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RESEARCH ARTICLE

CLINICAL MANIFESTATIONS OF LYMPHATIC FILARIASIS IN BUNGUDU LGA, ZAMFARA STATE, NIGERIA

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ABSTRACT

This study was conducted to determine the prevalence of clinical manifestations of lymphatic filariasis in Bungudu Local Government Area, Zamfara State, Nigeria. Semi structured questionnaires containing volunteer's socio-economic data were used to obtain descriptive information about the volunteers. An overall prevalence (11.11%) of clinical manifestations (Hydrocoele and lymphoedema) was recorded. However, Nahuche and Kwatarkwashi were found to have the highest prevalence (14.28%) of infection among the wards, while least prevalence (5.95%) of infection was recorded in Gada-Karakai ward. Gender and age related prevalence indicated that females had the highest prevalence (3.52%) than males with (2.95%). A Chi-squire analysis showed significant association between the disease and age ($P<0.005$). People within the age group of 70 years and above had the highest prevalence (31.25%), followed by age group 60-69 years and least prevalence (3.95%) was occurred in age group of 0-9 years. Hydrocoele was the common clinical manifestation observed in males individuals only, with overall prevalence of 11.47%. However, no breast elephantiasis was encountered during the study. The results of this study indicated that, the clinical manifestations of lymphatic filariasis are presence in the study area. Therefore, proper sanitation, public enlightenment, mass drug administration and treatment of infected individuals are urgently needed in the study area, if the elimination of the infection is to be achieved by the year 2020.

INTRODUCTION

Lymphatic filariasis is a disease caused by infection with microscopic thread-like parasitic worms that inhabit the lymphatic vessels and lymph nodes of a human host (Medicinenet, 2016; News-medical, 2016). These worms include; *Wuchereria bancrofti* in Africa, *Brugia malayi* and *Brugia timori* in Asia Pacific and are transmitted by *Anopheles, Culex, Aedes* and *Mansoni* mosquitoes (Christiana *et al*., 2013; WHO, 2016). The Cater Center reported that, lymphatic filariasis is transmitted by the same mosquito that transmits malaria (The Cater Center, 2016). Lymphatic filariasis is characterized by a wide range of clinical presentations including acute and chronic manifestations with about 40 million incapacitated people and disfigured by morbid grotesque manifestations of the disease known as lymphoedema and hydrocele (Christiana *et al*., 2013). Lymphoedema is the build-up of excess protein-rich lymph fluid in body tissues due to lymphatic insufficiency or obstruction of lymphatic drainage back into the bloodstream. The affected area can become swollen and distorted in shape. This can result in pain, heaviness, discomfort, including physical changes, impairment to function and daily life activities, challenges for work, social and leisure activities, and financial implications and it impacts on daily activities (NCCP, 2015; Jeffs and Purushotham, 2016). Hydroceles result from the gradual accumulation of fluid in the tunica vaginalis of the scrotal sac and may be accompanied by thickening of the spermatic cord and changes in the scrotal skin and subcutaneous tissue (Otabil and Tenkorang, 2015). When left unattended, filarial hydroceles may lead to other urogenital complications, including lymph scrotum, a urogenital condition characterized by the presence of lymphatic vesicles on the surface of the scrotal skin that can easily rupture, giving rise to drainage of the whitish secretion typical of the disease (Otabil and Tenkorang, 2015). *W. bancrofti* was reported to have the widest distribution and it is responsible for 90% of all the cases of lymphatic filariasis, extending throughout central Africa, the Nile Delta, Turkey, India, Southeast Asia, the East Indies, the Philippine, Oceanic Islands, Australia New Guinea, and parts of South America (Despommier and Karapelou, 1987; Roberts and Janovy, 2010). Therefore, the significant burden of lymphatic filariasis (LF) in Nigeria is caused by the *Wuchereria bancrofti* (Elkanah *et al*., 2011; FMoH, 2013). Lymphatic filariasis is the fourth leading cause of long-term and permanent disability and is among the tropical diseases which lie second only to malaria in terms of disability-adjusted years (Obi *et al.,* 2010; Omudu and Okafor, 2011).

