Studies on the Diagnosis and Transmission Dynamics of Lymphatic Filariosis in Biase Local Government area, Cross River State, Nigeria

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Abstract—Over the years the endemicity of bancroftian filariasis in Biase Local Government Area of Cross River State, Nigeria revolved around clinical assessment and the examination of night blood sample was associated with low sensitivity particularly in individuals having low parasitaemia and cryptic filarial infection. The present study was undertaken to evaluate the prevalence of filariasis in 9 wards of Biase local government using an immunochromatographic test (ICT).

Methods: Clinical examination was performed according to WHO criteria to classify filarial disease. Night blood smears collected between 21.00 to 00.00h were examined to detect microfilarla (MF) microscopically. The Binax Now filariasis test kit was used to detect the circulating antigen of Wuchereria bancrofti in blood samples. A total of 425 participants made up of 260 males and 165 females were examined randomly from the community with particular emphasis on those with suspected cases of infection such as elephantiasis of the leg. The results showed that 56 (13.2 percent) of subjects had microfilaria of wuchereria bancrofti from night samples, while 207 (48.7 percent) of the population studied had positive result with ICT cards. There was a statistically significant difference in the prevalence of W. bancrofti microfilaria and circulating filarial antigenaemia by the method of detection(X2=11.004, P<0.05). We found out that there was no correlation between the two methods of detection of filarial infection (r=0.096, P>0.05). The mosquitoes were caught using human handing catches and pyrethrum spray catches method. The entomological analysis of mosquitoes which include speciating into genus and dissecting them to unveil any microfilaria in the thoracic region, abdomen, and mouth parts of the mosquitoes. The prevalence of circulating antigens was observed to be higher in females (55.1%) than in males (46.9%). Entomological analysis shows that, from the 432 mosquitoes caught 256 (61.3%) were Culex species, 114 (26.4%) Anopheles species, 34(7.9%) Aedes species, and 19(4.4%) of other Genera. Out of 337 mosquitoes dissected, 24(7.1%) contained developed stages (L1 – L3) of W. bancrofti larvae. 13/337 (3.86%) of the infected mosquitoes were of Culex species and Anopheles species accounted for the other 3.26% (11/337). The entomological studies showed that Anopheles species and the Culex species are the vectors of lymphatic filariasis in the study area. Characteristics of the ICT method including high sensitivity promptness and specificity, justifies its use for screening of filariasis.

Conclusion: The study confirms CFA ICT as a more sensitive method for the diagnosis of lymphatic filariasis. The high endemicity of the disease, reported in this study calls for immediate institution of control measures.

Keywords—Diagnosis, Lymphatic filariasis, Nigeria, Transmission

I. INTRODUCTION

LYMPHATIC filariasis (LF) caused by the filarial nematode wuchereria bancrofti affects more than 120million people worldwide[1]. It is a mosquito-borne parasitic disease that is caused by three species of tissue dwelling filaroids (Wuchereria bancrofti; Brugia malayi; Brugia timori): Wuchereria bancrofti is responsible for 90 per cent of cases and is found throughout the tropics and in some sub-tropical areas world-wide [1]. Brugia malayi is confined to Southeast and Eastern Asia where Brugia timori is found only in Timor and its adjacent islands. Unlike malaria where the only vectors are Anopheline mosquitoes, lymphatic filariasis can be transmitted by various species of the genera Anopheles, Culex, Aedes, Ochlerotatus, and Mansonia.

The biting-time of the mosquito correlates with the periodicity of the microfilariae. In most parts of the world, the vectors are nocturnal feeders and the microfilariae exhibit nocturnal periodicity, where they are present in the blood in the greatest number around midnight.

In Africa, the Prevalence of lymphatic filariasis is especially striking, affecting over 40 million people in the sub-Saharan region alone[1]. Overall, Africa is thought to account for 40 percent of all cases of lymphatic filariasis in the world[1].

The third most endemic country in the world for this disease (after India and Indonesia) is Nigeria, where it is caused by W. bancrofti, and 22,1 percent of the population is thought to be infected[4].

