DISSERTATION ON "ADVERSE DRUG REACTIONS OF ANTI SNAKE VENOM AMONG HAEMOTOXIC AND NEUROTOXIC SNAKE BITE – A PROSPECTIVE OBSERVATIONAL STUDY"

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This is to certify that the dissertation titled **'ADVERSE DRUG REACTIONS OF ANTI SNAKE VENOM AMONG HAEMOTOXIC AND NEUROTOXIC SNAKE BITE – A PROSPECTIVE OBSERVATIONAL STUDY'** is a bonafide research work of **Dr. K. DEVA KUMAR** for the requirements of **M.D Pharmacology** Branch-VI Examination of the Tamil Nadu Dr. M.G.R Medical University to be held in MAY - 2018, was carried out by him under our direct supervision and guidance.

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DECLARATION

I, Dr. K. Deva Kumar solemnly declare that, the dissertation title **ADVERSE DRUG REACTIONS AND DOSAGE PATTERN OF ANTI SNAKE VENOM AMONG HAEMOTOXIC AND NEUROTOXIC SNAKE BITE – A PROSPECTIVE OBSERVATIONAL STUDY** was done by me from department of Pharmacology at Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, under the supervision and guidance of professor **Dr.M SaravanaKumar.,M.D.,** This dissertation is submitted to The Tamil Nadu Dr. M.G.R Medical University, towards the fulfillment of requirement for the award of M.D. Degree in Pharmacology (Branch –VI).

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ABBREVIATIONS

1. ASV - Anti-Snake Venom
2. ADR - Adverse Drug Reactions
3. ADE - Adverse Drug Event
4. WHO- World Health Organization
5. AChE- Acetylcholinesterase
6. ISCICS - Irula Snake Catchers Industrial Cooperative Society
7. MCBT - Madras Crocodile Bank Trust and Centre for Herpetology
8. IIS - Indian Institute of Science
9. ATREE - Ashoka Trust for Research in Ecology and the Environment
10. VIT - Vellore Institute of Technology
11. AVRU - Australian Venom Research Unit
12. GSI - Geographical Survey of India
13. ACA - Antivenom Anticomplimentary Activity
14. CPR – Cardio Pulmonary Resuscitation
15. WBCT – Whole Blood Clotting Count
16. aPTT – Activated Prothrombin Thromboplastin Time
17. RBC – Red Blood Cells
18. ABG – Arterial Blood Gas
19. DIC – Disseminated Intravascular Coagulation
20. ATIII – Antithrombin III
21. CT – Clotting Time
22. IM – Intramuscular
23. IV – Intravenous
24. AMA – Against Medical Advice

CONTENTS

INTRODUCTION

"**Cured yesterday of my disease, I died last night of my physician**"

-Matthew prior

Adverse Drug reactions is defined as "Any noxious change which is suspected to be due to a drug, occurs at doses normally used in man , requires treatment or decrease in dose or indicated caution in the future use of the same drug"[1]. It has been estimated that only 6 to 10% of all the ADRs are reported. The overall approximate hospitalization due to ADRs is estimated to be 5% ranging from 2% to 20%. At least one in 10 to 20% of the hospitalized patients develop ADR [2]. ADRs ranks fifth among all causes of death and its management contributes from 5 to 10% of hospital costs [3]. Pharmacovigilance is the science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other medicine related problem [4]. It involves the study of drug-related reactions and making warning or withdrawal recommendations for pharmaceutical agents. In addition to preserving the safety and quality of life for the patient, Pharmacovigilance can represent a cost effective treatment to the patient and the health care institution. Pharmacovigilance in India is rate less than 1% against the world rate of 5% [5].Studies have shown that between 20% and 80% of ADEs and ADRs are preventable with the majority of latter studies showing around 60- 70% preventability[6].

All the tropical diseases have alternate drugs for their management. But, ASV is the only lifesaving yet dangerous treatment for snake bite. The reactions due to ASV are indeed unpredictable and underreported. The irrationality in its usage is usually due to lack of fear and experience. Moreover the cost and the adverse reaction

is mostly taken under consideration. In various parts of the world, there is a continuing crisis in the production, deployment and accessibility of antivenom. It is therefore a matter of great urgency to promote international collaboration—best coordinated by the World Health Organization—involving national and regional health organizations and diverse public & private partnerships in order to accomplish the following goals: (1) to gather accurate epidemiological information on the impact and characteristics of snake bite envenoming in many regions, using properly designed community studies; and (2) to provide effective and safe antivenom in those regions who need them. Above all the current focus on the individual variation in the efficacy and safety of ASV are brought into consideration. Many of the physicians nowadays do not rely mainly on the polyvalent ASV in India as they do not cover all the important snake species. Thus, the utilization pattern tends to vary in different regions.

Snakebite is a terrifying experience at an individual level, as in India the low socio-economic people are mostly affected in all age groups. The concept of "Big 4" had been on the benefit of the laypersons to describe more about the snakes. ASV being the only mode of treatment is also derived from the snakes of the "Big 4". Since the management in paediatric to elderly has no dose variations, the efficacy and safety is looked upon the overall population. The most important aspect of the effective management of snake bite is the outcome of the patient. The cost procured in the management of snake bite ranges from Rs.5, 000 to 2, 00,000. While a painful death is how Hollywood typically portrays snakebites in film, the reality is far more distressing that most people could imagine and the consequences are often social stigmatization. Snakebite can have devastating physiological effects on the human

body, because snake venom toxins have evolved to target almost every type of bodily function or body part.

Only by the year 2009, snake bite was included in the mist of neglected disease by WHO. The past decade has seen a wide range of studies on snake bite. But the clarity on the utilization pattern and adverse reactions are still underreported. There are very limited manufacturers of ASV in India. Only polyvalent ASV is available in India. There is always a debate on the incidence of adverse reactions due to ASV. So the present study brings about the analysis of adverse reactions and its difference in various ASV manufacturers used in the study area. Also the present study had focused on three study area among which the epidemiology of snake bite in Perambalur and Ariyalur has to be studied as there are no studies reported so far. The Recent views on the safety and efficacy of the ASV among different manufacturer comes into existence. There are many in-vitro studies which revealed mixed results on the different manufactures. So the present study was done to analyze the ADR and compare their safety profile among the manufacturers used in three districts of Tamilnadu.

OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVE

- To analyze the prevalence of the Adverse Drug Reactions and dosage patterns of Anti-Snake Venom.
- To compare the safety profile with regard to Anti-Snake Venom among three Manufacturers.

SECONDARY OBJECTIVE

- To perform causality and severity assessment of the Adverse Drug Reactions.
- To Study the Demographic and clinical profile of snake bite cases.

REVIEW OF LITERATURE

Comprehensively, around 4,21,000 envenoming and 20,000 deaths due to snake bite occur every year. Based on the fact that envenoming occurs in about one in every four snakebite, between 1.2 million and 5.5 million snakebites could occur annually [7]. The first national survey in India, the Million Death Study was undertaken in 2010 by the Registrar General of India and the Centre for Global Health Research gives an estimate of 46,000 annual deaths by snakebite in the country whereas the Government of India's Central Bureau of Health Intelligence reports only 1,350 deaths each year for the period 2004 to 2009. This massive statistical disparity has important and urgent implications. The deficiency in surveillance and the paucity of properly designed epidemiological studies explain why the impact of this important public health problem has remained for so long unrecognized and neglected.

Snakes are poikilothermic carnivorous reptiles distributed in almost all the earth's surface except in the Antarctica, Greenland, Iceland and New Zealand. Among the Indian states the highest incidence seems to be in Maharashtra followed by Kerala, Tamilnadu, Uttarpradesh and West Bengal. Most of those who died from snake bite in developing countries like India are agriculturalist and manual laborers who, by the very nature of their work, the environment where they work in and their habit of working with bare hands are short implements and of walking bare footed are more likely to suffer snake bite. By destroying forests for creating agricultural land, the prey base of the snake (that is frogs and rats) has increased. The rice belts which harbor millions of rats, attract a lot of snakes. The number of snakes per acre in a rice belt is abnormally high when compared to the natural population in the forest. Humans go

into the belt every morning and come out in the evening, just the time when snakes are active. Thus the chance of an encounter between farmer and snake is very high. As more areas are inhabited at the periphery of towns, even there the chances of human / snake interaction increase.

Cobras flourish as long as there are rice fields; there they feed mainly on the mole rat (*varapu eli* in Tamil), live and lay their eggs in the rat burrow networks. Kraits also get by very well in rice belts because they like the plentiful small rodents such as the field mouse (*sundeli* in Tamil) and rock mouse (*kallu eli* in Tamil). Kraits are also found in the mounds of earth and rubble near wells. The Russell's viper lives in the rocky outcrops and hedgerows of cactus and other bushes which often form the boundaries of agricultural land. There, on the high ground, they have a plentiful supply of common gerbil (*velleli* in Tamil) which is also attracted to the food, humans provide by their farming activities. They belong to poorer sections of society and in most cases, are the sole bread winner of the family. When they die, a sudden death often in the prime of their life, the ensuing distress could well be imagined. Even if the bitten person who escapes death, might be left with permanent disfigurement or a crippling handicapped or long term or belated complications which will tell on the quality of life and the unusefulness to himself and to his family. It is likely that for every snake bite death, several survivors are left with chronic disability including physical handicap from necrotic effects of the venom requiring amputation, chronic ulceration, osteomyelitis with malignant transformation , chronic renal failure, chronic pituitary adrenal insufficiency and neurological sequelae from intracranial hemorrhages and thrombosis.

According to Vaiyapuri's survey, almost 13-14% of children of 0-10 years in all the three villages Erode district of Tamil Nadu, suffered snakebites. The numbers increased to almost 19% in the age group between 11-20 years. Further there is no appropriate data on snakebite victims and there is no proper reporting system. We need to generate these and make them available for researchers. In a study at West Bengal only 22.19% of snake bite cases reported to the government hospitals whereas the rest of the patients were dependent on the local traditional faith healers [8].

A substantial number of these deaths and long lasting complications of long disabilities could be avoided by some knowledge of precautions against snake bite and the proper mode of treatment. Even though snake bite has been reviewed with greatest dread from the time, our earliest ancestors, prayers, incantations, rituals, charms, use of "snakestones", countless bizarre concoctions, herbal preparations, many quick-fix techniques, all have been tried from the beginning, only to be discredited sooner or later. Modern medicine has fared only a little better. Whether in the recommended practices in first aid or in the use of antivenin, there have been so many ambiguities and uncertainties and even contradictions. Many of the practices once adopted by medical practitioners in first aid and some recommended even in recent decades are now considered useless or even harmful. In administering antivenin, there are so many precautions to be observed that even experienced medical practitioners have to be aware of what they are doing. And there could be side effects which have serious implications. There are issues on which the jury is still out.

