

Original Research Article

Exploratory study of filariasis lymphatic in non-endemic area in Benin: the case of Atlantic department

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ABSTRACT

Background: Lymphatic filariasis (LF) is caused by a microfilaria, *Wuchereria bancrofti*, transmitted mainly by mosquitoes: female *Anopheles* and *Culex quinquefasciatus*. In Benin from 2000 to 2016, a program of LF elimination implemented. In 2019 southern departments of country reported non-endemic, however some LF disease cases are sometimes founded in hospitals of this area. The aim of this study was to determine whether there are still cases of LF in these regions, even though they have been declared non-endemic.

Methods: The study sample consisted of 107 subjects with elephantiasis of our area study (Atlantic department). All of them underwent to ultrasound exam at autonomous radiology center.

Results: Our 107 subjects included 61 male and 46 female subjects with the minimum and maximum age are respectively 4 and 80 years old. Table 1 shows also a little representation of subjects age group from 0 to 20 years old. The subjects in our sample consist mainly of fisherman (n=42) and fisherman (n=34) followed artisan (n=16), trader (n=5), student (n=3) and functionary (n=7). As the FL manifestations we noticed mainly about our subjects axillary and inguinal inflamed node, lymphedema, filariasis dancing sign (FDS) across all age group.

Conclusions: Although the conclusions of the literature which declared non-endemic some areas in Benin, our study still reveals the persistence of the cases of LF diseases.

Keywords: Benin, Elephantiasis, Southern departments, Ultrasound

INTRODUCTION

In Africa, lymphatic filariasis (LF), also known as elephantiasis, is due to a microfilaria, *Wuchereria bancrofti* which is transmitted mainly by mosquitoes: female anopheles and *Culex quinquefasciatus*.¹ LF is actually a neglected tropical disease (NTD). NTDs are diseases linked to poverty, social stigmatization and conflict. They are one of the reasons why the bottom billion people are unable to escape poverty.²

Elephantiasis, a disease of the lymph nodes and lymphatic system, occurs when there is a mechanical obstruction to the circulation of lymph in the vessels draining the affected area. It can be caused by parasitic worms (Bancroft's *Wuchereria*, *Brugia Malayi* and *Brugia Timori* filaria) that live in the lymphatic circuit. It can also be caused by a lymphatic malformation, a compression by a tumor, a lymphangitis (inflammation of the lymphatic vessels).³⁻⁶ These tiny parasitic worms are transmitted to humans by mosquitoes of the species *Culex*, *Aedes*, *Anopheles* and *Mansonia*, which are abundant in the hot and humid climates of the

intertropical zone.^{7,8} Bancroft's filaria (*Wuchereria bancrofti*) is one of the main filarias responsible for lymphatic filariasis.⁹ Lymphatic filariasis manifests itself a few months after the infesting bite with transient fever outbreaks, accompanied by pain in the inguinal nodes and groin. Once in the body, the parasites have a life span of 4 to 6 years and produce millions of larvae that circulate in the blood.^{2,5,10} In its most obvious manifestations, elephantiasis causes enlargement of the leg or arm, genitals, vulva and breasts.⁷ Although most infestation occurs in early childhood, the effects often do not become apparent until adulthood.¹¹ The accumulation of lymph leads to edema and can give the leg a hard, elephant-leg appearance, which is why it is called elephantiasis. But even in the absence of visible signs, studies have shown that apparently healthy victims actually have latent lymphatic pathology and kidney damage.¹¹

New techniques make it possible to circumvent the endemic areas and thereby control the spread of the disease and, above all, the treatment. This treatment aims essentially to remove microfilariae (larvae) from the blood of the patient in order to interrupt the chain of transmission by the mosquito. Since 2000, 6.2 billion treatments have been distributed to stop the spread of the infection.¹² After this health strategy, in 2019 Batcho et al conducted an assessment study and they showed that the departments of southern Benin are not be endemic zones for lymphatic filariasis but the transmission is ongoing in the at Ouinhi, part of the Zou Department.⁹ Despite this progress, some lymphatic filariasis cases reported in southern Benin hospital. This reality motivated our study to assess the persistence of this disease in non-endemic area. The purpose of this study was to show the presence of elephantiasis cases in the major cities of the three departments of southern Benin, even though they have been declared non-endemic.