In 2003, a survey was carried out in Plateau and Nassarawa state in Nigeria where the prevalence of lymphatic filariasis determined by ICT test was 22.5 percent and 22.4 percent respectively[2]. The diagnosis of filarial infection by clinical examination and parasitological methods was the mainstay in detecting filarial infection up to early nineties. These methods though correctly assess the clinical cases and microfilaraemic subjects with high microfilariae MF count, but fail to identify...
low MF count and cryptic filarial infection in asymptomatic amicrofilariaemic individuals[6]. In recent years, with the introduction of new diagnostic methods such as rapid diagnostic tests(RDTS), the prevalence of filarial disease was redefined in many parts of the globe. The antigen and antibody assays have several advantages over microscopic identification of MF in blood, which is the traditional method of diagnosing LF infection[3]. They are more sensitive (i.e., MF-negative persons with positive antigen or antibody test are frequently identified)[21] and both overcome the logistical constraint of obtaining blood at night, which is necessary in the many endemic areas where MF have nocturnal periodicity. The purpose of this study was to Study the infection status of the human population and finally to assess the impact of mectizan distribution for Onchocerciasis control on lymphatic filariasis in area where the two diseases are co-endemic. To date such study was not done in Biase thus, the results of the present study may be relevant to determine the geographic distribution of lymphatic filariasis and the location of communities that requires treatment beyond Biase Local Government area, Cross River State, Nigeria.

II. METHODS

Study area: The study was carried out in nine wards namely Abayong, Akpet/Abini, Etomo/Ikum, Adim, Ehom, Mbiakpan, Agwagune, Umon and Ekei. (Total population 89737 males and 79446 females, census 2007) of Biase Local Government Area, Cross River State Nigeria. Biase Local Government is bordered in the north east by Yakurr and Obubra Local government, in the south by Akamkpa and Odukpani local governments and in the West by Abia State.

The study was approved by the Ethical Committe of the Cross River Ministry of Health, Calabar.

Informed consent was obtained from study individuals (parents in case of minor). Children less than 16 years old and individuals who did not give their consent were not part of the study.

Sample collection, a door-to-door survey was carried out from October 2008 to November 2009 in the local government to include individuals (adults and children aged 16 years and above in the study. History suggestive of filariasis and diethylcarbamazine citrate (DEC) or mectizan consumption was recorded. MF detection: MF was detected by making two thick blood smears of 20μl each on a clean glass slide from 21.00 to 00.00h. The smears were air dried, dehaemoglobinised and stained with Giemsa stain to detect Mf.

Antigenaemia detection: About 2ml of blood was collected from all the individuals (n=425; 260 males and 165 females) enrolled in the study. Sera were separated in the field and brought to the laboratory and stored at - 200c until tested. The binax now filariasis was used for detecting and quantifying W. bancrofti antigen. The test card was removed from the pouch just prior to use. The card was laid flat on the work surface. The capillary tube was filled to the 100μl mark using capillary action with venous blood. The 100μl of sample was added slowly from the capillary or pipette onto the top of the pink and white pad. The 100μl of sample was added slowly from the capillary or pipette onto the top of the pink and white pad.

Important: Each drop was allowed to soak in before adding the next drop onto the pad. Incorrect addition of sample resulted in device failure. It was allowed until the sample has flown into the pink area and was completely wet (this was about 30 seconds to 1 minute).

The adhesive liner was removed and discarded and the adhesive of the test card was exposed.

The card was closed. To ensure good test flow, the card was pressed very firmly along the entire area to the right of the window. The timing started. The result was read through the viewing window after 10 minutes

A. Entomogical Studies

Mosquitoes were captured at night in five selected wards using the human landing catches method and pyrethrum spray catches in the rainy and the dry season. The mosquito species were determined, and were examined for first second and third stage larva of W. bancrofti [3]. The biting rate (the number of mosquitoes attempting to take a blood meal per person), the infective biting rate (the number of mosquitoes that will have at least one infective larva), and the transmission potential were determined [9]

B. Human landing catches

Four local peoples (in each ward) were recruited to catch night biting mosquitoes from randomly selected compounds. At each compound two seated outdoor from 9 pm to 11 pm to two different locations. The two teams were rotating between the two locations after one hour of collection period, to compensate for individual differences in attractiveness. Thus 2 human landing catches methods were made for each ward. This was facilitated using the electric mosquito swatter to catch the mosquitoes. The captured mosquitoes were kept in paper cups labeled to denote the hour and location.