THE BIG FOUR

The description of "THE BIG FOUR" is for the benefit of the layperson and the physicians who should know enough of the snakes- that is these four kinds (Cobra, Common Krait, Russell's viper, Saw scaled viper) – which together account for the bulk of fatalities and life-threatening consequences of snakebite in India. The argument is also heard that the usage of the term "Big four" has lulled laboratories and manufacturing facilities into the belief that they need not consider antivenin for other life-threatening species. The reason that they have gone beyond the "Big Four" is that in view of the rarity of bites from the other species (Hypnale hypnale, Echis sochureki & king cobra) and the very high cost of manufacture of antivenin, it is just not commercially viable to take them up. The concept of the "Big 4" snakes is reviewed to demonstrate its failure to include all currently known snakes of medical significance in India and its negative effects related to clinical management of snakebite. Most of the reports from the regions of south India have a higher incidence of reporting snake bite due to Hump nosed pit viper (*Hypnale hypnale*) has reduced the concept of "Big 4". The "Big 4" concept is controlling sound epidemiology and the development of effective ASV. It should be replaced by the model, introduced in the 1980s by the World Health Organization, which has not received adequate circulation and implementation [9].

Russell's viper (*Daboia russelii*)

The Russell's Viper is a stout bodied snake, the largest of which grows to approximately 1.8 meters in length. Like all the vipers it is a nocturnal snake, but unfortunately for humans, during the daytime it rests up under bushes, at the base of

trees and in leaf litter. It is therefore frequently encountered by rural workers as they are carrying out general agricultural activities. It yields 21-268mg of venom[10]. There are two key identification features that are worth noting. The first is a series of chain-like or black edged almond shaped marks along the snakes back and flanks. The second distinguishing mark is a white triangular mark on the head with the apex of the triangle pointing towards the nostrils.

Saw scaled Viper (*Echis carinatus*)

The southern indian Saw Scaled Viper is a small snake, usually between 30 and 40 centimeters long. The northern Indian species (*Echis sochureki*) is much larger, with an average size of 60 centimeters. It yields 18 to 72mg of venom. It inhabits mainly dry arid climates but can also be found in scrubland. One of the key identification features of this species is the posture it adopts when it is agitated. It moves its body into a figure of 8 like arrangement with its head at the center. It rapidly moves its coils against each other and produces a hissing like sound which gives its name of 'Saw Scaled'. In addition, there are often wavy hoop like markings down both sides of the Saw Scales body. On the head, there is usually a white or cream arrow shaped mark, pointing towards the front of the head, often compared to the shape of a bird's foot.

Spectacled Cobra (*Naja naja)*

The Spectacled Cobra is probably India's most well recognized snake. The hood markings of the spectacle like mark, distinguishes this snake from other species and its habit of rearing up when alarmed makes it distinctive but not definitive as other species do this, notably the Trinket Snake. In vitro studies have found that the

species from eastern part of India is neurotoxic and procoagulant. Whereas the western species are myotoxic and anticoagulant[12]. They yield venom ranging from 58 – 742mg[13]. The Cobras coloration may vary from pale yellow to black. One of the studies in Chennai has evolved a cocktail antiserum against this species using monoclonal antibodies for the management of snake bite treatment in future[14].

Common Krait (*Bungarus caeruleus*)

The Common Krait is a nocturnal snake which usually grows to approximately 1.0 to 1.2 meters in length. Its primary diet is mostly snakes and rodents. It can be found all over Peninsular India and often seeks habitation near human dwellings. During the day it rests up in piles of bricks, rat burrows or other buildings. It can produce 8-60mg of venom[15]. The Common Krait is the most poisonous snake in India and its venom is pre-synaptic neurotoxic in nature. There are a number of key identifiers which are worth remembering. The Krait is black, sometimes with a bluish tinge, with a white belly. Its markings consist of paired white bands which may be less distinct anteriorly. These paired white bands distinguish the snake from another black nocturnal snake, the Common Wolf Snake. The Wolf Snake's white bands usually are thicker and are singular bands equidistant from each other. The second useful distinguishing feature is a series of hexagonal scales along the top of the snakes back. This feature is really useful if the dead/alive snake has been brought to the hospital and examined.

The Hump-nosed Pit viper (*Hypnale hypnale*)

The Hump-nosed pit viper is one of India's tiniest venomous snakes, its total length ranging from 28.5 to 55cm. Its distinctive features include the presence of five

large symmetrical plate scales on the top of the head in addition to the smaller scales typical of all vipers. There are heat sensitive pits between the nostril and the eye. Mostly, this species is frequently mistaken as saw-scaled vipers (E.Carinatus) in Kerala[11].

King cobra (*ophiophagus hannah*)

One of the largest venomous snakes in Western Ghats. It occurs wherever relatively undisturbed bamboo stands and forests remain, but have not caused documented bites in recent years. One of the very first reports on Indian king cobra venom was not neutralized by the commercially available polyvalent ASV and so there is no antivenom therapeutically and commercially available in the Indian subcontinent to treat king cobra bite[16]. The production of antivenom for king cobra is still to be considered.

Table 1: The Honors of `The Most Dangerous' Have To Be Shared By 4 Snakes:

The most widespread in distribution	The Indian cobra i.e. the spectacled cobra and monocled cobra taken together (*Naja naja and N.kaouthia*)
The commonest within its range	
Occurrence in areas with the densest Human population	
Frequency exposure to humans	
Potency of venom	The common krait (*Bungarus caeruleus)*
Frequency of bites	The Russell's viper (*Daboia russelii*)
Frequency of fatal or life-threatening envenomation by bites	The saw scaled viper (*Echis carinatus*)

Table 2: Clinical Aspects and Therapeutic Response of The Most Commonly Available Snakes In India:

FEATURE	COBRAS	KRAITS	RUSSELLS VIPER	SAW SCALED VIPER	HUMP NOSED VIPER
Local Pain / Tissue Damage	YES	NO	YES	YES	YES
Ptosis / Neurological Signs	YES	YES	YES	NO	NO
Haemostatic abnormalities	NO	NO!	YES	YES	YES
Renal complications	NO	NO	YES	NO	YES
Response to neostigmine	YES	NO	NO	NOT applicable	NOT applicable
Response to ASV	YES	YES	YES	YES	NO

There is no antivenin manufactured in India for king cobra bites. A monovalent antivenin for its bite is manufactures in Thailand and a polyvalent one in china. But, considering the variations in geographical races, it remains to be seen how far they are effective for the bite of a king cobra in India. In the meantime we may draw some

comfort from the fact that in the last over 20 years, only four deaths from king cobra bite have been reported from India, all from south India.

THE SNAKE VENOM

The venom in the snake is secreted in two glands which are modifications of the parotid or salivary glands that occur in other vertebrates. These glands are located on the snake's mouth which is below and behind the eye. The venom can be described as `modified saliva'. Its purpose is firstly to immobilize or kill the prey before it is swallowed and secondly to aid digestion by breaking down the prey's tissues. The venom of each species is unique with a different composition of toxic and non-toxic constituents. Venoms are 90% proteins and these are mostly enzymes and about 25 such enzymes have been isolated, the matter of which may differ according to species. Some of the toxic components in the venom are not enzymes. The enzymes and other components have different destructive properties, namely:

- Cytotoxins damage the tissues.
- Haemotoxins cause heavy bleeding internally and externally.
- Neurotoxins impair the nervous system.
- Cardiotoxins act directly on the heart.
- Myotoxins damage the muscles.

Various toxins in snake venoms exhibit a high degree of specificity toward cholinergic receptors. The α-neurotoxins from the Elapidae family interact with the agonist-binding site on the nicotinic receptor. Alpha-Bungarotoxin is selective for the muscle receptor and interacts with only certain neuronal receptors such as those containing α 7 through α 9 subunits. Neuronal bungarotoxin shows a wider range of

inhibition of neuronal receptors. A second group of toxins called the Fasciculins which inhibits AChE. A third group of toxins, termed the muscarinic toxins (MT_1 through MT_4) includes partial agonists and antagonists for the muscarinic receptors. Venoms from the Viperidae family of snakes and the fish-hunting cone snails also have relatively selective toxins for nicotinic receptors. The actual distribution of AChE in various snake venoms is poorly known due to the limited number of published accounts. However, snake venoms are the richest source of AChE known and contain only the soluble globular form of AChE.

Approximately there are 2,500 different species of snakes. About 20% are venomous and these are divided into numerous subfamilies of the families Elapidae and Viperidae and the polyphyletic family Colubridae. Among these, the Elapidae is the main subfamily that possesses significant AChE activity. The Crotalinae and Viperinae subfamilies lack this enzyme, and the presence of AChE is unknown in the Hydrophinae. In the Elapidae, all venoms assayed contain AChE except those from the genus *Dendroaspis* (Mambas). In *Dendroaspis,* instead of AChE, venoms contain very potent reversible inhibitors of AChE, the Fasciculins which bind at the peripheral site of the enzyme. Venom of the coral snakes (*Micrurus*) is also a rich source of AChE. The catalytic characterization of affinity-purified AChEs from the venoms of four elapid genera showed that they share features of other vertebrate AChEs such as inhibition by eserine, preferential hydrolysis of acetyl rather than of propionyl or butyryl esters and substrate inhibition[17].

Snake venoms can be classified as haemotoxic i.e. attacking tissue and blood (Russell's viper and saw-scaled viper) and neurotoxic i.e. damaging or destroying

nerve tissue (cobras and kraits). Exceptionally viper venom can cause some neurotoxic effects also. A curious feature of the venom is that its composition not only differs from species to species, as mentioned above but may differ even among individuals of the same species representing different geographical races and surprisingly even among individuals of the same litter. Paradoxically enough, the new-born and the very young have more potent venom than adults.

Table 3: Fatal Dose, Venom per Bite and Average Time Between Bite and Death

SNAKE SPECIES	FATAL DOSE	VENOM PER BITE	AVERAGE TIME BETWEEN BITE AND DEATH
***Naja naja* (Cobra)**	15mg	200-350mg	8 hours (12 minute2 to 120 minutes)
***B caeruleus* (Krait)**	40mg	150-200mg	18 hours (3 to 63 hours)
***Daboia russelli* (Russell's viper)**	6mg	22mg	3 days (5 minutes to264 hours)
***Echis carinatus* (Saw scaled viper)**	8mg	4.5mg	5 days (25 hours to 41 days)

Neutralizing capacity of 10 vials of ASV in India (100 ml) for:

i) for Naja naja (Cobra) – 60mg, ii) B caeruleus (Krait) - 45 mg,
iii) Russell's viper 63 mg - 60 mg, iv) Saw-scaled viper 45 mg [18].

SPECIAL FEATURES OF SNAKE BITE

i. Male snakes produce more venom than females.

ii. There may be seasonal variations in the quantum and potency of the venom produced.

iii. The venom is more toxic immediately after the snake moults. Conversely, if it is nearing its moult, the venom will be less toxic.

iv. The quantity of the venom in the glands is likely to be less if the snake had a prey recently. When the venom glands are completely emptied by forceful venom extraction, it requires around 2 weeks to regenerate the venom [19].

v. Experiments have shown that the snakes can voluntarily control the quantity of venom injected. If the intention of the snake is only to frighten a perceived enemy, it may inflict a bite without injecting any venom – the `dry bite'- or the venom discharged may be minimal.