METHODS

Study framework

Benin, the former kingdom of Dahomey, is a West African country with an area of 114,763 km² for a population of about 9 million inhabitants. It is divided into twelve (12) departments, including the Atlantic, which contain the major cities.¹³ It is part of West Africa and bordered by the Atlantic Ocean to the south, Togo to the west, Burkina Faso and Niger to the north and Nigeria to the east. Benin is divided into twelve (12) departments, subdivided in turn into seventy-seven (77) municipalities. The population of Benin is 10,008,749, of which 5,120,929 are women, or 51.2% of the total population. This study focused on the southern Atlantic departments.

The Atlantic department is one of the smallest of Benin's twelve (12) departments in terms of geographic size. It stretches over nearly 100 km from the coast to the interior of the country. The Atlantic department has a surface area of 3233 km² and includes eight communes, namely

Abomey-Calavi, Allada, Kpomassè, Ouidah, Sô-Ava, Toffo, Tori-Bossito and Zè. The municipality of Abomey-Calavi for the Atlantic Department.¹⁴

Materials

The study population consists of people selected in the eight municipalities of the department of Atlantique who are farmers, fishermen, hunters, etc. or coming from areas bordering the department. The sampling focused on 107 patients randomly identified from November 2019 to December 2020 for all 4 sites of the two zone hospitals. The patients recruited are those who voluntarily came to consult without prior publicity about the study.

Inclusion criteria

Being a resident of the study area (Atlantique department) and suffering of elephantiasis disease, or reside a close relative; belonging to the family of an elephantiasis and agreeing to participate in the study.

Non-inclusion criteria

All subjects that reside out of the study area.

Our samples came from patients coming to consult for problems of swelling of limbs (thoracic or pelvic), bursa, breasts, etc. To do this, an information sheet (surname, first name, and contact) was deposited at the various receptions of medicine and surgery of the zone hospitals of Calavi de Ouidah and Allada after authorization of the directors of these centers, that of the ethics committee (CE). These sheets were collected at the end of the day after the daily consultations, for registration in an Excel file. Patients were then contacted for a group interview to explain to them the purpose of the study and the risks and benefits of their participating. Those who freely chose to participate after signing a consent form underwent the ultrasound examination. On the day of the examination, patients from the same area were grouped together and transported to and from the imaging center by us. At the imaging center, patients were seated on a bench in the waiting room and took turns entering the exam room. In the waiting room, a public interview followed by questions and answers took place to explain once again the objective of the study and especially the course of the examination. In the ultrasound room, they were answered a questionnaire (surname, first name, sex, age, profession, commune of origin, origin of the disease, previous treatment, use of mosquito nets).

In this study, we used a Mindray DP 8800 ultrasound scanner. With the patient lying on the bed, the examination was done with a multifrequency linear probe from 6.5 to 10.5 MHZ. All parts affected by the disease in patients were examined as well as the axillary and inguinal regions. The resulting images were stored in a logger associated with the device; they were then retrieved, processed, and analyzed.

The study received approval from the National Ethics Committee for Health Research (CNERS/SA) on April 23, 2021.

Statistical analysis

All the data collected were entered into an excel 2010 file. They were analyzed through the parameters of descriptive statistics and the realization of graphs.

Need a section on ethical clearance/use of human subjects: explains the case report form, assurance of

patient privacy, name and approval number of the agency that approved the study.

RESULTS

In our exploratory study about the persistence of LF in one most declared non-endemic department of Benin, we recruited 107 subjects. This sample included 61 male and 46 female subjects with the minimum and maximum age are respectively 4 and 80 years old (Table 1). The most represented age group was from 40 years old to 50 years old followed the age group from 60 years old and more with respectively 23 and 21 subjects.

