

IFMSA Policy Proposal Neglected Tropical Diseases

Proposed by Team of Officials
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Policy Commission

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Policy Statement

Introduction:

Neglected Tropical Diseases (NTDs) are a heterogeneous group of rare, chronic, disabling or disfiguring diseases, hence an important public health problem, the occurrence of which is prevalent, but is not limited to, the tropics. NTDs are estimated to affect over a billion people worldwide and represent a clear global health burden for displaced people and populations, particularly in rural areas and urban slums in low resource settings, due to major determinants like poverty and neglect. NTDs are humanitarian issues that have been underreported and given little attention by multiple stakeholders over the past years, majorly due to a lack of political will or commitment by national policymakers and insufficient media coverage for widespread advocacy purposes.

IFMSA position:

The International Federation of Medical Students' Associations (IFMSA) believes that Neglected Tropical Diseases are global public health problems of major concern, as they pose a threat to the overall health and human rights of populations; and thus recognizes the need for multi-sectoral approaches; particularly an interprofessional collaboration under a one-health approach to tackling NTDs. IFMSA also recognizes the important roles and efforts made thus far by multiple stakeholders and emphasises the need for increased advocacy efforts and implementation of policies and interventional strategies at the national, regional and international levels that are aimed at effective NTDs prevention, control, eradication or elimination.

Call to Action:

Therefore, the IFMSA calls on:

Governments to:

- Partner with youth and civil society organisations to increase the health promotion, education and advocacy efforts to end NTDs.
- Identify and tackle the diverse social determinants behind the NTDs, including but not limited to water pollution and the general sanitation of the most affected communities.
- To allocate financial resources to support research on NTDs, strengthen health systems and train health workers to manage NTDs.
- To implement a trans-sectoral approach with all relevant governmental bodies and fields to plan NTDs-inclusive national strategies with a focus on the general population and implement them in an efficient manner under the one health approach taking into consideration human, animal and environment health.

The World Health Organisation (WHO) and international agencies to:

- Continue to call upon the WHO Member States to introduce the values and objectives set in the WHO Roadmap for Neglected Tropical Diseases.
- Partner with non-state actors related to neglected tropical diseases to increase the global reach of their advocacy efforts to curb these ailments
- To provide technical and logistical support to member states and through the monitoring of the progress of implementing NTDs strategies.
- To implement a trans-sectoral approach with member states, non-state actors and intergovernmental organisations in planning, executing and evaluating NTDs strategies.

Medical Schools and medical students to:

- Initiate campaigns and advocacy efforts toward developing and promoting meaningful solutions to the problem of NTDs
- Ensure that NTDs are included as part of the core curriculum of teaching
- Direct more substantial financial support into research projects on NTDs while endorsing and providing worthwhile opportunities for students within the NTDs research.
- Contribute, participate and partner with concerned stakeholders to execute all local, national, regional and global efforts towards eradicating NTDs.

IFMSA National Member Organisations to:

- Implement and support advocacy efforts targeting the NTDs within the NMOs through activities and national policies.
- Educate the Members on NTDs in National Training Sessions and other local and national events
- To apply an evidence-based approach in organising NTDs activities with a special focus on research in NTDs.
- To advocate for NTDs using a multistakeholder approach through organising activities and campaigns.
- Campaign and create petitions to pressure national governments to acknowledge NTDs as a serious political issue that requires investment in disease prevention, treatment and research.
- Campaign and create petitions to lobby pharmaceutical companies to invest more in the research of NTDs and donate medication in general and for mass drug administration.

POSITION PAPER

Background information:

Neglected tropical diseases (NTDs) consist of 20 conditions that are mainly prevalent in tropical areas, where they mostly impact impoverished groups and disproportionately impact women and children. These diseases cause detrimental health, social and economic consequences to more than one billion people. Estimates suggest that approximately 1 in 10 of the world's population live in extreme poverty (on <\$1.90/d), with most infected with one or more of the NTDs. [1]

In addition to significant morbidity and mortality - about 200,000 deaths and 19 million disability-adjusted life years (DALYs) are lost every year - NTDs cost developing communities billions of US dollars annually through direct health costs, loss of productivity and decreased socioeconomic and educational attainment. Moreover, they are responsible for other consequences, including but not limited to social exclusion, stigmatization, disability and discrimination, which results in a huge financial burden on patients and their families.

