

S N A K E B I T E I N K E N Y A

11

DR. BENJAMIN STEPHEN MBINDYO, M.B., Ch.B.(E.A.)

A THESIS SUBMITTED IN

PART FULFILMENT FOR

THE DEGREE OF MASTER OF MEDICINE(SURGERY)

IN THE UNIVERSITY OF NAIROBI

1 9 7 5

UNIVERSITY OF NAIROBI
LIBRARY

University of NAIROBI Library



0325903 3

D E C L A R A T I O N

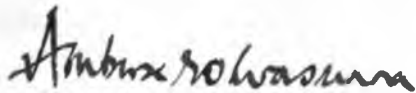
CANDIDATE:

This thesis is my original work and has not been presented for a degree in any other University.


Dr. B. S. Mbindyo

SUPERVISOR:

This thesis has been submitted for examination with my approval as University supervisor.



Professor A. E. O. Wasunna

A C K N O W L E D G E M E N T

I am particularly grateful to Professor E. O. W. Knight, M.D., F.R.C.S., then Acting Chairman, Department of Surgery, University of Nairobi for his suggestion, help and encouragement.

I also wish to record my sincere gratitude to Professor A. E. O. Wasunna, M.D., F.R.C.S., Chairman of the Department of Surgery, University of Nairobi for his advice and for criticising the thesis.

To Mr. Alex Mackay of the Kenya National Museum for his useful discussions and help in mapping the poisonous snakes in the country.

I also acknowledge the help of Johnson Wakhisi for taking the photographs and to Jackson for handling the snakes.

My sincere thanks are also due to Mrs. Violet Waweru for typing the manuscript.

STATEMENT

C O N T E N T S

Summary 1

Introduction 5

Chapter

I Kenya Snakes and their distribution 7

II Clinical presentation of snakebite 15

III Identification of Snakebite 21

IV Treatment 26

V Conclusion 31

Photographs 33

References 37



S U M M A R Y

Snakebite is an occupational hazard and those at greatest risk are those who work in the fields. Young adventurous children form another group at high risk. The majority of snakebites occur during the productive years of life for both sexes. The greater number of snakebite victims in Kenya take hours to days before they present in hospital and this increases the morbidity and mortality of those affected. In many parts of the country today snakebite is still associated with witchcraft and forces beyond nature. The overall incidence of snakebite in the country is difficult to estimate but as a cause of morbidity and mortality is an insignificant medical problem.

All snake groups of medical importance are encountered in Kenya. The vipers are by far the most important group of snakes in the country. The puff adder (*Bitis arietans*) is responsible for most cases of snakebite and deaths in the country. The clinical picture produced by viper envenomation includes initial pain at site of bite followed by local tissue swelling which in severe poisoning may progress to impair circulation and cause gangrene in the affected limb. Tissues at site of envenomation become necrotic and slough off. Some cases of viper bite present with haemorrhagic manifestations due to disseminated intravascular clotting and inhibition of coagulation by anticoagulant activity of the venom. Deaths due to

viper bites are not usual and are often delayed for 4 - 24 hours depending on the amount of envenomation. The vipers strike low and most of their bites can be prevented by the wearing of boots or shoes. First aid in the form of a tourniquet is of no value in viper bites. Two other vipers are worth of note. The gaboon viper (*Bitis gabonica*) is the deadliest of the vipers. It is strictly a forest animal and is confined to the Kaimosi forest only. The carpet viper (*Echis carinata*) is confined to the arid regions of Northern Kenya. Its venom has very strong coagulating powers. Other vipers in the country are of little medical importance.

The elapides are represented in this country by the cobras, mambas and garter snakes. The mambas are the most deadly of the elapides but cobras are more numerous and responsible for more bites. The spitting cobra (*Naja nigricolis*) is the second snake of importance in the country and with the puff adder are responsible for nearly all the snakebite envenomations in the country. The elapide venom has mainly neurotoxic effects and any of the following symptoms may occur - nausea, vomiting, salivation, sweating, ptosis, abolition of eye movements and accommodation, slurring of speech, drowsiness and a gradually increasing difficulty in breathing. Death in elapine poisoning is due to respiratory failure and occurs within minutes to an average of 4 to 8 hours. A tourniquet may be life saving in elapine poisoning and should be applied as a

first aid measure while awaiting antivenom to be given.

The poisonous columbines - boomslang and vine tree snake, have a limited distribution in the country and are of no medical importance in this country. Symptoms due to boomslang poisoning take hours to develop and present in the form of bleeding all over the body. There is no antivenom against boomslang poisoning in the country.

Seasnake bites are unknown in the country but with increasing deep sea fishing cases may be encountered in future.

The use of a tourniquet by the general public is not advised because of the long delays before arrival in hospital and also because most snakebites are caused by the vipers. Those at high risk should be educated on the importance of transporting victims to the nearest hospital as quickly as possible.