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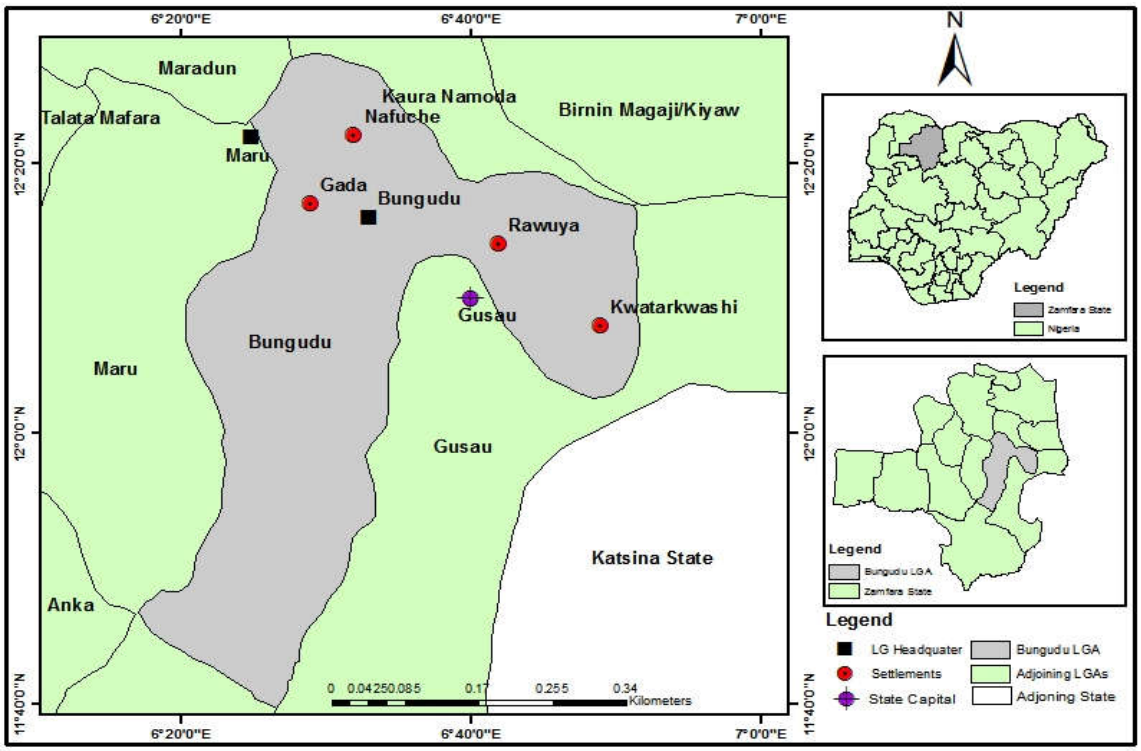

Figure 1. Map of Bungudu LGA indicating Study Areas

W. bancrofti was once common in Japan, China, the Republic of Korea, Turkey, Egypt, and Oceania, but it is diminishing from these areas due to disease elimination programs (WHO, 2011). Currently, 73 countries are considered endemic for filariasis, of which 6 (Cambodia, The Cook Islands, Maldives, Niue, Sri Lanka and Vanuatu) were acknowledged as achieving elimination of LF as a public health problem. There are thirteen (13) more countries that have successfully implemented the recommended strategies, stopped mass treatment and are under surveillance to demonstrate that elimination has been achieved (WHO, 2016). About 947 million people in 54 countries worldwide remain threatened by lymphatic filariasis and preventive chemotherapy to stop the spread of this parasitic infection has not been delivered to all the endemic areas as at the end of year 2015.

