

# Venomous snake bites

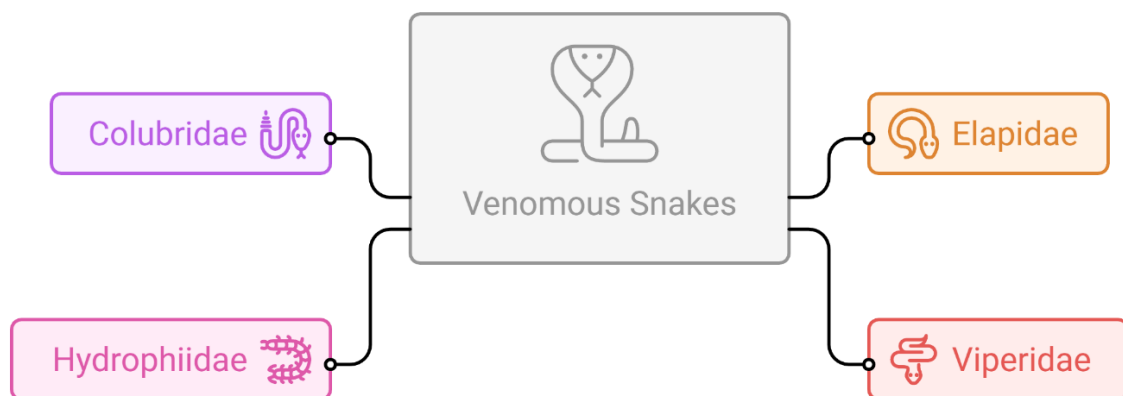
## Families of Venomous Snakes

### Introduction

- Venomous snakes are responsible for significant morbidity and mortality worldwide, particularly in tropical and subtropical regions.
- In clinical toxicology, understanding the taxonomy of venomous snakes is crucial, as it helps predict the type of envenomation syndrome and select appropriate antivenom therapy.

### Major Families of Venomous Snakes

- There are **four main families** of venomous snakes relevant to human envenomation.
- Among these, the first three are of highest clinical significance:



#### A. Elapidae (Fixed front-fanged snakes)

- **Common Members:** Cobras, Kraits, Coral snakes, Sea snakes
- **Geographic Distribution:** Widely found in Asia, Australia, Africa, and the Americas
- **Fang Morphology:** Short, fixed, front-fanged
- **Venom Type:** *Primarily neurotoxic*
- **Example (India):**
  - *Naja naja* (Indian cobra)
  - *Bungarus caeruleus* (Common krait)

#### Effects:

- Neurotoxicity (paralysis)
- Minimal local tissue damage
- Respiratory failure in severe cases

#### B. Viperidae (Long front-fanged snakes)

- **Common Members:** True vipers and pit vipers

- **Geographic Distribution:** Worldwide (excluding Antarctica and Australia)
- **Fang Morphology:** Long, hinged, front-fanged (foldable)
- **Venom Type:** *Hemotoxic and cytotoxic*
- **Example (India):**
  - *Daboia russelii* (Russell's viper)
  - *Echis carinatus* (Saw-scaled viper)

### Effects:

- Hemorrhage
- Coagulopathy
- Tissue necrosis
- Shock

## **C. Hydrophiidae (Sea snakes)**

- **Common Members:** Beaked sea snake (*Enhydrina schistosa*)
- **Geographic Distribution:** Coastal waters of Indian and Pacific Oceans
- **Venom Type:** *Potent neurotoxin + myotoxin*
- **Envenomation Characteristics:**
  - Rhabdomyolysis
  - Myoglobinuria
  - Paralysis
  - Acute kidney injury

## **D. Colubridae (Rear-fanged snakes — mostly non-venomous)**

- **Common Members:** Boomslang, Twig snakes
- **Note:** Majority are non-venomous or mildly venomous
- **Clinical Relevance:** Some, like the boomslang, have fatal hemotoxic venom, though envenomation is rare

## **Clinical Effects of Venoms**

- The clinical presentation of snake venom toxicity depends on the species, type of venom, quantity injected, site of bite, and individual host factors (e.g., age, health status).

### **Neurotoxic Effects**

Primarily seen with Elapidae (Cobras, Kraits, Sea snakes)

### **Mechanism:**

- Neurotoxins block neuromuscular transmission.
  - **Presynaptic blockade:** prevents acetylcholine release (e.g., krait)
  - **Postsynaptic blockade:** blocks acetylcholine receptors (e.g., cobra)

### **Clinical Features:**

- Ptosis (drooping eyelids)
- Diplopia (double vision)
- Ophthalmoplegia (paralysis of eye muscles)
- Difficulty in swallowing (dysphagia)
- Respiratory muscle paralysis → *respiratory arrest* (life-threatening)

## **Hemotoxic Effects**

Mainly with Viperidae (e.g., Russell's Viper, Saw-scaled Viper)

### **Mechanism:**

- Procoagulant enzymes activate clotting pathways → consumption coagulopathy (DIC)
- Damages endothelial cells → bleeding
- Platelet dysfunction

### **Clinical Features:**

- Bleeding from gums, nose, bite site
- Hematuria (blood in urine)
- Hematemesis, melena
- Ecchymosis, purpura
- Shock, hypotension
- Acute renal failure (due to hemoglobinuria or direct nephrotoxicity)

## **Cytotoxic and Local Tissue Effects**

Seen especially with Vipers

### **Mechanism:**

- Enzymes like phospholipase A2 and metalloproteinases damage tissues

### **Clinical Features:**

- Local pain and swelling
- Blister formation
- Hemorrhagic bullae
- Necrosis and gangrene

