



Diseases of Poverty: Neglected Tropical Skin Diseases in a Dermatologic Clinic in South- South Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author BOO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors DA and OO managed the analyses of the study. Authors EH and DA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Neglected tropical diseases (NTDs) are a diverse group of communicable diseases that are present.

In tropical and subtropical countries. They predominantly occur in developing countries, but may also be found in some developed countries; often associated with poverty, inadequate sanitation and living in close contact with infectious vectors and domestic animals and livestock. The World Health Organization (WHO) has set targets for elimination and eradication of NTDs, as this would improve the conditions of living in affected communities.

A number of neglected tropical diseases have skin manifestations, thus the dermatologist has a key

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role to play in their elimination and eradication. This study at the dermatologic clinic of University of Port-Harcourt Teaching Hospital, aims to identify the types and prevalence of these diseases.

Materials and Methods: This is a retrospective descriptive study in which the records of patients presenting with neglected tropical skin diseases (NTSDs) in the dermatologic clinic of University of Port-Harcourt Teaching Hospital from January 2015 to April 2018 were obtained and analysed.

Results: One thousand five hundred and eighteen (1518) patients who visited the dermatology clinic during the study period were assessed. Number of 115 cases of NTSDs were identified, which represents 7.57% of the total population. There were more males (60.87%), with vast majority of cases being in their third decade. Five NTDs were identified, scabies being the most prevalent (80.87%) followed by Hansen's disease (15.65%). These diseases affected the productive age groups, therefore possessing the potential of perpetuating poverty in the community.

Conclusion: Neglected tropical skin diseases are common in the dermatologic clinic, Scabies and Hansen's disease were most prevalent cases recorded. Interestingly scabies was found more in males, in the third decade of life.

This is when men are quite productive, and therefore has the possibility of perpetuating poverty.

Keywords: Neglected tropical skin diseases; diagnosis; Hansen's disease.

1. INTRODUCTION

Neglected tropical diseases (NTDs) are communicable diseases that occur under conditions of poverty and are concentrated almost exclusively in impoverished populations in the developing world [1]. NTDs affect more than 1000 million people in tropical and subtropical countries, costing developing economies billions of dollars every year [1]. There are 20 (NTDs) listed by W.H.O (Table 1) [2]. 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 [1].

Skin examination offers an opportunity to screen people in the communities or children in schools to identify multiple conditions in a single visit [1]. Skin NTDs are frequently endemic in many countries, districts and communities [3-10].

Four of the highest prevalent NTDs exhibit significant cutaneous manifestations [11]. They are ranked using a metric known as the disability adjusted life years, a combination of the years of life lost and the years lost through disability [12].

The disability adjusted life years for almost 300 global health conditions was compiled through the global burden of Disease study 2010 which revealed that the disease burden of the 4 major NTDs with cutaneous manifestations is almost 5 million disability adjusted life years, exceeding that of every other reported dermatologic condition (including psoriasis, cellulitis, acne

vulgaris, alopecia areata, pruritus, urticaria and decubitus ulcer, with exception of eczema [12].

While none of the skin NTDs are significant causes of mortality, they are responsible for a large number of disability adjusted life years (DALYs) lost [13]. For instance, contractures and resulting disability in buruli ulcer; advanced lymphedema and hydrocele in lymphatic filariasis; the consequences of permanent nerve damage in leprosy; amputations in mycetoma and bone involvement in yaws can lead to debilitating deformities and difficulty in securing employment [14]. Skin NTDs result in complications and scarring which would eventually lead to stigmatization and segregation for the affected individuals. This culminates in a reduction in quality of life and overall reduction in the wellbeing of the individual.

The economic impact of accessing care and rehabilitative measures can be substantial. In May 2013, the World Health Assembly (WHA) adopted resolution WHA 66.12 which called on member states to intensify and integrate control measures to improve the health of NTD affected populations [15].

For scabies, infestation with the ectoparasite *sarcoptes scabiei* is associated with more than 1.5 million disability adjusted life years (with the highest disease burden in South Pacific and Northern Australia) due to intense pruritus and secondary bacterial infections leading to pyoderma and post-streptococcal glomerulonephritis as long term sequel [16].

Seven NTDs infect many millions of the poorest of the poor ('the bottom billion') and many infected individuals suffer the indignity of co-infections ('polyparasitism') [17].

Communicable diseases account for 73% of the total disease burden and 71% of deaths [18]. Infections and parasitic diseases are a sub-group of the communicable diseases.