Despite all this, NTDs have historically ranked very low and are almost absent from the global health policy agenda; this changed in 2015 with the inclusion of NTDs in the Sustainable Development Goals (SDG target 3.3). The WHO's action to control, prevent, eliminate and eradicate NTDs is following the NTD road map 2021-2030, which shifts from vertical disease programmes toward integrated cross-cutting approaches. This would result in the facilitation of the coordinated scale-up of key interventions through public health approaches such as individual case management, preventive chemotherapy, vector control, veterinary public health and water, sanitation and hygiene (WASH). [2]

Discussion:

Definitions

Neglected tropical diseases (NTDs) are a group of communicable diseases that can be transmitted from one person to another. They include bacterial, viral, parasitical and fungal diseases and toxins and are called "neglected," because of their absence from the global health agenda. [1] The majority of these diseases tend to thrive in developing regions of the world and are common in areas with water sanitation and hygiene issues, poverty, defective health systems and lack of hygiene. According to the WHO, twenty neglected tropical diseases are recognized and include: Schistosomiasis, Leishmaniasis, Chagas disease, Buruli ulcer, snake bites, mycetoma, echinococcosis, Human African trypanosomiasis (sleeping sickness disease), dengue and chikungunya, onchocerciasis, rabies, scabies and ectoparasites, leprosy, lymphatic filariasis, food-borne trematodiasis, yaws, Trachoma, chromoblastomycosis and other deep mycoses, cysticercosis, soil-transmitted helminths [1]

Epidemiology and Global Burden

The WHO estimates that more than one billion people, which makes up almost one-sixth of the world's population, suffer from at least one NTD. Although NTDs do not usually cause death, they can cause significant disability that persists for a lifetime, including disfigurement, blindness, and fatigue. Sufferers' quality of life is usually negatively impacted through missing school or inability to work, in addition to embarrassment to even seek medical care. By diminishing quality of life and opportunities to succeed, NTDs, can unfortunately, strengthen the cycle of poverty among the world's disadvantaged communities. [3]

Symptoms and transmission

Signs and symptoms of neglected tropical diseases vary widely according to the type of pathogen or causative agent and host immunity. Several NTDs are transmitted by insects, such as Chagas disease (triatomine), African trypanosomiasis (tsetse flies), leishmaniasis (sand flies), onchocerciasis (black flies), dengue fever and lymphatic filariasis (mosquitos), while other NTDs are transmitted through consumption of food or water that harbours parasites. These include soil-transmitted helminths, schistosomiasis, taeniasis and fascioliasis. Most NTDs do not transmit from person to person, while other NTDs such as leprosy can transmit through respiratory droplets in sneezes and coughs and consequently leads to thick skin lesions and nerve damage. [4]

Both human African trypanosomiasis and Chagas disease are caused by parasites of the genus *Trypanosoma*. Human African trypanosomiasis, also known as sleeping sickness, is transmitted by tsetse flies and can be considered fatal in the absence of treatment.[5] On the other hand, Chagas disease (American trypanosomiasis) is transmitted by “kissing bug” bite, resulting in acute and chronic phases, where patients are mainly asymptomatic but may develop life-threatening medical conditions [6]

Leishmaniasis is transmitted through sand fly bites. The patient is asymptomatic but can develop

- Skin sores in cutaneous leishmaniasis
- Sores in mucous membranes of the nose, mouth and throat in mucocutaneous type
- Fever, weight loss, enlargement of liver, spleen and pancytopenia in visceral leishmaniasis [7]

There are two NTDs that cause blindness: Trachoma and Onchocerciasis. Trachoma is caused by chlamydia trachomatis bacteria serotype A, B and C. The infection is transmitted through indirect or direct contact with the eye discharge of infected people. [8] Onchocerciasis, or river blindness, is transmitted by black flies' bite (*Simulium* genus) and the causative organism is the parasitic worm *Onchocerca volvulus*. It can cause cataracts and eventually blindness; from this comes the name (river blindness disease) [9]

Both dengue and chikungunya are viral infections transmitted by *Aedes Aegypti* and *Aedes Albopictus* mosquitoes. Chikungunya begins with acute febrile illness, headache, muscle pain, joint swelling, rash and polyarthralgia. [10] On the other hand, dengue is a febrile illness that can present with retro-orbital pain, joint pain, muscle and/or bone pain, rash and mild bleeding [11]

Lymphatic filariasis is caused by *Wuchereria Bancrofti* and transmitted by culex mosquito bites. Most infected people will never develop clinical symptoms, but a small percentage can suffer from lymphedema and elephantiasis and can even cause permanent disability [12]

In schistosomiasis, the parasite is transmitted when individuals swim or get in contact with polluted water containing cercaria. The patients are usually asymptomatic but may develop acute symptoms after some days at the site of cercariae penetration, like itching and rash. After 1-2 months, the patient may develop more severe abdominal, genitourinary and neurological symptoms. [13]