The use of antivenom is not indicated in all cases of snakebite. Those with minimal or no signs of poisoning should be treated conservatively.

Snakebites in Kenya are not an appreciable medical problem in terms of numbers of victims affected and with more caution on prevention and management of victims the morbidity and mortality can be reduced to a minimum.

INTRODUCTION:

The history of snakes and their bite is full of folklore and superstition. In the early days snakes or serpents as they were called, were thought to have powers to alter the course of fortune for good or evil, influence changes in weather, safeguard personal or community treasures and in many other ways generally affect the lives and create lasting beliefs among people. In the ancient medical sciences, the image or engraving of a snake figured very prominently and was associated with healing powers. This belief remains engraved in medicine today as the symbol of the medical profession (9,12,18,21).

The dread of snakes and the fear of their bite is universal and affects the reactions of both the patient and the attending doctor. The fright of a rapid and unpleasant death dominates the clinical picture of most cases of snakebite. Emotional symptoms develop rapidly within minutes of the bite and may be very severe. These symptoms usually disappear dramatically after a placebo injection. This contrasts to symptoms due to systemic snake venom poisoning which rarely appear within half an hour to two hours after the bite and only respond to specific antivenom treatment (14,28). Contrary to expectations of most people, even without specific treatment, the mortality from snakebite is low and in most countries, excluding Asia, is less than 1 per 100,000 population

per year^(2,18). Other than envenomation snakes do not transmit any other disease⁽¹³⁾. The venom too has been shown to have no long term sequelae in human beings⁽¹⁾.

Every doctor in the country should have some knowledge of the poisonous snakes found in his locality and the effects of poisoning produced in man. The distinction of poisonous from non-poisonous snakes or the identification of one snake from another is usually not important for the clinician who should be able to distinguish the type and degree of poisoning and hence decide on the proper line of management.

Even today in many parts of Kenya bites and envenomation by snakes is often attributed to witchcraft and forces beyond nature. There are no snake charmers in the country but the traditional medicineman, in several parts of the country, continues to administer treatment for snakebite which is non-specific and often does more harm than good. Kenya's poisonous snakes, their distribution and the medical importance of their bites are subjects about which very little has been written. About 90% of the Kenya population lives in rural areas where hospitals are often long distances away and patients take hours and even days before reaching the nearest hospital. It was with this in mind that this study was undertaken to find:-

1. The magnitude of the snakebite problem in the country.

2. The snakes responsible and their distribution.

3. And to try to look for a more practical approach to this problem, with the facilities available, in an effort to reducing the morbidity and mortality from snakebites.

The magnitude of snakebites and the problems encountered were studied by reviewing cases treated at the Kenyatta National Hospital between February, 1973 and August, 1974. Further information on snakebites in the country was obtained through enquiries from doctors who have worked in the various parts of the country. This study is representative in that nearly all areas of the country were covered in the review. The mapping of snakes was facilitated by the invaluable and generous information from Alex Mackay of the Kenya National Museum who has done a lot of work on snakes in the country and is on the process of writing a book on this subject.

CHAPTER I

KENYA SNAKES AND THEIR DISTRIBUTION:

There are over 2,500 different kinds of snakes in the world⁽²⁾. Approximately 375 species of snakes are dangerous to man to some extent and they are unevenly distributed throughout the world⁽²¹⁾. In Kenya, over 90 different snakes have been named but so far only 27 species are known to be poisonous and less than half of these are actually capable of causing death to man⁽¹¹⁾. Our share of snakes includes some of the most poisonous snakes in the world such as the black mamba, the cobra and many of the vipers. These snakes are found unevenly distributed throughout the country depending on climate, altitude and the availability of their food, but not one single region is free from all the poisonous snakes⁽⁴⁾. All these snakes fall in the broad medical classification of snakes into:-

1. Viperidae.
2. Elapidae
3. Colubridae
4. Fangless snakes
5. Sea snakes

1. The Viperidae:

The vipers or adders form the most important medical group of snakes in the country. They are easily distinguished by their short stout bodies, triangular heads and colour patterns. There are over

14 named species of vipers in Kenya. The gaboon viper (*Bitis gabonica*) is the deadliest of these serpents, and its venom, which is injected deeply into the victim with the long fangs, is said to kill almost instantaneously. The gaboon viper is mainly a forest animal and does not constitute a danger to man. In Kenya it has only been recorded in the Kaimosi forest of Western Kenya^(2,9,23).

