REVIEW OF THE STATUS OF NEGLECTED TROPICAL DISEASES IN SOUTHERN NIGERIA

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ABSTRACT: Neglected tropical diseases (NTDs) are illnesses that are most common among underdeveloped communities in tropical and subtropical regions. They are sometimes referred to as "disease of the poor" and are brought on by pathogens such as bacteria, helminth parasites, and fungi, most of which are spread by vectors. The most common NTDs in Nigeria include onchocerciasis, trachoma, Buruli ulcer, schistosomiasis, and soil-transmitted helminthiasis. They have significant prevalence rates throughout Africa, particularly Nigeria. A number of these NTDs, including soil-transmitted helminthiasis, Buruli ulcers, and urinogenital schistosomiasis, are common in Southern Nigeria as a result of a variety of environmental and socioeconomic factors, including the local climate, health literacy, and access to water and sanitation. This paper details the prevalence of NTDs in southern Nigeria and suggests methods for preventing the spread of these illnesses.

Keywords: Neglected tropical diseases, Microbes, Pathogens, southern Nigeria, diseases of poverty.

INTRODUCTION

Neglected tropical diseases (NTDs) adversely impact on the health and economy of impoverished communities (Bockarie *et al.*, 2013). Over 1000 million people are affected in tropical and subtropical countries, with Nigeria having the highest burden in Africa (WHO, 2021). Simply put, neglected tropical diseases (NTDS) can be described as a group of communicable diseases that occur under conditions of poverty and are concentrated almost exclusively in impoverished populations in the developing world (Mitja*et al.*, 2017). People mainly affected by these diseases include people living in remote rural areas, urban slums or conflict zones. There are twenty diseases listed by the WHO as neglected tropical diseases (WHO, 2019).

The NTDs are classified into two groups: preventive chemotherapy and transmission control (PCT) NTDs, and innovative and intensified disease management (IDM) NTDs. Examples of the PCT group are lymphatic filariasis, onchocerciasis, schistosomiasis, and soil-transmitted helminthiasis (STH); the main tool for their control is the periodic administration of various, safe, and inexpensive (usually donated) drugs to entire at-risk populations. The IDM group on the other hand, focuses on those NTDs that currently lack appropriate tools for large-scale treatment and control.

The NTDs endemic in Nigeria include: Onchocerciasis, Schistosomiasis, Soil Transmitted Helminths - also known as geo-helminths (such as ascariasis, hook worm diseases, trichuriasis, etc.), Lymphatic filariasis, Leishmaniasis, African sleeping sickness, Leprosy, Buruli Ulcer, Trachoma and Dengue fever (WH0, 2020). These diseases are caused by a variety of pathogenic organisms which include viruses, bacteria, protozoa and helminthes which are transmitted directly or through their respective vectors. Several NTDs exhibit significant cutaneous manifestations that are associated with long term disfigurement and disability including buruli ulcer, cutaneous leishmaniasis, leprosy, mycetoma, yaws, hydrocele and lymphedema. Among the Sub-Sahara Africa countries, Nigeria has been approximated to have the highest prevalence of helminthic infection which includes hookworm, schistosomiasis, ascariasis, trichuriasis, and Lymphatic filariasis. Nigeria has also been reported as the second highest in terms of the prevalence of leprosy while Buruli ulcer is found in the Southern and Southeastern areas of the country (Hotez, *et al.*, 2007).

NTDs cause local burdens of disease, impair physical and cognitive development and

contribute to mother and child illness and death. They cause more of disability than death in affected populations (WHO, 2019). Other consequences of NTDs are stigma, inability to attend school or go to work, and funds spent in treatment and control measures (Rees *et al.*, 2019). Since global attention is focused more on killer diseases, NTDs have remained largely neglected in the global health agenda.

In Nigeria, the Southern region consists of six states which include Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo and Rivers States. However, only a small number of these NTDs are common in Southern Nigeria, which may be related to environmental conditions. NTDs such as schistosomiasis, soil transmitted helminthes (STH), leprosy, and onchocerciasis cases have been reported in the southern region of Nigeria.

