

REVIEW**The Burden of Bancroftian Filariasis in Nigeria: A Review****Adamu Hussaini^{1*}, Clement Isaac¹, Hussaini Rahimat¹, Inegbenosun Collins¹, Obasuyi Cedric², Ezekiel Solomon¹****OPEN ACCESS**

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Affiliation and Correspondence:

¹Department of Zoology, Faculty of Life Sciences, Ambrose Alli University, Ekpoma, Nigeria.

²Department of Microbiology, Faculty of Life Sciences, University of Benin, Nigeria.

*Email: ojagefuadams@gmail.com

ABSTRACT

BACKGROUND: *Lymphatic filariasis (LF) is a neglected tropical disease (NTD) vectored by mosquito; and people in rural areas are mostly at risk of infection. Pooling prevalence data across the six geo-political zones of Nigeria is expected to provide a clearer insight into the burden of the disease as this information could guide towards planning eradication programmes.*

METHODS: *Search for pertinent literature was done on Google Scholar, African Journal Online (AJOL) and PubMed databases using relevant keywords. Studies on the prevalence of LF due to Wuchereria bancrofti in Nigeria were selected and reviewed. Prevalence data from the different states were further organized into the six geopolitical zones and analyzed.*

RESULTS: *Of the 36 states in Nigeria, prevalence data were available only for 19 states. Furthermore, in the six geopolitical zones, North-West had the highest disease burden (44 per 10 000) of Years Lived with Disability (YLD), while North-Central (4 per 10 000) had the lowest disease burden.*

CONCLUSION: *Result are largely attributed to the prevailing conditions in the different zones. In view of ensuring a successful control plan and eventual eradication of the disease, a comprehensive national survey in every state should be carried out using more sensitive tools.*

KEYWORDS: *Lymphatic filariasis, Wuchereria bancrofti, YLD, Nigeria*

INTRODUCTION

Wuchereria bancrofti vectored by mosquitoes is a human parasitic filarial round worm responsible for the disease-lymphatic filariasis (LF) (1). Of note, is the fact that *Wuchereria bancrofti* is more prevalent than filariasis from *Brugia malayi* and *Brugia timori*, as infection could advance to a chronic stage like elephantiasis of the extremities and genitals (1).

In sub-Saharan Africa, 512 million people are at risk of being infected, while 28 million are known to be infected (2). Although mortality from LF is low, the disease is the fourth leading cause of Disability Adjusted Life Years (DALYs) (2,3).

Nigeria is ranked the third most endemic country globally; and in the past, studies on the disease distribution were classified based on the disease prevalence at national or sub-national levels with no account for geopolitical zones heterogeneity (4). Therefore, such estimates did not accurately capture LF burden at zonal levels (5). Analyzing data at geopolitical/zonal level would provide more detailed report on the dynamics of the disease in a way that the disease prevalence and burden could be mapped and as such guide on control strategy. This review article thus presents prevalence data of LF from endemic areas in Nigeria and highlights the gaps in knowledge.

CASE DETAILS

LF, after malaria happens to be the second most common vector-borne parasitic diseases; and it is present in over 80 tropical and subtropical countries (6). According to WHO, LF ranks second as the common cause of long-term disability after mental illness (6,7). LF is of global recognition, playing a significant role in the overall Africa disease burden. Furthermore, one-third of infected persons live in India, a third live in Africa and the remainder in the Americas, the Pacific Island, Papua New Guinea and South-East Asia (8). Persons with LF and other helminthic diseases particularly women and children become more susceptible to secondary infection with HIV/AIDS, tuberculosis and malaria (2). LF is known to cause a wide range of clinical and subclinical symptoms. It is estimated that two-thirds of infected individuals present no obvious proof of the disease, but when tested, they showed some level of immunosuppression. In addition, there could be evidence of renal dysfunction, chronic lymphoedema, elephantiasis and hydrocele.

