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NEGLECTED TROPICAL DISEASES AND SOCIAL DETERMINANTS: AN INTERSECTION OF INCIDENCE

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ABSTRACT

The neglected tropical disease affect almost a billion of the world's population and pose a serious threat and concern in the present scenario. NTDs (Neglected Tropical Diseases) are very heterogeneous and consequently the analysis of inequity and social determinants is extraordinarily complex. They are associated with various combinations of social determinants, which often overlap with each other. NTDs are both drivers and manifestations of poverty and social inequality. This review discusses the social determinants like environment, water, sanitation and hygiene, poverty and migration that influence the incidence of the NTDs. Although apart from these factors discussed there are many more, but the purpose of this review is to highlight the fact that proper control, monitoring of the social factors followed by the implementation of proper development programmes at the local grass root level can control and subsequently eradicate the NTDs and reduce human suffering.

KEY WORDS: ***Neglected tropical disease, Social factors, poverty, migration, hygiene.***

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INTRODUCTION

Neglected Tropical Diseases (NTDs) is a diverse group of heterogeneous diseases that affect millions of people in different countries worldwide[1]. According to the reports of World health Organization, 13 such diseases were primarily categorised as NTD. The term "tropical" is not absolutely correct as some NTDs (for example cholera and leprosy) are not limited to specific climate zones. However, as a shorthand, the term points to where most of the NTDs (as well as most disadvantaged people) are found. The diseases are generally of the communicable form and are easily transmitted through different modes. Many of the disease are also zoonotic (i.e. that can be transmitted from an animal to humans). These diseases are caused by a variety of pathogens like virus, bacteria, protozoa and helminths. They usually affect the poverty stricken low income group population of the developing countries of Africa, Asia and America[2]. the NTDs as per WHO guidelines are Buruliulcer, Chagas disease, cholera, dengue fever (including dengue haemorrhagic fever), dracunculiasis, lymphatic filariasis, human African trypanosomiasis, leishmaniasis, leprosy, Onchocerciasis, schistosomiasis, soil-transmitted helminths and trachoma. WHO (reports, 2017) has prolonged the list of NTDs to 20 and has included Mycetoma, Podoconiosis, Scabies, Snake bite and Strongyloidosis as other "neglected condition" which reflect the alarming scenario of the NTDs worldwide[3]. The different pathogenicity and disease biology of each NTD is unique and causes a major challenge to the scientific world for combating them. Of these 20, two were targeted for eradication (dracunculiasis (guinea-worm disease) by 2015 and yaws by 2020, and four were targeted for elimination (blinding trachoma, human African trypanosomiasis, leprosy and lymphatic filariasis by 2020[4-6]. The global health is facing critical challenges due to emergence, re-emergence of different NTDs. The scenario is further challenging due to increased drug resistance of the pathogens and emergence of new strains and serotypes. According to Centres of disease Control and prevention (CDC) at least five NTDs simultaneously affect the low income countries. NTDs are a major cause of world-wide diseased burden, premature disability adjusted years and death and almost 149 countries are at risk. In 2010, the Global Burden of Disease Study of NTDs accounted for 26.06 million disability-adjusted life years (DALYs) (95% confidence interval: 20.30, 35.12)[7-8]. As per recent reports of CDC, more than a billion accounting for almost one sixth of the world estimated population are infected with one or more than one NTD(including more than 500 million children. Out of the 20 NTDs, the eight of these diseases like Acariasis (roundworm affects 807 million), Trichuriasis (804 million), Hookworm infection (576 million), Schistosomiasis (207 million), Lymphatic filariasis (elephantiasis, 120 million), Trachoma (41 million), Onchocerciasis (river blindness, 37 million) and Leishmaniasis (12 million) take a heavy toll on life as their magnitude of incidence on the world population is alarmingly high (in parenthesis)[9-12].The effect of NTDs as a group is comparable to that caused by malaria and tuberculosis. The coinfection of NTDs with AIDs and other opportunistic infections make the situation grave. Reports have documented that the lesions of Genital schistosomiasis in females increases the susceptibility of HIV infection. Studies have also shown that non-communicable diseases like bladder cancer is associated with urinary schistosomiasis. In spite of the world wide magnitude of incidence, the group of neglected diseases have remained under the shadow of other prevailing non-communicable diseases that affect mostly the developed countries[13]. They remain "neglected" because they affect the poorest of populations inhabiting remote areas with inadequate access to resources and suboptimum quality of life. The people belong to penurious populations who lack the reliable statistics, strong political opinion to speak for them, poor health and hygiene values and last but not the least the NTDs have difficult names and unique pathologies that have made them unpopular. NTDs have severely affected countries like Brazil, Cambodia, countries in sub-Saharan Africa, low and middle income countries of Asia and Latin America. NTDs are therefore the diseases of the underprivileged and are found in tropical and subtropical climatic conditions. These climatic conditions provide humid, hot moist environment for breeding of the pathogens and support the biology of the vectors. All sectors including men, women and children are equally affected with NTDs[14-15]. Women suffer due to poor sanitary conditions, reduced access to clean water, improper measures of hygiene and waste disposal. The proportion of the population that depend on rivers for drinking water and their daily chores are often susceptible to infection of NTDs like river blindness. Working in the soil for agriculture and other labours also facilitate the contact with different parasite and worms. In children, infection of worms is the most pronounced and the disease attains severity with the increase in the load of infection. Such conditions not only cause the disease but also lead to a loss of a number of daily adjusted life years. Thus, the severity of the NTDs are often correlated with different social determinants. However, some of these social attributes are interwoven and overlapping which make their individual analysis different. As NTDs are mostly dependent on the external physical or biological conditions, factors such as water and sanitation, housing and clustering, and environment play central roles in the present analysis and may actually be seen as biosocial determinants. The present review summarizes some of the selected social determinants and their interrelationship with the incidence of different NTDs.