Approximately, 80% of the infected individuals are living in the following ten (10) countries: Angola, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, India, Indonesia, Mozambique, Myanmar, Nigeria and the United Republic of Tanzania. Enhanced strategies are now required in about 29 countries to achieve elimination targets and stop treatment by 2020 (WHO, 2016). In year 2000, more than 120 million people of all ages and sexes were infected with one or more of the lymphatic filariae worldwide, and an estimated 25 million men suffer with genital disease and over 15 million people are afflicted with lymphoedema (Samantha *et al*., 2013; USAIDS, 2014; WHO, 2016). Nigeria was rated as the third most endemic country with lymphatic filariasis in the world after India and Indonesia. It was reported that 22.1% of the Nigerian population is thought to be infected, with 66% people at risk of being infected. The epidemiology of the infection is complicated due to the diversity of environmental conditions of different regions of the country (Obi *et al*., 2010). Several studies in Nigeria have reported the prevalence rate of infection with LF ranging from 6%-47% (Omudu and Ochoga, 2011).

There is still the need for more epidemiological information on the infection and its clinical manifestations in the rural and urban communities of Nigeria. As Nigeria prepares to implement the Lymphatic Filariasis Elimination Programme (LFEP) there is the need to have the necessary base line information on the disease, but unfortunately readily available information of some areas that could be endemic is lacking and until data on the distribution of the disease is available that the elimination of the disease will be achieved in the country. It is in this light coupled with the absence of a comprehensive report on the infection and its clinical manifestations in Zamfara state, that this study was designed in order to determine the prevalence of lymphatic filariasis associated morbidities in Bungudu Local Government Area.

Objectives of the Study

The specific objectives of the study are to determine:

- The prevalence of clinical manifestations of lymphatic filariasis in the study area.
- The age and gender related prevalence of clinical manifestations.

MATERIALS AND METHODS

Study Area: The study was conducted at Bungudu Local Government Area, Zamfara State, located between latitude 12°09′00″-12°16′00″N and longitude 6°30′00″- 6°33′24″E occupying an area of 2,293 km² and estimated population of 367,729, (Nysczamfaranews, 2016; NPCN, 2017) (Figure 1). The Local Government is divided into 11 wards (Logbaby, 2017). Majority of the inhabitants are Fulani and Hausa people, hence the main languages spoken in the area are Hausa and Fulfulde while English is the official language (Revolvy, 2016). Islam is the principal and major religion of the inhabitants; they practice similar customs and cultures (Facts,

2016, Logbaby, 2017). Bungudu LGA is in the Northern Guinea Savannah and it is rich in agricultural lands (Onlinenigeria, 2003). The major occupation of the communities especially those living in rural agricultural areas is farming, hence its slogan "farming is our pride". Most inhabitants are engaged in one or more of the following; wet and dry season farming, fisheries, poultry and livestock production. They produce both food and cash crops, like; Rice, wheat, tomatoes, guinea corn, maize, ground nut, cotton, beans, etc. Animals raised in the area include; sheep, cattle, goats, chicks, fishes etc (Facts, 2016; Placng, 2016). In addition to farmers, there are also public servants, traders, fishermen, artisans and other handwork related businesses. The sources of water supply to the inhabitants are river, ponds, wells and bore holes (Yaya *et al.,* 2003). The climate of the area is warm tropical with temperature rising up to 38°C (100.4 °F) between March to May. Rainy season starts in late May, the onset of the rains tends to bring a cooling effect with temperatures dropping below 36°C. The peak of the rainy season is from about July to September (Mamman *et al*., 2000; Zamfara, 2016). The mean annual rainfall in the area is measured 798mm (Onlinenigeria, 2003).It is between October and November that the tropical continental air masses from the Sahara predominates and lower the temperatures to around 17°C–20°C which leads to the cold season known as harmattan that lasts from December to February (Mamman *et al*., 2000; Zamfara, 2016).

Sampling Techniques

A cluster sampling techniques as described by Baba, (2005) was employed in random selection of six out of 11 wards of Bungudu Local Government Area. However, 84 subjects each from Bungudu, Kwatarkwashi, Sankalawa, Nahuche, Rawayya-Bela and Gada-karakai were randomly selected for the study. The study population comprised of males and females of all ages.

