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ORIGINAL ARTICLE

Wuchereria Bancrofti Infection in Children Living in a Rubber Plantation Estate in South-South Nigeria

Infection par Wuchereria Bancrofti chez les Enfants Vivant dans une Plantation D'hévéas dans le Sud-Sud du Nigeria

[1]*E. E. Ekanem, [1]B. D. Umoh

ABSTRACT

BACKGROUND: Chronic manifestations of bancrofti filariasis can be debilitating. There is paucity of description of this disease in the childhood population, yet early detection can prevent disability such as elephantiasis.

OBJECTIVE: The objective of the study was to determine the prevalence and
clinical features of this infection among children in a plantation estate in Cross River State, Nigeria.

METHODS: It was a cross-sectional study in subjects aged 1 to 18 years, recruited from the nine camps of the settlement, using multistage sampling technique. The presence of Circulating Filarial Antigen (CFA) was tested for using Immunochromatographic Card Technique (ICT). Simple proportions, percentages, Chi square and Fisher's exact tests were used to analyse the data.

RESULTS: A total of 342 subjects were recruited into the study. One hundred and sixty three (47.7%) were males. The mean age was 8.52± 4.41years. Majority of the subjects, 316(92.4%), were from families of low socioeconomic status. Twenty of the 342 children (5.8%) were positive for microfilaria antigenaemia. Increasing age (p=0.006) and duration of stay in the estate (p=0.005) were positively associated with antigenaemia. None (0%) of the 55 subjects who used insecticide treated nets was positive for CFA, while 20 (6.97%) of the 287 who did not, were positive (p=0.03). Only ten (3.95%) of the 253 subjects who used insecticide spray vs 10 (11.0%) of the 89 who did not use spray were positive for CFA (p=0.016). Itching was the only significant symptom identified.

CONCLUSION: The prevalence of *Wuchereria bancrofti* in the subjects was 5.8%, with increasing prevalence with age. Itching was the only significant clinical feature. The use of insecticide treated nets and insecticide sprays significantly reduced the chances of being infected. There is a need for elimination programme to be extended to the childhood population and to sub-urban areas. **WAJM 2022; 39(12): 1294–1298.**

Keywords: *Bancrofti* filariasis, Children, Endemic area.

RÉSUMÉ

CONTEXTE: Les manifestations chroniques de la filariose de bancrofti peuvent être débilitantes. Il existe peu de descriptions de cette maladie dans la population infantile, mais une détection précoce peut prévenir des handicaps tels que l'éléphantiasis.

OBJECTIF: L'objectif de l'étude était de déterminer la prévalence et caractéristiques cliniques de cette infection chez les enfants d'une plantation dans l'État de Cross River, au Nigéria.

METHODES: Il s'agissait d'une étude transversale chez des sujets âgés de 1 à 18 ans, recrutés dans les neuf camps de la colonie, en utilisant la technique d'échantillonnage à plusieurs degrés. La présence d'antigène filarien circulant (CFA) a été testée à l'aide de la technique de carte immunochromatographique (ICT). Des proportions simples, des pourcentages, le Chi carré et des tests exacts de Fisher ont été utilisés pour analyser les données.

RESULTATS: Un total de 342 sujets ont été recrutés dans l'étude. Cent soixante trois (47,7 %) étaient des hommes. L'âge moyen était de 8,52 ± 4,41 ans. La majorité des sujets, 316 (92,4 %), provenaient de familles de faible statut socio-économique. Vingt des 342 enfants (5,8 %) étaient positifs pour l'antigénémie des microfilaires. L'augmentation de l'âge (p = 0,006) et de la durée de séjour dans le domaine (p = 0,005) était positivement associée à l'antigénémie. Aucun (0%) des 55 sujets qui ont utilisé des moustiquaires imprégnées d'insecticide n'était positif pour le CFA, tandis que 20 (6,97%) des 287 qui n'en avaient pas étaient positifs (p=0,03). Seuls dix (3,95 %) des 253 sujets qui ont utilisé un insecticide contre 10 (11,0 %) des 89 qui n'ont pas utilisé de spray étaient positifs pour le CFA (p = 0,016). Les démangeaisons étaient le seul symptôme significatif identifié.