FACTORS AFFECTING THE SEVERITY OF SNAKE BITE

i. The mental state and behavior of the victim. If the victim is agitated or runs or exerts him after the bite, it will speed up the action of the heart and lead to faster absorption of the venom in the blood.

ii. Excessive movement of the bitten limb will lead to greater absorption of the venom.

iii. Whether the bite was on a bare body part or through clothing.

iv. The number of bites influences the quantity of the venom injected.

v. Presence of micro-organisms in its mouth, these may enter the wound and aggravate the problem.

vi. Adverse effect of wrong procedures followed in first aid results in damage to the tissues or lacerations leading to greater absorption of the venom.

vii. The extent of the delay in getting expert medical attention.

TRADITIONAL CURES & MYTHS OF SNAKEBITE

- Biting off the head of the snake that has bitten or biting hard on its body.
- Body parts of venomous snake, such as the head, heart, liver etc., preferably of the culprit, processed in various forms and consumed or applied to the bite site. The belief is as old as Aristotle (384-322 BC). In his history of animals, he was categorical that the body of the species was the only known remedy for its bite.
- A mixture of mercury and snake venom evaporated and applied to the bite site.
- Poultices of goat's cheese applied to the bite site.
- The bitten limb immersed in goat's milk.
- Pig's lard, rancid butter or olive oil applied to the bite site.
- Bleeding flesh of live chicken applied to the bite site in the belief that it will suck out the venom.
- Animal excreta applied to the bite site.
- Human urine applied to bite site.
- Bowels of a snake applied to the bite site.

As regards the `snakestone', the belief is that when it is placed on the bite site, it adheres to the wound, sucks out the poison and then falls off. If it is then immersed in milk, the poison will drain out and the stone can be dried and re-used. His belief has been widespread in India at least till recent times. Jean-Philippe chippaux says that it has existed even in European countries but had travelled there from India around 1650

and had found mention in 1656 document popularizing far eastern customs. The belief, in all probability, occurs in other countries as well. Many different substances have been identified as `snakestones': burnt bones, pumice, porous chalk, calcined antlers of sambar and bezoars found sometimes in the stomach of certain ruminants like cow, buffalo, sheep, etc., and other animals.

The following account of the various methods will be of interest:

Tourniquet:

It has long been the best-known first aid for snakebite and even today, this is the first thing that occurs to most people when first aid for snakebite is mentioned. It was mentioned as long back as the 2nd century A.D. by the Greek physician, Galen, and has been highly recommended by many different authorities including well-known physician's right down to recent times. It consists of a strip of cloth or rubber band tied tightly above the bite site to prevent or retard the venom travelling up the circulating system. Over a period of time it was realized that a very tight tourniquet was not necessary since the venom travels through the lymphatic system and the vein which lie just below the surface. Further, if the tourniquet completely chokes the arteries, the denial of all blood supply to the tissues will lead to gangrene which may be irreversible, leading to amputation of the limb. It was, then, recommended that the tourniquet should not be very tight and should be loose enough to allow the insertion of one finger under it. It was further recommended that it should be loosened once in 30 minutes and then tightened again. This is a dangerous procedure since the venom that had collected below the tight tourniquet will then surge into the lymphatics and the blood stream. It is now established that the tourniquet will do more harm than

good and should not be used. It should also be noted that the tourniquet gives the victim and his caretakers a false sense of security and this will further encourage the delay in reaching a hospital. The effectiveness of the tourniquets among Russell's viper bite victims in retarding venom movement from the bite was studied in 37 cases by measuring venom antigen levels by ELISA in venous samples taken proximal and distal to the tourniquets and also before and after release of tourniquets. In most cases, the tourniquet did not prevent proximal spread of venom. In 8 of 37 cases, the venom antigen assays did not prove the delayed absorption by using tourniquet [20].

Application of substances to bite site:

The traditional remedies mostly fall in this area and have no effect on venom. One such remedy which can be described as `modern' is the application of a chemical known as ethylene diamine tetra acetic acid (EDTA). To be effective it must be injected quite promptly after the bite. It does not counteract the lethal effect of the venom.

Application of potassium permanganate:

Also referred to as Condy's crystals, used to be recommended to be rubbed into the bite site or applied as a solution in the belief that it destroyed the toxin by oxidizing it. This is said to have been introduced in 1881 by De lacerda and has been popular till recent times. Further, it interferes with the lymph flow from the wound which normally would remove some venom. Rubbing the crystals on the wound may add to the complications.

Cauterization:

This refers to burning the flesh around the bite site by application of a red-hot iron or fire or acid or scalding oil. This is a dangerous procedure that will have no effect on the venom but will damage the tissues irretrievably.

Slashing the bite site with a knife or razor blade:

This is done in the belief that the venom will ooze out along with the increased flow of blood. But it does not, since the venom goes into the system very quickly and no significant portion may be left at the bite site to be drained off in this fashion. Further, there is every danger of grave injury to nerves, tendons and blood vessels and also the risk of infection.

Amputation of the bitten limb:

This will not work as a first aid measure since by the time this is accomplished; the venom might have travelled well up into the systemic circulation. It may also, later on, be found to have been unnecessary if there was really no serious envenomation.

Suction of the wound by mouth:

This is used to be widely recommended till recent times. This does not work if the venom has already been absorbed into the system which happens fairly rapidly after a bite. Experiments in the U.S. have shown that suction started after three minutes removes only less than one-thousandth of the venom. Further, the procedure may infect the wound. These apart, it is very risky for the aid-giver if he has any abrasions or sores in the mouth or lips or cavities in the teeth, which he may not be aware of himself , in which case it will be in the individual to get envenomed.

Suction of the wound by devices:

Suction devices such as sawyer extractor have been in use especially in the West. These too generally have no effect since, as already mentioned, the venom gets absorbed into the systemic circulation within minutes. When it is used within 5 to 15 minutes, appreciable amount of venom can be removed. In Indian conditions, therefore, use of a mechanical extractor effectively is hardly feasible. There is also a view that use of a suction device may increase envenomation as it inhibits natural oozing of venom from the bite site and may also promote necrosis or cause excessive bleeding especially in viper bites where the blood loses its ability to coagulate.

Cryotherapy or Cryopathy:

This involves application of icepacks or cold compresses to the bite site and it was highly recommended for a long time in U.S. for rattle snakebite. Its chief proponent was Herbert L.Stalinka of Arizona State University. Cryotherapy now stands discredited. It is not only effective but will also damage the tissues, causing necrosis.

Electroshock therapy:

Applying electric shock to the wound site with an insulted rod used to be done for rattler bites in America and was popular in the 1980s. The belief was that this denatured the venom. This treatment is useless and dangerous. It may cause serious burn at site or may even injure the heart.

Consumption of alcohol:

This used to be popular remedy especially for rattle snakebites in the U.S. during the prohibition days. L.M. Klauber, a leading herpetologist, is credited with the

statement: “The rattler, more than any other cause, made the high plains country a hard-liquor area”. Alcohol is, in fact, contra-indicated. It dialates the blood vessels and speeds up the blood circulation leading to faster absorption of the venom.

The following account of the various guidelines by WHO:

Local compression pad or `Monash technique’:

The 1998/2005 guidelines of WHO : “The use of a local compression pad [a hard pad of rubber or cloth] applied over the wound, without pressure bandaging of the entire limb, has produced promising results in Myanmar and deserves further study”. The recommendation of S Grenard (1994) on the application of small (4``x4``) wad of folded (to 1``x 1`` size) gauze dressing strapped tightly over the fangs marks. It is stated that this may delay the spread of the venom while limiting the area of possible tissue damage consequent on being restricted to a small area. This method needs further study.

The `Sutherland technique’ or Pressure immobilization Method:

Guidelines for management of snake bite (2016) by WHO includes Sutherland technique recommended by Dr.Struan K. Sutherland (1936 -2002) in 1981 had two components. One is the application of a pressure bandage to impede the flow of lymph and venous blood, thus preventing or slowing down of the systemic absorption of the venom and at the same time, not interfering with the flow of blood through the arteries to the tissues. A roll of crepe bandage about 10 cm wide and 4.5 m long, is ideal for this. Bandaging should be over the bitten area first and then extended from the toes or hands upwards. The other component is the immobilization of the limb through resort to a splint loosely but firmly tied to the limb with strings and if the bite is on upper

limb, the limb cradled in a sling tied to the shoulder as in the case of a fracture to the limb. The immobilization of the limb will impede the pumping action of the skeletal muscles, thus slowing down the passage of the venom. The objection is that, to be effective, the pressure applied has to be very precise and this varies between the upper and lower limbs. The pressure on the upper limb has to be 40 – 70 mmHg and on the lower limb 55- 70 mmHg. If the victim walked, 10 minutes after application would be ineffective. It has been pointed out that even doctors are not able to judge the specific pressure to be applied correctly and therefore this is near impossible in the field. Further to be effective, the pressure bandage has to be applied within a few minutes of the bite and this is not feasible in the field conditions in India.

Immobilization of the limb:

This part of the pressure immobilization method has to be considered as a first aid measure by itself and is desirable. Tying a splint to the limb and supporting it in a sling, will slow down the progress of the venom by preventing the pumping action of the skeletal muscles.

But most parts of India, majority of people still follow the crude methods as first aid measures which will delay the vital time complicate the treatments.

ANTIVENIN

The only scientifically proven antidote to snake venom is anti venene, now generally spelt as `antivenin', also called anti snake venom (ASV) or antivenom immunoglobulin. Injected intravenously into the body, this neutralizes the venom. It was in 1887 that Henry Sewell of the University of Michigan, USA, conducted experiments on snake venoms and laid the foundations for antitoxin therapy. In 1891,

Calmette followed up the research works and discovered antivenin. (Calmette's name is immortalized in BCG – Bacillus Calmette-Guerin – used in the inoculation against tuberculosis). He discovered this vaccine jointly with Camille-Guerin. Albert Calmette a French scientist of Pasteur institute working at its Indochine branch in 1895 developed the first antivenom for snakes (called an anti-ophidic serum) against the Indian Cobra (*Naja naja*). Fraser in Edinburgh coined the term `anti venene', now spelt as `antivenin'. Antivenin first became available on commercial scale in 1927 – in the United States. In India, antivenom production began at the Central Research Institute, Kasauli, Himachal pradesh during the 1920s.

Parentral administration of antivenom is the only specific antidote to snake venom and the cornerstone in management of snake bites[21]. Antivenoms are derived from immunoglobulins, obtained and purified from the plasma of animals immunized with snake venoms. Selection of snake venoms is critical to cover the majority of cases of envenoming in a particular given geographical region. The composition of snake venom is complex and a high inter/intra-species variation has been documented. Production of antigenic mixture to be used for antivenom production is a challenging task for manufacturers[22].

