

DHMOSH GUIDANCE FOR THE PREVENTION AND MANAGEMENT OF SNAKE BITES

JANUARY 2024

INTRODUCTION

Snakebite envenoming is a potentially life-threatening condition caused by toxins in the bite of a venomous snake. Envenoming can also be caused by having venom sprayed into the human eyes by certain species of snakes that have the ability to spit venom as a defense measure. According to current data, 4.5–5.4 million people get bitten by snakes annually¹. Of this, 1.8–2.7 million develop clinical illness, and 81,000 to 138,000 people die from complications. Most of these occur in Africa, Asia and Latin America. In Asia, up to 2 million people are envenomed by snakes each year, while in Africa, there are an estimated 435,000 to 580,000 snake bites annually that need treatment. Morbidity and mortality occur most frequently among young people, and children suffer higher case fatalities. Pregnant women are extremely vulnerable to snake bites.

While prevention via avoidance of snakes is the most important way to prevent bites, most deaths and serious consequences of snake bites, once it has occurred, are preventable by making safe and effective antivenoms more widely available and accessible¹. High-quality snake antivenoms are the most effective treatment to prevent or reverse most of the venomous effects of snake bites. It is important for those working in countries with high exposure to snake bites to be aware of their local epidemiology and species of snakes in the area and, thereby, specific management, including antivenom.

This guidance was developed by the Public Health Section of DHMOSH for clinical staff and provides information on the prevention of snake bites as well as clinical management and post-exposure management. For any questions on this document, contact the DHMOSH Public Health Section at dos-dhmosh-public-health@un.org.

PREVENTION⁴

- Avoid places where snakes may live. These places include tall grass or brush, rocky areas, fallen logs, bluffs, swamps, marshes, and deep holes in the ground.
- Be aware of snakes that may be swimming in the water to get to higher ground and those that may be hiding under debris or other objects.
- If you see a snake, back away from it slowly and do not touch it. Do not pick up a snake or try to trap it.
- If you see a snake in your home, immediately call animal control or other local agencies in your area to help safely remove/dispose of the snake.

FIRST AID²

Initial first aid of snake envenomation is directed at reducing the spread of venom and expediting transfer to an appropriate medical center.

1. General principles

- Remove the patient from the snake's territory.
- Keep the patient calm and at rest, remaining as still as possible.
- Attempt to identify the snake **only if** it is safe for the patient and the rescuer, and it will not delay the transport of the patient to definitive medical care.
- Snake or snake parts should not be handled directly. The bite reflex may remain intact in recently killed snakes and permit further biting. A photograph taken at a safe distance may be useful for identification purposes.
- Remove any jewelry or footwear from the affected extremity. Clothing that is not tight and does not cause circulatory compromise can be left in place.



- Immobilize the injured part of the body in a functional position. Limited evidence exists regarding the recommended height of the bite wound relative to the level of the heart. Expert recommendations vary according to the expected degree of local injury compared with systemic toxicity.
- Fashion a splint out of any rigid object (e.g., a padded piece of wood or tree branch, rolled newspaper, sleeping bag pad, or backpack frame) and apply to the extremity as follows:
 - Splint the leg posteriorly in extension, immobilizing the ankle and the knee.
 - Splint the arm to the elbow and apply a sling.
- Transport the patient to the nearest medical facility as quickly as possible.
- Do **not** allow the victim to walk because of exertion, and with bite wounds on the lower extremity, local muscle contraction may increase snake venom absorption.
- Do **not** manipulate the wound except to permit gentle bandaging or, if indicated, pressure immobilization or placement of a pressure pad.
- If transport to definitive care will be prolonged and a venom detection kit will **not** be used (countries other than Australia and Papua New Guinea), gentle cleansing may be performed.
- Withhold alcohol and any drugs (such as aspirin and nonsteroidal anti-inflammatory medications) that may confound clinical assessment or interfere with treatment.