The puff adder (*Bitis arietans*) is responsible for more snakebites and deaths than any other snake in this country. It has a wide distribution and is found scattered all over the country outside forests and below 8,000 ft. above sea level. This snake is usually not aggressive and bites human beings only when trodden upon or aroused carelessly. It likes basking in the sun on paths and roads and can be found lying in these places long after sunset. The carpet viper (*Echis carinata*) is another viper of importance in the country and is found in Northern Kenya only. Its venom has very strong coagulating powers. The other vipers are of less medical importance and are shown in Table 1^(3,4,9,23).

2. The Elapidae:

The elapides are long slender snakes which have short front fixed fangs. Their venom is rapid acting and produces mainly distant neurotoxic effects. In this country the elapides are represented by cobras, mambas, and the garter snakes.

All the cobras are distinguished by the presence of

a hood which they almost invariably display as a warning before attacking. There are five recorded species of cobras scattered all over the country. *Naja nigricollis* is the most important of our cobras and with *Bitis arietans* are responsible for nearly all the cases of snakebite in the country. There are two species of spitting cobras. *Naja nigricollis* is the commonest and the more important spitting snake. Spitting is purely defensive and can be directed accurately at a target to a distance of twelve feet (3.7 m.). If the venom falls on the eye it causes pain and inflammation and may produce temporary or permanent blindness. The venom has no effect on skin unless it falls on a raw area. Any venom falling on the eye should be washed off with plenty of clean water immediately. The addition of antivenom serum to the water is advocated but this may not be possible in this country where patients take hours and even days before reaching hospitals. A bite from this snake can be fatal. This spitting cobra is found in dry to wet savanna regions outside forest and high altitude. The second spitting cobra, *Naja mossambica*, or the red spitting cobra, is confined to the arid regions of Northern Kenya and in Southern Rift Valley around Lake Magadi. The distribution of the other cobras is shown in Table II (3,4,5,9,23,24).

The mambas from another sub-group of the elapides and there are three species of them in this country.

The black mamba is the longest of the African poisonous snakes. It has a disputed temper but is extremely agile and aggressive and its venom is very potent. A bite from a large specimen may render the victim hopeless in less than half an hour, and a bite directly into a vein might kill an adult in two or three minutes. The black mamba is often referred to as the deadliest animal alive. In Kenya the black mamba is found in the hot low lying scrubland of the Coast. It is also found in the arid Kerio Valley and Northern Kenya and has been recorded in the Amboseli and Mt. Elgon areas. The green mamba is found along the coastal belt and extends along the Tana River Basin up to Meru District. It lives in thick bush and has not been recorded outside this area in the country. The Jameson mamba is a forest dweller and is found only in Western region in the Kakamega and Nandi areas. The mambas are rare, shy and do not constitute a danger to human beings.

The garter snakes are of less medical importance. They are found in wet highlands of East and West of the Rift Valley above 5,000 ft^{5,9,23}.

3. Colubridae

There are over 47 species of columbines in the country. Many species previously thought to be harmless have been shown to have venoms harmful to man to some degree. The columbines are back fanged and shy and do not bite unless provoked to extremes. They are not

medically important in this country. Kenya harbours two known poisonous species. The boomslang (*Dispholides lips*) is the most important of the columbines and in Kenya is found mainly in the low lying areas of the Coast Province and in the Kakamega District. The boomslang lives in thick bush away from dwellings and does not constitute a danger to human beings. Several bites from this snake have been reported in the country but none of the victims sustained severe poisoning. The lotornis (*kirtlandii* (vine snake) is the other poisonous columbine and its distribution is confined to the coastal belt only 5,9,10.

4. Fangless snakes:

Most species of snakes fall under this group. Some are toothless and others have teeth but no fangs. Although they are often referred to as harmless some can bite when provoked and others like the African rock python (*python sebae*) with solid teeth can inflict painful wounds which may become the seat of secondary infection. Fangless snakes have a wide distribution in the country and are found in all the regions (10,23).

5. Hydrophiidae:

Pelamys platuris is the only seasnake of importance in Kenya. It is a deep sea animal but occasionally is washed to the coast where it may become entangled in a fisherman's net and constitute a danger.

It has a widespread distribution in the Indopacific oceans. There are no known cases of seasnake bite in the country but envenomation by other marine animals is fairly common along the coast. Seasnake bites are common in Malaya (9,17).

Scientific Name	Common Name	Distribution
<i>Hydrophis cyanoptera</i>	Puff snake	Sri Lanka, India, Burma, Malaya, etc.
<i>Hydrophis elegans</i>	Common snake	Sri Lanka, India, Malaya, etc.
<i>Hydrophis platurus</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis jayakeri</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.
<i>Hydrophis elegans</i>	[Redacted]	Sri Lanka, India, Malaya, etc.