ENVIRONMENT

Environment broadly refers to the surrounding soil, air, water, vegetation, and climatic factors. This also includes certain water resource development and biodiversity preservation schemes developed by human beings. Thus, environment is a social determinant from the biosocial point of view. Moreover, the recent global climate change is the result of over exploitation and industrialization by human beings[16]. Among authors reviewing the concept of space in epidemiology, Pavlovsky was one of the first researchers to study the interrelated components of microclimate, flora, and fauna in disease occurrence. Thus, environment is a very crucial factor that affects the epidemiology of infectious diseases. Beyond human action, extremes of weather and natural disasters have also influenced

vector-borne infectious disease spread, suggesting the role for climate change in these events. Climate change scenarios include a change distribution of infectious diseases with warming and changes in outbreaks associated with weather extremes. Environmental changes such as the introduction of a new insect or plant vector into a region or population have also led to rapid transmission of diseases that were not previously prevalent, such as in the case of Rift Valley fever, dengue, and malaria[17].The ranges of several vector-borne diseases or their vectors are already changing in altitude due to warming. In addition, more intense weather events create conditions conductive to outbreaks of infectious diseases: Heavy rains leave insect breeding sites, drive rodents from burrows, and contaminate clean water systems. The incidence of mosquito-borne parasitic and viral diseases, are among those diseases most sensitive to climate. Climate change affects disease transmission by shifting the vector's geographic range and by shortening the pathogen incubation period. Climate-related increase in temperature in sea surface and level would lead to higher incidence of waterborne infectious and toxin-related illnesses, such as cholera. Altitude is an important factor for the distribution of this vector for Chagas disease[18]. Outbreaks of cholera in Bangladesh have been shown to be closely related to climatic factors[19]. Food-borne illnesses are another area of emergence, with outbreaks of *Salmonella*, *E. coli*, and bovine spongiform encephalitis all occurring due to poor food processing practices[20]. Hence, understanding the cause of a disease's emergence can be critical to its prevention and treatment. There is also a close relationship between human Trypanosomiasis and the incidence of the disease. Construction of large dams for hydroelectricity may increase the breeding sites of vectors for onchocerciasis. The relationship between water resource development schemes and schistosomiasis has been well documented. Spread of Schistosomiasis in China has been linked to climate change scenarios[21]; climate change models have been used to predict Lyme disease risk and to forecast the emergence of tick-borne infectious disease. Climate significantly influences the transmission of infectious diseases[22-23]. Many zoonotic enteric pathogens, including salmonella, cryptosporidium and campylobacter, are known to exhibit seasonal patterns, while climatic conditions including temperature and rainfall influence the transmission of vector-borne diseases ranging from tick-borne encephalitis to dengue.