2. Pressure immobilization (only appropriate for snakebites from specific species)

- It's suggested that patients with snakebites from species with venoms that cause paralysis with little to no local tissue damage (e.g., Australian elapids, kraits), some purely neurotoxic cobras, coral snakes, or South American rattlesnakes) in whom transportation to definitive medical treatment will be prolonged, should receive pressure immobilization (Annex 1) rather than immobilization alone.
- Pressure bandage immobilization (PBI) is **not** suggested following bites by snake species whose venom is associated with significant local tissue necrosis (e.g., many cobras, adders, pit vipers, and rattlesnakes). In these patients, the localization of toxins may worsen tissue damage and could possibly raise compartment pressures.
- Application of a pressure bandage and immobilization (PBI) to the extremity consists of the following steps (**Annex 1**)
 - Do not remove clothing.
 - Avoid excessive movement of the affected limb.
 - With the patient at rest and the affected extremity below the heart, wrap the extremity with an elastic bandage from the lower to the upper portion of the limb.
 - If an elastic bandage is not available, use pantyhose or other clothing torn into wide strips.
 - Ensure that the bandage is firm and has the same tightness as for wrapping of a sprained ankle but just permits passage of two fingers underneath. Check that distal pulses remain palpable.
 - Fashion a splint out of any rigid object (e.g., a padded piece of wood or tree branch, rolled newspaper, sleeping bag pad, or backpack frame) and apply to the extremity as follows:
 - Splint the leg posteriorly in extension, immobilizing the ankle and the knee.
 - Splint the arm to the elbow and apply a sling.
 - Do not remove the pressure bandage and immobilization until the patient has reached the hospital and a clinical assessment regarding the need for antivenom has occurred⁵.
- One exception to this rule occurs if it is evident that the bandage is so tight that it is hampering circulation (i.e., distal pulses are markedly decreased or not palpable). This situation may occur if pressure immobilization is improperly applied, or local swelling has increased the tightness of the bandage. If time to definitive care will exceed the likely ability of the distal limb to survive prolonged anoxia, the bandage should be carefully loosened to permit distal circulation but to avoid systemic venom absorption.
- The pressure bandage and immobilization technique have wide support in Australia, where elapid snake toxins primarily cause neurotoxicity and/or coagulopathy without tissue necrosis and where there may be significant delays in transfer to medical facilities.

3. Methods to avoid

- The following methods, while used widely in the past and advocated by some, cause more harm than good, and should be avoided:
 - Incision and oral suction
 - Mechanical suction devices



- Cryotherapy
- Surgery
- Electric shock therapy
- Tourniquets

CLINICAL MANAGEMENT²

1. Initial stabilization

- Emergency management of respiratory depression and shock, followed by timely antivenom administration, if available, to patients with appropriate indications comprise the key initial interventions in patients with snakebite. More information on initial interventions can be found in **Annex 2**.
- If pressure immobilization is in place, then it should **not** be removed until initial assessment, stabilization, and, if needed, antivenom are provided.
- Additional management depends upon whether the biting snake is known or unknown and whether envenomation has occurred. Please refer to region-specific resources.

2. Antivenom

- When deciding whether to administer antivenom, clinicians who are unfamiliar with the management of snakebite should seek expert consultation with a clinical toxicologist, poison control center, or physician experienced in management of snakebites in the region. Please refer to region-specific resources

REGION-SPECIFIC RESOURCES

1. African snakebites

- [Guidelines for the prevention and clinical management of snakebite in Africa](https://www.who.int/publications/i/item/9789290231684). World Health Organization Regional Office for Africa, Brazzaville, Mauritius, 2010: <https://www.who.int/publications/i/item/9789290231684>
- [Target product profiles for animal plasma-derived antivenoms: antivenoms for treatment of snakebite envenoming in sub-Saharan Africa](https://www.who.int/publications/i/item/9789240074569). World Health Organization, 2023: <https://www.who.int/publications/i/item/9789240074569>

2. South-East Asian snakebites

- Warrell DA. [Guidelines for the management of snakebites](https://www.who.int/docs/default-source/searo/india/health-topic-pdf/who-guidance-on-management-of-snakebites.pdf?sfvrsn=5528d0cf_2). World Health Organization Regional Office for South-East Asia, India, 2016: https://www.who.int/docs/default-source/searo/india/health-topic-pdf/who-guidance-on-management-of-snakebites.pdf?sfvrsn=5528d0cf_2