Ethical Clearance

Before commencement of the study, an approval from State Health Research Ethics Committee and permission from the Ministry of Health was obtained, so as to have a better access to the community members and to ensure consent of their leaders and confidentiality of each participant for the study.

Questionnaire Administration

Semi structured questionnaires were used to in obtaining information from the respondents as described by Boynton, (2004) and Richter, (2018). The questionnaires containing volunteer's socio-economic data and other relevant questions about the disease were used to obtain descriptive information from the volunteers. A response to 'yes' or 'no' about history of fever and the presence of any sign of dry skin or swelling in any part of the body was used in the physical examination of clinical manifestations. The outcome of results (whether positive or negative with the diseases) were recorded on respective volunteer's questionnaire.

Identification of Lymphoedema

After obtaining the required information from the participant, clinical manifestations of lymphoedema in each infected volunteer was examined with the help of trained personnel as described by Eigege*et al.* (2002). During the physical assessment of lymphoedema, infected participants were simply asked to lift up their clothing to expose the affected limb(s). The skin of the affected limb(s) was examined for; dryness, increased thickness, hyperkeratosis (scaling), lymphangiomas (blisters containing lymph fluid), abnormal warm or hot temperature, unusual darkness on skin, and the presence of any nodules as these are important indicators of lymphoedema (Sarvis, 2016). The results; positive or negative were recorded on the participant's questionnaire (Plate 1).

Plate 1: Patients with Lymphoedema in the Study Area

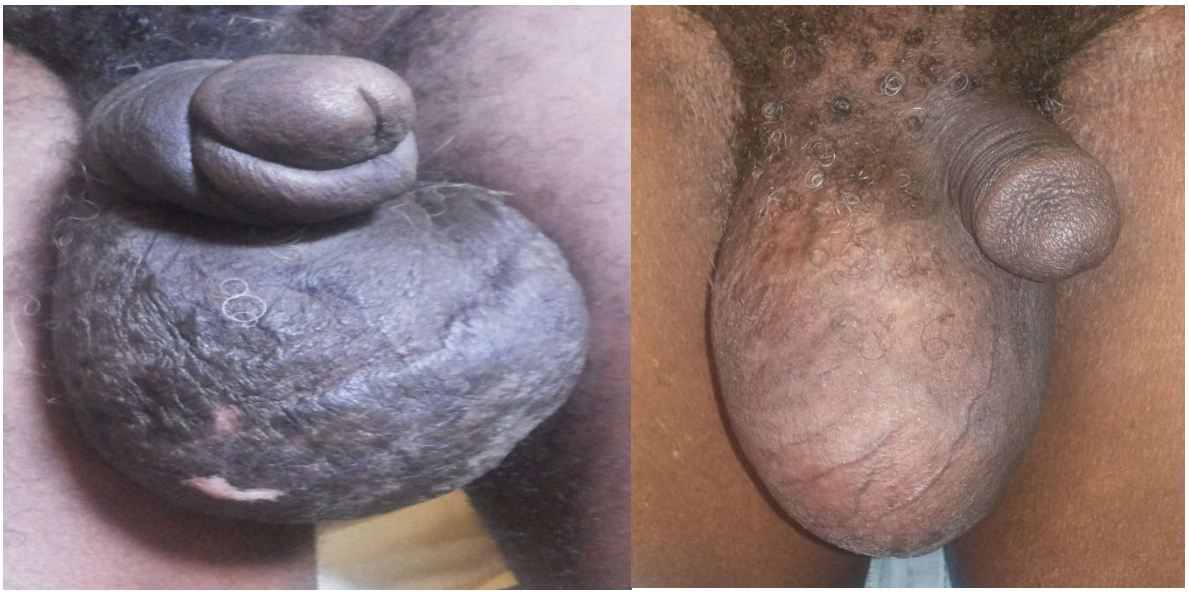

Plate 2. Patients with Hydrocoele in the Study Area

Table 1. Prevalence of clinical manifestations of lymphatic filariasis with respect to wards