Monospecific antivenoms

They are used clinically for effective cross neutralization of single or closely related snake species envenoming. It is practically possible only when there is a very high prevalence of a single species of snakes in the desired region, but most of the countries are inhabited by more than one medically relevant species of snakes, where the use of polyspecific antivenoms is highly recommended.

Polyspecific antivenoms

The polyspecific antivenoms are obtained by immunizing an animal (preferably horse) with venoms of more than one species of snakes of high medical relevance to the concerned geographic area/region. Another methods of production includes i)immunizing individual animals with venom of a single species and then mixing the various hyper immune plasmas for fractionation and ii) mixing appropriate quantities of relevant purified antivenoms before formulation. These polyspecific antivenoms should be promoted whenever feasible, as they offer clinical advantages like better usefulness than monospecific antivenoms. Their use reduces the need for identification of snakes, prior to initiation of antivenom therapy and simplicity in logistics provides great advantages.

The basic procedure in manufacture of antivenin is as follows:

At the first stage, venom is extracted from the snake by making it bite on an s-rubber plastic diaphragm stretched and tied over a glass receptacle. The venom which will have saliva and other impurities is purified by centrifuging and it is preserved at -10°C. It is freeze-dried using a lypophilizer and reduced to a powder form and stored in airtight bottles. Its shelf life in this form can be as much as 12 years. At the second stage, the venom is reconstituted as liquid and a very small quantity is injected into a horse. Repeated injections are given at periodic intervals and the dosage being increased gradually. The horse's immune system produces anti-bodies in its blood to fight the venom. At a certain stage, the horse's blood is extracted and the blood serum which contains the antibodies is separated and purified. This is the antivenin. The final product marketed is in crystal form. As and when necessary,

this will be reconstituted in hospitals with distilled water in prescribed proportions and used for injecting the victim of snakebite intravenously. Nowadays, plasmapheresis, whereby erythrocytes are re-injected into the donor animal within 24 hours of blood collection, is commonly employed to reduce anaemia in the hyperimmunized animal that donates the plasma. Accordingly, it is almost exclusively, plasma rather than serum that is used as the starting material for the extraction of the immunoglobulin or its fragments.

The venom of the cobra/krait and the viper has different characteristics. Therefore, to get the best results, the antivenin has to be prepared specifically for cobra or krait or viper. This is called monovalent antivenin. But this gives rise to some practical problems. Most of the victims and the doctor cannot be certain about the snake that has bitten especially when it happens during the night or among people who are not well-informed. The use of monovalent antivenin without being sure about the snake species can have dangerous consequences. Therefore, a polyvalent antivenin is manufactured by injecting the horse with a mix of the venoms of different species of snakes. But a polyvalent antivenin has its own drawbacks. It is not as effective as monovalent antivenin, thus necessitating larger dosages which results in pushing up the cost of treatment, the antivenin being a very costly drug. It may also cause more adverse side-effects compared to monovalent antivenin.

Currently the laboratories in India produce only a polyvalent antivenin which is used for the bites of the different species of cobras and kraits and pitless vipers found in India. It is not effective against the bites of the king cobra or the pit vipers or sea snakes. Even among the same species of snakes, there are variations in the

compositions and potency of venom produced by individuals in different geographical areas. This places limitations on the efficacy of the antivenin produced in a particular facility using venom from snakes in a particular area. This limitation can be there even within the same country. For severe cases of envenomation, the maximum dosage required will be 20 vials in the case of neurotoxic bites (cobra, kraits) and 30 vials in the case of haemotoxic bites (Russell's viper, saw-scaled viper). Neurotoxic snake bite is an independent predictor of mortality in snake bite patients. Currently used polyvalent ASV may be less effective in treating neurotoxic snake bite[23].

The Irula Snake Catchers Industrial Cooperative Society (ISCICS), Madras Crocodile Bank on Chennai's East Coast Road which operates in two districts of Tamil Nadu totaling 7,850 sq. km, is a tribal self-help project set up in 1978. They also conquer the traditional knowledge of medicinal plants for the management of snake bite[24]. The Madras Crocodile Bank Trust and Centre for Herpetology (MCBT), in association with experts at the Indian Institute of Science (IIS), Ashoka Trust for Research in Ecology and the Environment (ATREE),Vellore Institute of Technology (VIT), the Australian Venom Research Unit (AVRU) from the University of Melbourne and the Global Snakebite Initiative have begun an ambitious project working with government and antivenom manufacturers to revolutionize the Production of snake antivenoms for use in India. 80 percent of the venom currently used to raise indian polyvalent venoms is collected by the irula cooperative for snakes inhabiting in one small area around Mahabalipuram in Tamil nadu The Society is licensed by the Tamil Nadu Forest Department to capture an average of 8,000 snakes per year of the four most medically important species, the 'big four'. Snakes are kept

in captivity for 3–4 weeks and venom extracted four times from each snake. Snakes are then released back to the wild. The state forest department license determines the number of snakes permitted to be caught and the relative quantities of venom produced. This has resulted in a perennial surfeit of cobra and Russell's viper venom, hence the Irula Cooperative stipulates that buyers must purchase venom in a ratio of 5 : 5 : 1 : 1 (Naja : Daboia : Bungarus : Echis). For buyers who wish to purchase only krait or saw-scaled viper venom, the price is an astronomical US$ 3888 per gram13. In the year 2010, the Antivenom producers have expressed concern over the high venom prices and the purchase of Venom from the Irula Cooperative venoms dropped down considerably. New methods of immunization require much less venom to produce the same results which will of course reduce demand even further. Comparing the cost for Indian snake venoms produced in the USA are 600 US$ for Russell's viper, 150 US$ per gram for spectacled cobra, and 400 US$ for saw-scaled viper (Kentucky Reptile Zoo). The Irula Cooperative now produces a major portion (an estimated 80%) of India's venom needs (for the production of antivenom) from snakes found within two districts of Tamil Nadu. They charge (as of April,2008) Rs.10,000 per gram of cobra and Russell's viper venom and Rs.30,000 to Rs.80,000 per gram of saw scaled viper and common krait venoms. Therefore, it would be advantageous to expand the scope of the cooperative activities to other parts of the country by becoming a multi-state cooperative in order to include other snake catching communities under its wing. This will possibly benefit the snake catchers and also effectiveness of the regional venom variation improves which possibly makes the others snake species medically important. However, it is to be noted that the standards

of venom production and protocols of the cooperative have considerable scope for improvement in conformity with WHO guidelines[25]. Clinicians in other parts of the country are reporting that the antivenom they are using is relatively ineffective in counteracting the effects of a venomous bite. In Rajasthan, envenoming by subspecies in saw-scaled viper (Echis carinatus sochureki) requires larger doses of antivenom than smaller subspecies (E.c.carinatus) in the South. So, there is geographic variation in the composition of the venom of a single species. In the year 2016-17 the geographical survey of India (GSI) and the MCBT hope to raise US$20,000 to make it possible to complete the testing of venom from representative Indian Russell's viper populations spread right across India.

ANTIVENIN IN INDIA

Only polyvalent anti-venom is produced in India. It contains F(ab)2 antibody and its half-life is approximately 80-100 hours. The ASV preparation in India is available in two forms

	LYOPHILISED	**LIQUID**
ADVANTAGES	Long Shelf Life (5 Years) Requires no cold chain	Speed of reconstitution immediate
DISADVANTAGES	Speed of reconstitution of 30-60 minutes	Short Shelf Life (2 years) Requires a cold chain

The cold chain is a useful feature in remote areas where power supply is inconsistent. The advantage of the lyophilized form is that it does not require refrigeration. However, it is more expensive than the liquid preparation. Ways and

means should be explored to drastically bring down the cost of antivenin. The cost of treatment with antivenin today is prohibitive. An average dose of antivenin will be about 10 vials (of 10ml each). A patient will ordinarily need about 10 vials and this may go up to 20 to 30 vials in very bad cases. One vial of 10 ml. costs Rs.400 to Rs.450 (as of July 2008). The ministries of health supply ASV free of cost but their supply remains insufficient and irregular which has led a lot of patients to purchase in case of private hospital[26]. One way to bring down the cost is by switching over to monovalent antivenins as mentioned above. The other is by using alternative media for production of antivenin instead of relying exclusively on horse serum. Some work has been done in other countries for the production of antivenin from sheep serum and from egg-yolk but no such work has been done in India. Recently camelid IgG monospecific antivenom was studied to be efficacious and a better choice in snake specific envenoming[27]. A study in Pakistan states that indian antivenoms significantly neutralized the pro and anticoagulant activity of Pakistan Russell's viper venom[28]. Several polyvalent ASV manufacturers have been established, all of which follow the Indian pharmacopoeia requiring products which neutralizes 0.6mg/ml of Naja naja venom, 0.6mg/ml of Daboia russelli venom, 0.45mg/ml of Bungarus caeruleus venom and 0.45mg/ml of Echis carinatus venom. Since the early 1950s the potency of ASV has much reduced where earlier indian ASV neutralize 4mg/ml Daboia russelli venom and 2mg/Naja naja venom was used[29].

Table 4: MANUFACTURERS OF ANTISNAKE VENOM IN INDIA

PUBLIC SECTOR	PRIVATE SECTOR
• Central Research Institute Kasauli. (Reduced Production) • Haffkine Biopharmaceutical Company Ltd. Mumbai. (Production 2015-2016: 40, 00,000 vials) supplying Maharashtra • Bengal chemicals & pharmaceuticals, Calcutta. (Currently stopped Production) • King's Institute of Preventive Medicine, Madras. (in 2016 announced resumption of production after a 15 year break)	• Serum Institute of India, Pune (Reduced Production) • VINS Byproduct Ltd., Hyderabad. (Production 2015-16: 10, 00,000 vials) • Biological E.(Evans) Ltd., Hyderabad. (Production 2015-16: 5, 00,000 vials of liquid antivenom only) • Bharat Serum and Vaccines Ltd., Mumbai. (Production 2015-16: 80,000) • Mediclone Biotech Pvt. Ltd, Chennai (Production 2015-16: 40 000 vials, reducing production) • Premium Serum and Vaccines, Mumbai (Production 2015-16: 6, 00,000 vials)

PHARMACOLOGY OF ANTI SNAKE VENOM

The pharmacology of various types of antivenom differs due to the difference in their molecular masses. It is expected to be similar to other intravenous drugs being delivered to the central compartment with zero order input kinetics (constant rate of infusion). Antivenom is then distributed throughout the body and is eliminated by the kidneys and/or the reticuloendothelial system.

DISTRIBUTION

A) Volume of Distribution

1) The composition of antivenom can vary depending on the degree of purification and the degree of antibody fragments [IgG, $Fa(ab')^2$ or F(ab)]. In general, venom distributes mainly into the tissue compartments, while IgG and $F(ab')^2$ distribute only weakly out of the plasma volume; therefore they are unable to neutralize antigens within the tissue.