3. Australian snakebites

- White J. [Snakebite & spider bite management guidelines South Australia](https://www.sahealth.sa.gov.au/wps/wcm/connect/85950800457e1fda87c5d7519b2d33fa/Snakebite-Spiderbite-Guidelines-SAHealth-2018.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-85950800457e1fda87c5d7519b2d33fa-onrP8eK). Department of Health, Adelaide, 2018: <https://www.sahealth.sa.gov.au/wps/wcm/connect/85950800457e1fda87c5d7519b2d33fa/Snakebite-Spiderbite-Guidelines-SAHealth-2018.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-85950800457e1fda87c5d7519b2d33fa-onrP8eK>
- A comprehensive publication on the management of envenomation in Australia ("A Clinicians Guide to Australian Venomous Bites and Stings"): https://biomedicalsciences.unimelb.edu.au/_data/assets/pdf_file/0004/3216739/A-Clinicians-Guide-to-Venomous-Bites-and-Stings-2013.pdf
- An extensive database of the distribution for snake species, their clinical manifestations, and treatment of envenomation provided by the University of Adelaide, Australia. Available at www.toxinology.com.

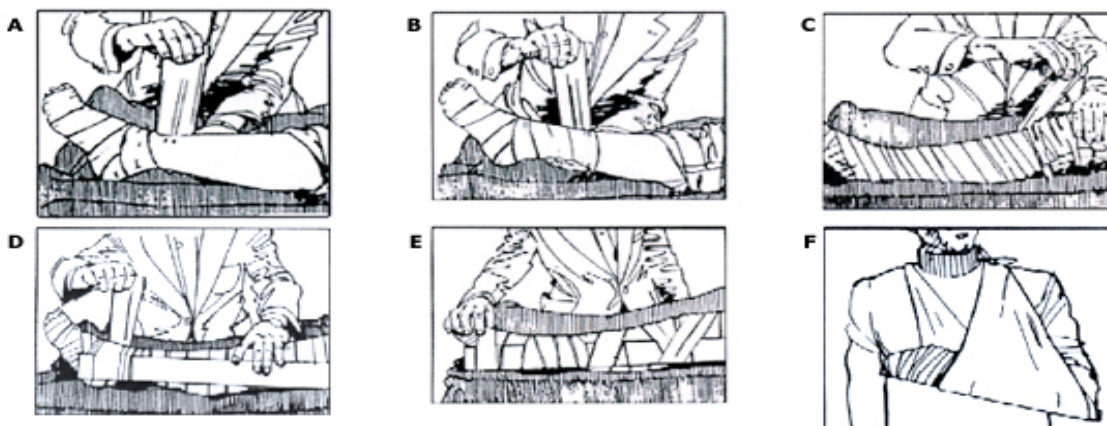
REFERENCES

1. Snakebite envenoming. World Health Organization (WHO). Accessed January 8, 2024. https://www.who.int/health-topics/snakebite#tab=tab_1
2. Venomous bites and stings. MSF Medical Guidelines. Accessed January 8, 2024. <https://medicalguidelines.msf.org/en/viewport/CG/english/venomous-bites-and-stings-18482425.html#section-target-1>
3. Guidelines for the management of snakebites, 2nd edition. World Health Organization (WHO). Accessed January 8, 2024. <https://www.who.int/publications/i/item/9789290225300>
4. Prevent or Respond to Snake Bite. Centers for Disease Control and Prevention. Accessed January 8, 2024. <https://www.cdc.gov/disasters/snakebite.html>
5. Management of a Pediatric Snake Envenomation After Presentation With a Tight Tourniquet. Wilderness and Environmental Medicine. Accessed January 8, 2024. <https://pubmed.ncbi.nlm.nih.gov/25792002/>



ANNEX 1

First aid for snake bites - pressure-immobilization method



Bites to the lower limb:

- (A) Apply a broad pressure bandage over the bite as soon as possible.
- Wide crepe bandages are ideal, but any fabric may be used; clothing or towels may be torn into wide strips. Pantyhose has been successfully used.
 - Do not take off clothing, as the movement of doing so will promote the movement of venom into the blood stream.
 - Bandage upwards from the lower portion of the bitten limb. Even though a little venom may be squeezed upwards, the bandage will be more comfortable, and therefore can be left in place for longer if required.
- (B) The bandage should be as tight as you would apply to a sprained ankle.
- You should be able to slip a few fingers under the bandage.
- (C) Extend the bandage as high as possible up the limb.
- (D) Apply a splint to the leg.
- Any rigid object may be used as a splint, such as a spade, a piece of wood, tree branch or rolled up newspapers.
- (E) Bind the splint firmly to as much of the leg as possible

Bites to the hand or forearm:

- (F) • Keep the patient still. Lie the patient down to prevent walking or moving around.
- Bandage as much of the arm as possible, starting at the fingers.
 - Use a splint to the elbow.
 - Use a sling to immobilize the arm.