Study Areas		Hydrocele		Lymphoedema		Total	
(Wards)	No. Examined	No. Infected	Prevalence (%)	No. Infected	Prevalence (%)	No. Infected	Prevalence (%)
Bungudu	84	5	5.95	4	4.76	9	10.71
Nahuche	84	7	8.33	5	5.95	12	14.28
Sankalawa	84	8	9.52	2	2.38	10	11.90
Kwatarkwashi	84	10	11.90	2	2.38	12	14.28
Bela-Rawaiya	84	8	9.52	0	0	8	9.52
Gada-karakai	84	3	3.57	2	2.38	5	5.95
Total	504	41	8.13	15	2.97	56	11.11

x^2=4.259; *df*=5; *P*<0.05

Identification of Hydrocoele: Hydrocoele was diagnosed based on the finding of a non-tender, soft, fluid-filled mass bigger than the size of an orange (Omudu and Ochoga, 2011). The physical examination of hydrocele was carried out based on procedure described by Campbell, (2015) and Mayoclinic, (2016**).** Each swollen scrotum was examined for tenderness, even though the testicle cannot be felt because of the surrounding fluid, therefore a pressure is applied on the abdomen and scrotum to check for inguinal hernia, if the size of the fluid collection varies, then it is more likely to be associated with an inguinal hernia. Transillumination was also carried out in dark rooms by shining a bright light through the enlarged portion of the scrotum to identify the hydrocele. If the scrotum is full of clear fluid, as in a hydrocele, the scrotum will light up. The results positive or negative were recorded on the participant's questionnaire (Plate 2).

Statistical Analysis: The prevalence expressed in percentages was calculated as number of infected individuals divided by the total number of individuals examined and then multiplied by 100. The data obtained for the wards, age, gender, and risk factors was analysed using Chi-square. *P* values of 0.05 and 95% confidence interval (CI) were used for statistical significance.

RESULTS

The overall prevalence of clinical manifestations of lymphatic filariasis recorded in the study areas was 11.11%. However, Chi-squire analysis showed no significant association among the communities (wards) with occurrence of the disease. Kwatarkwashi and Nahuche wards recorded the highest prevalence (14.28%) of the disease, followed by Sankalawa with 11.90% and the least prevalence (5.95%) occurred in Gada-karakai. The overall prevalence with respect to hydrocoele in the study area is 8.13%. But community (ward) based prevalence indicated the highest prevalence (11.90%) in Kwatarkwashi, followed by Rawaiya-Bela and Sankalawa with (9.52%), the least prevalence (3.57%) was in Gada-karakai, while overall prevalence with respect to lymphoedema showed 2.95**%**. The highest prevalence (5.95%) of lymphoedema was obtained in Nahuche, followed by Bungudu with 4.76% and then 2.38% as the least prevalence in Sankalawa and Kwatarkwashi. However, there was no record of lymphoedema infected individuals in Rawaiya-Bela Table 1. Age related prevalence of clinical manifestations of disease showed significantly high prevalence in old age individuals than in young ages individuals (χ^2=28.534; *df*=7; *P*<0.05). It was indicated that, people at age group 70 years and above, had the highest prevalence 5(31.25%), followed by age group 60-69 years with 11(22.45%), then age group 40-49 with 13(18.31%), the least prevalence 3(3.95%) was occurred in age group 0-9 years. However, there is variation in specific prevalence of the manifestations i.e. lymphoedema (Plate 1) and hydrocoele (Plat 2) with respect to gender and age of the people. Prevalence of lymphoedema with respect to gender of the people indicated the highest prevalence 7(3.52%) of disease in females than in their counterpart males with 9(2.95%). Chi-squire analysis (χ^2=0.126; *df*=1; *P*>0.05) indicated insignificant association between gender and disease.