TABLE I

GEOGRAPHICAL DISTRIBUTION OF VIPERS IN
KENYA

GENERIC NAMES	OTHER NAMES	DISTRIBUTION
<i>Bitis arietans</i>	Puff adder	Everywhere outside forests and below 8,000 ft.
<i>Bitis garbonica</i>	Gaboon viper	Lowland forests, Kaimosi only.
<i>Bitis nasicatorinis</i>	Rhinoceros viper	Forests and woodlands West of Rift Valley
<i>Bitis worthingtonii</i>	horned viper	Limited to Naivasha-Nakuru area
<i>Causes rhombeatus</i>	Rhombic night adder	medium altitude in moist savanna
<i>Causes resinus</i>	Valvety green night adder	Wet savanna West of Rift Valley
<i>Causes lichtensteinii</i>		Low to medium forests West of Rift Valley
<i>Antractaspis</i> spp.	Burring vipers	Everywhere outside arid regions and below 6,000 ft.
<i>Athris desaixi</i>	bush viper	Meru-Nyambeni forests
<i>Athris squannigera</i> <i>Athris nitschei</i> <i>Atheris hispida</i>	Tree vipers	Lower regions of Western Rift
<i>Echis carinata</i>	saw-scaled viper (carpet viper)	Semi arid regions of Northern Kenya, Turkana, Somali, Rindile, Baringo.

TABLE II

GEOGRAPHICAL DISTRIBUTION OF ELAPIDES IN
KENYA

<u>GENERIC NAME</u>	<u>OTHER NAMES</u>	<u>DISTRIBUTION</u>
<i>Naja nigricollis</i>	Spitting cobra	Widespread dry to wet savanna excluding high altitude.
<i>Naja mossambica</i>	Red spitting cobra	Arid regions of Northern Kenya and Southern Rift Valley
<i>Naja haje haje</i>	Egyptian cobra	Pocket distribution in dry savanna, Nairobi, Thika, Athi River, North and South Rift Valley
<i>Naja melanoleuca</i>	Forest cobra	Strictly a forest animal. West of Rift Valley, Nyambeni and Meru
<i>Pseudohaje goldii</i>	black necked cobra	Lowland forests of Kakamega District.
<i>Dendroaspis polylepis</i>	black mamba	Widespread dry bushland, Coast, Amboseli, Kakamega and Northern Kenya.
<i>Dendroaspis angusticeps</i>	Green mamba	Mainly Coastal, Tana and Meru.
<i>Dendroaspis jamesonii</i>	Forest mamba Jameson mamba	West of the Rift Valley only, Kakamega, Nandi
<i>Elapsoidea sundevalii</i>	Garter snake	Wet Highlands above 5,000 ft. East and West of the Rift Valley

CHAPTER II

CLINICAL PRESENTATION:

Incidence:

The incidence of snakebite in the country is difficult to estimate because the majority of victims never reach medical records. However, the overall incidence in the country must be very small compared with other countries in the world like Burma where the incidence of snakebite is as high as 15.4 per 100,000 population per year with some districts recording as high a rate as 36.8 per 100,000. India has a snakebite incidence of 5.4 per 100,000 population per year. (2,18).

Between February 1973 and August 1974, 18 cases of snakebite were treated at the Kenyatta National Hospital. Of these 13 sustained their bites within Nairobi and five were bitten outside this area. Reports from other hospitals in the country indicate that the incidence of snakebite is no higher than that seen at the Kenyatta National Hospital. Snakebite is an occupational hazard and those at the greatest risk are those working and living in the countryside. Young adventurous children form another group at high risk.

Sex:

Both sexes fell victims of snakebite. The male/female ratio was 11:7. (Fig I).

Age:

The youngest patient was 4 years and the oldest was

54. The majority of snakebites were sustained during the productive years of life. The distribution of age is shown in Figure I below.

Time of Bite:

Most of the snakebites were inflicted at night. Twelve patients sustained their bites after sunset and six, mainly children, were bitten during the day.

There was no significant difference in the number of snakebites sustained during the different seasons of the year. The distribution of the bites by month is shown in Figure II.

Site of Bite:

Generally the site of bite depends on the striking snake. The vipers strike low while the cobras rise up when attacking and therefore inflict bites higher than the vipers. The mambas are arboreal and usually inflict their bites on the upper limbs, head and trunk. But any snake may strike any part of the body depending on circumstances. The majority of snakebites in this series were sustained on the lower limbs and more so on the foot, 4 bites were sustained on the upper limbs and one on the trunk. The figures are displayed in the table III.

Time lapse prior to Treatment:

<u>Period in hours</u>	<u>No. of patients</u>
0 - 2	5
2 - 8	3

8	-	24	3
24	-	48	0
48	-	74	2
74	-	96	4
96	-	120	1
TOTAL			<hr/> 18

There was a considerable delay before treatment was instituted. The fact that most of the victims sustained their bites within Nairobi and yet took so long to reach hospital indicates the poor information that the public has about the urgency in treating snakebite victims. The long distances victims have to cover in rural areas before reaching hospital will continue to increase the morbidity and mortality from snakebite and other diseases.

