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Snakebite Envenoming Overview and How Healthcare Professionals Can Help

Introduction

Snakebite envenoming is a potentially life-threatening disease caused by toxins in the bite of a venomous snake. Envenoming can also be caused by having venom sprayed into the eyes by certain species of snakes that have the ability to spit venom as a defence measure. In most of Africa, incidences of snake bite are counted as an unusual occurrence but in reality, it is a serious public health issue associated with how people live, work and move about. Understanding its scale helps shift the conversation from fear to preparedness. Inadequate past efforts to control snakebite envenoming has produced fragmented, inaccurate epidemiological data. Many victims do not attend health centres or hospitals and instead rely on traditional treatments. However, available data show 4.5–5.4 million people get bitten by snakes annually. Of this, 1.8–2.7 million develop clinical illness and 81 000 to 138 000 die from complications. Across West Africa, snakebite envenoming is estimated to cause between 10,000 and 100,000 serious cases and 1,000 to 10,000 deaths each year. Nigeria alone accounts for about 43% of the region's total disability burden from snakebite, measured in disability-adjusted life years.

High-risk groups include rural agricultural workers, herders, fishermen, hunters, working children, people living in poorly constructed houses and those with limited access to education and healthcare. Morbidity and mortality occur most frequently among young people and children suffer higher case fatality. Furthermore, women experience increased barriers to accessing medical care in some cultures and pregnant women are extremely vulnerable.

An ongoing crisis restricting access to safe, effective antivenom treatment in many regions, and particularly sub-Saharan Africa, is one factor that contributes to the predisposition for seeking help through traditional medicine.

Symptoms

Bites or sprayed venom from venomous snakes can cause a range of acute and serious medical emergencies. Envenoming from different types of snakes can cause different symptoms, some more serious than others. This makes the preparation of correct antivenoms an ongoing problem. Envenoming can cause severe paralysis that may prevent breathing, making immediate medical attention critical. People may also experience bleeding disorders that can lead to fatal haemorrhages or irreversible kidney failure. Severe local tissue destruction may also occur, which can lead to permanent disability and even limb amputation. Children are at higher risk of severe effects due to lower body mass than adults.

Most deaths and serious consequences from snake bites are entirely preventable by making safe and effective antivenoms more widely available and accessible, particularly in high-risk areas. High quality snake antivenoms are the only effective treatment to prevent or reverse most of the venomous effects of snake bites.

Treatment

Snake antivenoms are effective treatments to prevent or reverse most of the harmful effects of snakebite envenoming and are included in the WHO list of essential medicines. The availability and accessibility of these antivenoms, along with raising awareness on primary prevention methods among communities and health workers, are

the best ways to limit serious consequences and deaths from snakebite envenoming.

After a bite by a snake suspected of being venomous, follow these steps:

- Immediately move away from the area where the bite occurred.
- Remove anything tight from around the bitten part of the body to avoid harm if swelling occurs.
- Reassure the victim, as most venomous snake bites do not cause immediate death.
- Immobilize the person completely and transport the person to a health facility as soon as possible
- Applying pressure at the bite site with a pressure pad may be suitable in some cases.
- Avoid traditional first aid methods or herbal medicines.
- Paracetamol may be given for local pain (which can be severe).
- Vomiting may occur, so place the person on their left side in the recovery position.
- Closely monitor airway and breathing and be ready to resuscitate if necessary

Culled from: https://www.who.int/health-topics/snakebite#tab=tab_1

Question And Answer About Snakebite Envenoming

How many snakebites occur each year and how many injuries/fatalities result from them?

It is very difficult to determine the number of snakebites that occur worldwide, but the best available evidence suggests that each year as many as 2.7 million people develop a clinical illness following a bite from a venomous snake. In the field of clinical toxinology, which studies snakebite and other illnesses caused by venomous and/or poisonous organisms, the term used for such an injury is "envenoming" (American "envenomation"), and patients suffering the effects of venomous snake bite are said to have been "envenomed". Of the 2.7 million people envenomed each year, between 81,000 and 138,000 die as a result, and as many as 400 000 of the survivors are left permanently disabled.

What makes snakebite a 'neglected tropical disease'?