Soil-transmitted helminths are transmitted when individuals eat contaminated food with eggs (ascariasis and whipworm infection) or when walking barefoot, giving a chance for hookworm larvae to penetrate the human skin. [14] Patients with ascariasis are mainly asymptomatic, but can develop abdominal discomfort, impaired growth in children and cough. [15] Hookworm infections are mainly asymptomatic but gastrointestinal symptoms and anaemia due to blood loss are common. [16] [5] For whipworm infection, individuals are mainly asymptomatic, but can have rectal prolapse, growth retardation, impaired cognitive functions and anaemia in children. [17]

Infection with *Taenia Saginata* occurs when individuals eat contaminated raw beef meat, while *Taenia Solium* infection is due to raw pork meat. Most people with taeniasis develop no or mild symptoms. Symptomatic patients can have abdominal pain, loss of appetite, weight and active pass of pterygoid in feces. [18]

Rabies is a viral infection transmitted by bites or scratches of cats, dogs, raccoons or bats. Symptoms of rabies are initially nonspecific and develop after years into fatal neurological symptoms [19].

Scabies is transmitted through direct, prolonged, skin-to-skin contact with a person who has scabies. Common symptoms are itching and skin rash in lower and upper limbs, belt region, fingers and wrist of the hand [20]. Yaws is also a cutaneous bacterial infection that is transmitted through direct skin contact with yaws to a healthy individual. [21] Food-borne trematodes are transmitted through eating raw contaminated fish, crustaceans or vegetables. The early stages of the disease can be asymptomatic but can lead eventually to severe lung and liver diseases [22].

Chromoblastomycosis is a chronic fungal infection of the skin and subcutaneous tissue, transmitted through inoculation into broken skin. Chromoblastomycosis is presented with skin lesions and brain abscesses among immunocompromised patients. [23] Mycetoma can be caused by fungal or bacterial agents. It is transmitted through trauma, thorn pricks into broken skin, and presents with painless subcutaneous nodules and sinuses and can invade up to the bone [24]. Buruli ulcer is a bacterial infection for which not much is known regarding transmission to humans. [25] Lastly, individuals with snake bites present with a puncture at the bite site, redness, swelling, bleeding, nausea and vomiting, visual disturbances, weak pulse and blood pressure, muscle twitching and tingling. [26]

Prevention

NTDs are largely preventable, even without the need for vaccination. Clean water, sanitary food handling, and good hygiene can prevent diseases. Vector-borne NTDs can be prevented through control of the vectors themselves. This control would be manifested in the form of mass spraying of insecticides in areas where the vectors breed or gather, thus killing them before they become parasite carriers. Other control methods may include genetic alteration of vectors, which is still being explored, in terms of the ability to prevent the carrying of the parasites, and consequently, when breeding takes place, these abnormalities will be transmitted to future generations of those vectors. Educating vulnerable populations and controlling environmental factors is also an important aspect of NTD prevention that would reduce their risk. For example, eliminating areas of standing water where mosquitoes breed will decrease the risk of mosquito-borne diseases or sleeping under a treated bed net will decrease the risk of diseases carried by flies that circulate at night. Travellers to areas where insect-borne NTDs are widespread should take care to wear protective clothing, use bug repellent, and sleep under a treated bed net. [27]

Determinants of NTDs

Causes for neglect

The term “neglected” emerged due to the lack of inclusion of NTDs in the global health agenda. Even nowadays, the main focus is Universal Health Coverage. Additionally, there is a lack of research, policies and funds from international agencies. In spite of the huge “neglect”, UK funding towards aid for NTDs (financial year April 2021 - March 2022) was decreased by 90%. [28] Moreover, there is a lack of inclusion of NTDs in the medical curriculum resulting in poor knowledge and practice of medical students and health professionals toward NTDs. [1] The WHO formalises the use of the Disability-Adjusted Life Years (DALYs) to determine the burden of infectious and non-infectious diseases. A published study by Vanderelst et al. revealed that NTDs are less explored than similar diseases to disability adjacent life years. Especially during recent years, it is estimated that the number of papers on the matched diseases was four times more in the PubMed database and six times more on the Web of Science. However, around 2003–2004, when the variations in the number of publications for each group were the largest, the number of NTDs papers was five to eight times less in PubMed and in Web of Science than in situations with similar approximated impact. Governments and policymakers use DALYs to specify health priorities; therefore, these data need to be highly considered. [29] Moreover, there is a low number of papers on the knowledge, attitude and practice of medical professionals (the future healthcare providers) regarding NTDs, especially in developing countries, where NTDs are more predominant. According to a study published by Elfar et al. at Cairo University evaluating medical and nursing students, students lacked knowledge about NTD identification, diagnosis, management, control and prevention, which represents the need to re-evaluate and restructure the teaching programs on this topic. [30] Interesting results were shared by Errea et al. in a conducted study at the School of Medicine Alberto Hurtado at Universidad Peruana Cayetano Heredia in Peru, in which there is a focus on NTDs in the 7-year medical program. This was reflected in significant improvement in the clinical skills and sociodemographic and epidemiological knowledge among students. [31]