Bites to the trunk:

- If possible, apply firm pressure over the bitten area. Do not restrict chest movement. Keep the patient still.

Bites to the head or neck:

- No first aid for bitten area. Keep the patient still.

Research stresses the importance of keeping the patient still.

This includes all the limbs. Bring transport to the patient if possible.

- DO NOT cut or excise the bitten area
- DO NOT apply an arterial tourniquet; they cut off the circulation to the limb and are potentially dangerous.
- DO NOT wash the bitten area. In Australia, the type of snake involved may be identified by the detection of venom on the skin.

If the bandages and splint have been applied correctly, they will be comfortable and may be left on for several hours. They should not be taken off until the patient has reached medical care, as venom may move into the bloodstream quickly after they are removed.

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ANNEX 2

Site of action of venom, clinical features, tests, and management

Site of action	Clinical features	Ancillary testing	Management
Local tissue	Pain Fang marks Swelling Blistering Ecchymoses Tissue necrosis Lymph node swelling and tenderness		Antivenom Manage signs of compartment syndrome (Rare)
Neuromuscular junction	Ptosis Diplopia Dysphagia Bulbar palsy: "drooling" pooling of secretions in pharynx Dyspnea Limb weakness	Positive neostigmine trial indicates post-synaptic paralysis responsive to antivenom and anticholinesterase* Low maximal inspiratory and expiratory forces	Antivenom Anticholinesterase (eg, neostigmine)* Maintain and support airway and breathing, as needed
Coagulopathy	Epistaxis Gingival oozing Bleeding from venipuncture site Ecchymoses and bruising Clinically evident bleeding (hemoptysis, hematemesis, hematuria, intracranial hemorrhage)	Thrombocytopenia (Complete blood count) Anemia Prolonged INR or aPTT Decreased fibrinogen Increased fibrin degradation products or D-dimer 20-minute whole blood clotting test (resource-limited settings) [¶]	Antivenom primary treatment Blood products (eg, whole blood, fresh frozen plasma, or platelets) only if life-threatening bleeding and, when available, after antivenom administration Heparin, aminocaproic acid not helpful
Shock	Hypotension Tachycardia Signs of poor perfusion (prolonged capillary refill, decreased urine output, altered mental status)	Central pressure monitoring	Antivenom Intravenous isotonic fluids (eg, normal saline) and vasoactive infusions to maintain perfusion pressure depending upon whether shock is hypovolemic, cardiogenic, or both
Rhabdomyolysis	Red or brown urine Oliguria	Rapid urine dipstick positive for blood with microscopic urinalysis showing no red blood cells Positive urine for myoglobin Increased serum creatine kinase, potassium, creatinine, and/or blood urea nitrogen EKG changes indicating hyperkalemia	Intravenous normal saline in volumes sufficient to reestablish urinary output ^Δ Hemodialysis, as needed, for acute kidney injury

* Refer to UpToDate topics on snakebites worldwide for specific guidance on performing a Tensilon (edrophonium) test and for recommended dosing of neostigmine in snakebite victims with a positive test.

¶ The whole blood clotting test (WBCT) has also been considered a useful bedside screening test when more formal coagulation testing is not available; failure of the blood to clot in a clean glass tube after 20 minutes has been considered evidence of severe hypofibrinogenemia. The WBCT has low sensitivity but high specificity. Thus, a positive test is a reasonable indication for antivenom administration. However, a negative test does **not** mean that antivenom should be withheld, especially if there are clinical features of coagulopathy (eg, blood oozing at puncture sites, bleeding gums, or epistaxis).

Δ Antivenom may attenuate rhabdomyolysis but will not reverse it for selected snakes. Refer to UpToDate topics on management of snakebites worldwide.