CONCLUSION: La prévalence de Wuchereria bancrofti chez les sujets était de 5,8 %, avec une prévalence croissante avec l'âge. Les démangeaisons étaient la seule caractéristique clinique significative. L'utilisation de moustiquaires imprégnées d'insecticide et de pulvérisations d'insecticide a considérablement réduit les risques d'infection. Il est nécessaire d'étendre le programme d'élimination à la population infantile et aux zones suburbaines. **WAJM 2022; 39(12): 1294–1298.**

Mots clés: Filariose de Bancrofti, Enfants, Zone d'Endémie.

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INTRODUCTION

Wuchereria bancrofti is one of the filarial nematodes known to cause lymphatic filariasis, a disease which manifests with a range of symptoms including adenolymphangitis, hydrocele and elephantiasis.[1] Bancrofti filariasis accounts for 90% of the nearly 120 million people affected worldwide.[2,3] The geographical spread spans the whole of the equatorial region, including regions in the tropics and sub-tropics such as Africa, the Middle East, South East Asia, the Caribbean, China, the Far East, and New Guinea.[4,5]

It is an arthropod borne parasite transmitted by various species of mosquitoes of the genera: *Anopheles, Culex, Aedes* and *Mansoni.* Humans are the only known definitive host.

The clinical manifestations of filariasis are due to both the immunologic response of the body to product of the organism and the obstructive effects of the adult worm.[6–8] These range from sub-clinical presentation with no-overt symptoms to acute presentation with fever, adenolymphangitis, testicular pains in men, and limbs or genital swelling. About a third of infected persons may ultimately suffer the dreaded debilitating chronic forms of the disease including hydrocele, elephantiasis or lymphoedema.[9] Currently, lymphatic filariasis is rated the second leading cause of permanent disability and a major contributor to poverty in the world.[2,9,10]

Nigeria is one of the countries in tropical Africa endemic for lymphatic filiariasis.[11,12] Globally, Nigeria is ranked third, behind India and Indonesia, among countries with the highest burden of the disease in adults. Unfortunately, most with the highest studies of the disease have excluded the childhood population yet there is evidence that the infection may occur in this age bracket and preventive measures such as insecticide treated nets, introduced early in life, can also prevent long-term debilitating complications. This study was therefore carried out in the childhood population in a rubber plantation estate in Cross River State, Nigeria, with conditions likely to favour transmission of the parasite.

SUBJECTS, MATERIALS AND METHODS

The study was carried out on children between the ages of 1 and 18 years in Pamol (Nig) Limited Rubber Plantation Estate, located 15 kilometers north of Calabar city, from 1st August, 2013 to 27th July 2014. From the direct census conducted with the help of the clinic staff and the camp porters, the total population of inhabitants was 3641, out of which 1849 (50.8%) were children between 1–18 years of age. This number was distributed within nine camps of varying sizes ranging from the smallest with 58 children to the largest with 464 children.

Inhabitants are labourers drawn from all over Cross River and Akwa Ibom States of Nigeria. They occupy socio-economic class V, according to the Olusanya's classification.[13] The camps are typical farm settlements constructed by the management of the plantation. They are made of rows of houses with single room apartments. One of the camps consists of high cadre management quarters occupied by professional staff members settled in the estate, but these are few.

The physical environment is typically of forest vegetation, being predominantly made of the rubber trees with bushy background. Drainage system is poor, leaving many stagnant pools of water within the estate, which form veritable breeding environment for mosquitoes.

The community is served by a centrally located Medical Centre which is about four kilometers from the furthest camp. There has not been any onchocerciasis control programme in the settlement.

The sample size was calculated using the formula for studies of population size over ten thousand. No study has been done on this parasite in the paeditrics age group in this region. The WHO estimation of p of 50%, where such study has not been previously done, was fed into the formula.

The study was cross sectional and community-based study. Children aged between 1 and 18 years and who had lived at least one year within the estate, were recruited from the nine camps that make-up the settlement.

Multi-stage sampling technique was used to Select the subjects. In the first stage, a proportionate sampling technique was used to determine the number of subjects to be selected from each camp.

Then a systematic random sampling technique was used to select the subjects proper, based on the sample frame prepared from the list of all the children from each camp.