2) $F(ab')^2$ fragments - volume of distribution is approximately twice as high as plasma volume, which suggests a poor distribution in tissue. The fragments however distribute more rapidly than whole IgG.

B) Peak Plasma Level

1) IgG - the concentration peak is reached in 6 hours in superficial tissue and 30 hours for deep tissue.

2) $F(ab')^2$ fragments reach a concentration peak in 1 hour in superficial tissue and 6 hours in deep tissue

EXCRETION

1. Kidney

F(ab) is excreted via the kidneys. This is only possible when F(ab) is free or combined with a hapten and not when it's combined with venom proteins. A potential risk of renal lesions due to F(ab) immune complexes has been observed in some patients, as noted by a significant decrease in the rate of Creatinine clearance.

2. Other

IgG and F $(ab')^2$ are excreted via cells of the immune system. Glomerular filtration stops for molecules that are higher than 50 to 60 kDa.

Rapid elimination of some therapeutic antivenoms (e.g. when Fab fragments are used) has led to recurrence of envenoming in patients. However, the choice of preparing specific IgG or fragments appears to depend on the size and toxicokinetics of the principal toxin(s) of the venoms. Large relative molecular mass (Mr) bivalent antibodies (IgG and $F(ab')^2$ fragments) may be effective for the complete and prolonged neutralization of intravascular toxins (e.g. procoagulant enzymes) which have a long half-life in envenomed patients, whereas low Mr and monovalent IgG fragments such as Fab may be more appropriate against low-molecular-mass neurotoxins which are rapidly distributed to their tissue targets and are rapidly eliminated from the patient's body [30].

One ml. of polyvalent antivenin neutralizes 0.6 mg of cobra and Russell's viper venom and 0.45 mg of krait and saw-scaled viper venom. Antivenin is marketed in vials of 10 ml each (liquid) or equivalent in lypophilized form. Liquid antivenin is very unstable at room temperature. It requires storage at 0°C to 4°C and even then its

shelf life is only two years, lypophilized antivenin has a shelf life of five years when stored in a cool dark place. Preferably, it should be stored in a refrigerator

To retain their full potency within the limits of stated expiry dates, lyophilized antivenoms (shelf life about 5 years) should be stored at below 25ºC and liquid antivenoms (shelf life 2-3 years) should be stored at 2-8 ºC and not frozen. The antivenoms should be used within the stated expiry dates with proper storage. Studies report that, they can also be expected to retain useful activity for months or even years after these dates. WHO guidelines also stated that the recently expired antivenoms may be useful if there is no alternative treatment in case of severe envenoming [level of evidence E][31]. An unpublished data revealed polyvalent ASV in India was found to be more effective with Indian cobra and saw scaled viper bites, whereas it was less effective in Russell's viper and common krait.

ADVERSE EFFECTS

Apart from the efficacy of ASV, the possibility of adverse reactions by activation of the immune system is of at most importance in the management of snake bite. WHO has classified as i) Early anaphylactic reactions; ii) Pyrogenic (endotoxin) reactions; and iii) Late (serum sickness type) reactions[32].

Early Anaphylactic reactions

These reactions are the earliest and the first to occur within 10-180 minutes just after administration on while administration. They IgE mediated or non IgE mediated reactions mostly characterized by itching, urticaria, fever, nausea, vomiting, abdominal colic, diarrhea and tachycardia. Some patients develop characteristic anaphylaxis (hypotension, angioedema, bronchospasm).

- IgE mediated reactions
    - Previous exposure to equine immunoglobulins leads to IgE antibody production which upon administration of ASV interact with the IgE receptors on the basophils and mast cells induces cell degranulation and release of mediators.
    - Other hypothesis is the presence of antibiotics in antivenom which has been found when horses were treated for infections. This triggers IgE mediated response
- Non IgE mediated Reactions
    - Majority of the observed reactions fall under this category.
    - Antivenom anticomplimentary activity (ACA) and heterophilic antibodies play an important role in the pathology.
    - Blood, blood products, and therapeutic immunoglobulins causes anaphylactoid reactions (mast cell degranulation by non immunological mechanisms) without prior exposure by formation of immune complexes and subsequent activation of complement cascade [33].
    - Anaphylotoxins (C5a, C4a, and C3a) stimulate chemotaxis, degranulation of mast cells and release of pharmacologically active mediators of immediate hypersensitivity reactions [34].
    - Heterophilic antibodies pave their way into the human plasma through vaccines or ingested food.

Pyrogenic (endotoxin) reactions

These occurs 1-2 hours post treatment which is characterized by fever, chills, rigors, nausea, malaise, headache, hypotension. Children suffer from febrile convulsions. The main cause of this reaction is the contamination of antivenom by bacterial endotoxin (lipopolysaccharide) during the process of manufacture. The molecular mechanism states that the interaction with toll like receptors and/or lipopolysaccharide binding protein receptors activates monocytes and the immune system leading to TNF and cytokine production [35].

Late reactions (serum sickness type)

These reactions occur between 1-12(mean 7) days after treatment characterized by fever, arthralgia, myalgia, lymphadenopathy, recurrent urticaria. They are IgG mediated type III hypersensitivity reactions. Antigen-Antibody complexes are responsible for late reactions which activates the complement pathway. These complexes activate the acute inflammatory response that leads to compliment activation and leukocyte infiltration.

The early institution of ASV is beneficial in preventing complications however severe is the systemic envenomation [36]. Attempts to prevent early reactions which included pretreatment with epinephrine, antihistamines, corticosteroids and reduction in speed and concentration of intravenous antivenom administration have not been effective in adequately designed clinical trials [37-39].Patients with hypogammaglobulinemia are more susceptible to serum reactions than others [40].

Contraindications to antivenom

There are no absolute contraindications to antivenom treatment till date. Patients who have exposed to horse (equine) or sheep (ovine) serum in the past (for example, after treatment with equine anti-tetanus serum, equine antirabies serum or equine or ovine antivenom) and those with a strong history of atopic diseases (especially severe asthma) are at high risk of severe reactions and should therefore be given antivenom only if they have signs of systemic envenoming.

MANAGEMENT OF SNAKE BITE

IN FIELD

Early management to be started as soon as possible. The traditional methods have been found harmful than good. Delayed transport of the victim to the nearest health care Centre with anti-snake venom should be discouraged. The first aid being currently recommended is based around the mnemonic: "Do it R.I.G.H.T."

R =Reassure the patient. 70% of all snakebites are from non-venomous species. Only 50% of bites by venomous species actually envenomate the patient.

I = Immobilize in the same way as a fractured limb.. Do not apply any compression in the form of tight ligatures, they can be dangerous!

G.H. = Get to Hospital Immediately. Traditional remedies have NO PROVEN benefit in treating snakebite.

T = Tell the doctor of any systemic symptoms such as ptosis that manifest on the way to hospital.

Tourniquet: not recommended due to risk of arterial compression which may lead to gangrene with a tight tourniquet. If the patient presents with tourniquet applied elsewhere, it is recommended not to remove the tourniquet until medical treatment is started. Check for distal pulses, if absent remove tourniquet immediately with gradual release (sudden release will increase the surge of venom circulation) of pressure. If distal pulse is present, avoid removing tourniquet, until ASV is administered.

Don'ts

Do not attempt to suck the venom through mouth

Do not attempt to capture or kill the snake

Do not hold a dead snake by the head

Do not wash with soap or any solutions over the site of bite.

Don't cut or incise the bite mark

Measures during transport include:

- Oxygenation if the patient is not maintaining saturation (oxygenation masks the early sign of respiratory failure)
- Stabilize airway breathing circulation.
- Identify the ptosis, ophthalmoplegia and other neurological symptoms.
- Watch for paradoxical respiration (abdomen expands rather than the chest, while attempted inspiration).
- Secure intravenous line and rush fluids.

Management in Hospital

Assessment and stabilization of airway, breathing, and circulation. Monitor for gurgling/ whistling/ noisy breathing to evaluate airway patency. Head tilt / chin lift /

jaw thrust maneuver to be followed if airway is compromised. Bag mask ventilation followed by CPR if the patient is not breathing. Advanced airway support if needed (mostly in neurotoxic snake bite envenomation). Rush fluids for rapid and low volume pulse with hypotension.

Management after stabilization

Quick history: where did the snake bite occur (sleeping on ground peculiar for Krait), when was the snake bite, what part of body was bitten. How does the person feel now (dizziness and faint, difficulty in breathing)

- Ask questions as to what the victim was doing at the time of the bite. Feeding stock animals, grass cutting can be suggestive of snakebite. A short history of the status of snake bite and the progression of local and systemic signs is very important. Fang marks are evident for the doctor that the patient has been bitten by a snake.
- Bite marks are of no use in identifying if a species is venomous or not though in some countries bite marks have limited use in determining species. Many non venomous species leave just two fang-like marks e.g. Wolf Snakes. Some species like the Krait may leave no bite mark at all. Many venomous species grow reserve fangs in case the main ones break off.
- Determine the exact time of the bite can provide warnings regarding the progression of symptoms. Only few symptoms can be elicited if the patient has arrived at the hospital soon after the bite irrespective of the amount of venom injected. If the patient was bitten at night while asleep, a krait was probably implicated; if in a paddy field, a cobra or Russell's viper; if while tending fruit

trees, a green pit viper; if while swimming or wading in water a cobra (fresh water) or sea snake (sea or estuary).

- A common early symptom of systemic envenoming is vomiting. Patients who become defibrinogenated or thrombocytopenic may begin to bleed from old, partially-healed wounds as well as bleeding persistently from the fang marks. The patient should be enquired about the amount of urine passed. Patients who complain of drowsiness, drooping eyelids or blurred/double vision are suggestive of neurotoxic envenoming. Generalized pain, tenderness and stiffness of muscles and trismus develop within 30 minutes of sea snake envenoming.
- Where possible identify the snake responsible. The color of the snake is unreliable in determining the snake species. The victim or their attenders shall carefully bring the killed snake to hospital. The identification of snake species and management would be helpful if the snake has been killed and brought by the attenders or the patient. If it is obviously a harmless species (or not a snake at all!), the patient can be quickly reassured and discharged from hospital.
- Determine if any traditional medicines have been used. Traditional treatments can cause problems, in addition to the time taken to administer them. For example, the ingestion of herbal or other products can generate symptoms that confuse the diagnosis. In some areas the ingestion of clarified butter or ‘ghee’ is a common remedy use to induce vomiting. The rationale is that venom is thus vomited from the body. The victim’s vomiting may be entirely unrelated to envenomation.