C. Pyrethrum spray catches

A randomly chosen room in the village was allowed opened overnight for mosquitoes to enter and at exactly 4 am the doors were locked and the windows closed for the mosquitoes to remain indoors. Using pyrethrum insecticide formulation (Raid Insecticide) spray the mosquitoes were knocked down and picked from 4 am – 6 am and were placed on moist filter paper in labeled petri dishes. In each household, one insect collector spent 2 hours searching all the resting places such as hanging objects, walls, and roof and beneath the surfaces of fixed objects

D. Mosquito Collection/Identification/Dissection

Both live and dead mosquitoes were stored in paper cups until dissection (up to ten hours after collection). A visual identification using dissecting microscope was made, categorizing mosquitoes as Anophele species, Culex species,
Aedes species and others.

Mosquito collections were maintained according to household number. Mosquitoes were dissected individually to determine W. bancrofti infection status, including stage and location of the parasites in the mosquito body. Microfilaria (mf) stages were also counted, but not included in the calculation of infection rates. The abdomen, thorax and head were placed in separate drops of saline water and dissected to count all stages of W. bancrofti larvae.

The proportion of dissected mosquitoes positive for any stage (mf, or first (L1) second (L2) or third/ infective (L3) stage larva) was termed the infection rate, and the proportion positive per L3 was termed the infectivity rate. The infection rates were estimated using the algorithm of katholi. The mosquito collections from each household were anaesthetised and were segregated according to species. Each mosquito were divided in three parts (head, thorax and abdomen) and were placed in three separate drops of normal saline. The parts were gently macerated with needles and were examined under a compound microscope for the presence of filarial larva. The number of different stage filarial larva present in each body part was recorded.

E. Statistical Analysis

The Pearson correlation coefficient, Student T-test and Chi square test was used to analyze the data.

III. RESULTS

A total of 425 individuals were examined from Biase local government. The prevalence of Mf and CFA was 13.2 percent and 48.7 percent respectively. There was a statistically significant difference in the prevalence of W. bancrofti microfilaria and circulating filarial antigenaemia by method of detection ($X^2=11.004, P<0.05$). The correlation analysis showed that there is no relationship between the two methods of detection of filarial infection ($r=0.967, P>0.05$). The percentage of Mf and CFA positive individual increased steadily with age reaching a peak in the 16-26 year age group. The prevalence of Mf and CFA decrease steadily between 49-70 year age group. Beyond 70 year there was a fall in CFA prevalence while no individual was positive for Mf. There was a statistically significant difference in the distribution of circulating antigen of lymphatic filariasis in the blood of subjects by age ($P<0.05$) Table 1 (1). The Relationship between circulating filarial antigen (CFA) and microfilaria (MF) detection with clinical status is presented in table 2. It was observed that in asymptomatic individuals (n =399), ICT Now Filariasis Kits could detect infections in 203 (53.4%) individuals while night blood smear had 48 (12.6%) positive cases only. In symptomatic individuals (n=26), the prevalence was 61.5 and 46.1 percent by ICT and night blood smear respectively. Infection rate detected by CFA was significantly ($P<0.05$) higher compared to that by night blood smear examination. Of the 425 individuals included in the study, 26 had clinical symptoms of filariasis (elephantiasis and hanging groin). Among the 24 individuals presenting with elephantiasis, Mf was present in 10 (38.5%) and CFA in 14 (53.9%) cases. All the 2 individuals presenting with hanging groin were microfilaraemic and the infection rate of CFA was found positive for CFA (Table 3). It was observed that all the microfilaraemic individuals were CFA positive but all the CFA positive individuals were not microfilaraemic. A total of 159 individuals were CFA positive but having no circulating Mf. From the 159 microfilaraemic antigen positive individuals, 151 were asymptomatic and microfilaraemic having cryptic infection detected by ICT now filariasis test kits.

