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Review

Loa loa and *Mansonella perstans*: Neglected human infections that need control in Nigeria

O. M. AGBOLADE[1*], D. O. AKINBOYE[2] and O. F. OGUNKOLO[3]

[1]Department of Plant Science and Applied Zoology,
Olabisi Onabanjo University, P.M.B. 2002, Ago-Iwoye, Ogun State, Nigeria.
[2]Department of Zoology, University of Ibadan, Ibadan, Nigeria.
[3]Department of Physiology, Faculty of Basic Medical Sciences, Olabisi Onabanjo University, Ikenne Campus, Ogun State, Nigeria.

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Despite the continued endemicity of *Loa loa* and *Mansonella perstans* infections in many parts of Nigeria, there has been no meaningful large-scale control program against them. This paper presents the epidemiological status of the infections in Nigeria, evaluates and emphasizes the severity of the recorded clinical symptoms, justifies the need for a control program, and proffers possible control measures. It is shown that, based on available literature, the clinical symptoms of the infections could be seriously debilitating with grave negative socio-economic impacts, especially among the rural populace who contribute immensely to agriculture in Nigeria. We opined that it is inhumane and deceptive to neglect these infectious diseases and the sufferers if truly the country desires health for all.

Key words: *Loa loa*, *Mansonella perstans*, neglected diseases, control, Nigeria.

INTRODUCTION

Loa loa and *Mansonella perstans* are two important human filarial parasites which are found in tropical Africa, causing the diseases called loiasis and mansonellosis (perstans filariasis), respectively. Other human filarial parasites found in tropical Africa are *Wuchereria bancrofti, Onchocerca volvulus,* and *Mansonella streptocerca* (Hawking, 1977; Cheesbrough, 1987; Heyneman, 2004).

L. loa infection is restricted to the rain-forest belt of western and central Africa and equatorial Sudan, and from 20 to 40 million has been estimated as carriers (Fain, 1978; Piekarski, 1989; Boussinesq and Gardon, 1997). The two main vectors of human *L. loa* are *Chrysops silacea* and *C. dimidiata* which are normally restricted to the forest canopy (Fain, 1978; Noireau et al., 1990). Contact between the vectors and man is enhanced by human movement in the forest and the presence of wood-fire (Duke, 1955; Muirhead-Thomson, 1982). *M. perstans* infection occurs across the centre of Africa, from Senegal and Gambia on the west coast to Kenya, Zimbabwe and Tanzania on the east (Piekarski, 1989; Ottesen, 1990). The vectors are blood-sucking midges such as *Culicoides grahamii, C. austeni,* and *C. fulvithorax* which thrive in the underbrush (Crewe, 1977; Muirhead-Thomson, 1982; Agbolade, 2002).

To the best of our knowledge, there has been no meaningful large-scale control program against *L .loa* and *M. perstans* infections in Nigeria or any other tropical African country despite the widespread distribution of the infections. This apparent neglect seems to be on the premise that the filarial infections, especially *M. perstans*, exhibit little or no severe symptoms. The situation is worsened by the common perception that the transmission of the infections is naturally controllable without any direct human efforts: *L. loa* controlled by normal village growth and *M. perstans* by bush-burning. This paper presents a review of the epidemiological

*Corresponding author. E-mail: agbolmos@yahoo.com.

status of the infections in Nigeria since about three decades ago, re-appraises the recorded clinical symptoms of the infections, justifies the need for a control program, and proffers possible control measures against the infections in the country.