There are four primary criteria that define an illness as a neglected tropical disease (NTD), and snakebite envenoming satisfies each of them:

- First, there is a significant burden of mortality and morbidity (as detailed in the answer to question 1) – snakebite envenoming is a high-impact disease.
- Secondly, a majority of incidents of snakebite occur in the world's tropical and sub-tropical regions, and it particularly impacts the poor – snakebite is a tropical disease.
- Thirdly, snakebite is amenable to treatment, as well as prevention – the impact of snakebite can be mitigated now if we make the effort to do so.
- Finally, the overall level of investment in research addressing snakebite, from prevention to diagnosis to treatment and rehabilitation, is exceptionally low in comparison to its impact – snakebite is a neglected disease.

Where in the world do the most bites occur?

The majority of snakebite envenoming cases occur in tropical and subtropical regions of

the developing world. As many as 46 000 snakebite deaths happen in India alone; sub-Saharan Africa, tropical Asia, New Guinea, and Central and South America are also snakebite hot spots. Underscoring the fact that snakebite is a disease of the developing world are the incredible statistics from Australasia – although Australia itself is world famous for its diversity of highly venomous organisms, on average only 2 people die from snakebite there each year. In nearby New Guinea, on the other hand, an almost identical snake fauna (with, if anything, a lesser diversity of venomous species) claims more than 1000 lives each year. This is largely due to the differing socioeconomic and development levels of the two countries and emphasizes the greater impact of snakebite envenoming in poor, less-developed communities.

Who is most impacted by snakebite?

Like most NTDs, snakebite affects particularly the poorest members of society. Agricultural workers (including working children aged 10–14 years) and people living in poorly constructed homes face the highest risk and often have limited access to education, health care and even footwear. When poor people are bitten, the luxury of modern health care is usually far removed from their reality.

What are the socioeconomic consequences of snakebite?

The socioeconomic impacts of snakebite for survivors and their families can be dire.

In rural India, where 75% of people live on average monthly household incomes of just 5000 rupees (US$ 78), immediate treatment costs after snakebites of more than 350 000 rupees (US$ 5400) have been reported. The follow-on economic losses, due to loss of income or being forced to sell livestock, homes or land in order to meet additional costs, can be as high as 400 000 rupees (US$ 6215). Elsewhere in the developing world, the story is similar: those lucky enough to survive a venomous snakebite are often financially crippled by the cost of treatment, as well as physically crippled by the effects of the venom. Given that a majority of bite sufferers are among the most productive members of society (young, working age men and women), disablement following snakebite can prevent survivors from earning an income, making them a lifelong financial burden for their family members. In addition, snakebite survivors may suffer disfigurement and post-traumatic stress disorder, which can result in their becoming social pariahs.

What species of snakes are responsible?

The snake species implicated in serious snakebite injury vary from region to region, a fact that increases the challenge of mitigating the burden of snakebite worldwide. In India, the “big four” species are the Indian cobra (*Naja naja*), the Russell’s viper (*Daboia russelii*), the Indian saw-scaled viper (*Echis carinatus*) and the Indian krait (*Bungarus caeruleus*), although other species are also implicated in many life-threatening bites.

Throughout the rest of tropical Asia, a similar cohort of culprits occurs, and cobras (*Naja* ssp.), kraits (*Bungarus* ssp.) and Russell’s vipers (where they occur) are responsible for most of the serious bites.

In Africa, different types of cobras (*Naja* ssp.), multiple species of saw-scaled/carpet viper (*Echis* ssp.), and puff adders (*Bitis arietans*) are major culprits, although in some areas mambas (*Dendroaspis* ssp.) are also responsible for numerous bites, along with other species of viper (particularly other members of the genus *Bitis*). Although Nigeria is home to dozens of snake species, a small number of these species account for most serious injuries and deaths. Research from affected

regions indicates that the West African carpet viper alone accounts for roughly two-thirds to three-quarters of severe snakebite cases in some savanna communities. Other medically important species include puff adders and spitting cobras, but the dominance of the carpet viper helps explain why certain regions carry a much heavier burden than others. Risk, in this sense, is shaped as much by species distribution as by human behaviour.

In Central and South America, a range of pit-viper species, particularly lanceheads (genus *Bothrops* and related genera) and rattlesnakes (genus *Crotalus*) are responsible for the most bites, although coral snakes (genus *Micrurus*) are common in some areas and capable of inflicting life-threatening envenomations.

In New Guinea, the taipan (*Oxyuranus scutellatus*) is responsible for the most bites, followed by the death adders (*Acanthophis* spp.) – both groups of snakes occur also in parts of Australia, but bites in that country are very rare.