Table II shows the prevalence of lymphatic filariasis according to the knotts concentration methods and ICT. Among participants who had meaningful results, 56 (13.2 per cent) were positive for the thick blood film technique and 207 (48.7 per cent) by ICT card test. Out of 56 mf positive persons by the Knotts concentration method, only 2(3.6 per cent) were negative by the card test, whereas 151(41.1 per cent) individuals were negative by the Knotts concentration method. 216(58.8 per cent) were negative according to both Knotts concentration and ICT card test whereas 218(51.3 per cent) were negative for ICT card test alone. The overall sensitivity of the whole blood ICT card test was 96.5 per cent (56/58) while the specificity of the test was 58.8 per cent (216/367). The two false negative were males in the 37-47 year of age group.

Table 4 Distribution of mosquitoes caught during the rainy and dry season.

A total of 432 mosquitoes were caught during the dry season (October-March) and rainy season (April-September) in Biase local government (Table 4). About 265(61.3 per cent) were of culex spp, 114(26.4 per cent) Anopheles spp, 34(7.9 per cent) Aedes spp and 19(4.4 per cent) other genera. Of the two methods used in catching the mosquitoes, human landing catches produce more result (51.9 per cent) than the spray catches (48.2 per cent). Abundance of all mosquitoes dropped during the dry season during which time Culex spp was found in greater numbers than Anopheles spp, Aedes spp and other genera. Of the 432 mosquitoes caught, 164(38 per cent) were caught in the dry season while 268(62 per cent) were caught in the rainy season. There was a statistically significant difference in the number of mosquitoes caught in the dry and rainy season ($X^2=0.62, P>0.05$). There was a little variation in the abundance of mosquito catches between the two seasons as they were more in rainy season than in the dry season. There was no relationship about the number of mosquitoes caught in the dry and rainy season ($r=0.99, P>0.05$).
9(2.7 per cent) were infected in the rainy and dry season respectively. The correlation analysis showed a positive correlation between the infection rate among mosquitoes in the dry and rainy season ($r=0.85, P<0.05$). There was a statistically significant difference in the infection rate between the two seasons ($X^2=0.87, P<0.05$).

### TABLE I

**Comparative Prevalence of Microfilaria of W. Bancrofti and Circulating Filarial Antigenemia**

<table>
<thead>
<tr>
<th>Aged group (yes)</th>
<th>No examined</th>
<th>No. (%) positive for Microfilaria</th>
<th>No. (%) positive for CFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-25</td>
<td>178</td>
<td>29(16.3)</td>
<td>9(50.9)</td>
</tr>
<tr>
<td>27-37</td>
<td>105</td>
<td>18(17.1)</td>
<td>4(40.0)</td>
</tr>
<tr>
<td>38-48</td>
<td>67</td>
<td>6(8.9)</td>
<td>3(42.9)</td>
</tr>
<tr>
<td>49-59</td>
<td>25</td>
<td>1(4)</td>
<td>1(4)</td>
</tr>
<tr>
<td>60-70</td>
<td>37</td>
<td>2(5.4)</td>
<td>1(54.5)</td>
</tr>
<tr>
<td>71-81</td>
<td>13</td>
<td>&lt;(0)</td>
<td>3(23.1)</td>
</tr>
<tr>
<td>Total</td>
<td>245</td>
<td>59(24)</td>
<td>207(85.7)</td>
</tr>
</tbody>
</table>

M: microfilaria, CFA: circulating filarial antigen - Denote absence of post-exposure immunity section

### TABLE II

**Prevalence of Lymphatic Filariasis According to the Knott's Concentration Method and ICT Card Test**

<table>
<thead>
<tr>
<th>ICT Card Test</th>
<th>Knotts concentration</th>
<th>Negative (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>53(FP)</td>
<td>155(FP)</td>
<td>208</td>
</tr>
<tr>
<td>Negative</td>
<td>2(FN)</td>
<td>216(TN)</td>
<td>218</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>367</td>
<td>422</td>
</tr>
</tbody>
</table>