On entering each camp, a starting point (i.e the first household) was taken. Using the sample fraction of 0.2, every fifth child from the sample frame was recruited into the study till the number for each camp was completed. After getting consent from parents, each subject was counseled and a finger prick blood sample was collected through a 100 microliter haparinised capillary tube and analyzed immediately. The sample was analyzed using "Now Filariasis Rapid Card Test" which detects the presence of any *W.bancrofti* antigen. Ethical clearance was obtained from the University of Calabar Teaching Hospital Ethics Committee. SPSS version 20 was used to analyse the data. Simple proportions and percentages were calculated and categorical data compared with Chi square test or Fisher's exact test. A confident interval of 95% was set and a *p*-value less than 0.05 was considered statistically significant.

RESULTS

A total of 342 subjects were recruited, with ages ranging from 1 to 18 years. One hundred and sixty three (47.7%)were males while 179(52.3%) were females, giving a male: female ratio of 1:1.1. The mean age ± was 8.52 ± 4.41 years.

Two hundred and twenty four (65.5%) children were between 1 and 10 years while 118 (34.5%) were aged 11–18 years. Majority of the subjects, 316(92.4%) were from families of low socioeconomic status (Table 2). Only 2.9%used insecticide treated nets.

Twenty of the 242 subjects were positive for the antigen, giving a prevalence of antigenaemia of 5.8%. Table 2 shows that increasing age and length of stay in the estate were positively associated with increased positivity rate (p=0.019 and p=0.005; respectively),

while gender and social class were not determinants of positivity. Itching was the only significant symptom identified in children who were positive($p<0.001$: Table 3).Table 4 shows that none of the 55(16.1%) subjects who used insecticide treated nets was positive for CFA. All the 20 children who were positive for CFA did not use insecticide treated nets ($p= 0.03$). Also 10 (3.95%) of the 253 subjects who used insecticide spray were positive, compared with 10 out of 89 who did not use the spray ($p= 0.02$).

Table 1: Childhood Population Distribution in the Rubber Estate

Camp	Target Population	Sample Fraction	No. of Subjects
Banga camp	316	0.2	63
Field 8	464	0.2	93
No 4 camp	229	0.2	46
B cap	121	0.2	24
D 4	308	0.2	62
Field 20	110	0.2	22
5 miles	115	0.2	23
Mgt. camp	88	0.2	18
Field 21	58	0.2	12

Table 2: Relationship between Circulating Filarial Antigen and Sociodemographic Variables in 342 Study Subjects

Age Group (years) in group	Number affected	Number (%)	Fisher exact p-value
1 – 5	110	1(0.9)	0.019
6 – 10	114	6(5.3)	–
11 – 15	93	11(11.8)	–
16 –18	25	2(8.0)	–
Gender			
Male	163	9(5.5)	0.823
Female	179	11(6.1)	–
Stay in Pamol (years)			
1 – 5	123	1(0.8)	0.005
6 – 10	132	11(8.3)	–
11 – 15	73	8(11.0)	–
16 – 18	14	0(0.0)	–
Social Class			
I – III	26	0.(0.0)	0.383
I – IV	316	20(0.0)	–

Table 3: Relationship between Circulating Filarial Antigen and Symptoms (N=342)

	Number in Group	Frequency (%)	Fisher exact p-value
History of Swollen Leg			
Yes	2	0(0.00)	0.89
No	20	340(5.89)	
History of Swollen Scrotum or Labia			
Yes	1	0(0.00)	0.94
No	321	20(6.23)	
History of Persistent Itching			
Yes	55	17(30.91)	<0.001
No	267	3(1.12)	

Though positivity decreased with increasing use of insecticide spray, this was not statistically significant. The 10 subjects who ever used insecticide spray but were positive were those who used it less frequently than once a month-occasionally, 2(10%) or only when mosquito is plenty, 8 (40%).