Nigeria is estimated to have the highest prevalence of helminthic infections such as hookworm, schistosomiasis, ascariis, trichuriasis, and Lymphatic filariasis in Sub Sahara Africa, as well as the second highest registered prevalence of Leprosy. In addition, arboviral and other zoonotic infections are common in Nigeria, including yellow fever, rabies and toxoplasmosis [19]. While Buruli ulcer is found in the southern and southeastern areas of the country [20].

Indeed, except for a few diseases that are mostly or almost exclusively found in sub-Saharan Africa, such as onchocerciasis and schistosomiasis, most of the world's NTDs are found in pockets of poverty in the G20, including wealthy countries such as the United States. [21]. It is obvious that the financial power of individuals, families, communities and therefore nations would be adversely affected by the presence of NTDs, because a healthy community is a wealthy one.

2. MATERIALS AND METHODS

This is a descriptive retrospective study in which the medical records of patients presenting with neglected tropical skin diseases in the dermatologic clinic of University of Port-Harcourt Teaching Hospital from January 2015 to April 2018 was studied. A diagnosis of neglected tropical skin disease was established on the basis of characteristic clinical features and when necessary, relevant laboratory investigations such as scabetic scrapings, skin biopsies, skin slit smears, skin snips, and Elisa and PCR were carried out. Data was captured and analyzed using Statistical Product and Service Solutions version 20 (SPSS Inc, IL, Chicago, USA). Descriptive statistics are computed and displayed as frequencies and percentages, while quantitative variables are presented using means and standard deviation. Results are presented as tables and charts.

3. RESULTS

One thousand five hundred and eighteen (1518) records of patients who visited the dermatologic clinic during the study period was assessed. Number of 115 cases of NTSDs were identified, which represents 7.57% of the total population. The age range was from 1-60 years with a mean of 23.40 ±14.11. Males (64.3%) were the most affected. Vast majority of persons with NTSDs were in their third decade, scabies also showed the highest numbers. (21.7%). Five NTDs were identified, scabies being the most prevalent (80.87%) followed by Hansen's disease (15.65%). Other NTDS were Onchocerciasis 1.7%, Dengue fever 0.9% and Cutaneous larva Migrans 0.9%.

Table 1. Neglected tropical diseases (WHO)

Buruli ulcer
Chagas disease
Dengue and Chikungunya
Dracunculiasis (guinea-worm disease)
Echinococcosis
Foodborne trematodiasis
Human African trypanosomiasis (sleeping sickness)
Leishmaniasis
Leprosy (Hansen's disease)
Lymphatic filariasis
Mycetoma, chromoblastomycosis and other deep mycoses
Onchocerciasis (river blindness)
Rabies
Scabies and other ectoparasites
Schistosomiasis
Soil-transmitted helminthiasis
Snakebite envenoming
Taeniasis/Cysticercosis
Trachoma
Yaws (Endemic treponematoses)

Table 2. Age range of cases with neglected tropical diseases

Age range Years	Frequency (n=115)	% frequency
0-10	22	19.1
11-20	24	20.9
21-30	34	29.6
31-40	20	17.4
41-50	9	7.8
51-60	6	5.2

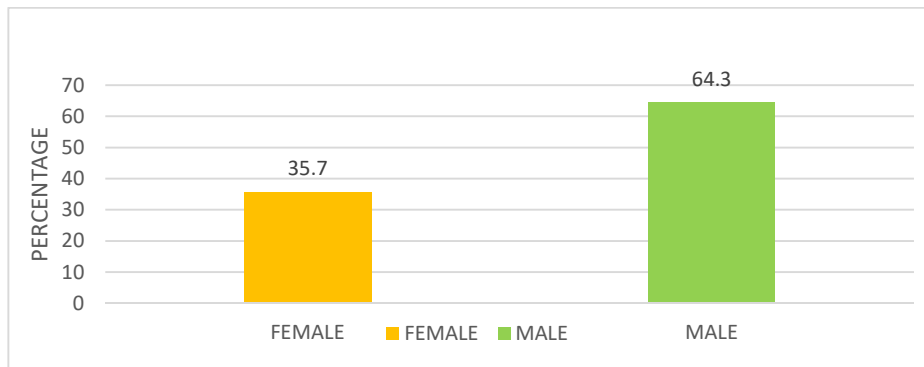


Fig. 1. Sex prevalence of the cases with neglected tropical diseases.....

