POISONOUS SNAKES OF INDIA AND THEIR SALIENT FEATURES.

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INTRODUCTION

Approximately 2,000 species of snakes are found in the world with about 400 known to be poisonous. The total number of species found in India is 216 (Smith, 1943) with eighty (fifty land and thirty sea snakes) reported to be poisonous. According to an old estimate about 200,000 people are bitten by snakes every year worldwide, with between 20,000 and 25,000 deaths (Minton, 1971). Of these 15,000 deaths are reported to occur in India (Swaroop & Grab, 1954). The common poisonous snakes of India include cobras, kraits, coral snakes, sea snakes, true (pit-less) vipers and pit-vipers. The venom of cobras, kraits and coral snakes affects mainly the nervous system producing paralysis. The venoms of the sea snakes are myotoxic, causing damage to muscles. The venom of the vipers and pit-vipers acts mainly on the blood and body tissues to produce swelling, cellular necrosis and haemorrhages. The venoms of the coral and sea snakes are toxic but their bites are rarely fatal (Reid, 1968). The important distinguishing features of these snakes and the signs and symptoms produced as a result of their bites are described in the following pages.

ELAPINE SNAKES *(ELAPIDAE)*

This family of oviparous snakes are front fanged having comparatively small, permanently erect, deeply grooved fangs situated anteriorly in the upper jaw. The venom is invariably neurotoxic. Included here are the cobras, kraits and coral snakes.

Cobras

In Portuguese the word cobra means any snake while in English it pertains to a particular hooded snake. Ten species of cobra are found in the world, seven in Africa, one in the Philippines and two, the Common cobra (*Naja naja*) and the King cobra (*Ophiophagus hannah*), in India and Asia.

Common cobra (*Naja naja*) The head of this snake is indistinct from the neck. In the neck region the ribs are elongate and moveable allowing expansion to form the hood. The hood may or may not be marked, and on the basis of these markings the common cobra has been divided into three categories:

(a) Common cobra binocellate (*Naja naja naja*)
(b) Common cobra monocellate (*Naja naja kaouthia*)
(c) Common cobra acellate (*Naja naja caeca*)

The cobra varies in colour from black or dark brown to yellowish white. Occasionally one may come across a golden yellow coloured specimen which has just left hibernation, but this soon changes to brown when exposed to sunlight for a period of time. An albino variety is known in lower Rajasthan (Gharpurey, 1962).

The venom of the common cobra affects the nervous system leading to respiratory paralysis and cardiac failure. The venom is very potent and is capable of killing a man within two to six hours after biting, the average cobra being able to se-

crete enough venom to kill fifteen persons (Chaudhuri et al., 1971). In bites by this species the predominant symptom is stinging and burning pain. The pain is immediate and persists for some time after which the bitten area may become numb. Swelling of the bitten area appears quickly and gradually increases until the whole limb is swollen and tumid. In some cases pain and swelling may be absent. The earliest systemic symptom is a feeling of drowsiness or intoxication. There may be difficulty in opening the eyes, speaking, opening the mouth or even moving the lips and swallowing. The victim is unable to sit or lift their head. They may have increasing difficulty in clearing frothy and viscid secretions; bilateral ptosis is often marked. The victims vision may become blurred or double, the eyes often becoming immobile and central. Towards the end the victim falls into complete paralysis and a state of deepening coma (Reid, 1968).

King cobra (*Ophiophagus hannah*) This is the worlds longest poisonous snake reaching a length of eighteen feet. It is found in fairly dense forest particularly at high altitudes. Adult colouration is yellow-green, brown or black with light or dark cross bands on the fore part. The belly is uniform in colour with or without bars or mottling. The throat is light yellow or cream. Young specimens are jet black, with yellow or white cross bars. The hood of this species is narrower and longer than that of the Common cobra.
The King cobra is regarded as a fierce and horrible snake. It can raise its head up to a metre from the ground and stands in a very agressive stance.
This is the only snake which makes a nest out of bamboo leaves and twiggs for its eggs (Moore, 1980). It feeds for the main on snakes, poisonous

and non-poisonous, though occasionally it has been seen to feed on lizards.
It is a common belief that a King cobra may attack humans without provocation but authentic records are very few. Considering the size of this species, the amount of venom injected and a greater toxicity the bite of this snake is usually severe producing fatal consequences quickly, the victim often dying within a few hours. The large glands of this snake contain enough venom to kill an elephant (Whitaker, 1978). As this species is rare the deaths due to King cobra bites are few. The symptoms of a King cobra bite are very similar to that of the Common cobra but more rapid in occurrence. Common cobra anti-venom serum works well against King cobra bites.

Kraits
The kraits are restricted to Southeast Asia where nine species are found in India and one each in Burma, Sri Lanka and Malaysia. Of the nine species found in India, only two, the Common krait and the Banded krait, are common. The rest are very restricted in distribution and in some cases very rare. The kraits are highly venomous snakes, but due to their small mouths, gape and fangs are not as efficient at biting as other species of poisonous snakes. Despite this they are still capable of killing a man.