Social, Economic and Political Determinants

The burden of NTDs is heavily concentrated in low- and middle-income countries. NTDs are often assumed to be mostly present in the poorest populations. Poverty is usually considered a determinant of NTDs because of its association with living and working conditions and access to preventive and curative health services. In addition, NTDs have significant impoverishing effects because of the absence of social protection systems (including but not limited to health insurance to protect people against health-

related financial difficulties and sickness and disability insurance to protect people against loss of income in the case of sickness or disability) in most developing countries. [32]

A systematic literature review of literature from the most significant endemic countries reported significant socioeconomic inequalities in NTD distribution, with higher probabilities of infection or disease among poor and less-educated populations compared to more advantaged groups. The magnitude of inequality is variable, but often, the probability of infection or disease was twice as high among socioeconomically disadvantaged groups compared with better-off strata. Inequalities were usually apparent in the form of a gradient, with higher probabilities of infection or disease with each step down the socioeconomic hierarchy. [33]

Socioeconomic position (SEP) affects NTD infection through determinants such as hygiene behaviour, access to clean water and sanitation facilities, environmental hygiene, exposure to infection through working conditions, and access to health services. Living conditions associated with poverty play a major role in NTD transmission and undoubtedly also in explaining the association between SEP and infection. Furthermore, difficulties in accessing preventive and curative care increase the odds that poor people become infected and, once infected, are left untreated. [33]

Potential confounders of the relationship between SEP and NTD infection can include age and sex. A Brazilian study found, for instance, that elderly people tend to be richer and, independently of SEP, have higher odds of having trachoma. In other words, the relationship between SEP and NTD infection can be stronger or weaker depending on age or sex. [34]

Health Equity and NTDs

NTDs are a good example of the way in which health inequities emerge. As a group of largely transmissible infections, they are driven by the environmental and social conditions in which people live, such as low-quality housing, inadequate water, sanitation and health services, and political instability. As NTDs often result in chronic disease, disability and stigmatisation, they perpetuate a vicious cycle of ill-health and poverty. Their tendency to affect marginalised groups, and to compound poverty, has led to the political and financial neglect of these diseases, resulting in the coining of the term NTDs. [35]

In addition, the socio-cultural factors, which are often associated with gender roles, interact with NTDs in various ways and can lead to stigma and social exclusion, further exacerbating the neglect and underlining inequity. If neglected tropical diseases are not prioritised, achieving health equity remains impossible. [35]

NTDs and Vulnerabilities

Factors increasing the vulnerability to NTDs

Poverty: Poverty is by far the greatest risk factor for NTD infections. NTDs and poverty are linked in numerous ways. Lack of access to clean water, sanitation, hygiene, housing, and health care leaves the poor vulnerable to a host of infections, including NTDs. [36]

Climate change: Temperature and rainfall are major influencers of diseases in tropical regions. Temperature enhances the distribution and survival of vectors, while rainfall makes the conditions favourable for these vectors to reproduce. NTDs fall into the category of diseases influenced by climate changes, as the life cycle of most vectors responsible for transmission is controlled and regulated by the long-term manifestations of weather and other atmospheric conditions. Therefore vast climate change regions like the tropics are always at risk of these vulnerabilities. [37-38]

Genetic and Biological factors: Women are at risk for acquiring NTDs due to the reproductive functions of pregnancy and childbirth. Their physiological makeup predisposes them to particular pathologies like female genital schistosomiasis. Their poor access to proper health care during pregnancy and childbirth will also increase their chances of getting infected.] [39]

Traditional gender roles also play a part in this incessant rise among women. For example, water-based domestic activities increase the risk of contracting Schistosomiasis, and child-care, which brings women into constant contact with children and triples their chances of developing trichiasis. Children are also biologically vulnerable due to the limitations of their developing immune systems. Their exposure to microbes during play or work in a poor living environment increases their risk on them. Their frail biological framework makes them more susceptible than adults to any environmental attack. [39]

Vulnerable groups to NTDs

NTDs are known to mostly affect impoverished communities and disproportionately affect women and children; this is closely related to its etymology of environmental conditions. Some of the vulnerable groups in such communities are:

Riverine dwellers: People, who find riverine areas a dwelling place, especially in impoverished communities, are always posed to be at great risk of NTDs such as Human African trypanosomiasis, Chagas disease, Schistosomiasis and onchocerciasis. This is because the vector carriers of many of these diseases breed in fast-flowing streams and rivers, therefore leaving dwellers highly susceptible. [40-41]