DISCUSSION

A prevalence of Circulating Filarial Antigen (CFA) of *Wuchereria bancrofti* of 5.8% was found in this study. This is much lower than the 48.7% reported by Maurice[14] who used similar ICT technique in a study of adult population in Biase LGA, Cross River State. Other researchers around the region, studying adult populations, reported similar higher prevalence. Work done by Okon *et al*[15] in 2010, in rural communities in Membe area of Cross River State, reported a prevalence of 15.5%, using the less sensitive thick blood film staining and microscopy method which may have underestimated the prevalence. These studies however did not include the childhood population. The only children study in Africa we could find was that of Ashton[16] in 2010 in Uganda, who reported a prevalence of 0.2% in children aged less than a year and 6% in children aged more than 5 years, using ICT technique. This is comparable to the prevalence rate reported in this study. Another study in children in Haiti[17] reported prevalence between 2.4 and 16.1% depending on the altitude. Higher altitude is associated with lower prevalence.[17] The current study falls within this prevalence range.

The lower prevalence in this study compared to other studies among adults in Nigeria can be explained by the fact that our study focused on the age group 18 years and below. In this study group, theduration of exposure has not been as long as it is in the adult studies. The risk of exposure may also be different in childhood populations due to differing activities.

This study recorded a significant increasing positivity with age, indicating a cumulative exposure effect. This finding is in agreement with those reported by Okon *et al,*[15] and Udoidung *et al*.[18] A second reason for the lower prevalence

Table 4: Relationship between Circulating Filarial Antigen and Use of Preventive Measures (N=20)

	Number in Group	Number Affected (%)	Fisher exact p-value
Use of Insecticide Treated Net			
Yes	55	0(0.00)	0.03*
No	287	20(6.97)	
Use of Insecticide Spray			
Yes	253	10(3.95)	0.02
No	89	10(11.24)	
Frequency of Insecticide use			
At least once a month	0	0(0.0%)	0.06
Occasionally	2	2(20.0)	
Only when mosquitoes are plenty	8	8.(80.0)	

may be the fact that this community is a sub-urban settlement with the adjacent community (Calabar) being urban, without forests. Other studies[14,15] were in areas surrounded by rain forests.

There was no significant difference in the prevalence of CFA between males and females in this study, in contrast to some other works done in adults where clear sex preponderance was observed.[15,19,20] The absence of sex preponderance in this study might be because the studied children did not have peculiar difference in the times of exposure as was the case in some of the adult studies, where males and females were assigned different occupational roles.[15] The bulk of the population studied belonged to the socioeconomic class IV and V. The use of insecticide or nets was minimal in this group. Heather *et al*[17] postulated that higher socioeconomic status did not offer protection against infection. What may be more important is environmental protection from bites. The history of use of preventive measures, including mosquito nets sand insecticide sprays, was found to significantly reduce the chance of CFA positivity. This demonstrates the effectiveness of both control measures.

The only significant clinical symptom recorded in those who were positive for CFA was persistent itching. This finding was different from that reported previously in the adult population by Okon *et al*[15] in which hydrocoele and lymphoedema were the most frequent clinical manifestations. Pani *et al*[22] reported that the most common manifes-tation of *W. Bancrofti* was genital involvement. The difference in clinical manifestation noted in this study can be
explained by the fact that symptoms develop following repeated inflammatory reaction and progressive obstruction of lymphatic vessels over years. Usually, the manifestations are seen from adolescence and early adulthood.[23] Infected children thus represent early infection with not enough time to develop the genital symptoms and signs, and also a good opportunity to prevent pro-gression of the disease.

CONCLUSION AND RECOM-MENDATIONS

Significant *Wuchereria bancrofti* infection does occur in children in the environment. The main symptom in this age group is itching. Repeated and prolonged infection may result in disability later in life. To avoid this, early treatment in this age group is advocated. The elimination programme should be extended to all rural communities with conditions likely to favour transmission of the parasite, with the inclusion of children. The use of insecticide sprays and mosquito nets is strongly advocated in this and similar environment.

RECOMMENDATION

This paper is dedicated to the memory of Dr. Bassey Daniel Umoh who died in a road accident soon after the first draft was completed. I am grateful to the management of the Pamol Nigeria Ltd for permission to conduct this study in their plantation estate. Drs. Ofonmbuk Umo, Andikan Inyang, Rekpene Ekat and Inibehe Essien assisted in data collection. I am grateful to Dr. C.C Chukwuegbo for assistance with data analysis. Prof Angela Oyo-Ita helped critique the manuscript.

Conflict of Interest

Nil.

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