Evidence of debilitating effect of acute filarial attacks that have been said to last from five to seven days and may occur two to three times each year have been associated with sufferers of LF

(6,7). Chronic filarial disease appears to correlate with serious social and economic burden as those afflicted with elephantiasis and hydrocele are often socially marginalized and are poor based on the severity of disease (9). Episodes of acute attack and chronic disability reduce economic output and increase poverty (6). Due to stigmatization, affected individuals avoid seeking treatment, and this result in the reoccurrence of acute febrile attacks and subsequent damage to the lymphatic system (9,10). Infected women bear double burden as young unmarried women could be forced to live a secluded life and thus limit the prospect of marriage.

More so, recurrent debilitating acute episodes hinder their ability to be gainfully employed. Consequently, the cost of health care as well as other needs make them financially dependent on other people (11,12). In West Africa and Thailand, there is a general believe that children born to women affected by LF would bear similar disease burden (2,13). Shame and fear are associated with difficulties in conceiving, and these feelings are peculiar to LF patients globally (14). Meanwhile, women may have concerns about marrying men with physical sign of LF; their gender expectation and prevailing power strata often leave them in hopeless situations. In Haiti and Ghana, researchers alluded to the point that the risk of unhappiness and marriage breakdown was greater in marriages where the wife had physical signs of filariasis (11,15).

In Nigeria, LF is widespread and it is a serious public health problem (1). Of the 36 states, LF studies were available for nineteen states (19) (Table 1). These studies spanned through the different geo-political zones (North-West, North-East, North-Central, South-West, South-East and South-South) of the country., However, there is still limited/lack of literature on the prevalence of LF disease in some other states.

Table 1. Prevalence of Lymphatic filariasis across Zones and State.

Zones	States	Sample size	Diagnostic techniques	Prevalence (%)	Study population	Reference
North-West	Kano	2790	Blood smear	1.7	Men and Women	[21]
	Kano	357	Blood smear	3.6	Indigens of Kano	[41]
	Kano	54943	Hydrocelectomy cases	2.31	Indigens of Kano	[42]
	Kaduna	793	DEC provocation	7.4	Indigens of Kaduna	[43]
	Kaduna	341	DEC provocation	2.9	Men and Women	[44]
	Zamfara	501	ICT Card test RDT kit	38.7	Men and Women	[22]
North-East	Bauchi	1628	Incubation	1.4	Men and Women	[45]
	Taraba	336	ICT Card test	30.05	Indigens of Taraba	[46]
	Taraba	458	Blood smear	33.84	Men and Women	[47]
	Taraba	327	Blood smear	30.8	Indigens of Taraba	[48]
	Taraba	1031	Blood smear	21.2	Children and Adults	[49]
North-Central	Benue	248	ICT Card test	32.6	Indigens of Benue	[50]
	Kogi	1069	ICT Card test	3.4	Male and Female	[51]
	Plateau	7250	Clinical examination	0.4	Men and Women	[52]
South-West	Plateau	940	Blood smear	1.8	Men and Women	[53]
	Ogun	500	Blood smear	21.0	Children and Adults	[54]
	Ogun	317	Blood smear	17	Children and Adults	[55]
	Ogun	587	Blood smear	3.2	Children and Adults	[56]
	Ondo	231	ICT Card test	29	Adolescent	[57]
	Ondo	1090	ICT Card test	27	Children and Adults	[58]
	Osun	870	ICT Card test	1.7	Children and Adults	[59]
South-East	Oyo	95	Physical examination	26.3	Indigens of Oyo	[60]
	Abia	498	Blood smear	22.3	Indigens of Abia	[61]
	Ebonyi	1243	Blood smear	16.9	Children and Adults	[1]
	Ebonyi	600	ICT Card test	23.50	Indigens of Ebonyi	[62]
	Ebonyi	425	Clinical examination	8.23	Men and Women	[63]
	Imo	200	Blood smear	20	Men and Women	[64]
South-South	Imo	845	Blood smear	8.9	Children and Adults	[65]
	Akwa-Ibom	400	Concentration	3.5	Children and Adults	[66]
	Bayelsa	78	Concentration	10.5	Children and Adults	[67]
	Cross-River	897	Blood smear	15.5	Children and Adults	[68]
	Cross-River	785	Blood smear	6.1	Children and Adults	[69]
	Cross-River	829	Blood smear	5.5	Children and Adults	[70]
	Rivers	1351	Blood smear	3.3	Children and Adults	[18]

DEC: diethylcarbamazine; ICT: immunochromatographic test; RDT: Rapid diagnostic test.