How can snakebite be prevented?

It is often said that prevention is better than cure, and a majority of snakebite accidents are readily preventable. In many parts of the world where snakebite envenoming is very common, walking barefoot through snake-infested areas is a major cause of snakebite and as many as 80% of all snakebites occur on the legs or feet, below the knee. These could be prevented if people had access to cheap, practical and protective footwear, and were educated to understand the importance of wearing their shoes.

Snakes are typically shy creatures that spend most of their time hiding, and piles of human rubbish and old construction materials make perfect shelter sites. Cleaning up and keeping the grass short in areas in close proximity to dwellings, along pathways, and in places where children play, are measures that can reduce the likelihood of snakebites. Similarly using a light when walking outside at night is essential in areas where some snakes forage after dark. Even the short walk to an outdoor latrine can be fatal if one steps on a snake in the dark.

Many homes in areas where snakebite is endemic are constructed in such a way that snakes can gain access. Sealing houses so that snakes cannot enter the dwelling can help to prevent snakebites, but if this is not possible, the simple act of sleeping on a raised platform with a well-tucked in mosquito net can prevent not only mosquito-borne diseases but also snakebites.

What is the appropriate first aid?

Most of the methods currently proposed as first aid for snakebites are either ineffective, dangerous, or delay proper medical treatment. Even methods that have been recommended by medical authorities in one part of the world may not be appropriate for use in other places because of the differences in the types of effects that different snake venoms can have.

Methods such as the use of narrow tourniquets, excision or incision of the wounds or the affected limb, the use of chemicals such as potassium permanganate or the application of heated glass containers to produce suction, can all be dangerous as well as ineffective and should not be used. Other approaches like the use of the Belgian black stone, are simply ineffective and waste valuable time.

The best approach is to immobilize the bitten person and keep them from moving around. The application of pressure at the bite-site via a pressure pad, a compression bandage applied to the bitten limb, or both, may be effective in delaying the onset of systemic effects, but is only recommended for bites from snakes with predominantly neurotoxic venom, and not for those that cause significant local tissue damage.

Place envenomed patients on a makeshift stretcher and transport them to medical care without delay. If possible, place them on their side to help protect their airway and breathing.

What effective treatments exist?

Administration of the appropriate antivenom is the most effective treatment for life-threatening snakebite. The best response to antivenom occur when administered as soon as possible following a bite, as many of the effects of snake venom are irreversible, including some neurotoxic, cytotoxic, haemorrhagic and haemotoxic effects.

Snake venoms are also highly variable in their toxic components and effects. This variation exists not only among species but often also within a single species among geographical regions, age and size classes, or between the sexes. As a result, antivenom raised against the venom of one species or population may not be effective in the treatment of envenoming by snakes from other species or even other populations of the same species. There are often barriers that complicate the task of ensuring early access to appropriate antivenom to snakebite victims, including lack of appropriate transport networks in developing countries, lack of unbroken cold chain-based distribution systems that can maintain the integrity of antivenom (which may require refrigeration) in rural and remote areas, and general lack of infrastructure associated with healthcare facilities. Surmounting these challenges is essential to effective control of snakebite envenoming.

What can we do to mitigate the impacts?

Reducing the burden of snakebite in the tropical developing world is a massive task, with many complicating factors, some of which have been detailed above.

The first step is securing the requisite resources via commitments from WHO Member States, donors and other funding bodies. Supporting the development of functional health systems and other infrastructure in the worst affected regions will not only help reduce the number of snakebite casualties but contribute to the capacity to fight the myriad other diseases that afflict these areas.

Education, both about the prevention of snakebite, and about appropriate treatment in the event of an accident, is a crucial piece of the puzzle.

Increased investment in research that can deliver tangible and sustainable solutions is essential, particularly with respect to developing and rolling out better diagnostic tools and therapeutic treatments, and improved control tools and strategies.

As with other NTDs, snakebite is a complex disease with many factors that contribute to its overall impact – mitigating these impacts requires commitment from multiple stakeholders.

Culled from: https://www.who.int/news-room/questions-and-answers/item/snakebite-envenoming

How Healthcare Professionals Can Help

Snakebite Information and Data Platform

As part of its 2019–2030 global strategy for the prevention and control of snakebite envenoming, WHO is launching a new Snakebite Information and Data Platform. This is the result of collaboration between the Departments of Control of Neglected Tropical Diseases (WHO/NTD) and Data Delivery for Impact & Analytics (WHO/DDI).