Common krait (*Bungarus caeruleus*) This snake occurs throughout India and is the only krait found south of the Ganges basin. It has glistening, smooth, glossy scales with the head only slightly distinct from the neck. It is jet black or steel blue in colour with distinct white cross bars on the back. This snake is often confused with the Wolf snakes (*Lycodon* and *Olygodon*) which are non-poisonous, brownish in colour and smaller. The

Common krait prefers to feed on other snakes especially the blind burrowing snakes but will also eat mice, rats, frogs and toads. Kraits are usually found in pairs and if one is sighted or killed a search should be made for the other. This is the most dangerous of all the kraits its venom being highly toxic to man. The lethal dose for an adult human has been estimated at about 2.5 mg. Bites by the Common krait are rare but the fatality rate is high (Moore, 1980). The venom of this snake is neurotoxic. There are no apparent local symptoms from the bite but the victim feels sleepy within about one hour after the bite, the venom inducing nerve paralysis. As there are no local symptoms the patient should be observed carefully for late systemic symptoms and treated for them. The signs and symptoms are often similar to those of a cobra bite, the victim being overcome by a creeping parlysis. There is often violent abdominal and joint pain. Death from a Common krait bite occurs within six to twentyfour hours.

Banded krait (*Bungarus fasciatus*) This is the largest and most attractive of all the kraits. It is coloured with a pattern of jet black and yellow bars. On the dorsal portion of the body there is a marked vertebral projection like a ridge with an enlarged hexagonal row of scales. This is such a quiet and inoffensive snake that it is often regarded as a harmless snake. When annoyed it curls up, hiding its head beneath its coils and rarely attempting to bite. The venom of this snake is more toxic than that of the Common cobra but less so than that of the Common krait. The symptoms of a Banded krait bite are similar to those of the Common krait with the anti-venom of the latter working well against the bite of the Banded krait.

Coral snakes
These small beautifully coloured snakes, most of which have part of the belly coral pink in colour, are restricted to Southeast Asia. Thirteen species are recognised of which seven are found in India. They are quiet snakes, very reluctant to bite, causing many people to consider them as harmless. Their venom is very toxic but due to their small size and thus small mouths they are not effective biters. The signs and symptoms of a coral snake bite are the same as with the cobra. The prototype of this group is Macclelland's coral snake (*Calliophis macclellandi*).

SEA SNAKES *(HYDROPHIIDAE)*

Sea snakes are readily distinguished from other snakes by the presence of a laterally compressed body and compressed fin-like tail, both of which are an adaption to their life in sea. The nostrils are situated on the top of the snout, and the eyes are very small. All sea snakes are poisonous but are usually inoffensive by nature and not inclined to bite. Fishermen catch them in numbers in their nets, and freely throw them back into the sea with few cases of bites being recorded.
Found from the Persian Gulf east to the Pacific sea snakes feed almost entirely on fish. The venom of sea snakes is four to eight times more toxic than cobra venom. Besides the disinclination to bite, sea snakes have a less efficient venom injecting apparatus than other poisonous snakes, the fangs not being well developed (behind the fangs there are usually three or four extra teeth). Though sea snakes are poisonous only a few of those bitten are seriously poisoned, as in defensive bites the amount of venom injected is small. Local bite marks are rarely seen. One to two hours after a bite there is pain on movement of arms,

legs, neck or trunk. There may be myoglobinuria. In severe cases symptoms are similar to those of a cobra bite and the victim might die of respiratory failure. Sea snake anti-venom is prepared in Japan and Australia but is not readily available in India. The most commonly found sea snakes are the Common sea snake (*Hydrophis caerulescens*) and the Hook-nosed sea snake (*Enhydrina schistosa*).

TRUE VIPERS *(VIPERIDAE)*

This Old World family of poisonous snakes is represented in India by three species: Russell's viper, the Saw-scaled viper and Leventine viper. The last named is found only in Kashmir. The remaining species of this family are found in Europe, Africa and northern Asia. The distinctive features of this snake family are:

(a) head broader than the neck and triangular in shape
(b) body cilindrical and the tail is short
(c) eyes moderate in size with vertically elliptical pupils.

These snakes possess highly developed and relatively large curved fangs anteriorly in the upper jaw. The fangs are attached to moveable bones and are erected during a bite, but rest folded against the palate when the mouth is closed. The fangs are covered with a sheath. Reserve fangs are present and if the active fangs become broken the reserve fangs come into play. Most species are viviparous giving birth to fully formed young.

Russell's viper (*Vipera russelli*) This is a very common and dangerous snake in India, reaching a length of five feet. The dorsal colour is light brown or buff with a sandy hue. The colouration and markings of this snake are sufficiently distinct that it cannot be mistaken for any other



Fig. 1. *Bungarus fasciatus*. Foto: W.K. Getreuer.