Cases of high prevalence of LF due to *Wuchereria bancrofti* have been reported with infection rates ranging between 9.1% and 18.8% in the eastern region and northern region respectively (16). Mbah and Njoku (17) reported a prevalence rate of 18.8% in Anambra State. Udonosi (18) observed prevalence rates of 8.7%, 11.8% and 14.9-25.6% in Imo and Rivers States respectively. Co-endemicity of *Wuchereria bancrofti*, *Loa loa*, *Onchocerca volvulus* with *Mansonella perstans* had a

prevalence rate of 21.21% in Rivers and Bayelsa States (18). Furthermore, Braide et al (19) reported 13 cases of LF in Cross Rivers State. Amadi and Udonosi (20) also reported a prevalence rate of 4.4% in Ogoniland, Rivers State. Recently, Dogara et al (21a) reported a prevalence rate of 30.2% in Kano. More recently, Ladan et al (22) in his studies on the seroprevalence of LF in six communities of Bungudu Local Government Area of Zamfara State reported a prevalence rate of 38.72%. The

prevalence data in North-East, North-West and South-West is largely unknown (Figure 1).

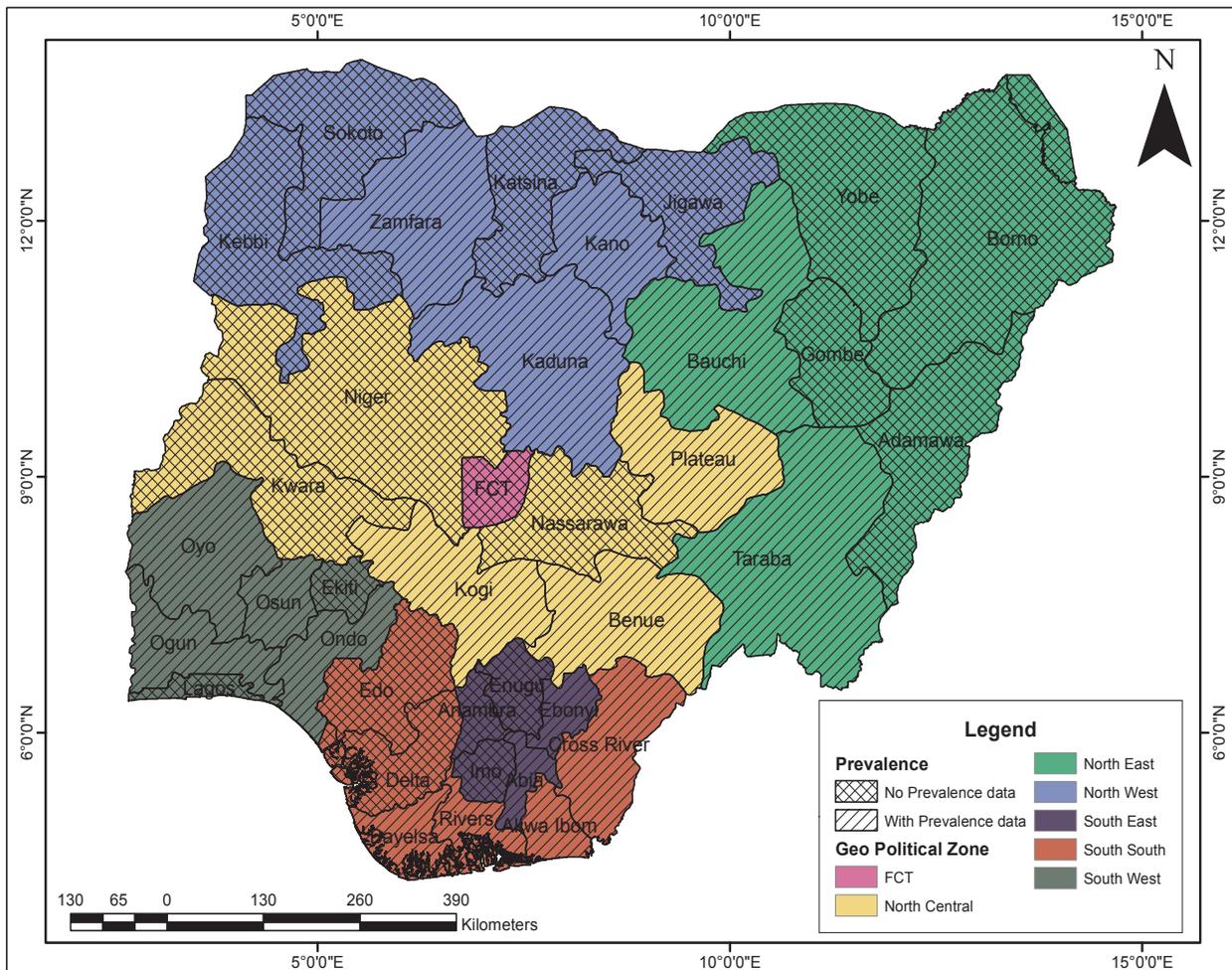


Figure 1: Prevalence data for *Wuchereria bancrofti* in the six geopolitical zones of Nigeria.

LF has impacted negatively on marriage and sexual life in endemic areas. Stigmatization of men with hydrocoele is also observed in some of the endemic countries as villagers in some parts of Nigeria discontinues association from people with filarial skin lesions and men with genital complications and elephantiasis (3). Furthermore, of the 128 million people estimated to be infected worldwide (11,23,24), 22 million (17.2%) are children (school-aged) below the age of 15. LF ranks the second leading cause of long-term disability (7). More so, it has been linked with serious impairment of mobility (25), affecting school-aged children's education and future career prospects due to regular absenteeism from school (26). The

affected children become frustrated to the point that they abandon their education and future endeavors (27).