CO-ENDEMICITY MAP OF NTDs IN NIGERIA

Nigeria has the highest burden of most cases of NTDs in sub-Saharan Africa. The map (Fig. 1) below shows the NTDs status of each state and its endemicity as well as the types of NTDs prevalent in a particular state.

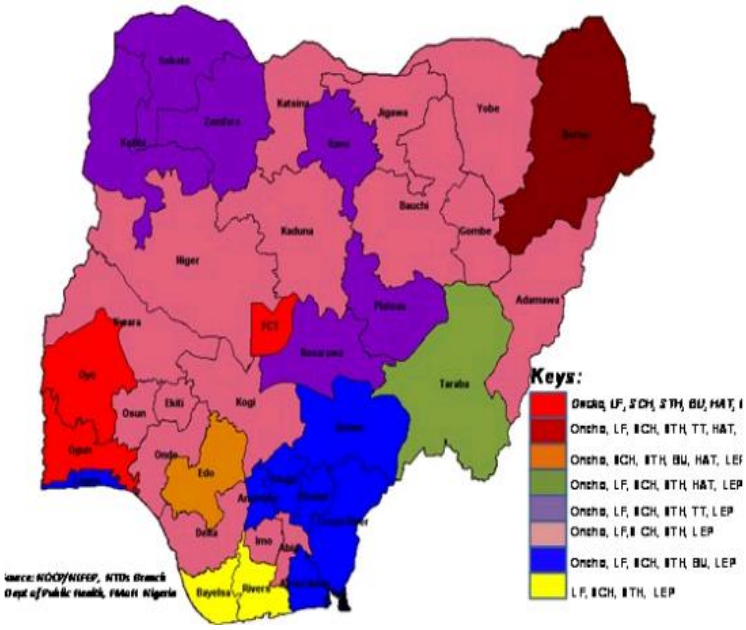

Figure 1: Neglected tropical diseases co–endemicity map–Nigeria (Source: Nigeria's Master Plan for Neglected Tropical Diseases (NTDs 2013-2017).

KEY: LEP- Leprosy, Oncho- Onchocerciasis, STH-soil transmitted helminthiasis, SCH-schistosomiasis, BU-Buruli ulcer, HAT- Human African trypanosomiasis, LF-Lymphatic filiariasis

TYPES OF NTDs AND THEIR PATHOGENIC AGENTS

Vectors are involved in the transmission of neglected tropical diseases (Tidman *et al.*, 2021). These vectors transmit the pathogenic agents (bacteria, virus, fungi or parasite) through food, water or direct human bites. However, some are transmitted through direct infection as in direct skin penetration or consumption of the parasite in food or water. Table 1 shows the various types of NTDs and the pathogenic agents responsible for causing the disease.

Table 1: Types of NTDs, their vectors and Microbial agents

Vector	NTD	Agent
Mosquito *Aedes/Culex/Anopheles*	Lymphatic filariasis (elephantiasis),	Parasite
Mosquito *Aedes*	Dengue	Virus
Black flies	Onchocerciasis (River blindness)	Parasite
Aquatic snails	Schistosomiasis (snail fever)	Parasite
Copepods	Drancuculiasis (Guinea worm disease)	Parasite
Vector not required	Soil transmitted helminthiasis (Ascariasis, Hook Worm Disease, Trichuriasis, Strogylloidiasis)	Parasite
Sandfly	Leishmaniasis	Parasite
Tse-tse fly	Human African Trypanosomiasis (HAT),	Parasite
Flies, cockroaches	Amoebiasis	Parasite
Triatome bugs	Chagas Disease	Parasite
Flies	Giadiasis	Bacteria
Bazaar fly (*Musca sorbens*)	Trachoma (Blinding eye disease)	Bacteria
Mosquito	Buruli ulcer	Bacteria
Mite (*Sarcoptes scabei*)	Scabies	Parasite (Ectoparasitic)
Vector not required	Mycetoma	Bacteria Fungi
Vector not required	Yaws	Bacteria