EPIDEMIOLOGICAL STATUS

Evidences abound in literature that human *L. loa* infection has been recorded in Nigeria since, at least, four decades ago (Hawking, 1977) and that both *L. loa* and *M. perstans* infections have persisted in various parts of the country, especially in the rural areas. In the western part of Nigeria, Ogunba (1971) reported *L. loa* microfilaraemia prevalence of up to 11%, while the symptoms ranged from 15 to 61% among school children in Ijebu division. Ogunba (1972) studied *L. loa* distribution in all the vegetational zones of the defunct Western State of Nigeria and reported that in the rain-forest zone the prevalence of *L. loa* among school children ranged from 0.9% in Ibadan division to 11.3% in Ilesha /Ife division. In the savannah zone the prevalence ranged from 0% in Egba, Ibadan and Owo divisions to 1% in Oyo division. The mangrove zone had 2.5% and 2.1% prevalence in Egbado and Okitipupa divisions, respectively. Among adults, the overall prevalence in the defunct State was found to be 8.3%. In a study among school children in Lagos State, Ejezie (1981) reported 0.7% prevalence of *M. perstans*. In a study at the University College Hospital, Ibadan, Akinboye and Ogunrinade (1987) reported a *L. loa* prevalence of 3.5% among blood donors. In another hospital-based study in metropolitan Lagos, Oyerinde et al. (1988) reported 5% and 0.8% prevalence of *L. loa* and *M. perstans* microfilaraemia, respectively. Three decades after Ogunba's first report of *L. loa* from Ijebu division, Agbolade and Akinboye (2001) reported 10.5% and 3.2% prevalence of *L. loa* and *M. perstans*, respectively.

In the eastern part of Nigeria, Arene and Atu (1986) reported 47% prevalence of *M. perstans* from Bori Local Government area of the Niger Delta. In another study in Niger Delta area, Udonsi (1986) reported 2.5% and 6% prevalence of *L. loa* and *M. perstans*, respectively. In the Igwun River Basin, Udonsi (1988) also reported prevalence values of 9.1% and 13.4% for *L. loa* and *M. perstans*, respectively. Recently, Takougang et al. (2002) reported up to 18% prevalence of *L. loa* from certain parts of Cross River State. Similarly, Anosike et al. (2004) reported *L. loa* and *M. perstans* as part of the 14 parasitic infections recorded among nomadic Fulanis of south-eastern Nigeria.

In the central part of Nigeria, Ufomadu et al. (1986) recorded 5.5% and 4.5% prevalence of *L. loa* and *M. perstans*, respectively. In another study in the area, Ufomadu et al. (1991) reported 2.1% and 6.8% prevalence of *L. loa* and *M. perstans*, respectively. In the same region, Akogun (1992) reported between 0.9% and 5.2% prevalences of *Loa loa* among some rural populace of Mutum-Biyu district of Gongola State.

In the northern part of Nigeria, Wijeyaratne et al. (1982) carried out a filariasis survey in Malumfashi district and reported *M. perstans* prevalence of 14.6% and 7.1% double infections with *M. perstans* and *W. bancrofti*. The authors also noted the presence of *Chrysops* vectors of *L. loa* in the district. In the north-western zone of Bauchi State, Anosike (1994) reported 0.7% and 1.4% prevalence of *L. loa* and *M. perstans*, respectively. In another study in Bauchi State, Anosike and Onwuliri (1994) reported 0.2% and 1.6% prevalence, respectively. The two studies from Bauchi State showed that fishermen, farmers and nomads were most affected.

From the available reports, *L. loa* and *M. perstans* infections often co-exist in many parts of Nigeria, even with some subjects having double infections (Oyerinde et al., 1988; Udonsi, 1986, 1988; Ufomadu et al., 1986, 1991; Anosike, 1994; Agbolade and Akinboye, 2001). The prevalences of *L. loa* and *M. perstans* microfilaraemia tend to increase with age and to be higher in males than in females in all parts of Nigeria (Ogunba, 1971; Oyerinde et al., 1988; Udonsi, 1988; Anosike, 1994). However, both infections occur indiscriminately in subjects regardless of their ABO blood groups (Ogunba, 1970; Agbolade and Akinboye, 2000, 2005a).