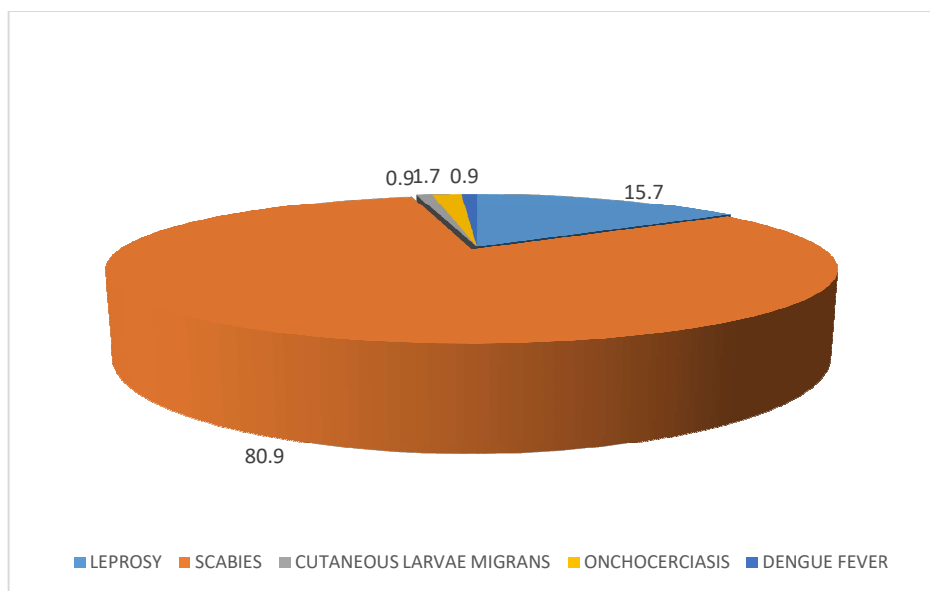


Fig. 2. Pie chart showing frequency of the observed neglected tropical diseases

Table 3. Age range of scabies patients

Age range (years)	Frequency	Percentage (%)
0-10	21	18.3
11-20	22	19.1
21-30	25	21.7
31-40	16	13.9
41-50	5	4.3
51-60	4	3.5
Total	93	80.9

The WHO has a list of 20 NTDS, outlined in Table 1 [2]. In 2017, at the 10th meeting of the Strategic and Technical Advisory group for NTDS, Chromoblastomycosis and other deep mycoses, Scabies and Snakebites were added to the list to increase it to 20 [2]. Neglected Tropical Diseases have always been thought to be found only in impoverished nations, but now studies have shown that Americans live with neglected tropical diseases and it affects them economically too [22,23].

4. DISCUSSION

Neglected tropical diseases (NTDs) are common, and they nonetheless affect over one billion people living in 149 countries and territories, with Nigeria being one of them [2].

This study showed that neglected tropical skin diseases occur in our environment with an age range slightly similar to the findings of a study by Henshaw et al. [24] in Calabar with an age range of 1-89years and mean of 28.4± 17.4. In this study NTDs were more common in males than

females, the male to female ratio was 1.8:1. Most of the NTDs occurred in patients in their third decade of life, scabies being the most prevalent followed by Hansen's disease. Scabies also occurred more frequently in patients of third decade. This was also observed in the Calabar study with a similar male preponderance, patients mostly in their third decade of life, and scabies was the most prevalent NTD detected [24]. This study corroborates the study from Calabar which showed that majority of the men affected were in the productive age and this indicates a negative effect on the economic wellbeing of families and communities [24].

The neglected tropical diseases (NTDs) are a group of chronic, disabling and disfiguring conditions that occur most commonly in the setting of extreme poverty, especially among the rural poor and some disadvantaged urban populations [25]. According to a recent World Bank analysis, 51% of the population of the sub-Saharan Africa (SSA) live on less than US\$1.25 per day, and 73% of the population live on less than US\$2 per day [25]. It also occurs amongst the extreme poor that live in the middle-income countries and even in some wealthy countries (such as the United States) that comprise the Group of Twenty (G20) countries as well as the Aboriginal populations [26].