Table 1: Distribution of patients by age and gender.

Gender	Age (years)							Total
	(0-10)	(10-20)	(20-30)	(30-40)	(40-50)	(50-60)	(60+)	
Male	4	4	10	10	11	8	14	61
Female	0	5	5	8	12	9	7	46
Total	4	9	15	18	23	17	21	107

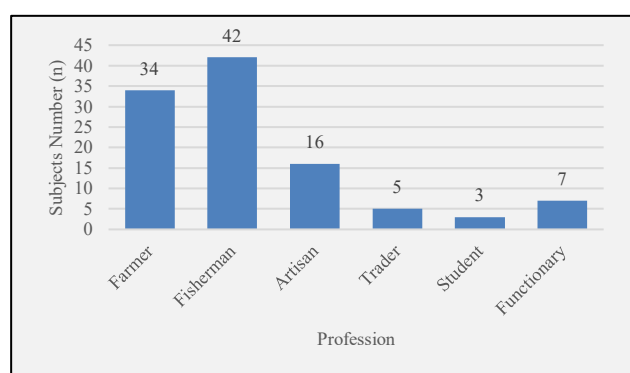


Figure 1: Distribution of subjects according to their profession.

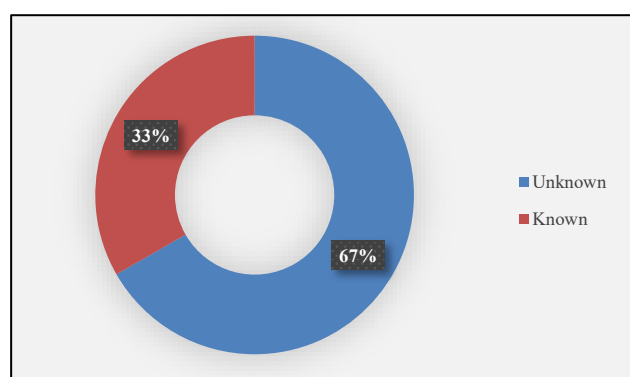


Figure 2: distribution of subjects according their disease knowledge.

Table 1 shows also a little representation of subjects age group from 0 to 20 years old. The subjects in our sample consist mainly of fisherman (n=42) and fisherman (n=34) followed artisan (n=16), trader (n=5), student (n=3) and

functionary (n=7). The morbidity of this disease has rendered all subjects inactive (Figure 1).

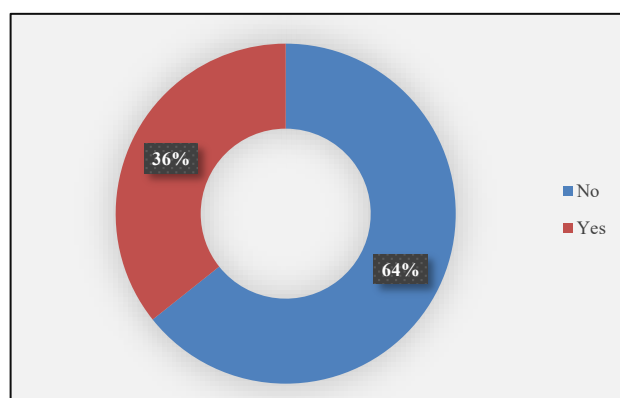


Figure 3: Distribution of subjects according the participation to medicine distribution administration (MDA).