CLINICAL SYMPTOMS

Among local or permanent residents of endemic regions, loiasis may be manifested only by an asymptomatic microfilaraemia in some infected subjects. But in many infected subjects, the adult worms sometimes move subconjunctivally across the eye (eye worm) (Nutman et al., 1986) often eliciting severe eye and peri-orbital itching and discomfort (Cook, 1990; Agbolade, 2002). In the Calabar area, up to 45% of the inhabitants of some localities were reported to experience eye worm which lasted 1 – 7 days (Takougang et al., 2002). In Nigeria, there have been two cases of total blindness due to intraocular adult *L. loa* worm infection (Osuntokun and Olurin, 1975). The commonest clinical symptom of loiasis is the fugitive swelling known as Calabar swellings which are localized areas of erythema and angioedema developing predominantly on the extremities (Cheesbrough, 1987; WHO, 1987; Ottesen, 1990). Takougang et al., (2002) reported 51% frequency of occurrence of Calabar swelling with 91% of the victims experiencing itching on the swellings. However, in Ijebu North area, eye and peri-orbital itching (associated with eye worm) and body itching (pruritus) were found more frequent in *L. loa* microfilaraemic subjects than Calabar swellings (Agbolade, 2002). In some few cases, loiasis has also been associated with some serious disorders including nephropathy, cardiomyopathy and encephalo-

pathy (Ottesen, 1990; Chippaux et al., 1996).

As stated above, *M. perstans* is generally regarded as asymptomatic because in some regions up to 90% of infected native subjects may exhibit little or no clinical manifestations. However, is it humane to neglect the ≥ 10% of the infected subjects who suffer serious symptoms of the infection? Serious symptoms that have been reported in mansonellosis include pruritus; swellings (similar to Calabar swellings); fever; pain in bursae and/or joint synovia, in serous cavities, or in the liver region; elephantoid scrotum; extreme exhaustion; and psychological symptoms (Adolph et al., 1962; Arene and Atu, 1986; Piekarski, 1989; Ottesen, 1990; Agbolade and Akinboye, 2005a).

Both *L. loa* and *M. perstans* infections elicit eosinophilia in sufferers like many other infectious diseases (Ottesen, 1990). However, there seems to be an additional haematological picture in some Nigerians infected with *L. loa* and/or *M. perstans* who had marked monocytosis (an increase in monocyte count above the normal or reference range) and neutrophilic toxic granulations (Agbolade, 2002, Agbolade and Akinboye, 2005a). It is known that monocytosis may occur in parasitic infections (Baker et al., 1998) and it has been documented that monocytes are involved in inflammatory response (Ward, 1980; Guyton and Hall, 1996), while neutrophilic toxic granulations are naturally associated with severe, particularly bacterial, infections (Dacie and Lewis, 1984). The occurrence of monocytosis and neutrophilic toxic granulations in loiasis and mansonellosis patients further demonstrates the seriousness of the infectious diseases.

In both *L. loa* and *M. perstans* infections, most of the clinical symptoms earlier stated in this review (especially pruritus and eosinophilia) are more frequent and debilitating in visitors who enter endemic regions (Nutman et al., 1986).

JUSTIFICATION OF THE NEED FOR CONTROL

Human loiasis is important socio-economically because of the appreciable morbidity it causes, particularly in the rural areas (Hovette et al., 1994), and also because it selectively affects man in the prime of life (Fain, 1978). According to Boulestiex and Carme (1986) and Pinder (1988), *L. loa* infection represents the third commonest cause for medical consultation in rural areas of some endemic countries. Should not this give health planners a serious concern? In Ijebu North area of western Nigeria, 10.3% of school children and adults infected with *L. loa* claimed inability to study or work during clinical symptoms episodes (Agbolade, 2002). Similarly, the socio-economic impact of *M. perstans* is demonstrated by the observation that 16.7% of infected school children and adults in Ijebu North area of western Nigeria were unable to study or work during the peak of clinical unable to study or work during the peak of clinical symptoms episodes (Agbolade, 2002; Agbolade and Akinboye, 2005a). Since the clinical symptoms in both *L. loa* and *M. perstans* infections are recurrent, the economic loses due the infections will no doubt be enormous.