Farmers: The prevalence of manual agricultural systems in developing countries contributes greatly to the spread of soil helminths such as hookworm and Ascaris. A survey on farmers in Kumasi, Ghana, showed increased statistics of soil helminths among farmers as compared to a specific control group. It showed a prevalence of 15.77% for farmers and 6.00% for the control group in a relative survey for Ascaris and 12.73% for farmers as against 2.00% for the control group in the survey for hookworm. [42]

Women and school-aged children: NTDs disproportionately impact women and girls among the rest of the population due to

1. Biological and physiological factors that lead to increased vulnerability to particular pathologies
2. Socio-cultural factors increasing the risk of NTDs e.g, water-based domestic activities (2/3 by women or girls) increase the risk of diseases such as schistosomiasis
3. The indirect impact of NTDs can also affect women and girls as caregivers, having to give up their jobs or drop out of school in order to take care of a sick family member. The domestic attachment of women and children poses a great threat to NTD vectors and carriers, hence increasing their susceptibility to this group of diseases. [43]

Vulnerabilities increased by NTDs

Gender-Based Vulnerability.

Gender equity in global health is a target of the Sustainable Development Goals and a requirement of just societies. Understanding how sex and gender intersect with the social determinants of health such as poverty, education and livelihood is key to ensuring that no one is left behind in the fight against NTDs. Over the years, gender inequalities have been shown to drive inequities in health and wellbeing. [44]

In this light, it is pertinent to note that among the poor communities affected by Neglected Tropical Diseases, one group that suffers disproportionately are women and girls. This may be attributed to biological differences, gender roles, and family dynamics. In addition, women disproportionately affected by poverty and illiteracy lack rights, are dominated by patriarchy and have little political voice, which increases their exposure to NTDs. Studies have shown that women suffering from disabling NTDs such as trachoma and lymphatic filariasis are barred from engaging in sexual relations, which causes them to experience stigma as well as social and psychological distress. Similarly, women involved in a marital conflict are forced to leave their matrimonial homes, while males seek sexual relations and companionship from other women. [43]

Female Genital Schistosomiasis, a gynaecological disease that is a complication of parasitic *Schistosoma Haematobium*, has been noted to affect at least 40 million girls and women, mostly in sub-

Saharan Africa. Most women in leprosy-endemic areas are seen and treated as inferior to men due to male dominance in patriarchal societies and suffer from socioeconomic dependency. Other studies have also highlighted the underestimation and underreporting of NTDs in women, specifically schistosomiasis and lymphatic filariasis (LF), as diagnosis of these diseases needs women to comply with activities that are considered culturally inappropriate or taboo, such as providing urine or stool sample or permitting intimate physical examination. [45]

Because of the dramatic impact of NTDs on the health of women, especially girls and women in their child-bearing years, it is critically important that these populations are included in current and proposed large-scale interventions for NTD. Women need to be empowered to access treatment to enhance their health and wellbeing as well as prevent them from being disease reservoirs for NTD transmission in their communities. [43]

HIV-AIDS Vulnerability

Recent studies suggest an increased susceptibility and enhanced progression of HIV disease as a result of several helminthic, bacterial, and protozoan NTD co-infections. This is corroborated by findings from two studies in Zimbabwe which showed that female genital schistosomiasis (FGS) occurs in up to 75% of women with *S. Haematobium* infection with a threefold increase in the risk of women acquiring HIV infection, which was attributed to the increased physical scarring on the vaginal walls of girls with Female Genital Schistosomiasis that may increase transmission of the virus during intercourse. [46]

Adolescent girls with FGS have a higher proportion of HIV receptors on their genital tissue cells than those without FGS. [47] Given the high prevalence and incidence of FGS and its strong geographic overlap with HIV/AIDS in countries such as Malawi, Mozambique, South Africa, Tanzania, Zimbabwe, and elsewhere, it stands to reason that FGS would be identified as a leading HIV/AIDS cofactor in Sub-Saharan Africa and people living with HIV/AIDS are vulnerable groups. [48]

NTDs in Health and Humanitarian Emergencies

General

Disasters and conflicts, along with water and sanitation, housing and clustering, environment, migration, socio-cultural factors, gender and poverty, are considered to be particularly important determinants of NTDs. [49]

Complex emergencies are humanitarian crises resulting from conflict and political instability. These are often related to social inequities and poverty and can result in disruption of livelihoods, threats to life and large-scale movement and displacement of populations. These emergencies have a negative effect on the health of affected populations, with most deaths occurring due to preventable causes such as malnutrition and infectious diseases. [50]