The WHO classified NTDs into two groups: preventive chemotherapy and transmission control (PCT) NTDs, and innovative and intensified disease management (IDM) NTDs [27]. The most prominent examples of NTDs that have been allocated to 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 use [27]. A 2009 analysis of NTDs in SSA, showed Nigeria as the country with the greatest number of cases of the so-called high prevalence NTDs, such as the intestinal helminth infections, schistosomiasis, and lymphatic filariasis (LF) [28]. Information confirms that Nigeria has the greatest number of intestinal helminth infections, i.e., ascaris, hookworm, and trichuriasis, among all African nations, ranking fourth or fifth globally behind only the much higher populated middle-income Asian nations, such as China, India and Indonesia [28]. Nigeria has the greatest number

of cases of LF and onchocerciasis in Africa, ranking globally third and first, respectively, and accounting for one-fourth or more of the global disease burden from these two NTDs [28]. It also has the third or fourth largest number of new cases of leprosy in Africa (behind Ethiopia and the Democratic republic of Congo [28]).

The NTDs most prevalent in Nigeria include Lymphatic filariasis (LF), onchocerciasis, schistosomiasis, STH, trachoma, leprosy, buruli ulcer and human African trypanosomiasis (HAT).⁽²⁹⁾ This study done in a tertiary hospital in south-south Nigeria found 5 NTDs, namely Scabies, Leprosy, Onchodermatitis, Cutaneous larva migrans and Dengue fever prevalent. The seven most common NTDs can often be controlled or in some cases even eliminated through low cost "rapid-impact" package of drugs which are either donated by multinational pharmaceutical companies or through the purchase of low-cost generic drugs. At the cost of less than US\$1 per person annually, the prevalence of the intestinal helminth infections and schistosomiasis could be reduced in some areas, while LF, onchocerciasis, and trachoma might even be eliminated over a period of several years [28]. The NTD program of the Nigerian Federal Ministry of Health currently addresses the following diseases: LF, onchocerciasis, schistosomiasis, soil-transmitted helminth infections, trachoma, leprosy, buruli ulcer, human African trypanosomiasis and guinea worm disease. The strategy of the NTD program is to progressively reduce morbidity, disability and mortality due to NTDs using integrated and cost-effective approaches with the goal to eliminate NTDs in Nigeria by the year 2020 [27]. Even though this paper's sample collection ended in 2018, it is obvious from the authors's personal observations at different dermatology clinics in this region, that NTSDs are still prevalent and more work has to be done to make this elimination a reality.

Most of the NTDs have skin manifestations, so are therefore managed at the skin clinic, such as Leprosy, buruli ulcer, leishmaniasis, lymphatic filariasis, onchocerciasis, cutaneous larva migrans and scabies. The dermatologist is therefore an integral part of the management of neglected tropical skin diseases (NTSD). The diagnosis is often difficult to make by many healthcare practitioners and therefore a lot of patients present with complications like pyodermas, ulcers, deformities and scarring, which cause stigmatization and reduce the

quality of life of such patients. This has led to difficulty in finding employment and partners for relationships, which invariably perpetuates poverty in the region.

As stated by Murray et al. [12] disability adjusted life years (DALYs) are the sum of two components: years of life lost due to premature mortality (YLLs) and years lived with disability (YLDs). For most of the major NTDs the reported DALYs result from YLDs (i.e disability not deaths). The NTDs are genuinely not thought to be killer diseases but can be very disabling e.g. blindness from onchocerciasis [29-32]. In the case of onchocerciasis, the DALYs do not consider the excess mortality due to blindness [29] and likely underestimate the effects of onchocercal skin disease. Among the killer NTDs, almost all the DALYs due to diseases such as rabies, dengue, and African trypanosomiasis resulted from YLLs, and practically no disability was associated with non-lethal effects from other conditions. (YLDs) [29].

The Global burden of disease (GBD) 2010 suggests that there exists an extensive geographic distribution of the NTDs with SSA representing the highest DALY rate per 100,000 individuals from NTDs - in part because of their high prevalence together with coinfections [29]. There are also some important NTDs for which there are no or limited published disease-burden estimates. These include strongyloidiasis, toxocarasis, and loiasis, which are among the most common parasitic nematode infections worldwide as well as toxoplasmosis [29].

4.1 Neglected Tropical Skin diseases (NTSDs)

The following were seen in the Dermatologic Clinic.

- 1) Soil-transmitted helminth
Cutaneous Larva Migrans from *Strongyloides* is the soil transmitted helminthic infection seen in the skin clinic. *Strongyloides* is the only helminth that can replicate in the human host or be transmitted from person to person. Adult worms have a finite lifespan, and in addition to whether or not an individual is infected, the intensity of infection (usually measured by the number of eggs per gram of faeces [33]) is important. The larva of the *Strongyloides* starts as a pruritic papule which then begins to elongate in a

serpiginous form usually from the foot and ascending upwards to the lower limbs. Treatment is usually by the benzimidazole antihelminthics, albendazole and mebendazole.