Local signs and Symptoms:

This is a retrospective study and many signs and symptoms were either not recorded or not looked for. The signs and symptoms shown below are those which appeared on the patients' hospital records.

Swelling:

This was the commonest local clinical sign and was found present in 14 out of the 18 cases. This sign was such a common finding because most of the victims were bitten by the puff adder.

Puncture Wounds:

Puncture wounds were demonstrated in 11 cases. All the patients presented within the first 24 hours. Thereafter no puncture wounds were noted.

Pain:

Pain at site of bite was not a significant symptom. Only 3 patients complained of pain in absence of marked swelling and secondary infection.

Fangs:

Fangs were recovered in only two patients.

Bleeding:

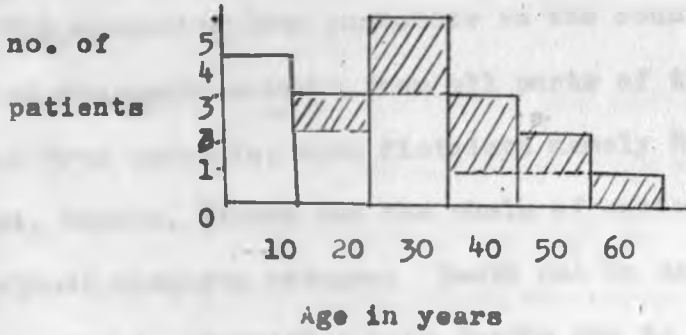
Only one case is reported as having been oozing blood at site of bite but did not show systemic signs of bleeding.

Systemic signs and symptoms:

No patient presented with systemic signs and symptoms of envenomation out of the 18 cases.

Year	Place	No. of cases	Total
1941
1942
1943
1944
Total	

FIG I



Key Male  Female 

FIG II

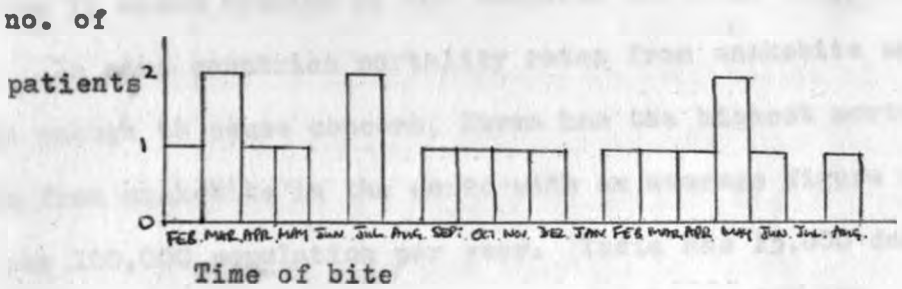


TABLE IIII

Site of bite

Lower Limb	Foot	12	72.2%
	Leg	1	
Upper limb	Hand	3	22.2%
	Arm	1	
Trunk		1	5.6%

Mortality from snakebite:

The mortality from snakebite in the country is low. Although the death returns from all parts of the country are far from complete, some districts namely Nairobi, Mombasa, Nakuru, Kisumu and the whole of central province give almost complete returns. Death due to snakebite in this country is classified with deaths due to all other forms of chemicals, radiation, thermal and shock. In 1971, 39 deaths were notified in this group out of a total of 15, 112 deaths in that year⁽²⁰⁾. There were no deaths in the 18 cases treated at the Kenyatta National Hospital.

In some countries mortality rates from snakebite are high enough to cause concern, Burma has the highest mortality rate from snakebite in the world with an average figure of 15 per 100,000 population per year. India has 15,000 deaths annually from snakebite with a rate of 5.4 per 100,000 population. In the U.S.A. where statistics are available there are about 15 fatalities out of 7,000 cases of snakebite poisoning every year. It is estimated that 35,000 - 50,000 persons in the world die each year from snakebite (2,21,18,21).

CHAPTER III

IDENTIFICATION OF SNAKE BITE:

The definite identification of the snake responsible for the bite will help in deciding what type of specific treatment is to be given if it is indicated. Most snakes disappear very quickly after an attack, which is usually at night, and are never identified or even seen. The ability of the average 'mwananchi' to name any but the commonest snakes is very lacking, and hence very little reliance should be placed on what is often no more than an opinion or guess and one should rely more on the clinical findings. A fairly accurate identification of the family of snake causing a bite can be made from the clinical effects produced by their venoms if there has been poisoning. Immuno assay is more specific in identifying the type of snake venom in human tissues and fluids. Radio-immuno assay, still in its infancy, is likely to play a big role in future identifying the type and quantity of poisoning and also help in calculations of the amount of antivenom to be given. (25,26,27)

The Vipers:

The vipers strike from a low position and are not likely to inflict a bite above the ankle. They also less often manage to sink both fangs into the flesh of the victim as the fangs unfold independently of one another and are very long. The usual picture of a viperine bite is one of acute oedematous swelling affecting the

the site of bite and starts a few minutes of the bite if venom is injected. This is a valuable clinical sign because if swelling is absent and one knows the biting snake to be a viper, then poisoning can immediately be excluded. The viper venom spreads by way of lymphatics and causes chiefly local self-limiting cytotoxic effects, the total result being necrosis of all tissues affected. In severe forms of poisoning oedema may progress until the circulation is impaired and gangrene sets in. The loss or deformity of a toe, finger or limb may be an outcome. The viper venom is also known to have haemotoxic effects and has strong coagulating powers. There is also a neurotoxic element in the venom causing intense local pain. In severe poisoning shock is evident and there is haematemesis and other haemorrhagic signs. Septicaemia, tetanus, and gas gangrene have been recorded in neglected cases. Death due to viperine bites is not usual and when it does occur is often delayed for 4 - 24 hours depending on the severity of the poisoning (1,3,6,7,10,14,22).

The Elapides:

The elapides rear up when striking and usually inflict their bites above the ankle. Their fangs are short and fixed and they therefore inflict only two wounds surrounded by less local reaction than that of a viper. Local necrosis may follow bites of African cobras but this is less marked than that of a viper. The venom of elapides spreads rapidly through the blood stream of the victim and produces

mainly distant neurotoxic effects by blocking transmission at the myoneural junction in a similar way to tubocurarine. There is motor paralysis involving both cranial and spinal nerves. There is also a direct action on the central nervous system producing vertigo, convulsions and unconsciousness. Any of the following symptoms may occur - nausea, vomiting, salivation, sweating, ptosis, abolition of eye movements and accommodation, slurred speech, drowsiness and a gradual increasing difficulty in breathing. Death due to respiratory failure may occur within minutes to an average of eight hours. Recovery from elapine poisoning when it does occur is slow but complete without sequelae. The heart continues to beat for some time after respiratory failure and if artificial respiration is maintained the outcome need not be fatal (3,7,9,10,11).

The Columbines:

The colubridae are backfanged and therefore do not usually cause poisoning at quick strikes. The injuries inflicted on the skin of the victim are mainly due to the teeth and are multiple and ragged in contrast to the single pair of puncture wounds made by the front fanged viperines and elapides. The effects of columbine venom is complex but mainly haemotoxic. The venom has strong coagulating powers producing afibrinogenemia. Symptoms due to columbine poisoning take hours to appear and take the form of blood extravasation, petechiae and saggilation in mucous membranes and in the presence of blood in urine and faeces.

Several cases of boomslang bites have been reported in Kenya but none had severe poisoning. Only about 20 cases of severe poisoning from the boomslang have been recorded in the world this century (3,9,10).

Fangless Snakes:

Harmless snakes have no fangs and their bites produces multiple puncture wounds, pieces of teeth are often left in the wound and these may become the seat of secondary infection (10).

Sea Snakes:

Seasnake venom is myotoxic. After envenomation there is generalised muscle pain and myoglobinuria occurs in 3 - 4 hours after the bite. In severe poisoning respiratory failure develops in a few hours. Seasnake venom is very potent, one drop of the venom could kill 5 men (14).

In the 18 cases treated at the Kenyatta National Hospital, 13 cases were undisputedly due to viper bite 12 of whom sustained their bites on the foot and one on the trunk. All developed necrotic wounds of varying sizes, four of which required skin grafting. The rest of the patients had minimal symptoms for the snake responsible to be identified. None of the patients sustained severe poisoning. This finding agrees with earlier records of the viper being the cause of most snakebites in the country.

Studies in other tropical countries show that more than half of the victims sustain minimal or no poisoning, only a quarter develop serious systemic poisoning, and

CHAPTER IV

FIRST AID:

First aid includes all the measures taken by a victim or his associate before medical treatment is given. Reassurance is the most important and patients should be comforted all the way through. An arterial tourniquet prevents toxins leaving the site of the bite by all vascular pathways and can be life saving in cases of elapine poisoning. It must however be applied effectively and not for more than one and a half hours. A tourniquet does not prevent the development of local tissues destruction in viperine bite and is of doubtful value. A tourniquet should therefore be applied only in cases of elapine and unidentified snake bites. The site of bite should be wiped and covered with a handkerchief or dressing. The injured limb is then rested and the patient rushed to the nearest hospital. Other measures done previously like incising or sucking the injured area are of no value and have been shown to be harmful. The application of local chemicals and the giving of local injections are also of doubtful or no value at all. No time should be spent looking for the snake since attempts to kill it might result in further bites (3,14,28,29).