Armed conflict and war, and infectious diseases are globally among the leading causes of human suffering and premature death. Moreover, they are closely interlinked, as an adverse public health situation may spur violent conflict, and violent conflict may favour the spread of infectious diseases. The worsening of the sanitation infrastructure, the decreasing use of protective measures against mosquito bites, the increase of difficulties in reaching public health care infrastructure and the decrease of safe water provision by tap or fountain are identified as some of the reasons that increase the risk of contamination of NTDs during armed conflict. For example, Visceral leishmaniasis (Kala-azar) was a humanitarian disaster among thousands of displaced populations who were victims of conflict in South Sudan in 1990; and the epidemic recurred in 2003. [51]

COVID-19 and NTDs

NTDs are mainly prevalent in tropical areas affecting impoverished communities. With over a billion people affected, it has become a major health issue influencing the achievement of the Sustainable Development Goals (SDGs). Health systems were massively impacted by the COVID-19 Pandemic, and this led to major setbacks in the efforts against NTDs, especially in endemic countries. The effect is clearly expressed in the direct or indirect consequences of measures to tackle the pandemic through a

combination of newer (WHO Recommendations to cease preventive chemotherapy programmes) and longer-term factors (which include conflicts, cessation, and social opposition to mass distribution and immunisation campaigns). The COVID-19 Pandemic has also critically altered the progress to achieving the objectives set by the WHO NTD RoadMap for 2030. [52]

The COVID-19 pandemic further complicated the management of NTDs, especially in LMIC with already struggling healthcare systems. Public Health Systems have been excessively stressed with resources, research and health budget being directed to tackle COVID-19, all resulting in a higher risk of severe health issues from Neglected Tropical Diseases. There are also major concerns that some NTDs could aggravate the severity of COVID-19 Disease, a major example being the "Cytokine storm" caused by severe COVID-19 also being induced by the Malaria Parasite. Therefore, a combination of both diseases could lead to a more severe outcome of COVID-19 infection. [53]

There is also concern surrounding the use of immunomodulatory drugs in COVID-19, as it may create room for NTD with opportunistic tendencies to cause severe and even potentially fatal Manifestations. [54]

NTDs and Health Systems

NTDs and UHC

Since NTDs are the most common amongst the poorest of populations in low-resource settings, access to quality healthcare services might be hindered if they are not readily available, accessible and affordable. Many of the individuals affected by NTDs are driven further into poverty due to the high incidence of out-of-pocket health financing models in such disadvantaged areas. This might lead to late presentations at healthcare facilities, which might make the management and treatment of NTDs more difficult and expensive because of the accompanying complications and disfigurement as a result of neglect. This is a major challenge to health systems. Addressing neglected tropical diseases by giving them the needed attention and active measures can pave the way for Universal Health Coverage in affected regions. [55]

Universal Health Coverage is solely dependent on proper health financing and equitable distribution of health resources, which should be implemented in the health response to eliminating NTDs. Thus, NTDs need to be seen as a global priority to be combated as it is one of the biggest challenges to global health. [56-57]

In response to NTDs and UHC, the health financing models in low-resource settings need to be revised through national and global investments in healthcare. The primary health systems which serve as the first line of response in NTDs endemic areas should be strengthened, and the infrastructures should be standardised. Effective medical interventions and therapeutics in NTDs' endemic areas should be readily available, accessible and affordable to accelerate the WHO Roadmap goal to end NTDs. [58]

NTDs Advocacy

Health Prevention

The WHO Roadmap to end NTDs, revised at the 73rd World Health Assembly (WHO, 2020) to reduce, eliminate, eradicate and control NTDs proposed health prevention of NTDs can be achieved through access to clean water, sanitation and hygiene (WASH) and improved treatment. [59]

Poor sanitation and water polluted riverine areas in low resource settings predispose millions to billions of people worldwide to the risk of contracting NTDs, which is uncommon in developed parts of the world. The local and national governing bodies of these affected regions have a huge role to play in the health prevention of NTDs. Firstly, by providing vulnerable communities whose main sources of water are polluted e.g. streams, lakes, rivers and other types of water bodies; with access to quality clean water systems and water treatment strategies; so as to improve access to safe and clean water.[60]

Secondly, Environmental Health is very essential for the prevention of NTDs. Threats to environmental health such as pollution, soil contamination and poor waste management systems need to be addressed at the local and national levels for the prevention of NTDs. The environmental factors that promote NTDs can also be controlled with adequate environmental interventions. The constant daily interactions between humans, animals and the environment cannot be controlled; and as such, there is an urgent need for one-health sensitization and the implementation of relevant action plans to prevent and control the transmission of NTDs. [1]