- Obtain a brief medical history (e.g., date of last tetanus immunization, use of any medication, presence of any systemic disease, and history of allergy)

Identify the syndrome:

1. No envenomation (local & systemic- nonpoisonous snake or dry bite)
2. Local swelling only – nonpoisonous snake
3. Local cellulitis with bleeding manifestation (all vipiridae)
4. Local cellulitis + bleeding manifestation + neuroparalysis + dark urine (Russell's viper)
5. Local cellulitis + neuroparalysis (Cobra)
6. Only neuroparalysis (Krait)
7. Paralysis with dark urine (Russell's or sea snake)

If asymptomatic- observe for 24hrs since snake bite can cause late serum sickness of type III hypersensitivy reaction.

Signs of envenomation

A. Local examination

1. Fang Marks

2. Local Pain

3. Local Bleeding

4. Bruising

5. Lymph Node Enlargement

6. Blistering

7. Local Infection/Abscess Formation

8. Necrosis

B. Signs of neurotoxic envenomation

1. Ptosis
2. Ophthalmoplegia – paralysis of the extra ocular muscles results in diplopia
3. Broken neck sign (due to paralysis of neck flexing muscles, the neck falls back when you lift the patient up the shoulder) – Krait envenomation
4. Paradoxical respiration

C. Signs of bleeding manifestation

D. Single breath count (normally more than 20**):** consider advanced airway of less than 16 in an adult

Pregnant Women

Watch for fetal distress, vaginal bleeding, threatened abortion, monitor uterine contraction and fetal heart rate. Lactating women should be encouraged to breast feed.

INVESTIGATIONS

Bedside

20 minute whole blood clotting time (WBCT)

5 ml of blood withdrawn in dry glass test tube and left undisturbed for 20 minutes. At the end of 20 min, the test tube is slightly tilted to look for clot formation. Normally the blood is fully clotted by this time but in haemotoxic snake poisoning, the time taken for clotting is prolonged and the blood may still be liquid in 20 minutes. The patient is re-tested every hour for the first three hours and then 6 hourly for 24 hours until either test result is not clotted or clinical evidence of envenomation

to ascertain if dose of ASV is indicated. In case test is non-clotting, repeat 6 hour after administration of loading dose of ASV. In case of neurotoxic envenomation repeat clotting test after 6 hours. This is a useful bedside test to diagnose haemotoxic envenomation.

Laboratory

1. **Hemoglobin**
2. **Platelet count**
3. **Prothrombin time**
4. **aPTT**
5. **Urine examination for RBC, hemoglobin, myoglobin**
6. **Serum Creatinine, urea, electrolytes.**
7. **ABG if facilities are available**
8. **Complete blood counts**
9. **Glucose**
10. **Creatinine phosphokinase**

INDICATIONS FOR ASV THERAPY

Anti-snake venom is the definitive treatment of snake bite envenomation and is the cornerstone of management. Systemic envenomation and severe local envenomation are indications for administering ASV to a patient. It is important to identify systemic envenomation early so that ASV can be administered as soon as possible before the venom becomes tissue-bound. ASV is effective only against freely circulating venom proteins and not against the tissue-bound proteins. If there are no

signs of systemic or severe local envenomation, it is advisable to monitor the patient for 24 hours and repeat a whole blood clotting time before discharge

ASV for neurotoxicity

In case neurotoxicity, administer 10 vials of ASV along with prophylactic adrenaline. The patient is then kept under observation for 1 to 2 hours. If there is worsening of neurological deficits for persistence of weakness after 1 to 2 hours, repeat 10 vials (100 ml) of ASV.

ASV for haemotoxicity

In case of haemotoxicity, administer 10 vials of ASV along with prophylactic adrenaline. Check the whole blood clotting time 6 hours after administration of the dose if the WBCT is more than 20 minutes or of there is clinical bleeding 1 to 2 hours after the dose, repeat the dose of 10 vials (100ml of ASV). Administering more than 20 vials of ASV is probably not beneficial and not recommended.

Low dose protocol for haemotoxicity

The problem with the usual regimen is that, 20 vials of ASV cost about Rs.20, 000 which is beyond what most patients can afford in India. Moreover the dosage of ASV is based on WHO recommendation of Southeast Asia. This may be more than what is required in individual patients. To address these issues several low dose regimens have been studied. Low dose protocol is used for haemotoxicity typically from a viper bite and not advisable for envenomations presenting with neurotoxicity. Administer 2 vials over 30minutes followed by 2 vials over 2 hours and then 2 vials over 4 hours. If there is evidence of clinical bleeding after 1 to 2 hours of starting the

dosing or, if the WBCT done after 6 hours of starting the dose is more than 20minutes, repeat 4 vials over 6 hours.

Late-onset envenoming

The patient should be kept under close observation for at least 24 hours. Many species, particularly the Krait and the Hump-nosed pit viper (Joseph et al, 2006) are known for the length of time it can take for symptoms to manifest. Often this can take between 6 to 12 hours. Late onset envenoming is a well-documented occurrence. In many cases of Common krait bites in West Bengal, bilateral ptosis appeared after 24-36 h after admission for pain abdomen.

ASV in pregnant women

Pregnant women are treated in exactly the same way as other victims. The same dosage of ASV is given[41,42].

ASV dose in children

Children are also given exactly the same dose of ASV as adults as snakes inject the same amount of venom into children and adult. Infusion: liquid or reconstituted ASV is diluted in 5-10 ml/kg body weight of normal saline. However, reduce amount of fluid in running bottle to 200 ml to avoid fluid over load

Recurrent envenomation

Unless proven recurrence no further ASV should be administered if coagulation is restored. If the patient comes with features of coagulopathy, ASV is to be administered (10 vials). There is no need to give prophylactic ASV to prevent recurrence. Recurrence has been a mainly US phenomenon, due to the short half-life of Crofab ASV. Indian ASV is a F (ab)2 product and has a half-life of over 90 hours

and therefore is not required in a prophylactic dose to prevent re-envenomation. But if the patient comes even after a few days reinstitute ASV therapy, because sometime absorption of snake venom depot under skin is erratic. If there is no improvement from the beginning of the whole blood clotting time, and it goes on increasing, then we are dealing with the snake bites which are not amenable to our usual polyvalent ASV[41]. It is rare for a patient to be bitten again, following a bite from a venomous species However, some professions like Herpetologists and snake charmers are prone to repeated venomous snakebite. The dosage schedule for ASV in the event of a second bite is, however, unchanged. The same starting dose and repeat dose schedule as for a normal bite applies.

First aid for venom spit ophthalmia

1. Venom coming into contact with eyes can cause intense conjunctivitis with a risk of corneal erosions, complicated by secondary infection, anterior uveitis and even permanent blindness.

2. Irrigate the eye or other affected mucous membrane as soon as possible using large volumes of water or any other available bland fluid. Never use chemical solutions or petroleum products such as petrol or kerosene. Milk is soothing and can be used, or in an emergency beer or urine are possibilities. Keep irrigating the eyes, hold them under a slowly running tap for a several minutes, while opening the eyelids and rotating the eyeball. The eye will be very painful, so patience, tact and reassurance are needed.

3. The eye should be bandaged using a pad over the eye and dark glasses worn.

4. Don't let the victim rub the eye.

5. Seek urgent medical attention[43].

No evidence of systemic spread of venom from ocular spitting exposure, the use of intravenous antivenom unjustified and risks anaphylaxis.

The use of current textbooks and medical education do not adequately prepare doctors to treat snake bite, particularly in the areas of use of ASV, dealing with adverse reactions to ASV and specific measures to deal with neurotoxic bites. Local protocols and training are required to adequately prepare doctors to improve treatment and reduce mortality[44].

Desensitization procedure only in case of severe anaphylaxis reaction to ASV

Pre-medication: Administer Inj. Hydrocortisone 100 mg I.V. and Inj. Adrenaline 0.5 ml subcutaneously/Intramuscularly (+/- Promethazine)

STEPS OF DILUTION OF ASV

STEP	INSTRUCTIONS	TOTAL VOLUME	SOLUTION	DILUTION
1.	Dilute 1 ml of ASV in a vial with 10 ml of normal saline	10ml	A	
2.	1ml of solution A + 9 ml of saline	10 ml	B	1: 10
3.	1ml of solution B+ 9 ml of saline	10 ml	C	1: 100
4.	1ml of solution C + 9 ml of saline	10 ml	D	1: 1000
5.	1ml of solution D + 9 ml of saline	10 ml	E	1: 10,000

After dilution and preparation of Solution E, Inject 0.1ml of solution E IV followed by 1ml and then the entire solution E. continue the same process for solution D,C,B,A

respectively and then the full dose. Watch for anaphylaxis in every administration OD the ASV dilution.

RECOVERY SIGNS

- Bleeding stops within 15 - 30minutes.
- Blood coagulability is usually restored in 6 hours. Principal test is 2OWBCT.
- Post synaptic neurotoxic envenoming such as in Cobra bite, improve as early as 30minuutes to several hours.
- It takes more time to improve neurotoxic envenoming, reflecting the need for the body to generate new acetylcholine emitters.
- Active haemolysis and rhabdomyolysis may cease within a few hours and the urine returns to its normal colour.
- In patients with Shock, blood pressure may increase after 30 minutes.

Drugs not to be used in viper bites

Heparin has been proposed as a means of reducing fibrin deposits in DIC. However, heparin is contraindicated in Viper bites. Venom induced thrombin is resistant to Heparin, the effects of heparin on antithrombin III(ATIII) are negated due to the elimination of ATIII by the time Heparin is administered and heparin can cause bleeding by its own action. Trial evidence has shown it has no beneficial effect.

Botropase is derived from the venom of one of two South American pit vipers is a coagulant compound. It prolongs the coagulation abnormality by causing consumption coagulopathy in the same way as the Indian viper venom currently affecting the victim so it is not used.

MATERIALS AND METHODS:

Study Centre:

The study was conducted at Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur after obtaining institutional ethical clearance from Institutional Ethical Committee. Cases of snake bite admitted to three hospitals were included for the study after getting permission from the respective authorities (Government secondary care centers at Perambalur and Ariyalur district, and a private hospital at Erode).

Study Period: The study was carried out from January 2016 to December 2016.

Inclusion criteria:

- All patients who were admitted with complaints of snakebite during the study period were considered for the study

Exclusion criteria:

- Cases of unknown bite or who lacked evidence of snake envenomation were excluded.

Methodology

The relevant details of the study population were collected from three different areas and entered in a proforma (Annexure II b) which included the demographic and clinical profile, type of envenomation, details of ASV used and its adverse effects, outcome of the patient. Inj. ASV used in this study were from three manufacturers

namely Biovins, Biological.E.limited and Bhart serums which were depicted in this study as ASV I, ASV II and ASV III.