- 2) Onchocerciasis (river blindness)
Is caused by infection with *O. volvulus*. Adult worms live in subcutaneous nodules, from which their progeny (microfilariae) emerge to migrate throughout the body, predominantly within the skin. This produces an intense pruritus and a chronic dermatitis that leads ultimately to skin atrophy and depigmentation [34]. Migration of microfilariae through the anterior and posterior segments of the eye precipitates inflammatory reactions that may lead to blindness through sclerosing keratitis, cataract or optic atrophy [35, 36]. Ivermectin is used for the treatment of microfilaria and antibiotics like doxycycline for the adult worms.
- 3) Leprosy is caused by *Mycobacterium leprae* a slow growing organism that produces chronic granulomatous inflammatory changes in infected skin and peripheral nerves. Initial clinical manifestations of infection depend on the exuberance of the host's cell-mediated immune response [34]. A vigorous response results in paucibacillary disease, defined as five or fewer visible skin lesions. Minimal response is associated with multibacillary disease, with six or more symmetrically distributed skin lesions: acid fast bacilli may be visible on stained slit skin smears [34]. Damage to nerves results in long-term disfigurement and disability [37,38].
WHO recommends multi-drug therapy (with combinations of dapsone, rifampicin and clofazimine) including monthly supervision, for about 2 years. Patient education, prevention of disability and rehabilitation should accompany drug treatment and continue for the rest of the patient's life. Paucibacillary treatment involves monthly Rifampicin and daily dapsone for 6 months.
- 4) Dengue Fever (DF) is caused by four serotypes of a virus (DENV), which is transmitted by mosquitoes, primarily *Aedes aegypti* and *Ae. Albopictus*. Approximately 390 million people are exposed to DENV each year, resulting in 96 million annual cases of viral associated disease globally, while approximately 3.6 billion people living

in the tropical and sub-tropical regions are at risk of infection [39,40]. According to WHO, approximately 500,000 people develop severe disease each year, and among them about 1250 (2.5%) die. [40]. Studies have shown that older age, having indoor potted plants, poor household conditions and people living in houses discharging sewage directly to the ponds were more likely to be associated with DF and Dengue hemorrhagic fever (DHF) [41, 42]. Cutaneous manifestations are present in 65% of patients [43]. A generalized morbilliform rash or a confluent erythematous rash with white islands of sparing petechiae is common [43]. Skin lesions can be the first symptoms of DF and can be helpful in making the diagnosis.

There is no effective treatment for dengue fever, supportive care with analgesics, fluid replacement, and bed rest is usually sufficient. Management of severe dengue fever requires careful attention to fluid management and proactive treatment of hemorrhage, such as platelet transfusion or whole blood transfusion. [40,41]. Complications such as deafness and diabetes mellitus can occur from dengue hemorrhagic fever [44].

- 5) Scabies- Is a contagious skin disease caused by *Sarcoptes scabiei var hominis*, a human-specific ectoparasite of approximately 0.4mm in size that is invisible to the naked eye [45, 46].

Scabies is estimated to affect around 150 - 200 million people globally [46]. Scabies infestation exists in all countries, but with a higher burden in low- income settings and tropical areas, and among infants, children and adolescents. [47] Outbreaks are frequent in institutionalized set-ups and areas of overcrowding, in both the low and high income countries. Outbreaks can reduce quality of life and be difficult to contain. Prevalence values from various studies in Nigerian children and adolescents ranges from 0.2 to 16.2 % [48, 49, 50].

Scabies can cause a pruritic rash that is embarrassing and affects quality of sleep, which can lead to reduced concentration and absenteeism from education and employment. It can range from mild to very severe. Scabies predisposes to superficial bacterial skin infection due mainly to (staphylococcus aureus and streptococcus

pyogenes) [51] which in turn can lead to serious complications including severe skin and soft tissue infections, sepsis, glomerulonephritis and likely acute rheumatic fever [52, 53].

Scabies is transmitted by skin to skin contact [54]. Transmission via fomites such as clothing or bedding is rare for common scabies, but may occur from crusted scabies [55].

On examination of the skin you find burrows which are slightly raised, silvery-grey, white or light brown thread like lesions. Secondary changes such as excoriation, impetiginization, eczematization and lichenification (thickening of the skin due to scratching and rubbing can occur [56].

The most common lesions are papules that are solid and 2-3mm in diameter [57].

