

Perspective

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Snakebite: A neglected tropical disease that can stymie progress toward the Sustainable Development Goals

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The adoption of Sustainable Development Goals (SDGs) under Agenda 2030 is one of the most ambitious ventures by the United Nations for the betterment of humanity. The SDGs are a comprehensive and holistic approach to making the lives of humans, not only the current human population but even future generations, worth living and celebrating. SDGs aim to end poverty, hunger, and inequities, provide everyone with clean water, energy, and an environment, and make the planet more peaceful, just, and habitable[1]. The beauty of the SDGs is that not only are they targeted to reduce various kinds of human, animal, and planet suffering in different ways, but they are also interconnected in such a way that if humanity is headed in the right direction to achieve targets of one SDG, then it will pull other SDGs along. The quantitative assessment of the success of the SDGs can be evaluated by examining various indicators for all SDGs, like progress on alleviating neglected tropical diseases (NTDs)[1].

NTDs are typically a group of microbial infections that affect billions of people, primarily in low- and middle-income countries (LMICs)[1]. They are called "neglected" because they receive little attention and because they affect people with minimal advocacy in some of the most marginalised sections of the world's population. Snakebite, however, is not a vector-borne tropical infection, but owing to the huge burden in terms of human lives it causes in LMICs, it has been included in the World Health Organization (WHO)'s NTDs list[2]. These NTDs not only have a significant impact on people's health, productivity, and overall well-being, but they are so intertwined with socio-demographic factors that they also exacerbate poverty, malnutrition, and other health issues that are to be reduced as per our SDGs.

According to the WHO, over 5.8 billion people on the planet are at risk of being bitten by a venomous snake[2]. Every year, 5.4 million snakebite incidences occur, resulting in over 2.7 million cases of envenoming, up to 138 000 deaths, and over 400 000 severe physical and mental disabilities worldwide[2,3]. In some communities, for every snakebite death, there are ten survivors who have serious morbidities, including amputations[2]. And this data is considered to be an underestimation of the true snakebite burden. It's not like snakebite incidences are prevalent only in tropical and poor countries. Snakebite incidences are also reported in developed countries, including Australia and the United States (Venomous

Snakes | NIOSH | CDC)[4]. But the impact of snakebite in terms of disability-adjusted life years (DALYs) is huge in poor and tropical countries. The burden of snakebite is estimated to be around 391 979 DALYs in seven ASEAN countries, which is equivalent to a loss of 2.5 billion US dollars. Incidentally, this is approximately 0.1% of the region's gross domestic product (GDP)[5]. In sub-Saharan African countries, the estimated snakebite burden is as high as 120 DALYs per 100 000 population[5]. This impact in terms of DALYs varies from region to region, being maximum in the poorest of the poor sections of LMICs[5]. Unfortunately, the impact of snakebite is not confined to human lives: a vast number of livestock and other animals are also equally, if not more, impacted, resulting in economic loss to humans[2,6]. Such is the negligence towards the snakebite issue that we don't have an accurate estimate of human and animal losses due to snake envenomation.

Some of the SDGs are directly affected by the snakebite menace, while progress in others is indirectly impeded[1]. While SDG 3 seeks the "good health and well-being of all," NTDs, including snakebite, cause a significant burden of disease in vulnerable and marginalised communities in LMICs in the form of mortality and morbidity, including blindness, disfigurements, and amputations, thereby impeding progress in achieving SDG 3. SDG 1, seeking the aim of "no poverty," is badly affected by snakebite by reducing the workforce of families in terms of loss of people and reduced abilities to work due to disabilities. The same also impacts the SDG 8 objective of "decent work and economic growth" by taking people out of the workforce or by making them less productive. All these lead to further poverty, which will exacerbate malnutrition and

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hunger, thereby stymieing the objectives of "no hunger" in SDG 2. Snakebite-associated severe morbidities can affect children's enrolment in schools, thereby affecting the objective of "quality education" envisaged in SDG 4.

Overall, alleviating the NTDs can help poor communities have healthier lives, climb out of poverty by keeping them in the workforce, have access to food and education to reduce hunger and inequality, and improve their lifestyle. In the past decades, we have made huge strides to mitigate some of the NTDs, but snakebite still remains one of the biggest challenges among the NTDs. The challenges associated with snakebite are usually due to inaccurate epidemiological estimates^[7,8], ignorance and a lack of education among marginalised and tribal people^[2,9], and the high cost of antivenom therapy for snake envenomation treatment^[2,5].

Another difficulty with snakebite is that, unlike other NTDs, there is no single causative species, but rather a wide range of region-specific venomous snake species with highly complex and diverse venoms, resulting in a wide range of clinical symptoms that vary depending on the snake (age, sex, behaviour *etc.*), geographical location, bite (envenomous or dry bite), and victim. Then, victims' cultural, social, and religious beliefs, as well as their preferences for post-bite therapy, can further cause inaccurate snakebite estimates and hinder need-based policy implementation, which could have resulted in a lesser DALY loss.

Snakebite is a preventable and treatable medical condition. A multidisciplinary collaborative approach has been recommended for tackling the issue of snake envenomations^[2,10,11]. We need a collaborative effort to educate people about snakes, their habitats, and preventive and first-aid measures, as well as an appeal to the scientific community to collaborate on developing cost-effective treatment alternatives that do not push victims further into poverty but instead encourage them to seek institutional health care rather than harmful traditional and home remedies. The WHO initiative to reduce snakebite burden by half by 2030 through investing in community empowerment and encouragement, safe and cost-effective treatments, strengthening health systems, a coordinated collaboration of stakeholders, and a variety of other snakebite mitigation measures are to be applauded. A more concerted and focused approach by the governments of affected countries, funding agencies, non-governmental organizations, scientific communities, and other stakeholders will go a long way toward not only reducing the snakebite burden but also accomplishing (or at least approaching) the SDGs within the time frame.

Conflict of interest statement

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