With support from the WHO GIS Centre for Health, the platform is developed with a

new generation of ArcGIS software. It comprises advanced tools for managing, analyzing, and visualizing updated multi-sourced data, providing an interactive and participative user experience. It includes updated range maps of all medically important venomous snakes, other relevant information, and an integrated antivenom products database.

Future developments will incorporate District Health Information Software data, modelling tools to improve access to treatment and antivenoms, and other enhancements to drive programme implementation and evaluation.

This new resource sets the foundation for developing specific activities and programmes associated with WHO's strategy for preventing and controlling snakebite envenoming. This will become a central space for collaboration, data-sharing, and access to snakes and snakebites for the Member States, the scientific community, industry, other stakeholders, and the general public.

Click the link below to learn more about the platform and how you can contribute: https://www.who.int/teams/control-of-neglected-tropical-diseases/snakebite-envenoming/snakebite-information-and-data-platform

Working towards the development of a snakebite envenoming community engagement and education toolkit

WHO is focusing on the development of a community engagement toolkit for snakebite envenoming for those wishing to engage with communities to improve outcomes for snakebite envenoming; this toolkit will be a repository of both information and practical tools. Whilst the focus is prevention and first aid treatment, other topics such as mental health, disability and rehabilitation are also included

WHO establishes a growing international and multidisciplinary Roster of Experts to support WHO activities on snakebite envenoming

In early 2020, WHO launched a process to establish an international roster of experts spanning a wide range of professional backgrounds in order to identify people who can potentially contribute to the implementation of the WHO strategic plan for control and prevention of snakebite envenoming. The group was established in early 2021 and multiple experts have already been supporting WHO projects on snakebite envenoming and will continue to do.

Snakebite Envenoming -- A Strategy for Prevention and Control

The core of the strategy is the goal for all patients to have better overall care, so that the numbers of deaths and cases of disability are reduced by 50% before 2030.

A disease whose time has come -- Snakebite envenoming is a neglected tropical disease (NTD) that is responsible for enormous suffering, disability and premature death on every continent. As over 5.8 billion people are at risk of encountering a venomous snake, it is not surprising but no less tragic that almost 7400 people every day are bitten by snakes, and 220–380 men, women and children die as a result adding up to about 2.7 million cases of envenoming and 81 000–138 000 deaths a year. The economic cost of snakebite envenoming is unmanageable in most countries, as it affects not only the victims but often their entire families, particularly in poor communities in

low- and middle-income countries that do not have social security.

As work towards achieving the objectives of UHC2030 (https://www.uhc2030.org/) accelerates, immediate action is needed to reduce the burden of suffering of some of the world's most disadvantaged communities, and countries around the globe have appealed for a coordinated response. Following a recommendation by WHO's Strategic and Technical Advisory Group for Neglected Tropical Diseases and a resolution on snakebite envenoming adopted by the Seventy-first World Health Assembly in 2018, WHO has added this disease to its list of category A NTDs. It has now developed a strategy to reduce mortality and disability from snakebite envenoming by 50% before 2030. This document describes the strategy for action in countries, supported by regional collaboration, that will save lives and prevent needless suffering.

A comprehensive strategy -- For millions of men, women and children around the world, the risk of snakebite is a daily concern as they go about their everyday activities – walking to school, tending gardens, herding livestock, fetching water or simply going to the toilet – where a misplaced step, a momentary lapse of concentration or being in the wrong place at the wrong time can be fatal. Reducing the problem starts with improving community education about the risk and encouraging them to seek health care and ensuring intensified case management for every patient. First aid, effective, affordable treatment provided by well-trained medical staff and rehabilitation will allow many victims to return more quickly to good health and productive lives.

The core of the strategy is the goal for all patients to have better overall care, so that the numbers of deaths and cases of disability are reduced by 50% before 2030. For this to be achieved, four strategic aims will be pursued.

- Empower and engage communities,
- Ensure safe, effective treatment,
- Strengthen health systems, and
- Increase partnerships, coordination and resources - Strong collaboration

Download your copy of the strategy using the link below to get information you can use:
https://iris.who.int/server/api/core/bitstreams/6436d4bd-ad12-4c88-9f47-48bc0ee58072/content