WATER, SANITATION AND HYGIENE

There are many reports documenting the relation of the incidence of infectious disease viz. NTDs with the Water, Sanitation and Household related factors. Neglected tropical diseases (NTDs) affect over 1 billion people. Safe water, sanitation and hygiene (WASH) contribute to prevention and management of most NTDs[24].Water can act as a source of infection as a breeding ground for vectors; on the other hand, adequate quantity and quality of water supply is vital for hygiene and the avoidance of infection. Inadequate facilities of sanitation and consequent exposure to human faeces plays a key role in the transmission of certain diseases. Lack of access to safe water and sanitation may result in cholera epidemics among refugees[25]. In South Africa, a choleraepidemic was found to result from reduced access to clean water. Soil-transmitted helminthiasis is caused by infections from parasitic intestinal worms (Ascaris, *Nectar americanus*, *Trichuristichuria*etc); transmission occurs directly through the faecal-oral route which naturally highlights the importance of sanitation and good hygiene[26]. Reports suggested that sanitation facilities decreased diarrhoea, morbidity and mortality and the severity of hookworm infection. Better water quality also reduced the incidence of Dracunculiasis [27]. A number of significant literature reviews have been conducted on water and sanitation in relation to diarrhoeal diseases, some of which are also relevant to NTDs[28]. The effect of large dams on health, including a number of NTDs has been documented however it is difficult to evaluate the health impact of water resource development schemes[29]. The need to address the determinants of NTDs has been recognized and WHO has adopted a new policy ensuring 'Water, Sanitation and Hygiene. This emphasizes on activities that benefit disease control.

POVERTY

Neglected tropical diseases are a group of protozoan, parasitic, bacterial, and viral diseases endemic in 149 countries causing substantial illness globally. Extreme poverty and warm tropical climates are the 2 most probable factors stimulating the spread of neglected tropical diseases. They are widespread in Central and South America, as well as the U.S. Gulf Coast.The ten member states of the Association of Southeast Asian Nations (ASEAN) constitute an economic powerhouse, yet these countries also harbour a mostly hidden burden of poverty and neglected tropical diseases (NTDs). Almost 200 million poverty stricken people of the ASEAN countries (viz. Indonesia, the Philippines, Myanmar, Viet Nam, and Cambodia) are affected by at least one NTD[30-31]. Poverty poses a threat to the incidence of NTDs due its direct and indirect effects on compromised quality of life. Thus, poverty mitigation and provision of affordable health care should be the key in all efforts to address structural social determinants in relation to NTDs. An example from Japan and Taiwan demonstrates the correlation between positive economic developments and decreasing leprosy which attests the need of poverty-alleviating interventions[32]. Moreover, funding for basic science research has not kept up, such that we are missing opportunities to create a more innovative pipeline of control tools for parasitic and related diseases. There is an urgent need to expand basic science approaches for neglected diseases. The world's poor deserve access to innovation for neglected diseases. It should be considered a fundamental human right.

MIGRATION

Migrant populations may be more exposed or vulnerable to certain NTDs. The exponential growth of travel and migration worldwide, which has occurred in the past few decades, has caused an increased circulation of tropical diseases outside the countries of origin[33]. Rapid population growth and uncontrolled urbanization, often as a consequence of migration for employment and differential access to services between rural and urban

areas, has facilitated the expansion of poor social and environmental conditions on the peripheries of cities. Migration has been found to be a social determinant of disease and has been hypothesized as a risk factor in continued leprosy incidence[34]. Migration can facilitate movement of disease between endemic and non-endemic areas, and has been considered a possible factor in continued leprosy incidence in Brazil[35]. Migration has been found to be an impediment to both leprosy elimination and control efforts. Prior research has suggested that migration may influence transmission and distribution of the disease as well as other neglected tropical diseases (NTDs). Reports also document that the exposure of dengue virus is closely associated with migration and travel hence personal protection measures when visiting high-risk urban areas may reduce the incidence[36]. Migrants contribute to the transmission and spread of Schistosomiasis: (i) by introducing the parasite into non-endemic areas, (ii) by creating habitats for snail intermediate hosts and water contact points in the areas where they settle and (iii) by direct moves in which infected people migrate to areas where Schistosomiasis has been controlled or eradicated. Studies revealed that a variety of types of population movement result in significant spatial and temporal shifts in the distribution of the population affecting the transmission, spread and control of Schistosomiasis[37]. There is also a significant knowledge of the operational aspects of healthcare provision for refugee populations[38]. Migrants also showed increased incidence of Chagas disease which would likely serve to highlight the real need for better screening, diagnostics, and treatment of individuals living with the disease[39].

CONCLUSION

The NTDs pose a particular burden to the most marginalized population segments and communities, mostly in the developing countries. There are innumerable social factors that pose a threat to NTDs but many of them are overlapping, hence a proper correlation is not possible. However, the intersection of incidence can be controlled and kept within permissible limits and suffering of human population can be reduced by employing several control measures and increasing the awareness of the masses towards a better and hygienic quality of life. As per WHO recommendations, the implementation of the WASH strategy is pivotal. There may be many promotive measures like

- Reducing poverty through employment opportunities and self-employment.
- Awareness of the masses through proper education.
- Providing better conditions of sanitation and hygiene.
- Reducing inequality among genders.
- Proper measures of health awareness.
- Improving health of migrating population.

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CONFLICT OF INTEREST

Conflict of interest declared is none.

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