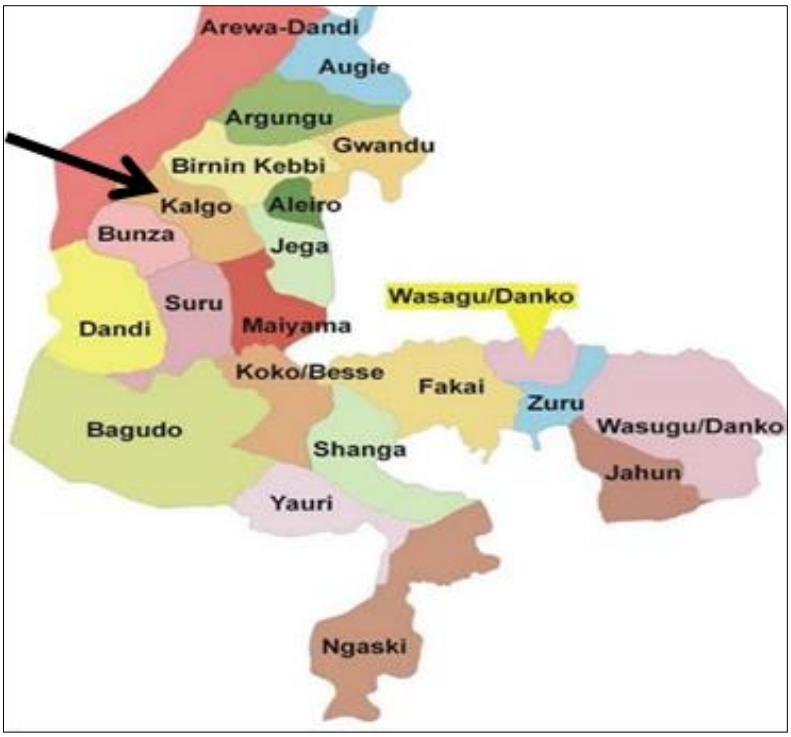

Fig 1: Map of Kebbi state showing Kalgo LGA

Fig 2: Map of Kalgo LGA showing the study villages

Consent and approval

Before the commencement of the study, ethical permission was obtained from Kalgo Local government secretariat. Consent was also obtained from the village heads of the six villages and health focal personnels 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 [10]. 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 [11] Micofilariae were identified based on certain morphological features and sizes, they were counted and recorded on the data sheet.

Clinical examination

The search for chronic clinical manifestations 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 [12]. 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/chills 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 5.00am 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 [13]. All observations were recorded on the data sheet.

Data analysis

Data was analyzed using SPSS package version 21.0. Prevalence was analyzed in percentages, using chi-square to test for significance. Correlation co-efficient was used to determine the relationship between ICT and hydrocele, ICT and lymphoedema. $p<0.05$ were considered statistically significant.

Result

Of 401 participants tested, 1 (0.25%) was positive for Circulating Filarial Antibody (CFA) of *W. bancrofti* and none of the participants was positive for microfilariae of the parasite. The infection was observed only in one village (Bangana) (Table 1). The positive individual is a male, married, aged between 30-39 and a farmer (Table 3 -5). Statistical association between the infection rate and variables of village, gender, marital status, age and occupational status was not significant. The chronic physical manifestations observed were hydrocele and lymphedema and the only acute stage clinical manifestation recorded in the area was fever/chills. The overall clinical manifestations was 3.24%. lymphedema rate was 0.49%, hydrocele, 1.25% and fever/chills 1.49% of the total population (Table 6). Mosquito species observed in the area were *Anopheles gambiae, A.pharoarisis* and *Culex quinquefasciatus*. A total of 177 female mosquitoes were dissected and no microfilaria of *W. bancrofti* was recorded.