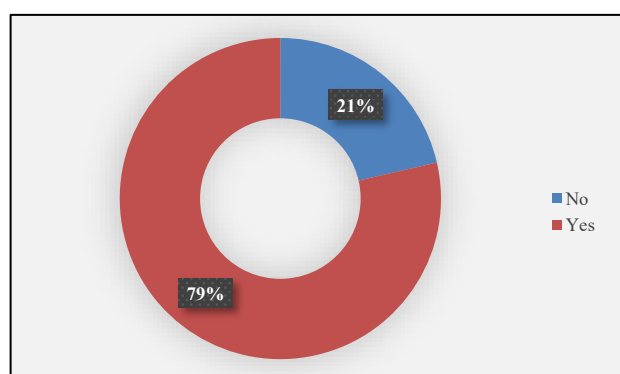


Figure 4: Distribution of subjects who consulted a physician.

About our subject's knowledge of the cause of the disease, Figure 2 shows that the majority is not informed about their disease (unknown =67%). We observed a similar distribution of subjects about their participation in MDA (no =64%) (Figure 3). Out of these realities, Figure 4 shows the majority of LF subjects underwent a medical appointment without real solution.

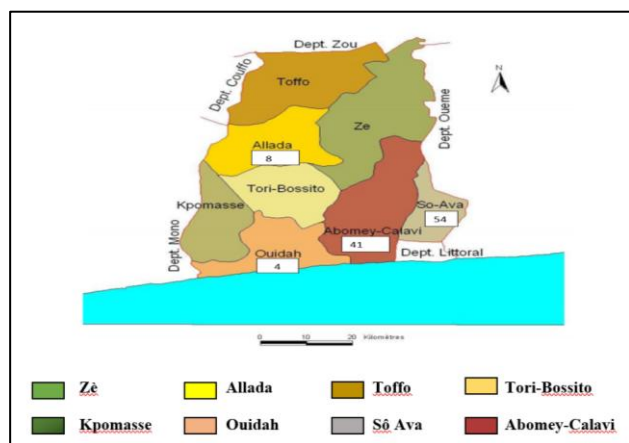


Figure 5: Map of subject's distribution according their city of residence.

These results also show a high concentration of the disease in the Atlantic department, especially in the communes of Abomey-Calavi and SÔ-AVA. Such a situation is due to the fact that these two communes, including Sô-zounko, are lake areas where fishing, agriculture and hunting are practiced by the most active age group, as shown in Table 1 and Figure 1. These images obtained from the patients we have actually received, testify to the presence of elephantiasis in the above-mentioned localities.

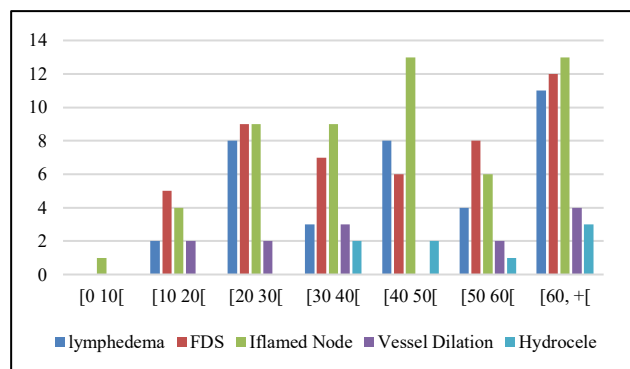


Figure 6: Distribution of subjects according the FL manifestations and age.

In the Atlantique department that is our area, subjects distributed in the major cities as follow: Abomey-Calavi (n=41), Ouidah (n=4), Allada (n=8), So-Ava (n=54). In these cities, our subject resides currently in a rural area or did so during childhood (Figure 5). As the FL manifestations we noticed mainly about our subjects axillary and inguinal inflamed node, lymphedema, filariasis dancing sign (FDS) across all age group (Figure 6 and 7).