Health prevention of NTDs can also be made possible through health promotion, adequate medical interventions and proper health financing strategies. The five medical intervention strategies recommended by the WHO in a universal cross-cutting approach in NTDs prevention and control include: Preventive chemotherapy, Vector control, Individual management of disease, Veterinary public health interventions and access to clean water, sanitation and hygiene (WASH). [61]

Health Promotion

NTDs are underreported because they mostly affect poor and displaced people. This is why Health Promotion of NTDs is necessary. Most NTDs are infectious diseases; meaning that they are contagious. [62]

Health promotion is at the core of NTDs advocacy and public health interventions for the prevention and control of NTDs. [63] Although, the weight of NTDs advocacy falls on local and national authorities; international health bodies and developed countries can help mitigate these 'neglected' tropical diseases through health promotion. Health promotion involves activities that can aid local, national, international stakeholders to implement preventive strategies, such as ensuring access to clean water, environmental sanitation and addressing food insecurity in affected regions; providing resources and navigating systems towards implementing favourable health policies and one-health action plans that are guided towards the prevention, control, eradication and total elimination of NTDs. Health promotion activities that include multi-sectoral community intervention strategies are useful in the prevention, control, treatment and elimination of NTDs. [64]

NTDs and Interprofessional Collaboration under a one health approach

NTDs are commonly transmitted by vector pathogens or are linked to zoonotic origin. The control of these disease-causing vectors can be achieved through effective vector control strategies and prophylaxis in NTDs endemic areas. [65]

The interprofessional collaboration of NTDs under a one health approach to addressing human, environmental and zoonotic disease-causative interactions can be very effective in preventing future outbreaks of NTDs. This can be achieved through strengthening and integrating health systems as regards this triad. [66]

While we cannot control how humans interact with animals and the environment; one health promotion and education at local, national and international levels can help inform and sensitise the human population on how the adoption of healthier interactions between humans, animals and the environment can help prevent and eradicate infectious diseases outbreaks; especially NTDs. To support the interprofessional collaboration of NTDs under a one-health approach, the WHO collaborated with the World Organisation of Animal Health and the UN Food and Agriculture in 2010 to aid national implementation of one-health approaches to tackle NTDs in countries and globally through the NNN Best Framework. [67]

The WHO multi-regionally launched a companion webinar document to the NTDs roadmap in March, 2022 titled 'One Health: Approach for action against Neglected Tropical Diseases 2021-2030' to create more awareness on NTDs and encourage stakeholders to take urgent actions in combating NTDs. [68]

NTDs on Global and National levels

Global Roadmap 2030

In 2012, WHO Published the Neglected tropical diseases (NTDs) Roadmap, this was followed by its London declaration on NTDs which stimulated international support in the control and elimination of NTDs by 2020. Expanded drug donations and financial commitments created a favourable environment which scaled up control and elimination programmes across all NTD-endemic geographies. Currently over one billion people have been reached through the tremendous rise in programmes targeting NTDs globally, with an increasing number of countries attaining elimination targets. [69]

The WHO road map for NTDs 2030, defines global targets, aligned with the United Nations' Sustainable Development Goals (SDGs) and the WHO's 13th General Programme of Work. It presents well defined objectives and milestones to prevent, control, eradicate and eliminate NTDs globally. These strategies as presented by the road map would serve as a means to achieve these objectives over the proposed period [(70]

This consultative process involved regional workshops with managers of NTD prevention and control programmes, national workshops with stakeholders in NTDs and all related areas of work, it incorporated inputs from disease experts and also donors obtained from over 300 responses from two rounds of online consultations across more than 100 bilateral interviews. The perspectives of the Member States and a wide range of stakeholders are therefore reflected by the document. [71] Fundamental shifts in strategy were indicated during the planning and development of the roadmap. Three shifts, in fact, form its pillars. The first is a shift from measuring process to measuring impact. Secondly, there is a shift from vertical programming to horizontal, cross-cutting programming and finally, the one which may be the most significant calls for a move away from partner-led to country-driven and country-owned work. [70]

The pillars consist of:

- *Pillar 1:* Accelerate programmatic action against NTDs, including interventions to reduce incidence, prevalence, morbidity, disability and death: to do so will require scientific advances, new interventions and tools, and strengthening strategies and service delivery, and enablers.
- *Pillar 2:* Intensify cross-cutting approaches by integrating interventions for several NTDs and mainstreaming them into national health systems, and coordination with related programmes (e.g. water, sanitation and hygiene, vector control and other programmes).
- *Pillar 3:* Change operating models and culture by increasing country ownership, clarifying the roles of organisations, institutions and other stakeholders, their culture and perceptions and aligning them to meet the 2030 targets. [72]