Fig. 2. *Vipera russelli*. Foto: D. Ripa.

snake, except the occasional Russell's earth snake or young python. Russell's viper is a stout and lazy looking animal. The plates under the tail are divided. The nostrils are much larger than any other Indian snake.
After a bite from a Russell's viper the signs and symptoms are burning pain (as if a live coal had been put on the bitten part) and usually a continuous oozing of blood from the site of the bite. Fang marks are usually visible. There is no loss of sensation or paralysis. The bitten part becomes markedly swollen, and may be discoloured and echymosed. Swelling is the paramount feature of local poisoning and a clotting defect of the blood is the most characteristic effect of systemic poisoning (Reid et al., 1963) with the systemic effect depending on the quantity of venom injected by the snake. There may be signs of external and internal haemorrhages such as epistaxis, haemoptisis, haematemesis, haematuria and melena. Petechial haemorrhages may occur on the skin and mucous membrane. The pupils dilate and do not react to light. Pulse is rapid and feeble. Blood pressure falls. There may be convulsions, loss of consciousness with signs of secondary shock, and signs of local gangrene. Haemorrhages may start from the third to fifth day after the bite. Death usually occurs between two hours and six days though extensive haemorrhage, uremia and secondary shock are all delayed effects which may delay death for up to 25 days. If a large dose of venom is injected directly into the vein death may take place within a few minutes due to intravascular and intracardiac coagulation (Chatterjee, 1965).

Saw-scaled viper (*Echis carinatus*) This is a heavily keeled snake with large eyes and head distinct from the neck. The dorsal colour is brown, greyish or sandy with a darker coloured zigzag

pattern on the back and a distict arrow or cross mark on the head. The venter is white with brown speckles. This species is the smallest of India's poisonous snakes (Bhat, 1974). Where the species is found bites from it are very common, though not usually fatal. The venom is a strong blood anti-coagulant which after neutralizing the body's fibrin, causes bleeding tendency similar to severe haemophilia or bleeder's disease. Even when a fatal dose is injected it generally takes several days for the victim to die. Anti-venom is available and should be given with vitamin K and assimilable calcium salts by intravenous drip (Whitaker, 1978).

PIT-VIPERS *(CROTALIDAE)*

This family of snakes is characterised by a triangular head, thin neck and broad belly scales. There is a pit in the loreal region, between the eye and the nostril. The top of the head of most species is covered with small scales though in a few some shields may be present. There are about 65 species of which two-thirds are found in America with the remaining species being found in Asia. Eleven species are found in India: seven belonging to the genus *Trimeresurus*, and four to the genus *Ancistrodon*. Though the Indian species are often large with well developed fangs their bites are rarely fatal to man. Locally the bitten part becomes swollen and painful with a clotting defect of the blood as with the true vipers. The victim remains unwell for a variable period which may be days, but eventually recovery is complete without any specific treatment.

Green pit-viper (*Trimeresurus gramineus*) This one of the most common species of pit-viper in India is pale green in colour. The head is wide and tri-

angular with a thin neck. All the scales on the top of the head are small and the body scales are slightly keeled. Fortunately this species is small and the venom weak resulting in their bites rarely being serious. Bites are common on plantations and during the grass cutting season. Symptoms are similar to those of the true viper bites with pain and swelling. Non-coagulability of the blood is prominent. Treatment with a specific anti-venom is generally not required, the victim usually recovering within a day or two.

Himalayan pit-viper (*Ancistrodon himalayanus*) This is a bluish brown snake with black spots often forming cross bars along the back, with whitish interspaces. The mouth is grey with black spots. The venter is brown with black and white spots. This species has been reported from an altitude of 5,000 metres (Deoras, 1965). The poison is probably haemotoxic. Locally the bitten part becomes swollen and painful. The victim becomes generally unwell, sometimes for weeks but eventually recovering completely. In Kashmir it is reported to be responsible for causing death to sheep and cattle.

The available information on the poisonous snakes of India is summarized in Table I

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Table 1. Size, venom dose per bite, fatal dose of bites of poisonous snakes of India.

Common name	Scientific name	size (cm)
Common cobra	*Naja naja*	100-200
King cobra	*Ophiophagus hannah*	300-500
Common krait	*Bungarus caeruleus*	80-120
Banded krait	*Bungarus fasciatus*	120-200
Coral snake	*Calliophis macclellandi*	30- 50
Sea snake	*Enhydrina schistosa*	50-100
Russell's viper	*Vipera russelli*	80-180
Saw-scaled viper	*Echis carinatus*	18- 30
Green pit-viper	*Trimeresurus gramineus*	80-120
Himalayan pit-viper	*Agkistrodon himalayanus*	40- 80

venom for human being, and death period after the

Dose per bite (mg)	Fatal dose for man (mg)	Death time (hours)
100-250	15	1-6
200-350	12	0,5-4
20- 30	2,5	6-24
30- 50	10	6-24
2- 5	venom fatal but can not make effective bite	rare
10- 15	1,5	rare
130-250	42	4-24
10- 15	5	6-24
12- 20	100	non-lethal
10- 15	100	non-lethal