Papules can be seen on the fingers, finger webs and sides, wrists, buttocks, axilla, torso, breasts of women. Vesicles (small circumscribed fluid lesions) and pustules (small circumscribed pus-filled lesions) may also be present in infants. The diagnosis for this study were all made clinically by a dermatologist. A 2020 IACS Criteria to standardize the diagnosis of common scabies has been formulated. It comprises of three levels, representing degrees of diagnostic certainty. Confirmed scabies (level A) is the most specific level, requiring direct visualization of the mite or its products.

Clinical scabies (level B) and suspected scabies (level C) are expected to be more sensitive but less specific, relying on clinical assessment of signs and symptoms. [56].

Treatment is with benzyl benzoate, ivermectin, permethrin and antihistamines for itching.

5. CONCLUSION

In the year 2020, NTDs still remain a serious problem to the developing nations and even developed countries like the USA and the UK, with the inclusion of the G20 nations as well. NTSDs are an integral part of NTDs so dermatologists have to be involved in taking decisions that would bring about the elimination and eradication of NTDs.

Research has shown that a lot of work needs to be done on the enlightenment of the populace in

south-south Nigeria on knowledge, causes and types of NTDs, with a lot of people admitting to having not seen anyone with a NTDs [58]. This could be due to people with NTDs living in obscurity due to the stigma associated with the disease. There has to be a sustained effort to increase people's awareness of NTDs.

The NTD programmes are being supervised by the Federal ministry of health, and cascaded down to all levels of governance. There is need for strong technical knowledge as well as managerial skills at the state and local level in order to train and supervise the various cadres of workers, organize appropriate health education, and monitor and evaluate the outcomes [59].

This can be effectively achieved through strong partnerships and collaborative links with the different sectors within the country, including academia, which may be able to provide a range of in-country technical support and expertise for mapping, monitoring and evaluating, operational research and documenting programmatic success [59].

There is increased need for access to specialized high-tech equipment and development of molecular and other laboratory skills through training programmes, as technology is advancing and specialized laboratory personnel could play a major role in the elimination process. [59].

Nigeria can take a cue from the United States of America that introduced a legislation in 2019 known as the Study, Treat, Observe, and Prevent Neglected Diseases of Poverty Act or the STOP

Neglected Diseases of Poverty Act, this is the first legislation of its kind to focus on addressing poverty-related neglected diseases within the United States [60].

The first ever World Neglected Tropical Disease day was celebrated this year on January 30. In Nigeria a press conference was held by the minister and permanent secretary of Health. The permanent secretary stated that the commitment to beat the NTDs is both ambitious and realistic and in line with the National Health Policy (Section 4.1.2.), and the second National health Plan (Section 5.30), World Health Assembly (WHA), Resolution 66.12, as well as Sustainable Development Goals (SDG 3.3) [61]. He noted

that the day had presented Nigeria a golden opportunity to scale up awareness, in order to make the campaign against NTDs a priority thus ending the chronic neglect associated with NTDs [61]. It is hoped that on such days and continuously the plight of people suffering from NTDs would be foremost in the minds of government authorities, researchers, clinicians, pharmaceutical companies, policy makers, academia, sponsors and all who in one way or the other have a part to play in reducing these diseases of poverty to the barest minimum in the shortest possible time. A proposed road map by WHO for 2020-2030 to end NTDs, set global targets and milestones to prevent, control, eliminate or eradicate 20 diseases and disease groups. It also sets cross-cutting targets aligned with both WHO's Thirteenth General Programme of Work, 2019-2023 and the SDGs, with strategies for achieving the targets during the next decade [62]. The road map is built on 3 pillars, pillar 1- Accelerate programmatic action, pillar 2- Intensify cross-cutting approaches, and pillar 3- Change operating models and culture to facilitate country ownership [62]. Pursuant to decision EB146(9) of the Executive board at its 146th session in February 2020, the proposed road map is being submitted to the Seventy-third World Health Assembly for consideration [62]. This road map is a call to action for member states, donors, implementing partners, disease experts and all other stakeholders to align their strategies and plans towards the prevention of infections and alleviation of the suffering of the people affected by NTDs [62]. In July 2020, WHO launched a mobile application to facilitate diagnosis of NTDs of the skin. The software application quickly allows health care workers and the public to get information about specific diseases and also provide a list of potential diagnosis. With all these new interventions and policies, targeted at NTDs it is hoped that skin NTDs would soon be a thing of the past [63].

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical clearance was obtained for the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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