Table 2. Prevalence of clinical manifestations of lymphatic filariasis with respect to age and gender of the people

	Males			Females			Total	
Age Group	No. Examined	Lymphoedema Prevalence (%)	Hydrocoele Prevalence (%)	No. Examined	Lymphoedema Prevalence (%)	Breast Lymphoedema Prevalence (%)	No. Examined	Prevalence (%)
0-9	34	0(0)	3(8.82)	42	0(0)	0(0)	76	3(3.95)
10-19	70	1(1.43)	4(5.71)	20	0(0)	0(0)	90	5(5.56)
20-29	39	1(2.56)	5(12.82)	31	0(0)	0(0)	70	6(8.57)
30-39	37	0(0)	2(5.41)	32	1(3.13)	0(0)	69	3(4.35)
40-49	38	2(5.26)	9(23.68)	33	2(6.06)	0(0)	71	13(18.31)
50-59	40	0(0)	8(20.00)	23	2(8.69)	0(0)	63	10(15.87)
60-69	37	3(8.11)	6(16.22)	12	2(16.67)	0(0)	49	11(22.45)
>70	10	2(20.00)	3(30.00)	6	0(0)	0(0)	16	5(31.25)
Total	305	9(2.95)	35(11.47)	199	7(3.52)	0(0)	504	56(11.11)

x^2=28.534; *df*=7; P>0.05

While age related prevalence of lymphoedema indicated that, people at age group 70-above years had the highest prevalence 2(12.50%), followed by age group 60-69 years with 5(10.20%), then age group 40-49 with 4(5.63%), the least prevalence 1(1.13%) was occurred in age group 10-19 years. However, no sign of lymphoedema was found in age group 0-9 years. In the prevalence hydrocoele only male individuals were found to be infected in which people at age group of 70-above had the highest prevalence 3(30.00%), followed by 40-49 years with 9(23.68%), and then 50-59 years with 8(20.00%) and the least prevalence 2(5.41%) was seen in age group 30-39 years. No breast elephantiasis was encountered in any of the age group during this study, Table 2.

DISCUSSION

The results of this study indicated that, the study area is endemic with lymphatic filariasis and it is associated morbidities. This report agreed with the findings of Ladan *et al*., (2018) who reported an overall prevalence of 38.72% infection with *W. Bancrofti* in the same study area. The overall prevalence of clinical manifestations obtained in the study area was 11.1%. The rate obtained in this study was comparatively lower than that obtained elsewhere by other researchers, for example, Christiana *et al*. (2014) obtained overall prevalence of 15% clinical manifestations of infection due to *W. bancrofti* in rural communities of Ogun state, Southwestern Nigeria. On the other hand it was higher than the prevalence (9.5%) obtained by Yahathugoda *et al*. (2005). However, the overall prevalence of subjects affected with hydrocele in this study was 8.1%. The result of this study agreed with that of Omudu and Ochoga, (2011) who discovered prevalence of 8.5% with hydrocele amongst the Ado people of Benue state, Nigeria. This prevalence rate was found to be lower than the other rates obtained in the reports of Udonsi, (1986) that found hydrocele prevalence rate of 12.3% in endemic areas of Niger Delta; Elkanah *et al*. (2011) reported the prevalence rate of 18.4% with hydrocele in five communities of Lau LGA, Northern Taraba state Nigeria; Christiana *et al*. (2014) with prevalence of 16.9%; Ramaiah and Ottesen, (2014) reported prevalence rate of 19.4%. However, our prevalence rate was found to be high as compared to the reports of Mbah and Njoku, (2000) who reported 4.2% prevalence with hydrocele; Targema *et al*. (2010) reported prevalence of 1.8%; Badaki *et al*. (2013) obtained hydrocele prevalence of 6.1%; and Dogara *et al*. (2012) with prevalence of 1.5% of hydrocele. The prevalence of affected subjects with lymphoedema on limbs indicated overall prevalence of 3.17%. This report is similar with the report of Uttah *et al*. (2004) who recovered 3.7% in their study on bancroftian filariasis in the lower Imo river basin, Nigeria; it was however higher than the rates obtained by Targema *et al*. (2010) who reported prevalence of 1.8%; Dogara *et al*. (2012) and Ojukwu and Njom, (2012) who reported 0.2% and 0.25% respectively. Prevalence was also found to be lower than that obtained by Mbah and Njoku (2000) who obtained 7.5% prevalence of hydrocele; Elkanah *et al*. (2011) reported prevalence of 9.2% and Christiana *et al*. (2014) recovered 4.6% and also Ramaiah and Ottesen, (2014) with prevalence rate of 14.4%. The clinical manifestations recorded in this study were hydrocele and lymphoedema only, no breast elephantiasis was obtained. However, hydrocele; a characteristic of chronic manifestation of lymphatic filariasis mostly found in male subjects was observed as the most common disease as compared to lymphoedema, similar observations were made by Elkanah *et al*. (2011) and Christiana *et al*. (2014). Clinical manifestation (lymphoedema) with respect to gender of the subjects indicated the highest prevalence of 3.5% in female than their counter parts males with 2.9%. The report of our study is not in line with the report of Das *et al*. (2006) and Okonofua and Morenikeji, (2010) who reported that prevalence of lymphoedema was significantly higher in males than in females. However, finding of this report agreed with the reports made by Omudu and Okafor, (2010), Uttah (2011), Dogara *et al*. (2012) and Christiana *et al*. (2014) who reported higher prevalence of lymphoedema in females than the males.