BURDEN OF NTDS IN SOUTHERN NIGERIA

ONCHOCERCIASIS

The NTD onchocerciasis is caused by *Onchocerca volvulus* (Nematoda: Filarioidea) and transmitted among humans by *Simulium* flies (Diptera: Simuliidae) (Inaki *et al*., 2022). The burden of onchocerciasis has been assessed by the Global Burden of Disease Study (GBD) for its contribution to years lived with disability (YLD) through visual impairment, blindness, and skin disease (Herricks *et al.,* 2017). Cases of Onchocerciasis have been reported from all the states in Nigeria with the exception of Lagos, Kastina, Bayelsa and Rivers States (Suleiman, 2016); 2 of these states (Rivers and Bayelsa) are located in the southern region of the country. A study by Onojafe *et al.* (2022) in Delta State reported 138 infected persons including males and females out of the 1201 sampled, positive for the microfilaria of *Onchocerca volvulus* and majority had no knowledge of the name of neither the diseases nor its vector.

The administration of ivermectin to communities has drastically reduced the burden of onchocerciasis across different parts of the world however; there are still persistent cases of onchocerciasis infection in Benue and Cross

River States (Southern Nigeria) which is as result of poor ivermectin coverage and COVID-19 outbreak (Ikani *et al.,* 2022). In addition to the report by Ikani *et al*. (2022) there are still active transmissions of human onchocerciasis infection in Igede community of Cross River State. Another study by Ogbonna *et al*. (2020) reported that onchocerciasis infection still persists in most regions with a percentage of up-to 24 (75%), 45.2%, lizard skin and leopard skin were seen in 3.5% and 2.0% respectively, hanging groin 2.6% and scrotal enlargement at 83% (Oria North Local Government Area of Edo State) however no blind cases were recorded in Oria North Local Government Area of Edo State, southern Nigeria.

Akibo *et al.* (2021) reported an overall prevalence of 74.3% of *Onchocerca volvulus* infection among ivermectin-treated respondents in Ekpan of Edo State, Southern Nigeria. Certain factors identified to be responsible included age, occupation, non-compliance of ivermectin treatment, and sources of water. These factors significantly affected the prevalence of *Onchocerca volvulus* infection among ivermectin-treated population in Ekpan of Edo State. The National Committees in eliminating onchocerciasis can be of assistance on tailoring and planning programmes in a bid to eliminate onchocerciasis (Griswold *et al.,* 2018).

SCHISTOSOMIASIS

Schistosomiasis exists in two forms which are the urinary schistosomiasis and intestinal schistosomiasis. The *Schistosoma* species responsible for urinary schistosomiasis is *S. haematobium* while those responsible for intestinal schistosomiasis are *Schistosoma mansoni, S. mekongi*, *S. japonicum*, and *S. intercalatum*. The species predominant in the Sub-Saharan African Countries are the *S. haematobium* and *S. mansoni* (Oyetunde *et al.,* 2020). All three species; *S. haematobium, S. mansoni*, and *S. intercalatum* known in Nigeria have been reported in the southern part of the country (Ekpo *et al.,* 2013). Goodhead and Dirisu (2016) established the presence of urinary schistosomiasis in one of the southern states (Rivers State).

A study by Ezeh *et al*. (2019) reported that there was no incidence of *Schistosoma haematobium* recorded in some parts of Southern Nigeria (Akwa Ibom and Bayelsa). However, a study by Odoya *et al*. (2021) reported the prevalence of *S. intercalatum* (10.4%), *S. mansoni* (4.2%) in Bayelsa State (Southern Nigeria).

Elele *et al*. (2020) reported an overall prevalence of 25% of *S. haematobium* infection

among primary school pupils in selected areas of Abua/Odua Local Government of Rivers State. The children aged 10-13 years had the highest occurrence which is attributed to their regular visits to water bodies to swim, fetch water and play in the mud whereas low prevalence was found among aged 3-5 as a result of restriction from parents to visit rivers often (Elele *et al.*, 2020).