- Compartment syndrome (increased pressure within muscle compartments)
- May require surgical debridement or amputation

## Myotoxic Effects

**Prominent in Sea Snake and some Krait envenomation**

### **Mechanism:**

- Muscle breakdown → release of myoglobin into circulation

### **Clinical Features:**

- Muscle tenderness, stiffness
- Dark red or cola-colored urine (myoglobinuria)
- Hyperkalemia → cardiac arrhythmias
- Acute kidney injury (from myoglobin deposits in renal tubules)

## Systemic Manifestations

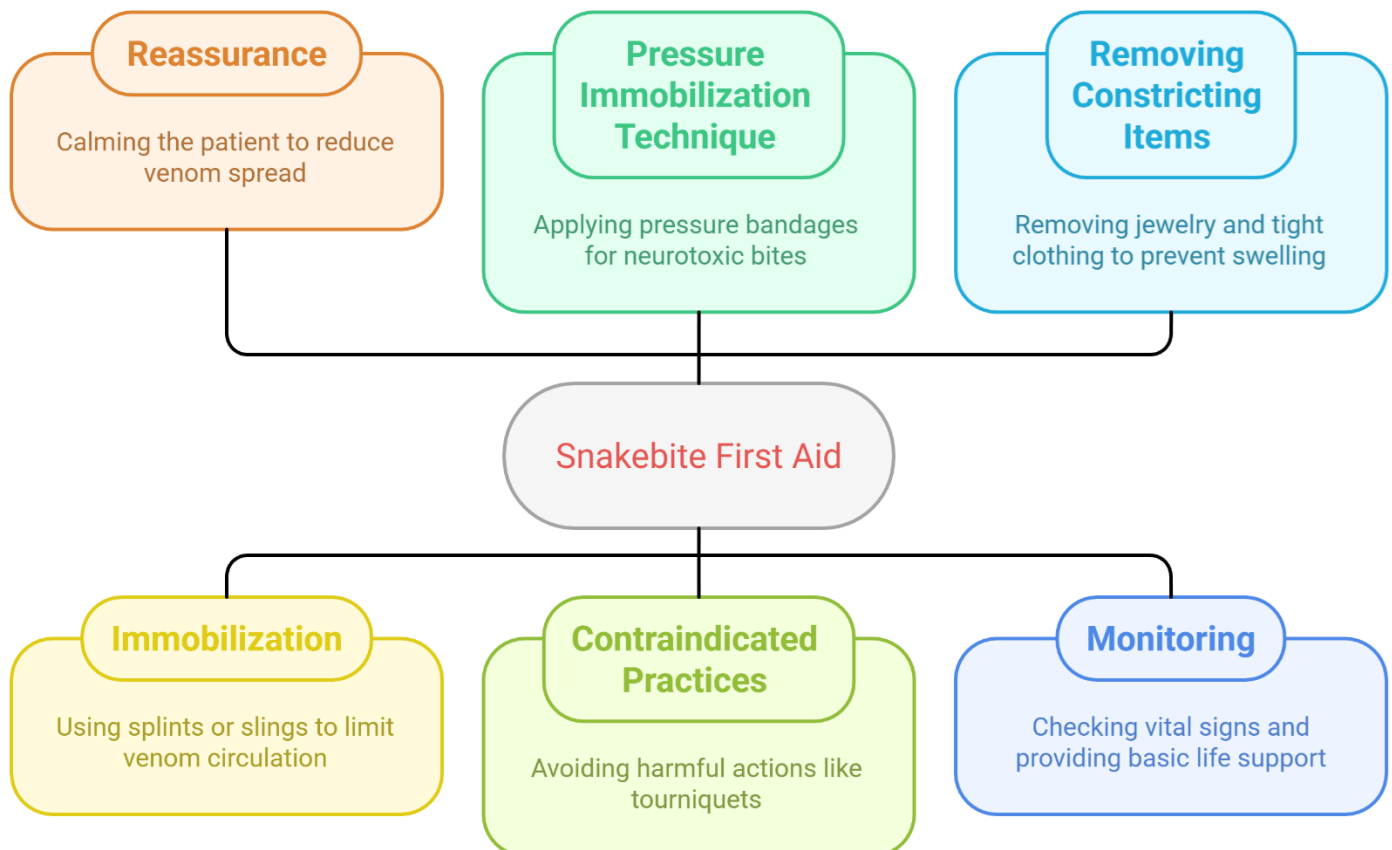
- Fever, chills
- Nausea, vomiting
- Hypotension, tachycardia
- Anaphylaxis (rare, usually from antivenom or repeated bites)

## General Management as First Aid (Venomous snake bites)

### Immediate Goals

- Prevent venom spread
- Preserve life and limb
- Minimize systemic absorption
- Rapidly transport the patient to a medical facility

### Recommended First Aid Measures



#### 1. Reassure and Calm the Patient

- Anxiety can increase heart rate and spread venom more rapidly.
- Reassurance reduces catecholamine-induced systemic venom absorption.

#### 2. Immobilization of the Affected Limb

- Use a **splint** or a **sling** to immobilize the limb.
- Keep the limb at or **slightly below heart level** to reduce venom circulation.

#### 3. Pressure Immobilization Technique (PIT)

- Recommended **only for neurotoxic bites** (e.g., elapids like kraits, cobras).
- Not advised for cytotoxic or hemotoxic bites (e.g., vipers) due to increased risk of local necrosis.



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