TP: True positive = number positive according to both Knotts concentration method and ICT test
FN: False negative = number positive for the ICT and negative for the Knotts concentration
TN: True negative = number negative according to both Knotts and ICT card test
Sensitivity = TP/(TP+FN) = 53/53+2 = 0.9692%
Specificity = TN/(FP+TN) = 155/155+2 = 0.9955%
Positive predictive value (PPV) = TP/(TP+FP) = 53/(53+155) = 0.2723%
Negative predictive value (NPV) = TN/(TN+FN) = 155/(2+155) = 0.9999%
False discovery rate (FDR) = FP/(FP+TP) = 155/(155+53) = 0.7377%

### TABLE III

**Prevalence of Microfilaria of W. Bancrofti and Circulating Filarial Antigenemia Among Subjects of Elephantiasis and Hanging Groin**

<table>
<thead>
<tr>
<th>Location</th>
<th>Number examined</th>
<th>No. (%) positive for CFA</th>
<th>No. (%) positive for microfilaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elephantiasis of the leg</td>
<td>24</td>
<td>14(58.3)</td>
<td>10(41.6)</td>
</tr>
<tr>
<td>Hanging groin</td>
<td>2</td>
<td>2(100)</td>
<td>2(100)</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>16(61.5)</td>
<td>12(46.1)</td>
</tr>
</tbody>
</table>

### Table IV

**Monthly variation of mosquitoes caught in the dry and rainy season**

<table>
<thead>
<tr>
<th>Types of mosquitoes</th>
<th>Dry season (October-March)</th>
<th>Rainy season (April-September)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anopheles</td>
<td>48</td>
<td>20</td>
<td>114</td>
</tr>
<tr>
<td>Culex</td>
<td>98</td>
<td>187</td>
<td>285</td>
</tr>
<tr>
<td>Aedes</td>
<td>18</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td>Others</td>
<td>7</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>163(38)</td>
<td>269(52)</td>
<td>432</td>
</tr>
</tbody>
</table>

### Table V

**Monthly Variation of Mosquitoes Infected in the Local Government**

<table>
<thead>
<tr>
<th>Types of Mosquitoes</th>
<th>Number of mosquitoes infected in each month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anopheles</td>
<td>Jan: 1, Feb: 1, Mar: 1, Apr: 2, May: 3, Jun: 2, Jul: 1, Aug: 1, Sept: 1, Oct: 1, Nov: -1, Dec: -1</td>
</tr>
<tr>
<td>Culex</td>
<td>Jan: -1, Feb: 1, Mar: 1, Apr: 2, May: 3, Jun: 2, Jul: 1, Aug: 1, Sept: 1, Oct: 1, Nov: 1, Dec: -1</td>
</tr>
<tr>
<td>Total</td>
<td>11, 1, 1, 2, 3, 5, 4, 1, 1, 1</td>
</tr>
</tbody>
</table>

### Table VI

**Distribution of Filarial Larva in Body of the Mosquitoes in the Dry and Rainy Season**

<table>
<thead>
<tr>
<th>Species of Mosquitoes</th>
<th>Total number of mosquitoes infected</th>
<th>Microfilaria (%)</th>
<th>Larva in Thorax</th>
<th>Larva in Abdomen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anopheles spp</td>
<td>11</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Culex spp</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>10(41.6)</td>
<td>8(33.3)</td>
<td>6(25)</td>
</tr>
</tbody>
</table>
**IV. DISCUSSION**

Filariasis is a major public health problem in Nigeria. With the continuous change in environmental factors, urbanization and availability of newer diagnostic tools [7] the estimation of 40% global burden due to filaria in Nigeria (8) may be an understatement. With the wide spread availability of the ICT assay, which deflects adult worm burden [7], it is evident that the prevalence of lymphatic filariasis in endemic communities is underestimated [4].