Of the 18 patients treated at the Kenyatta National Hospital, 8 had tourniquets applied and had them on for longer than two hours. However, they were not effectively applied and no complications were observed. Three patients

had local incision and one had local herbal treatment prior to arrival in hospital.

Medical Treatment:

Numerous methods of treating snake venom poisoning have been used. These have included the use of antihistains, steroids, adrenocorticotrophic hormone, calcium gluconate, heparin, streptokinase, antivenin, cryotherapy and excisional surgery but the true value of most of them remains questionable. Reassurance is the most important. Emotional symptoms should be treated with prophylactic antibiotics, tetanus toxoid or a placebo injection (3,14,28,29).

Antivenom has been shown to be the most effective method of treating systemic snake venom poisoning. Specific antivenom is superior to the polyvalent antivenom but since most snakes causing bites are never identified, the polyvalent antivenom is preferable. Antivenom is given to minimise tissue destruction in viperine bites in which case it must be given within two hours of the bite when there are signs of envenomation. Secondly, antivenom is the treatment of choice in systemic venom poisoning and is effective even when given hours or even days after the bite. In all cases of snake venom poisoning at least 20 mls. (0.4 ml. per Kg. body weight for children) of antivenom serum should be injected. The antiserum is best given in an intravenous drip as this route is safer should a serum reaction occur (3,7,16,25).

The viper venom causes local tissue necrosis and the

early administration of antiserum may not always prevent the development of tissue damage particularly if the site of bite is a toe or finger. At least 20 mls. of antivenom serum should be given to these cases which present within two hours of the bite and show local signs of envenomation. Antivenom has been shown to be effective in viperine shock when given in adequate doses but blood transfusion should be given in severe poisoning where the loss of blood may be considerable. The use of fibrinogen in hypo- or afibrinogenemia is disappointing and may even aggravate the coagulation defect. The use of steroids in viperine bite has been shown to be of no value in treating both local and systemic poisoning. Obvious necrotic sloughs should be excised but blisters have been shown to do better when left to break spontaneously. In neglected cases where infection has spread to bone and joints and in cases where there is gangrene of the affected limb, toe or finger, amputation is advisable (3,10,7,13,14,15,16,25).

In elapine poisoning at least 100 mls. of antivenom serum should be given. This treatment should be repeated if there has been no significant improvement after one hour. If respiratory failure occurs, the outcome need not be fatal if breathing is maintained by the intermittent positive pressure respiration (3,10,13,14,16,28).

In severe cases of boomslang poisoning specific antiserum (obtainable from South Africa) is life saving. Blood transfusion should be given also when the blood loss

is excessive. (3,10).

Seasnake venom poisoning is unknown in this country. The tiger snake antivenom (made in Australia) has been shown to be effective against seasnake envenomation as well as the commoner neurotoxic snakes of Africa and Asia excluding the mambas. (15)

If more than two hours have elapsed since the time of bite and there are no signs of poisoning no antiserum should be given even if the biting snake is known to be deadly poisonous. All cases of snakebite showing minimal or no clinical signs of poisoning should be treated symptomatically and antiserum should not be given. Serum reaction may occur. The immediate serum reaction is best treated with adrenaline. Steroids are not so effective as adrenaline for the immediate reactions but are useful for delayed serum reactions. In cases of severe snake venom poisoning where serum reactions occur, desensitization is needed before antivenom is given (3,7,16).

The management of snakebite victims at the Kenyatta National Hospital over the period of this study was far from satisfactory. All the patients were given antsnake venom irrespective of the presence or absence of signs of poisoning and time lapse since the bite. Antibiotics were found necessary in the majority of cases because of local tissue necrosis and development of secondary infection.

In Kenya the polyvalent antsnake venom serum (Behringwerke) is in current use. It gives protection

against the most important of our vipers, cobras and mambas. However, it is not very effective against the Jameson mamba and has no therapeutic effect on the boomslang and other columbine venom poisoning. Therefore, clinicians especially those working at the Coast and Western provinces should bear this in mind when dealing with snake venom poisoning of unidentified snakes which fail to respond to the polyvalent antiserum.

CONCLUSION:

Kenya has a wide variety of snakes including some of the most poisonous snakes in the world. The puff adder (*Bitis arietans*) and the spitting cobra (*Naja nigricolis*) are responsible for the majority of snake-bites in the country. Most of the victims escape with minimal or no poisoning. Deaths from snakebites are not common in this country but they have been reported. In Kenya seasnake bites are unknown but with increasing deep sea fishing we may eventually see a case.