Another study carried out in Itu Local Government in Akwa Ibom State reported 2% prevalence of *S. haematobium* (Ebong and Abah, 2018). In addition, a study by Opara *et al*. (2021) among school children in Obudu Local Government of Cross-River State reported 13.7% prevalence of *S. haematobium* among the study population. Urinogenital schistosomiasis is endemic in Obudu, Southern Nigeria but with decreased prevalence (Opara *et al.*, 2021).

SOIL TRANSMITTED HELMINTHIASIS (STH)

Soil transmitted helminthiasis are caused by pathogenic nematodes including *Ascaris lumbricoides, Strongyloides stercoralis, Trichuris trichiuria, Ancylostoma duodenale* and *Necator americanus* etc. They are spread by unhygienic attitudes. They have been reported in states of Southern Nigeria, including Akwa Ibom, Rivers, Bayelsa and Cross River States (Yaro *et al.*, 2018). Low prevalence of Strogylloidiasis has been reported in Rivers State by Eze (2017) who attributed it to improved environmental sanitation.

Yaro *et al*. (2018) reported a prevalence of 62.08% of *A. lumbricoides* in Delta State, 55.80% for hook worm infections in Akwa Ibom State and Delta State with a prevalence of 38.08%, for hookworm. Hookworm infection may be related to climatic factors and was more prevalence during the rainy season than the dry season. This high prevalence of STH was attributed to the high level of precipitation in the Southern regions and low altitude (Yaro *et al.*, 2018).

Oluwayemisi *et al*. (2022) reported the overall prevalence of 27.2% *E. vermicularis* among the inhabitants in Okordia, Beseni and Zarama communities in Yenagoa Local Government Area, Bayelsa State. Another report by Ohiolei *et al.* (2017) established that STH is distributed across all the States of Nigeria and are more prevalent among children of school age than in adults. These age groups of kids participate in play activities in polluted settings that can encourage the spread of intestinal helminthes due to their inability to comprehend the importance of maintaining general cleanliness Youngsters also tend to be less careful with their

personal hygiene than their peers mostly within the age of 14-16 age groups.

A study on STH among school children of Okorombokho, Eastern Obolo Local Government Area, Akwa Ibom State reported the prevalence of *A. lumbricoides* 14.2%, hookworms 5.8% and *Taenia* sp. 5.8% (Udoidung *et al*., 2021).

Gboeloh (2018) reported a prevalence of 43.9%, 21.5%, 10.3% and 4.7% for *Ascaris lumbricoides*, Hookworm, *Trichirus trichiura* and mixed infection *A. lumbricoides* + *T. trichiura* respectively among pupils of community primary schools in Nkpor in Mgbodohia, Obio/Akpor Local Government Area, Rivers State.

Odoya *et al*. (2021) also reported the prevalence of STH among rural communities in Bayelsa State with *Ascaris lumbricoides* 6.4%, *Trichuris trichiura* 2.6%, hookworm 2.4% and *Taenia* spp. 0.2%. Another study by Victor (2021) reported helminth species among Primary School Children Aged 2-6 Years in Odukpani Local Government Area of Cross River State, Southern Nigeria with an overall prevalence of 41.2% of soil-transmitted helminth.

Before beginning anyworm control program, the WHO advises conducting a baseline survey among school children to ascertain the prevalence of worm infestation,

and treatment should be offered in accordance with the survey results. Programmes for the control of STHs in endemic areas focus on mass drug administration (MDA) to reduce the intensity and prevalence of the parasites (Karshima, 2018).

HUMAN AFRICAN TRYPANOSOMIASIS (HAT)

Human African Trypanosomiasis (HAT), or sleeping sickness has two subspecies of *Trypanosoma brucei* responsible for the disease: *T. b. gambiense* in West and Central Africa, and *T. b. rhodesiense* in East Africa. Nigeria being located in West Africa has high prevalence of *T. b. gambiense*.