The relatively recent reports of both *L. loa* and *M. perstans* infections from different parts of Nigeria stated earlier in this review (Agbolade and Akinboye, 2001; Takougang et al., 2002; Anosike et al., 2004) and some other related ones (Agbolade and Akinboye, 2005b) indicate that transmission of the infections in recent years cannot be ruled out. Some recent vector studies in Ijebu North area of western Nigeria have shown continued presence of the vectors and, in some cases, L_3 infections in the vectors (Agbolade and Akinboye, 2001; Agbolade, 2002; Agbolade et al., under review). This is noteworthy because forest destruction and bush-burning have always occurred in the area. Possibly the widespread occurrence of flood due to rising sea level has provided new breeding sites for the vectors.

It is also pertinent to emphasize that many that 'live' with the insect vectors are ignorant of their potential roles in the transmission of parasitic diseases (Agbolade, personal observation). The situation is worsened by the fact that many rural health workers are ignorant of the aetiology and symptoms of both *L. loa* and *M. perstans* infections. Were they taught at health school at all? Ignorance has been identified one of the important factors enhancing the continued endemicity of parasitic infection in tropical African countries (Ukoli, 1984, 1992). Without a concerted control program how can the rural dweller be adequately informed?

It is well known that Nigeria and other African countries rely mainly on the rural populace for food production and agriculture in general (Ukoli, 1992). Yet, the rural dwellers who suffer from loiasis and mansonellosis, in addition to some other diseases, are been neglected simply because *L. loa* and *M. perstans* infections are 'less serious diseases'. It is our opinion that there is a need for a change for the better if health for all is truly desired and targeted.

POSSIBLE CONTROL MEASURES

The control of both *L. loa* and *M. perstans* infections can easily go together because they often co-exist. Fortunately, the drug of choice for both infections is diethylcarbamazine (DEC) which is usually administered at a dosage of 8-10 mg/kg/day for 2-3 weeks (for microfilaraemic loiasis) and 5-6 mg/kg/day for 10-20 days (for microfilaraemic mansonellosis). To avoid severe adverse effects (complications) in patients with high microfilaraemic intensity, low doses of DEC are given at initial days, and in loiasis, with simultaneous administration of steroids (Cook, 1990; Ottesen, 1990).

The microfilarial intensities of both infections appear low in many parts of Nigeria, indicating that selective or

mass chemotherapy with DEC will be safe in many cases. When necessary, the intensities (microfilarial loads) of the infections in victims can be determined using counting chamber method which is easy, time-saving, highly quantitative and cost-effective (WHO, 1987; Agbolade and Akinboye, 2005b).

Ivermectin (IVM), which is commonly used in onchocerciasis control, is essentially effective only in treating amicrofilaraemic loiasis (Hovette et al., 1994). However, it has been found that a single annual dose can markedly reduce loiasis transmission (Duong et al., 1997). This implies that with little, but concerted, additional measures, loiasis (and mansonellosis) can be meaningfully controlled in regions where IVM distribution is in effect.

Chemical control of the vectors can be done by larvicide spraying of the muddy areas which serve as breeding sites of the vectors in endemic regions. Dieldrin has been found effective against *Chrysops* in some limited trials (WHO, 1984). Siting of residential houses and schools away from banana plantations, wearing of protective clothing and application of insect-repellent creams to the body of inhabitants of endemic areas will hinder or reduce human-vectors contact.

However, only little can be achieved without a drastic effort to strip the rural dwellers of their ignorance of these infectious diseases. Therefore, there is need to adequately and consistently educate the rural populace on their aetiology, transmission and possible control measures. This is achievable through the rural health workers and community heads.

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