COMPOSITION OF ASV USED		
BioVins	**Biological.E.limited**	**Bharat Serum**
Cobra : 0.6 mg Common Krait : 0.45 mg Russell's Viper : 0.5 mg Saw-scaled Viper : 0.45 mg		
Preservative : cresol 0.25%	**Preservative** : phenol 0.25%	**Preservative** : cresol 0.25% **Stabilizer** : Glycine I.P **Excipients** : Mannitol I.P and Sodium Chloride I.P

(**The Batch number and manufacture date varies accordingly**)

The management of snakebite is as follows:

- Each case of snake bite was admitted and thoroughly examined by the treating doctor. After Securing airway the patient was subjected to Whole Blood Clotting Test (WBCT).
- Haemotoxic snake bite is characterized by WBCT >20minutes / presence of bleeding diathesis. They were administered 1 vial of ASV in 250-500 ml of normal saline at the rate of 10-15 drops/min over 15 minutes and was looked for signs of any adverse reactions. If no reactions were elicited, 7 more vials were added in that normal saline and administered over a period of one hour. If

repeat CT>20minutes and bleeding diathesis persists even after 6 hours, 5 vials was administer in 250-500ml normal saline over one hour. Two more times of 5 vials was repeated, if there is a bleeding tendency and CT>20 minutes. On persistent bleeding diathesis fresh frozen plasma or packed cells was administered.

- If WBCT is normal and the patients presents with signs of neurotoxicity such as dysphagia, diplopia, ophthalmoparesis or respiratory distress, ASV was administered same as the above. Patient was reassessed after 2 hours and if signs of envenomations persist or worsen, 8 more vials were added. Inj.Atropine 0.6mg IV, Inj. Neostigmine 1.5mg IM., was administered and Ventilator support was needed in cases of respiratory support.
- All the patients were monitored for a period of 12 to 24 hours
- For those who had any anaphylactic reactions, Inj. Epinephrine 0.5mg of 1:1000 solution IM (Repeat dose 10-15 minutes apart), Inj. Chlorpheniramine 2cc IM, Inj Ranitidine 50mg IV, Normal saline 500-1000 ml IV rapidly, Inj hydrocortisone 300-500mg IV was administered.

Causality and ADR severity assessment:

The data obtained were subjected to causality assessment using Liverpool algorithm (Annexure II c) and the ADR severity assessment using Modified Hartwig Seigel scale (Annexure II d).

Statistical Analysis

Data obtained was recorded in a structured case record form which was entered in excel format and analyzed using SPSS 16 software. Descriptive statistics, percentages was used for analysis. P value of 0.05 was taken as statistically significant. Chi square test was used to check the test of significant between associated factors.

RESULTS:

In this study, 476 patients were included. 370(77.73%) patients were from perambalur district, 64(13.44%) patients from Ariyalur district and 42(8.82%) patients from Erode district.

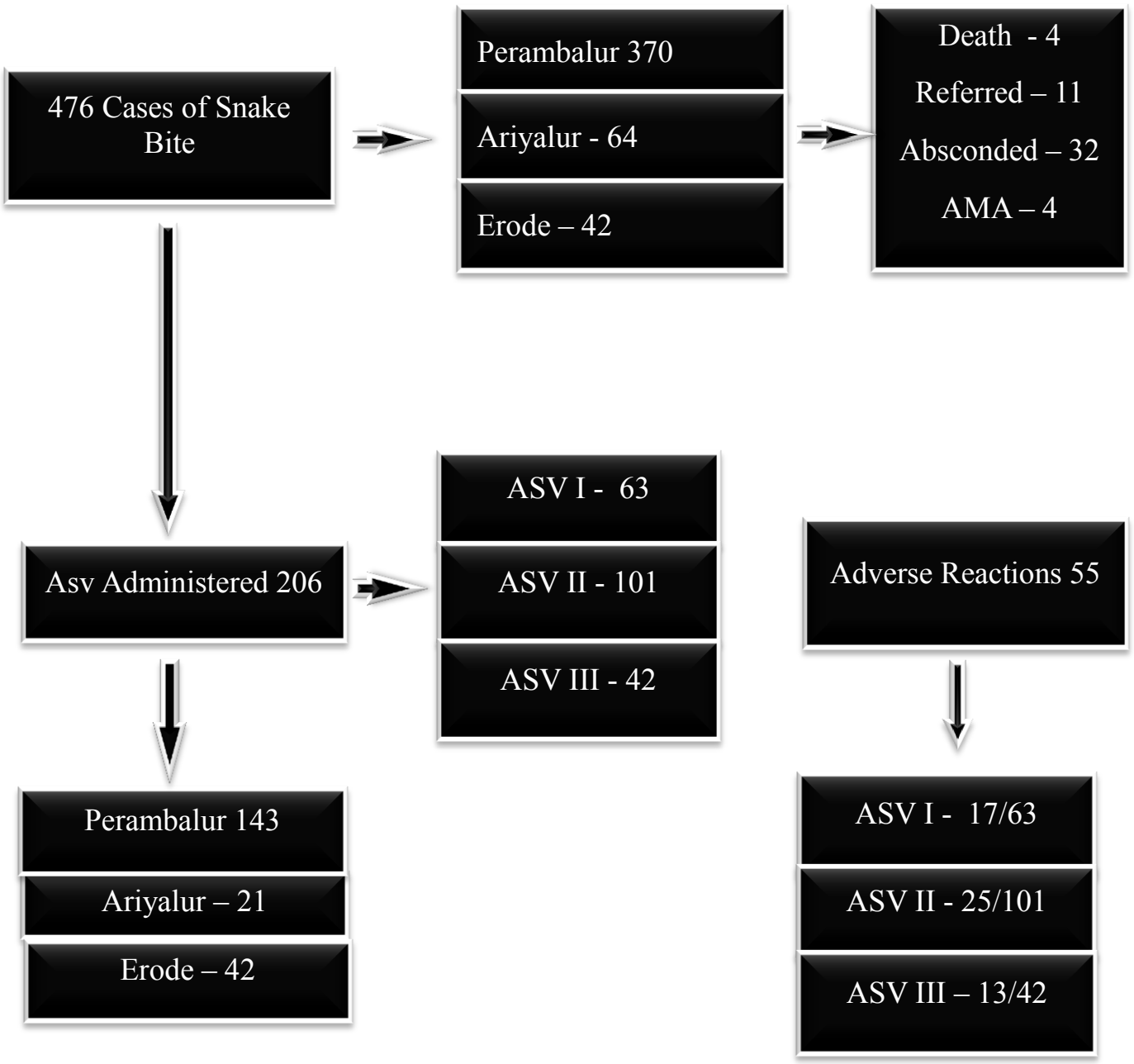
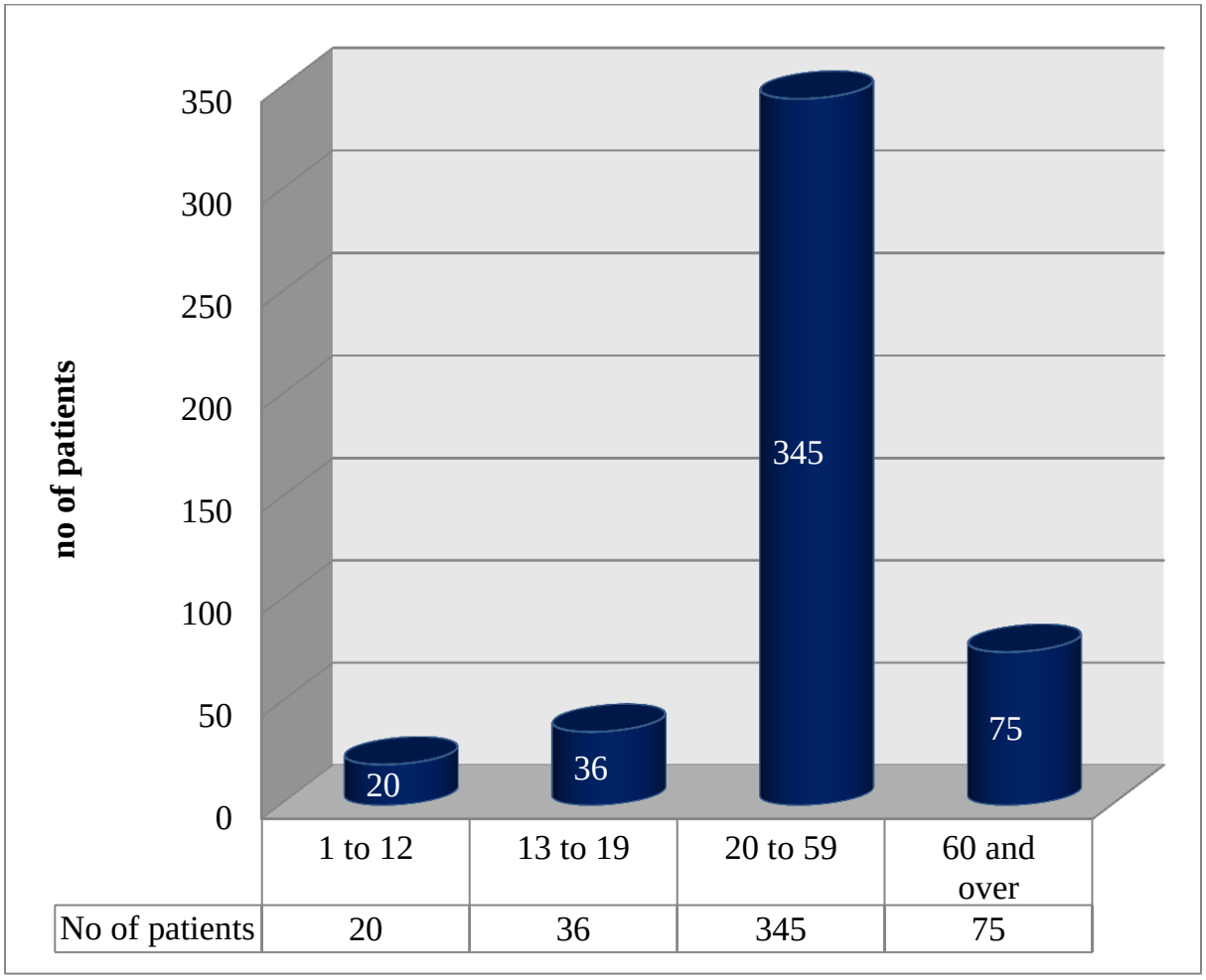
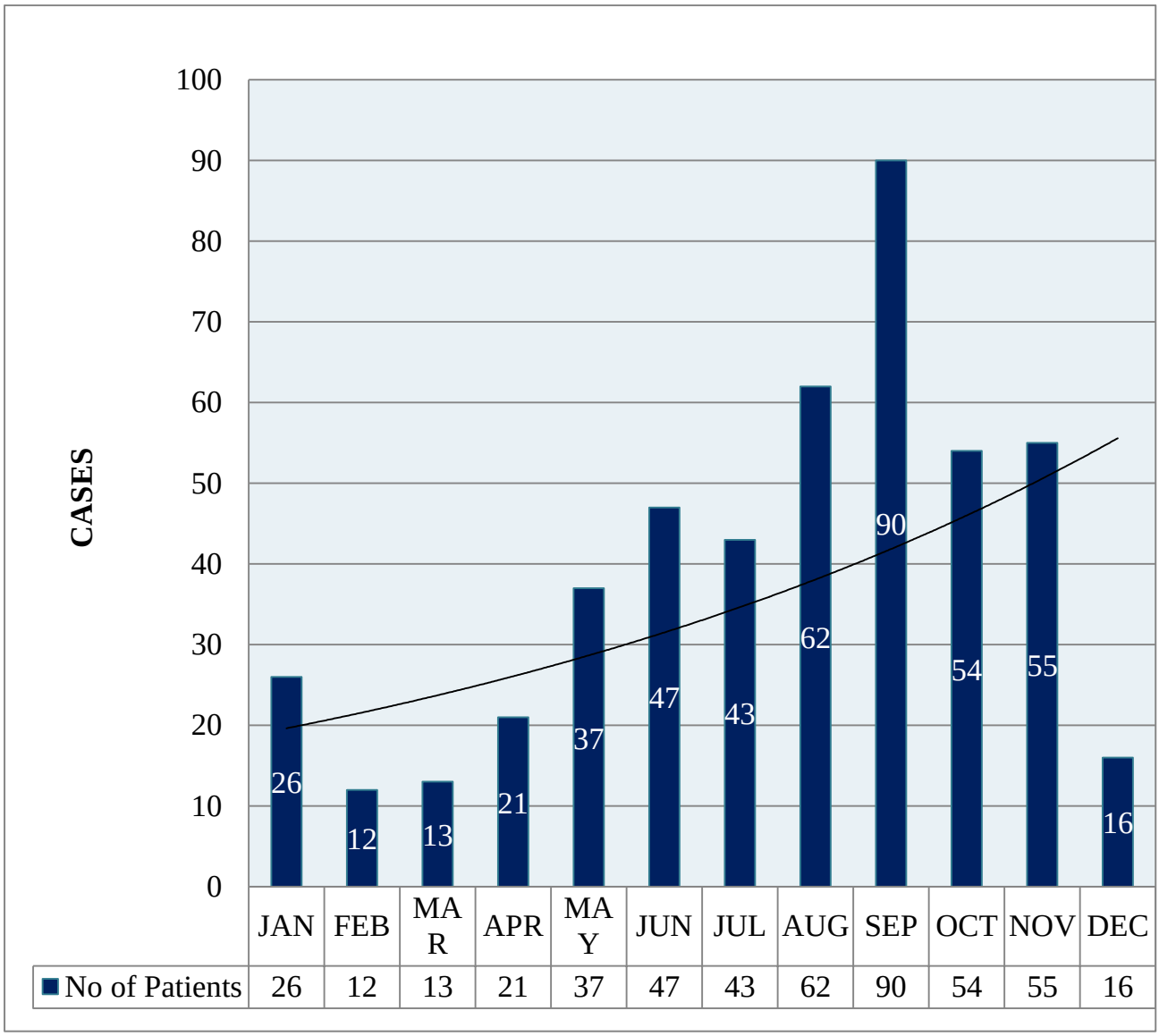