Kalgo LGA

Table 1: Village based distribution of infection rate in Kalgo Local Government Area

Village	No. Examined	ICT Positive	Prevalence (%)
Badaria	72	0	0.00
Bangana	72	1	1.39
Dangoma	65	0	0.00
Hirishi	65	0	0.00
Ungwa-Dikko	67	0	0.00
Na-Yelwa	60	0	0.00
Total	401	1	0.25

Table 2: Age group distribution of infection rate in Kalgo Local Government

Age Group	No. Examined	ICT Positive	Prevalence (%)
0 – 9	40	0	0.00
10 – 19	143	0	0.00
20 – 29	57	0	0.00
30 – 39	36	1	2.77
40 – 49	40	0	0.00
50 – 59	54	0	0.00
60 – 69	22	0	0.00
70 and above	9	0	0.00
Total	401	1	0.25

Table 3: Gender related distribution of infection rate

Gender	No. Examined	ICT Positive	Prevalence (%)
Male	284	1	0.35
Female	117	0	0.00
Total	401	1	0.25

Table 4: Distribution of infection rate according to occupation

Occupation	No. Examined	No. Positive	Prevalence (%)
Fishermen	0	0	0.00
Farmers	119	1	0.84
Traders	24	0	0.00
Pupils/Stds	147	0	0.00
Civil servants	13	0	0.00
Housewives	48	0	0.00
None	50	0	0.00
Total	401	1	0.25

Table 5: Distribution of infection rate according to marital status

Marital Status	No. Examined	ICT Positive	Prevalence (%)
Married	164	1	0.61
Single	237	0	0.00
Total	401	1	0.25

Table 6: Clinical manifestation of Bancroftian filariasis by village

Village	No. Examined	Lympoedema	Hydrocele	Fever/Chills	Total	Prev. (%)
Badaria	72	0	0	0	0	0.00
Bangana	72	1	0	0	1	1.38
Dangoma	65	0	1	1	2	3.08
Hirishi	65	0	00	0	0	0.00
Ungwa-Dikko	67	1	13	4	8	12.30
Na-Yelwa	60	0	01	1	2	3.33
Total	401	2	45	6	13	3.24
Prevalence %		0.49	1.25	1.49	3.24	3.24

Table 7: Clinical manifestation by age

Village	No. Examined	Lympoedema	Hydrocele	Fever/Chills	Total	Prev. (%)
0 – 9	10	0	0	0	0	0.00
10 – 19	143	0	0	0	0	0.00
20 – 29	57	0	0	0	0	0.00
30 – 39	36	0	0	0	0	0.00
40 – 49	40	0	0	0	0	0.00
50 – 59	54	1	0	2	4	7.41
60 – 69	22	1	2	3	6	27.27
70 and above	9	0	2	1	3	33.33
Total	401	2	5	6	13	3.24

Discussion

The low prevalence affection recorded in human population and zero infection and infectivity in mosquitoes indicate that transmission of *W. bancrofti* has been halted in the study area. In Plateau and Nassarawa States, Nigeria [14]. Similarly, reported o.4% ICT prevalence, thus Kalgo LGA has met WHO threshold of less than 1.0% positively for stopping MMA in a given community [15]. This low endemicity of the disease in Kalgo LGA may be due to effective and high compliance to Mass Medicine Administration as well as effective distribution of insecticide treated bed nets in the Roll Back malaria program in the State.

Lymphedema prevalence of 0.4% is similar observations of [16] in Sokoto and [17] in Kano who both reported lymphedema overall prevalence of 0.2%. Hydrocele rate of 1.25% in this study was low when compared with the work of [18] who reported hydrocele rate of 6.1% in Taraba State and [19] who observed the rate of 9.0% and 6.6% among Ado people of Benue State. The low hydrocele rate reported in this study may be due to the Federal Government sponsored hydrocele/hernia surgery conducted in the State. It may also be due to low transmission rate of the parasite [20] rightly pointed out that clinical manifestations of lymphatic filariasis are relatively slow to develop and are proportionate to the intensity of the infection.

The absence of microfilaria in dissected mosquitoes is an added evidence that transmission of the parasite has been halted in the LGA. This is likely due to the success of MMA programme in the study area. We therefore conclude that transmission of *W. bancrofti* has ceased in the study area and MMA can be stopped.

Acknowledgement

We are grateful to the Local Government Secretariat, Village Heads, Community Health Personnel's and Volunteers (participants) for their cooperation care and love.

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