Poor response of victims to submit themselves for examination and refusal to give night blood samples are challenges against the effective study of LF in Nigeria (20). Environmental factors and conditions influencing LF transmission are similar to those existing elsewhere in the tropics and other sub-Saharan African countries. Factors such as rural to urban migration, increasing urbanization, inadequate waste disposal and deteriorating sanitary conditions in the country could increase the number of breeding sites for the mosquito vectors (28). The roles of mosquitoes and other

dipterans in transmitting the parasitic agents of filariasis are poorly acknowledged in many endemic communities. Therefore, it is surprising that there is little awareness on the need to minimize mosquito contact. Vectors like *Culex pipiens quinquefasciatus* are distributed across the tropics and warm temperate regions and are believed to be indigenous to the low lands of West Africa. These vectors have reached the new world through slave ships; meanwhile an alternate hypothesis suggest it originates in Southeast Asia (29). *Culex pipiens quinquefasciatus* are found in association with other mosquitoes' species in domestic and peri domestic water containers (30). Breeding takes place in eutrophic water of artificial containers or man-made impoundments like ditches, ponds, drains with high nutrient containing human or animal sewage (30). Factors such as adequate rainfall and longevity of the female *C.p. quinquefasciatus* have been attributed to survival and reproduction. With distinct rainy season, their population reaches its peak densities during or immediately after the rainy season, while in subtropical and warm temperate areas, peak populations occur during the warmest month of the year (30). *Stomoxys* species is a filth fly with worldwide medical and veterinary importance. There are 18 known species in the genus *Stomoxys*. *Stomoxys calcitrans* is the only species that is synanthropic and present worldwide. *Stomoxys* species breeds in moist, decaying organic matter, while suitable environmental conditions like temperature of 27°C, availability of host for blood meal, influence their survival and reproduction (31). Some of these associated agents that contribute to spread of the disease increase the disease burden, and hence, impacting positively on the spread of the disease.