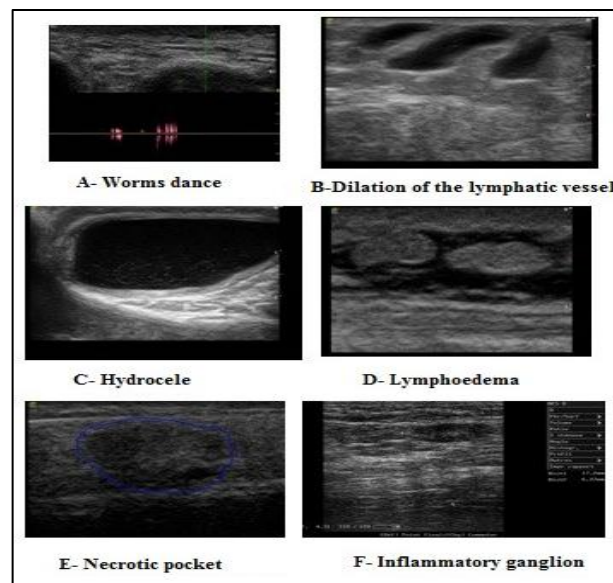


Figure 7: Pathological images in patients received on ultrasound.

From the data collected and even from the images, it appears that elephantiasis, a disease of the lymph nodes and vessels is present in the large cities of the three departments of southern Benin with a high prevalence in the lake towns.⁹ We had inflammatory ganglions (inguinal as well as axillary), necrotic pockets, dilation of vessels, hydrocele and especially the famous dance of filaria (dancing worm) as shown by the images obtained in accordance with the results of the precursors of the studies that preceded us.^{24,25}

DISCUSSION

Our exploratory study in non-endemic declared area in 2019 after a decade MDA health policy, found young and adult subjects in five major cities of Atlantic department of Benin. The presence of young subjects in our study suggests the existence of new cases of LF transmission. Our findings are consistent with those reported by Opare et al in Ghana and Akogun et al in Nigeria in 2025.^{15,16} They focused their study on young subjects to prove the continuation of the illness. Unlike us, their methodology employs an early diagnosis approach.

Adults (40 years old and more) are the most represented group and are farmers and fishermen but all them is not able to work today. That confirms the findings of Santoso et al in 2020 in Indonesia.¹⁷ LF predominantly affects middle-aged and elderly adults in rural areas, as visible symptoms appear after years of exposure to mosquito bites.¹⁸ These workers operate outdoors often early in the morning or late in the evening near wetlands (irrigated fields, riverbanks, ponds), where the mosquitoes that carry the parasite proliferate. The worms settle in the channels of the lymphatic system (the network that drains body fluids) and eventually block the flow of lymph. The infection is often contracted in childhood, but severe and dramatic signs (such as massive swelling of the legs or scrotum) only appear in adulthood, after decades of

lymphatic blockage. As they age and their disabilities worsen, these farmers and fishermen eventually lose their mobility and can no longer support themselves.^{18,19}

In our study LF subjects recognized not knowing the causes of the disease. They also did not receive a proposal for appropriate medical treatment in the hospitals. Kwarteng et al reported a similar finding in endemic area frequently showed that affected subjects and local communities lack awareness of this true cause.^{20,21}

The main pathologies found in this study are: lymphedema, hydrocele, dilation of lymphatic vessels, inflammatory ganglions. These results confirm those of Dreyer et al in 1998 in Recife, Brazil, showing the usefulness of ultrasound.²² In Ghana in 2011, Mand and al showed how ultrasound is a diagnostic tool in the study of lymphatic filariasis.²³ Thus, the results of our study are similar to those obtained by the precursors who had explored the field before us as mentioned above. It may be necessary to think of creating a national center for the management of elephantiasis in this study population. The disease is present in major cities of the Atlantic department which declared non-endemic in 2019.

CONCLUSION

The present study focused on patients with elephantiasis. The highlight of the study is that it shows that elephantiasis is still very present in Benin, especially in the large cities of Atlantic department, one of southern department Benin. The most affected age group is 40 years old and more. Although the conclusions of the literature which declared non-endemic some areas in Benin, our study still reveals the persistence of the cases of LF diseases.

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Conflict of interest: None declared

Ethical approval: The study was approved by the the National Ethics Committee for Health Research (CNER/SA) on April 23, 2021

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