The present study found a high sensitivity of the ICT card test compared with the Knotts concentration method. Nelsen et al., [9]; Simonsen et al., [5] and Lamine et al. [6] also observed that the prevalence of CFA was considerably higher than the presence of microfilaria in all age groups. In the present study in Biase, the prevalence of lymphatic filarial infection determined by ICT was 48.7% which was higher than that of the study carried out by Cynthia et al. [10] in Brazil, Abel et al. [13] in central Nigeria, Donald et al. [11] in Plateau and Nasarawa state in Nigeria and Surang et al. [12] in Thailand where the prevalence of lymphatic filariasis determined by ICT test was 31.7%, 22.5%, 22.4%, and 12.7% respectively.

In this study, the prevalence of lymphatic filariasis was 3.56 times higher when determined by ICT compared to microfilaria examination in all age groups. This also confirms the work done by Cynthia et al., [10] in Sao Paulo Brazil where the ICT test was 5.2 times higher than the Knotts concentration method. The present study found a high sensitivity (96%) of the ICT card test compared with the Knotts concentration method. The prevalence of microfilaremia and antigenaemia were slightly higher in males than in females: reasons being that male subjects (61.2%) were more in number than the females (38.8%). Females had euphoria of vein puncture and also most of them were engaged in farm work during the period of blood collection. Cynthia et al., [10] had similar results where the prevalence of microfilaremia and antigenaemia was slightly higher in males than in females in Brazil. Married subjects (55.8%) were more in number than the single subjects (44.2%) reasons being that most the subjects falls between the age bracket of 26-36 and 37-47 and these ages coincides exactly with period during which most peoples get married. Majority of subjects in this study were farmers (48.7%). This could be explained by the fact the research was carried out in the villages were most peoples residing there were farmers. Abel et al. [13] also carried out similar study in central Nigeria (Plateau and Nasarawa) where most participants (81.6%) were agricultural workers and had resided their entire lives in the village.

The two cases of hanging groin recorded were positive for ICT and the Knotts concentration while all individuals positive for the ICT were not positive for mf. This study suggest that hydrocele could also be used as diagnostic tool for lymphatic filariasis taking into consideration that some hydrocele could be other than filarial aetiology (e.g traumatic, tuberculous, idiopathic, etc.). In addition, if hanging groin surveys are to be used, it should be based on actual physical examinations and not questionnaires since the two cases of hanging groin of the male and female found in this study did not report hanging groin when asked. In addition, questionnaires surveys for hanging groin would also fail to distinguish it from other easily differentiable causes of scrotal swelling. Physical examinations could be carried out by personnel trained to correctly distinguished hanging groin from other forms of scrotal pathology.

In this study, those with physical symptoms of LF such as elephantiasis had poor marriage prospect. Only 4 out 24 were married and 20 were single. The explanation is that some of the participants were married and when the disease became chronic; their wives abandon them while those who reached the chronic stage without getting married could not find a wife or husband because of their conditions. Males subjects who married their wives before they became sick were able to manage the marriage while females whom their husbands develops chronic stages of elephantiasis abandon them alone because of their conditions (Plate I). Because of the stigmatization, those with chronic form of elephantiasis remain mostly indoors while those with early stages could still trade and even do their farming (See Plate I).