Recent studies in 2006 confirmed that HAT transmission is still active in the Abraka endemic focus in Delta State, Nigeria, and the same may well be the situation in many other parts of the country. Three cases of the disease were reported in 2011 in Delta and Niger States (Luintel *et al.,* 2017). About (7.7%) of *T.b. gambiense* were identified among the rural dwellers in Ukwuani and Ethiope East of Delta State which was a result of the presence and activities of tse-tse fly in the rivers within the LGAs hence exposing the communities at risk

to HAT (Musa *et al*., 2019). These results are an indication that HAT is still endemic in the country especially in some parts of the southern region with history of the disease; thus, surveillance is required to determine the current level of endemicity in affected locations.

BURULI ULCER (BU)

Buruli ulcer (BU) is caused by an environmental pathogen, *Mycobacterium ulcerans*. It is curable, yet due to late diagnosis, it leads to disfigurement (WHO, 2022). It is more prevalent in people who frequently visit sources of water for farming, irrigation, washing, etc. Children of about fifteen years of age are often more infected than both younger children and adults (Maman, *et al.*, 2018). BU has been reported from Ogun, Akwa-Ibom, Anambra, Cross River, Ebonyi, Benue, and Enugu States (Marion *et al.*, 2015). Out of the mentioned states reported for BU about 3 belonged to the southern region of Nigeria. Furthermore, the WHO reports that there is evidence that BU disease is gradually increasing in incidence and that its geographic range is also increasing (WHO, 2015).

In a report by Marion *et al.* (2015), Buruli ulcer has been reported to be more prevalent in the Southern region of Nigeria which was connected to the climatic factors characterized by a tropical rainforest climate, and also as a result of the lack of adequate public health structures dedicated to the diagnosis and treatment of Buruli ulcer in the region.

Nwafor *et al*. (2019) in his study reported a high level of stigmatization among BUD (Buruli ulcer disease) patients in Southern Nigeria. Fourty one (41) patients with BU lesion were identified in Ogoja Cross Rivers State in 2016 (Ukwaja *et al.*, 2016). Diagnosis of BUD among 15 states in Nigeria including 5 states from southern Nigeria (Cross River, Delta, Akwa Ibom, Bayelsa and Rivers State) with the highest samples from Cross Rivers State (18.6%) and Delta State (18.5%) (Gyang *et al*.,2021).

The prevalence of BU ulcer may not be directly related to the source of water (rivers and streams) for cooking bathing and washing but it is likely linked to the activities carried out in the water bodies such as bathing, playing and swimming in the rivers/stream. People who have access to pipe-borne water do not engage in these risk activities (Adogu *et al*., 2018)

FACTORS AFFECTING THE STATUS OF NTDS IN SOUTHERN NIGERIA

Some of the factors that have contributed to the prevalence of certain NTDs in southern Nigeria are as follows:

- Environmental factors such as climate
- Poverty

- Health Education
- Inadequate health infrastructure
- Inadequate Water Sanitation and Hygiene (WASH) practices
- Access to portable drinking water.

STRATEGIES ADOPTED FOR THE CONTROL OF NTDS

There are different strategies that can be adopted in the control and management of NTDs in Southern Nigeria as well as other parts of the country at large. Some of which includes the following;

1. Mass distribution and administration of drugs such as ivermectin and albendzole especially among communities with high risk and high risk groups.
2. Improved level of personal hygiene, regular exercises and conscious efforts to reduce disfigurement.
3. Health education and improvement and provision of portable water supply as well as improved sanitation and environmental management.
4. Early detection of NTDs and prompt treatment and isolation when necessary is a major control for NTDs

CONCLUSION

NTDs over the years have remained a major public health issue in impoverished communities across the tropical and subtropical nations of the world and Nigeria has been mapped as one of the countries in Sub-Saharan Africa with the highest burden of NTDs as reported by the World Health Organization. Certain NTDs, such as, soil transmitted helminthiasis, schistosomiasis, lymphatic filariasis, leprosy, and Buruli ulcer, are more prevalent in southern Nigeria. There is therefore the need to generate funds that will be used for epidemiological survey of rural communities to discover the focal points so as to enable adequate planning, control programmes and guarantee that interventions get to their target population. Health education should also be prioritized across the states of southern Nigeria to demystify NTDs such as Buruli ulcer as a way to enhance early diagnosis and treatment, thereby reducing the percentage of disability resulting from the disease.

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