There are many diagnostic methods available for the detection of LF. Until the 1980s, the only direct method to ascertain a diagnosis of infection by *W. bancrofti* was via the identification of microfilariae (MF) in the peripheral blood using camera counting, polycarbonate membrane filtration, the thick smear method or Knott's technique (32). Meanwhile, apart from their relatively low sensitivities, these methods only identify filarial infection by way of microfilaremia.

In the 1990s, significant improvements were made in the diagnosis of LF with the emergence of new diagnostic tools; namely, use of recombinant antigens to detect specific antibodies (33), PCR for the detection of filarial DNA, the visualization of live adult worms (AW) using ultrasound (US) and circulating filarial antigen (CFA) detection (34). Presently, the standard diagnostic tools are US (34) and CFA detection technique, with the latter using the monoclonal antibodies (McAbs) Og4C3 and AD12. Meanwhile, the CFA detection techniques are commercially available in the form of kits with the advantage of ensuring the possibility of diagnosis using blood samples collected at any time of the day (34,35). However, in Nigeria, there is no report of the use of molecular diagnostic tools for LF infection; therefore, we believe that the prevalence estimates presented in this report is significantly underestimated.

DISCUSSION

In drafting a cost-effective control for diseases, it is paramount that the disease burden be estimated. Disability Adjusted Life Year (DALYs) has become fast increasing metric measurement to assess disease burden (36). DALYs include years of life lost due to mortality (YLLs) and years lived with disability (YLDs). Reports of LF infection burden measured in DALYs are unavailable. Here, we have estimated the value of YLD (Table 2) based on the available prevalence data and morbidity of the infection (37). YLD due to LF in this review was estimated using this formula (38): $YLD = P \times DW$; Where P = number of prevalence cases, DW=Disability Weight.

Furthermore, prevalence was used rather than incidence (38), because in Nigeria, surveys are widely reported in prevalence (Table 1). However, DW (0.027) of infection which is represented on a scale of 0-1 (0=perfect health; 1=death), was adopted (39). YLDs due to LF, according to the geo-political zones are shown in Table 2. This review shows that the YLD from LF prevalence data in Nigeria ranged from 4.0 to 44.0 with the highest and least disease burdens recorded in North-West and North-Central respectively.

Table 2. *Lymphatic filariasis* mean prevalence and estimated YLD according to geopolitical zones (1982-2018).

Region	Mean \pm SD (%)	YLD per 10 000
North-West	9.4 \pm 14.5	44.0
North-East	23.5 \pm 13.3	16.0
North-Central	9.6 \pm 15.4	4.0
South-West	17.9 \pm 11.3	16.0
South-East	16.6 \pm 6.6	17.0
South-South	7.4 \pm 4.7	10.0

Control and elimination rely largely on chemotherapy through mass drug administration (MDA) to interrupt transmission of infection (40). Drugs commonly administered against LF in Nigeria are diethylcarbamazine (DEC), Albendazole and ivermectin. Studies based on selective treatment with single dose of DEC (6mg/kg) have been reported to decrease MF by 90% and adult by 50% (40). Furthermore, vector control methods such as the use of insecticides treated mosquito nets, indoor residual spraying as well as environmental sanitation would reduce the vector population and consequently the transmission of the disease. The YLD data in this report has clearly described the national situation and thus call for the need to intensify surveillance and treatment across all strata. LF control in Nigeria should especially be of high priority in the North-West.

The data in this review have highlighted LF prevalence in Nigeria, with North-West having the highest disease burden. The high prevalence in the North-West is largely attributed to unfavorable climatic conditions that threw up man-made options like construction of irrigation, thereby further enhancing the disease vectors to thrive. It is recommended that LF survey be carried out in states where prevalence data are yet to be available, so that a proper and more comprehensive evaluation of the LF situation in Nigeria be done to the extent that the most effective control strategy can be adopted and applied. Furthermore, to have a near-accurate picture of the prevalence of the disease, a more sensitive diagnostic method should be employed.

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