It appears in this study from the results that ICT results in lymphatic filariasis mapping activities was not influenced by the ongoing Onchocerciasis ivermectin treatment programme. The study area has been on ivermectin treatment for the past five years. Although all the wards were not on ivermectin treatment, there was no statistically significant difference in the distribution of CFA by wards that were on ivermectin treatment and those that had not received treatment. The ICT test was still positive on subjects who have been taking ivermectin regularly for the past three years. The test does not seem to be suitable for follow up and evaluation of control programmes because a considerable number of infected individual remain antigen positive for more than two years after DEC treatment [14]. Even if two to three years administration of ivermectin were to have an impact on CFA, the present study area couldn’t have been the best area for evaluation because many of the participants had received only once or twice in five years. Also many participants being very uncertain about the last time they received the mectizan. In this study, participants with chronic elephantiasis were ICT and microfilaria negative, this confirm the studies done by Michael et al [8] who found patients with clinical disease from LF who were often antigen or microfilaria negative. Also a report by Addis et al [2] shows 35% of 57 Haitian men with hydrocele were Og4C3 antigen negative. However, this finding was initially quite confusing to the field staff who expected that the ICT test results should be positive in chronic elephantiasis (e.g. as a diagnostic test for lymphatic filariasis). The confusion was abated by explanation that lymphatic filariasis often occurs after the body has mounted an effective immune reaction, e.g. burnt out disease. Thus persons with chronic elephantiasis and other manifestations of LF may no
longer have living worms or circulating worm antigens in their bodies to give a positive reaction on the ICT test [13]. Imperfect gold standards like Knotts concentration method usually introduce a series of biases, such as an underestimation of the prevalence of filariasis and predictive value of the new test, in addition to an overestimation of the negative predictive value. The dimension of these biases will depend on either the sensitivity of the reference test or the true prevalence of the disease in the population [15]. It was found that 151(40.6%) persons negative by Knotts concentration method were positive in the ICT card test for the endemic area. Considering the imperfections of Knotts concentration method, the ICT card test, in addition to being able to detect microfilaria infection probably indentifies early stages of infections. Therefore part of this group may represent infected individuals that were not detected through parasitological methods. There is also the possibility of false positives since the evaluation of the test in the non endemic area revealed a considerable number of test kits showing faint lines that following the manufacturer’s guide line were interpreted as positives. Since the prevalence of LF tends to fall while applying the control measures, it becomes important to utilize the test with higher positive predictive value.

A cost analysis of the ICT card test was carried out during the research. The Knotts concentration method was shown to have lower price (ICT cost per unit USS8 vs. Knotts concentration cost per unit US $0.3). However, certain features of the ICT card test proved to be extremely advantageous high sensitivity, the ability to offer prompt diagnosis, no need for complicated laboratory procedures, and no need for specialized technicians. These combined characteristics overcame the low price of the Knotts concentration making to be the overall more cost effective option, thereby justifying its use as a diagnostic tool in screening in endemic areas.

The use of such methods will allow interventions to be directed to the infected individuals who are responsible of maintaining the chain of transmission in focal areas. More studies evaluating the performance of the whole blood card test are necessary to verify indices of accuracy under different diagnostic criteria for instance considering faint lines either as a positive or negative result. In addition studies designed to take account of the problems arising from imperfect gold standards are essential as is a sounder diagnostic definition for the whole blood ICT card test. It would be useful if the manufacturer could give more specific details about the method and antigen applied in the test, as well as further information related to the correct interpretation of the tests in the case of extremely faint lines.

Entomology:

The high prevalence of infection and infectivity recorded in the mosquitoes indicate that previous annual mass treatment with ivermectin alone for the control of Onchocerciasis failed to interrupt transmission of W. bancrofti in the study area, where Culex spp and anopheles spp appears to be the main vectors.