Global efforts

The concept of neglected tropical diseases has started to develop since Kenneth S. Warren initiative of Great Neglected Disease (GDN) which aimed to support scientists to apply their knowledge to infectious diseases of the developing populations. In 1976, World Health Organization (WHO) , the World Bank and United Nations Development Programme (UNDP) developed a Special Programme for Research and Training in Tropical Diseases (TDR). TDR represents a multilateral partnership including both donors and disease-endemic countries. In spite of the efforts done, by the 1990s the number of donations and research towards the disease of the poor was not encouraging to the extent that scientists lacked interest to work on neglected diseases. A major change was induced by the entry of multinational pharmaceutical companies in developing drugs to treat neglected infections. [73] Decision makers have started to develop an interest in developing mass treatment programs to develop economic development. Even in the Millennium Development Goals, NTDs were referred to as "other diseases" in the sixth Millennium Goal ("To combat AIDS, malaria, and other diseases"). Additionally, the neglected tropical diseases were excluded from the global fund that should target all MDGs targets. The fund includes only Acquired Immunodeficiency Syndrome, malaria and tuberculosis. This led to leaving more than one billion people behind. In 2003, the WHO and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) conducted a meeting in Berlin regarding the control of neglected tropical diseases and discussed the possibilities of establishing collaborative evidence based actions. [74] In 2005, the WHO established the Neglected Tropical Diseases Department, which along with increased pharmaceutical company interest, commitment from non-governmental development organisations (NGDOs) and the existing disease-specific partnerships, gave the opportunity for the development of evidence-based global health policies.

These collaborative efforts resulted in cost-effective treatments for seven major NTDs: the three soil-transmitted helminthiases, lymphatic filariasis, onchocerciasis, schistosomiasis and trachoma [73,75,76] After the 2005 Berlin meeting, the WHO expanded this list of diseases to 20. The first Global Partner's Meeting convened by the WHO took place in 2007 and resulted in a shared commitment to support the WHO's strategies, goals and targets. [73,77,78] After the complete development of NTDs as a concept, NGOs have become active key players in the fight against these diseases. Eventually, these collaborative efforts led to the development of the NTD Network (NNN). Moreover, the establishment of the Coalition for Operational Research for NTDs, in the Task Force for Global Health, was also a major event. [73]

In January 2012, a meeting in London, chaired by Bill Gates, was convened to bring together the main players in the support of NTDs: the WHO, the BMGF, the USA and the UK as bilateral donors, NGOs and the pharmaceutical industry. The meeting resulted in the London Declaration, which established not only increased commitment but also Uniting to Combat NTDs as an advocacy group with the mandate to expand the partnerships and draw in new partners and donors. [79]

National Efforts

The Revised 2021-2030 WHO Road Map for NTDs identified three Pillars that would support Global Efforts towards control and eradication of Neglected Tropical Diseases. The Third Pillar proposed a change in operating models and culture to facilitate country ownership. [80] Countries would need to develop and Implement National Plans as well as contribute internally to funding the fight against NTDs. An integrated 'NTD Control' framework, utilising combined Mass Drug Administration (MDA) to control several diseases, is the current emphasis of global NTD control strategy, rather than the utilisation of separate control Programmes for different NTDs. Countries across sub-Saharan Africa have applied this framework with Ghana, Mali, Niger, Uganda and Burkina Faso being the first ones. [81]

The Department for International Development (DFID) funded an integrated approach programme in Northern Nigeria, which was effective in the control of seven NTDs - blinding trachoma, bilharzia, elephantiasis, river blindness, hookworm, whipworm, and roundworm. They employed the Mass Drug Administration strategy by distributing drugs once or twice annually to members of the community to prevent diseases. The Programme recorded tremendous success with the distribution of over 110 million treatments in Niger, zamfara, katsina, Kano and kaduna and providing treatment to more than 39 million beneficiaries. [82]

In January 2022, Saudi Arabia was able to eliminate Trachoma, by combining Primary Healthcare with its National Eye care programme and through cross-sector collaboration, including working closely with various ministries as education, environment, water and agriculture. [83]

India is another country making strides in eliminating NTDs and of its efforts aims to eradicate lymphatic filariasis, better known as elephantiasis. For this, the government is targeting a population of 600 million in 256 endemic districts with mass drug administration (MDA). A community-based pilot in Yadgir district of Karnataka is being done to assess the effectiveness of a three-drug combination (DEC + Albendazole + Ivermectin) vis-à-vis the existing two-drug regime (DEC + Albendazole). Mass administration of DEC-fortified salt to accelerate elimination of lymphatic filariasis is being tried in the Andamans. However, ensuring that the entire target population accepts MDA continues to be a challenge and needs advocacy and community engagement. [84]

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