The reasons for higher prevalence of lymphoedema obtained in females is inexplicable, but may be attributed to the fact that in rural communities where this study was conducted women are more prone to poor personal hygiene, they lives in dirty environment where they can easily get fungal or bacterial infections, this may leads to lymphoedema progression in infected individuals. In addition, these women were less privileged, they have a lower status than men. Culturally, they are denied the right to manage their own property, and have little control over themselves. This made it necessary to most of infected women to embark on self-medication. Similar observations were made by Tanner and Weiss, (2000). Mirta *et al*. (2004) reported that, in many cultures, men are still given better care within the family, as well as outside. Women's lower status in the household affects their access to information about health and preventive measures, as well as their ability to seek treatment. Evidence suggests that women's ability to make decisions has considerable influence on the health of their children. Another reason may be due to the magnitude of age-associated lymphatic pumping decline which was believed to be most significant in women of postmenopausal age than in men (Unno *et al.,* 2011). Morbidity pattern due to lymphatic filarial infection showed

significant increase with advancement of age, it was clearly indicated in this study that subjects within the age group of 60 years and above (>70 years) had the highest prevalence of clinical manifestations. Related researches conducted elsewhere by Udonsi, (1986); Mbah and Njoku (2000); Elkanah *et al*. (2011); Moffatt, (2003); Omudu and Okafor, (2007); agreed with the findings of this study. This observation could be attributed to the fact that majority of these infected individuals are farmers and are in close proximity to the mosquito breeding site during their farming activities. Another reason may be in line with the report of Unno *et al.,* (2011) that, lymphatic pumping pressure significantly decreases with increasing age. Because aging has adverse effects on many body functions, this result is not surprising since a man is as old as his lymphatics. Infection with *W. bancrofti* is usually acquired in childhood, but the painful and profoundly disfiguring visible manifestations of the disease such as hydrocele and lymphoedema/ elephantiasis occur later in life (Otabil and Tenkorang, 2015).

Conclusion

It is evident from the results of this study that associated morbidities of bancroftian filariasis are present in the study area. Therefore, improved sanitation, public enlightenment, mass drug administration, treatment of infected individuals with hydrocoele, providing group education from lymphoedema experts, provision of written information regarding lymphoedema care and general exercise are urgently needed in the study area, if the elimination of lymphatic filariasis infection is to be achieved by the year 2020. Further research is encouraged in the study area to determine the prevalence of infection with *W. bancrofti* and its diseases in other endemic areas that our study was unable to reach.

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Competing Interest

The co-authors have read through the manuscripts and are fully aware about the publication of the manuscript. We therefore, declared no competing interest.

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