In Burkina faso, kyelen et al., [16] similarly reported that 5years of semi-annual mass treatments with ivermectin alone (targeted at Onchocerciasis) reduce but did not interrupt the transmission of W. bancrofti. The results presented here describe the relative contribution of Anopheles spp and culex spp to LF transmission in Biase local government. Culex spp (3.8%) was shown to be more likely to harbor developing stages of the larva than Anopheles spp (3.3%). No developing stages of parasites were found in any of the Aedes spp and other genera of mosquitoes that were not identified. These findings differ with the one done in Central Nigeria by Audrey et al (18) to determine the contribution of different mosquito species to transmission of lymphatic filariasis where only Anopheles species (2.9%) contained developing stage (L1-L3) of W. bancrofti larvae. In this study, the number of mosquitoes caught during the two seasons using human landing catches (51.9%) were higher than the parethrum spray catches (48.1%). This study agrees with the work done by Daniel et al [17] in three villages within the Winneba district of Ghana where human landing catches accounted for 58% followed by Pyrethrum spray catches with 41% and light trap catches 0.3%. In the months of the dry seasons (October, November, December, January, February, March, April) the number of mosquitoes caught were smaller than the number caught in the months of the rainy season (June July, August, September). There were seasonal fluctuations in abundance of mosquitoes in the two seasons as the total number of mosquitoes caught in the rainy seasons were more in number than those caught in the dry season. The highest number of infected mosquitoes recorded was also found during the peak of the rainy season (September) where mosquitoes were abundant. This also explained the reasons while the numbers of mosquitoes infected in the rainy season were more in number than those in the dry season. The number of infective stage (L1-L3) found in the body of mosquitoes reflect also the infection status of the exposed population. The number of larva (L3) found in the heads of the mosquitoes reflect the infectivity status of the mosquitoes while the number of larva found in the head; thorax and abdomen reflect the infection status. The prevalence of mosquito infection with the third stage larvae of the parasite (which were recorded) is less likely to mirror closely the infection status of the residents of the sampled compounds. Females’ mosquitoes that have ingested blood containing microfilaria need to oviposit before the parasites develop into L3 and therefore usually leave the compound in which they took the infective blood meal in search of a suitable oviposition site. These females when seeking subsequent blood meals presumably enter other compounds and become randomly distributed through out the community since subjects live in cluster setting in the ward and the possibility of one infected mosquito flying from one compound to another is possible. It was also observed that because of power failure in the local government most participants remains out doors in their compounds till late
hours (between 11pm-12midnight) and most of the time men do stay half naked because of heat. These periods that participants remain outside coincides with the biting period of the vectors thus better transmission potentials. The mosquitoes bite mostly the legs and the hands around the fingers which are always exposed. Thus the present data on mosquito infectivity are probably better indices of community transmission than of human infection status in any particular households.

During the present study, where ivermectin had been administered alone for the control of Onchocerciasis ,the prevalence of mosquito’s infection in the local government seems not to have been reduced and annual mass treatment with ivermectin and albendazole will therefore appear superior to annual ivermectin monotherapy for lowering or stopping the transmission of W. bancrofti at least in rural area of sub-saharan Africa[2]. In a recent study in Papua New Guinea, Bockarie et al [3] showed that MDA-driven reductions in community levels of microfilaraemia and mosquito infection did not always overcome the abundance of human –biting mosquitoes and in some communities, therefore transmission potentials remains unacceptably high.

The different mode of controls employed in the local government by participants did not appear to be specific and accurate. The participants who appear to be using mosquito coils, bed nets, and insecticide only applied when they are about to go to bed meanwhile they had been exposed to mosquito bites before going to bed. Most of them lied out doors because of heat till late hours in the night during which mosquitoes bite them at random making control measures cumbersome. So control of lymphatic filariasis in these areas will be effective only if mass Drug administration (MDA) is used taking into consideration that MDA based solely on ivermectin alone may not interrupt the transmission of W. bancrofti in all area where LF and Onchocerciasis overlap[19] but the scale of the ivermectin distribution already in place throughout the Nigerian Federation is immense –there were, according to unpublished data from the African Programme for Onchocerciasis control, more than 20 million ivermectin treatments in 2003. There is therefore an unprecedented logistical opportunity to scale up the current LF –control programme in the country, quickly and relatively simply, by the addition of albendazole to the ivermectin in the areas already being treated for Onchocerciasis[20].

To enable such collaboration, areas where LF and Onchocerciasis are co-endemic need to be mapped, and both the LF and Onchocerciasis control programmes need to articulate the benefits of programme integration to local programme managers, international technical committees and the donor community [21].

V. CONCLUSION

While the global elimination program of lymphatic filariasis is ongoing, high sensitive and specific diagnostic assays are necessary to monitor and control the program. This study demonstrated the value of antigen detection tests as a means of surveillance for bancroftian filariasis in Biase local government. The presence of the three vectors of lymphatic filariasis (culex, anopheles and aedes) and with the proportion of Culex and anopheles infected indicated that Lymphatic filariasis is an important public health problem in the study area. We found out that the diagnosis of lymphatic filariasis using ICT card test and Knotts concentration method shows that there is high prevalence of lymphatic filariasis in Biase local government. Hanging groin was also observed in some participants who also tested positive for ICT

REFERENCES

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