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Snake Bite: A Neglected Tropical Condition

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Since reporting is not mandatory in many regions of the world, snakebites often go unreported [1]. Consequently, no large-scale study has ever been conducted to determine the incidence of snakebites. However, some estimates put the number at 5.4 million snakebites, 2.5 million envenomings, resulting in perhaps 125,000 deaths [1]. According to the most conservative estimates, at least 81,000 snake envenomings and 11,000 fatalities occur in India each year, making it the most heavily affected country in the world [1]. It is most unfortunate that despite a large population getting bitten by snakes every year and a large number succumbing to its complications, not much has been done to handle this preventable envenomation. Ignorance about the problem and the prevalent cultural practices delay arrival of patients to equipped health centers. Moreover, the anti-snake venoms (ASV) available in market are not effective against venoms of all snakes responsible for envenomation, adding to the mortality. More research in this area is needed to make suitable and safe ASVs to take care of regional variations in distribution of snakes. Community education to population at-risk regarding the behavior of snakes inhabiting their region, features of snake envenomation, do's and don'ts after a snake bite, and more specifically the transportation of a victim to a health centre will change the scenario favorably.

Of the roughly 3,000 known species of snake found worldwide, only 15% are considered dangerous to humans [1,2]. There are two major families of venomous snakes, *Elapidae* and *Viperidae*. Three hundred and twenty five species in 61 genera are recognized in the family *Elapidae* [3], and 224 species in 32 genera are recognized in the family *Viperidae* [4]. In addition, the most diverse and widely distributed snake family, the *Colubridae*, has approximately 700 venomous species [5] but only five genera – boomslangs, twig snakes, keelback snakes, green snakes, and slender snakes – have caused human fatalities [5]. In the Indian subcontinent, almost all snakebite deaths have traditionally been attributed to the big four – Russell's viper, Indian cobra, saw-scaled viper and the common krait [6]. However, studies have shown that the hump-nosed viper, previously considered essentially harmless and misidentified as the saw-scaled viper, is capable of delivering a fatal bite [7]. In regions of Kerala, India, it may be responsible for nearly 10% of venomous bites [7]. Commonly used anti-venoms in India do not appear to be effective against hump-nosed viper bites [7]. The Malayan pit viper and banded krait are two other species involved in a significant number of venomous bites.

The Madras Crocodile Bank Trust and Centre for Herpetology (MCBT), in collaboration with scientists at the Indian Institute of Science (IIS) and National Center for Biological Sciences (NCBS) and the Global Snakebite Initiative have begun a project that will initially concentrate on Russell's viper which is responsible for many serious and fatal bites. Venom will be collected from ten different geographic areas around India, quickly frozen using a new Geological Survey of

India (GSI)-developed protocol and then transferred to toxicologists at the IIS for studies of how effectively it is neutralized by Indian antivenoms. Detailed proteomic studies will follow. Results of these studies should improve the quality and potency of Indian anti-venoms.

Definitive data which can accurately determine the level of envenomation, e.g ELISA testing, needs to be employed as symptomatology is not a useful guide to the level of envenomation. It is important that a single ASV regimen be adhered to for treating envenomation. The usual recommended initial dosage of ASV is 100 mL of polyvalent ASV for adults and children, based on published research that Russell's Viper injects on an average about 63 mg of venom. The total venom injected can range from 5 mg to 147 mg; therefore, the total requirement of ASV is between 100 mL and 250 mL. The initial drip rate of ASV should be very slow and patients should be watched carefully for any adverse reaction. Children must receive the same dose of ASV as adults as the dose of venom injected is same. The correction of coagulopathy is the most important criteria to discontinue ASV treatment which sometimes takes several days and may even require blood and blood products. Adverse reactions to ASV include anaphylaxis which may require administration of adrenaline intramuscularly. In old patients, administration of intravenous hydrocortisone and H-1 and H-2 blockers may be particularly useful as intramuscular adrenaline can lead to a fatal outcome. In neurotoxic poisoning after the first dose has been given (100 mL of ASV) which neutralizes 120 mg of poison, another dose may be repeated after one hour in case the patient worsens or shows no improvement. No further ASV is required usually, but neostigmine and mechanical ventilation should be continued, if needed. In case of evidence of acute kidney injury (AKI) as seen commonly in viper bites, and if there is passage of dark brown urine suggesting myoglobinuria or hemoglobinuria, adequate hydration, correction of hydration and even dialysis may be needed. To reduce mortality due to snake envenomation, it is important to identify and predict which patients are likely to suffer from serious manifestations. In the study by Krishnamurthy, *et al*. [9] published in this issue of *Indian Pediatrics*, AKI was found to be associated with viper envenomation in patients with shock, bleeding manifestations and those receiving native treatment. Other studies have reported a high association of snake envenomation-related AKI in patients with albuminuria, raised bilirubin levels, and younger age [10,11]. Identification of high risk factors and early administration of ASV will certainly aid to curb mortality in snake envenomation.

Funding: None; *Competing interests:* None stated.

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