One of the drawbacks in minimizing mortality and morbidity in snakebite envenomation in the country, is the long delays before treatment is given. The public therefore and especially those at risk should be educated on the prevention and first aid of snakebite. Because of the fact that most snakebites are due to vipers and because of the long delays by victims before arrival in hospital, the use of a tourniquet by the general public is not advisable. First aid given by the public should therefore be in the form of covering the site of bite with a piece of cloth to prevent contamination, resting the affected limb and rushing the victim to the nearest hospital as quickly as possible. The public should be encouraged to wear boots or shoes. This would greatly reduce the number of viperine bites which account for the majority of our snakebite injuries. The wearing of long trousers gives

added protection and should be encouraged for those at risk. The popular acution of watch where you step is not practicable and one should rely on other precautionary measures. Organised expeditions and campers in high risk areas should be well equiped to handle this problem. Antivenom serum is not indicated in majority of our cases of snakebites. Those with minimal or no poisoning should be treated conservatively. Patients with less severe viper poisoning who are seen late should be managed conservatively. The incidence of snakebite in the country is not high and with extra caution on prevention and treatment, the snakebite morbidity and mortality could be reduced to a minimum.



Gaboon Viper (*Bitis gabonica*)



Fangs (*Bitis gabonica*)



Puff adder (*Bitis arietans*)



Puff adder (*Bitis arietans*)



Egyptian cobra (*Naja haje*)



Black mamba (*Dendroaspis polylepis*)



Boomslang



African Rock Python



Mole snakes

REFERENCES

1. Barnet. Lancet 2.60 1934 'Snakebite in British Isles'.
2. Bulletin of World Health Organization Vol. 10 No. 1 1954 'Snakebite Mortality in the World'
3. Davey. Companion to Surgery in Africa. Churchill Livingstone 1968.
4. Duff-Mackay. Journal of East African Natural Historical Society. Vol. 25 No. 1 1965 'Carpet viper in N.F.D.'
5. Easterbrook - A book of East African Snakes. Coast Publicity, Mombasa.
6. Forbes, Turpie, Douglas. East African Medical Journal 42:566 1965. 'The Anticoagulant Action of puff adder (B. arietans venom'.
7. Hall. East African Medical Journal 6. 1962. 'Investigations in a case of Snakebite'
8. Ionides, Putman. Journal of East African Natural Historical Society. Vol. 25 No. 2.
9. Isomonger, R.M. Snakes of Africa. South Central and East. Nelson 1961.
10. Mason, Central African Medical Journal 9, 219. 1963. 'Snakebite and its Treatment'.
11. Mackay Alex. Kenya National Museum. Personal contact.
12. Minton, S.A. Snake venoms and envenomation. Marcel Dekker, Inc. New York 1971.

13. Minton, S.A. Snakebite, Cecil-Loeb Textbook of Medicine. Eleventh Edition 1797 - 1802 W.B. Saunders Company 1963.
14. Reid, H.A. British Medical Journal 3,359, 1968 Snakebite in the Tropics.
15. Reid, H.A. 'The principles of Snakebite Treatment. Snake venom and Envenomation. MerceL Dekker Inc. NewYork 1971.
16. Reid, H.A. 'Treatment of bites by venomous land snakes'. May and Baker Ltd. Diary 1975.
17. Reid, Lin. British Medical Journal 2,1266, 1957, 'A survey of Fishing Villages in North West Malaya'.
18. Reid, Thean, Martin, British Medical Journal, 1,992 1963. 'Epidemiology of Snakebite in Northern Malaya'.
19. Reid, Thean, Martin. British Medical Journal 2,1378 1963 'Specific antivenom and Prednisone in Viper-bite poisoning: Controlled trial.
20. Registrar General's office. Office of the Attorney General Personal contact.
21. Reussel, F.E. Atlas of Poisonous snakes. Los Angeles Cal. U.S.A.
22. Sezi, Alpidousky, Reeve East African Medical Journal 49:8, 589 1972. 'Defebrinating Syndrome after snakebite'.

23. Snake Park Records. Kenya National Museum, Nairobi.
24. Strover. Central African Medical Journal 8,283
1964. Some principles of clinical Recognition,
Assessment and Treatment of Snakebite.
25. Sutherland, S.K. The Medical Journal of Australia
1: 30 1975.
'Treatment of Snakebite in Australia. Some
Observations and Recommendations.'
26. Sutherland, Coulter, Broad, Hilton, Lane. The
Medical Journal of Australia 1:27 1975.
'Human Snakebite victims. The successful
Detection of circulating snake venom by
Radio-immuno assay'.
27. Trethewie, E.R. Detection of snake venom in Tissue
Mercol Dekker, Inc., New York 1971.
28. Wapnick, Levin, Broadley, Central African Journal
of Medicine. 'A study of Snakebites Admitted
to a Hospital in Rhodesia'.
29. Uang, Lyuch, Lawson, Lewis, Annals of Surgery,
Vol. 179: 598 1974. 'The use of Excisional
Therapy in the management of snakebite'.
-
-
-