Figure 1: AGE WISE DISTRIBUTION OF SNAKE BITE VICTIMS



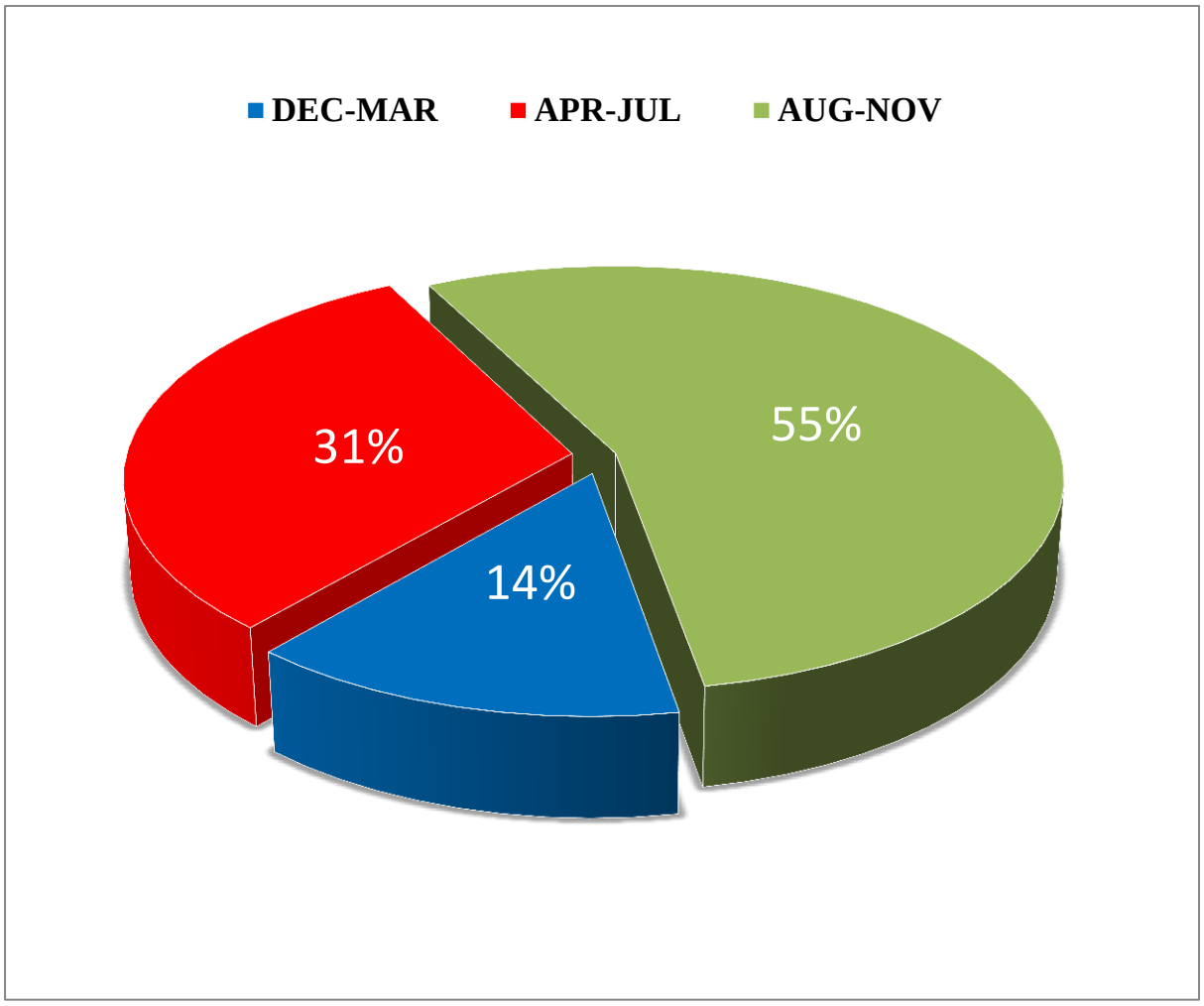
345 (72.5%) of the patients in this study belong to adult age group (20 to 59 years).

Figure 2: MONTH WISE DISTRIBUTION OF SNAKE BITE VICTIMS



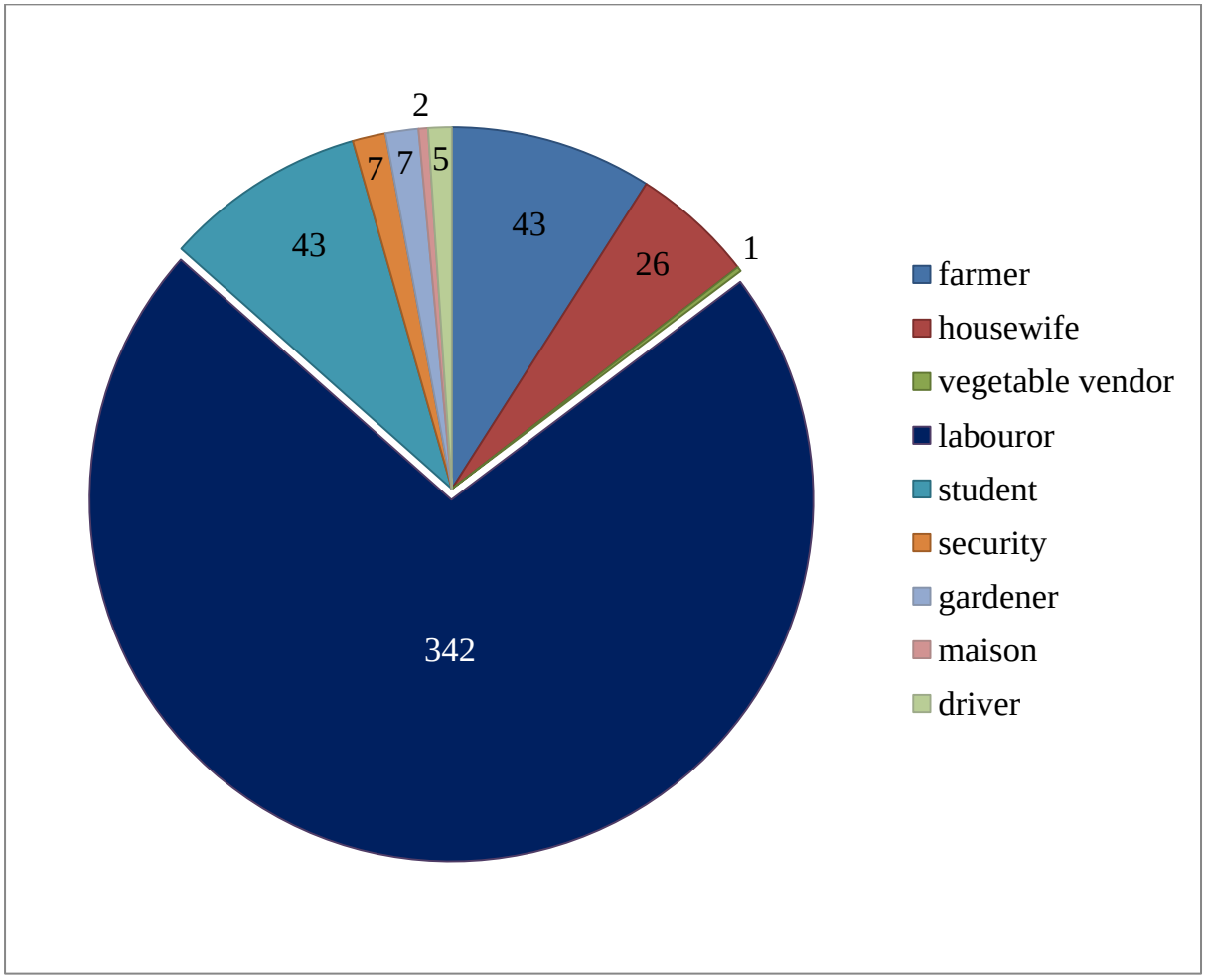
90 (19%) cases of the study population was exposed to snake bite the month of September and the least exposure was during February (12).

Figure 3: SEASONAL VARIATION OF SNAKEBITE CASES



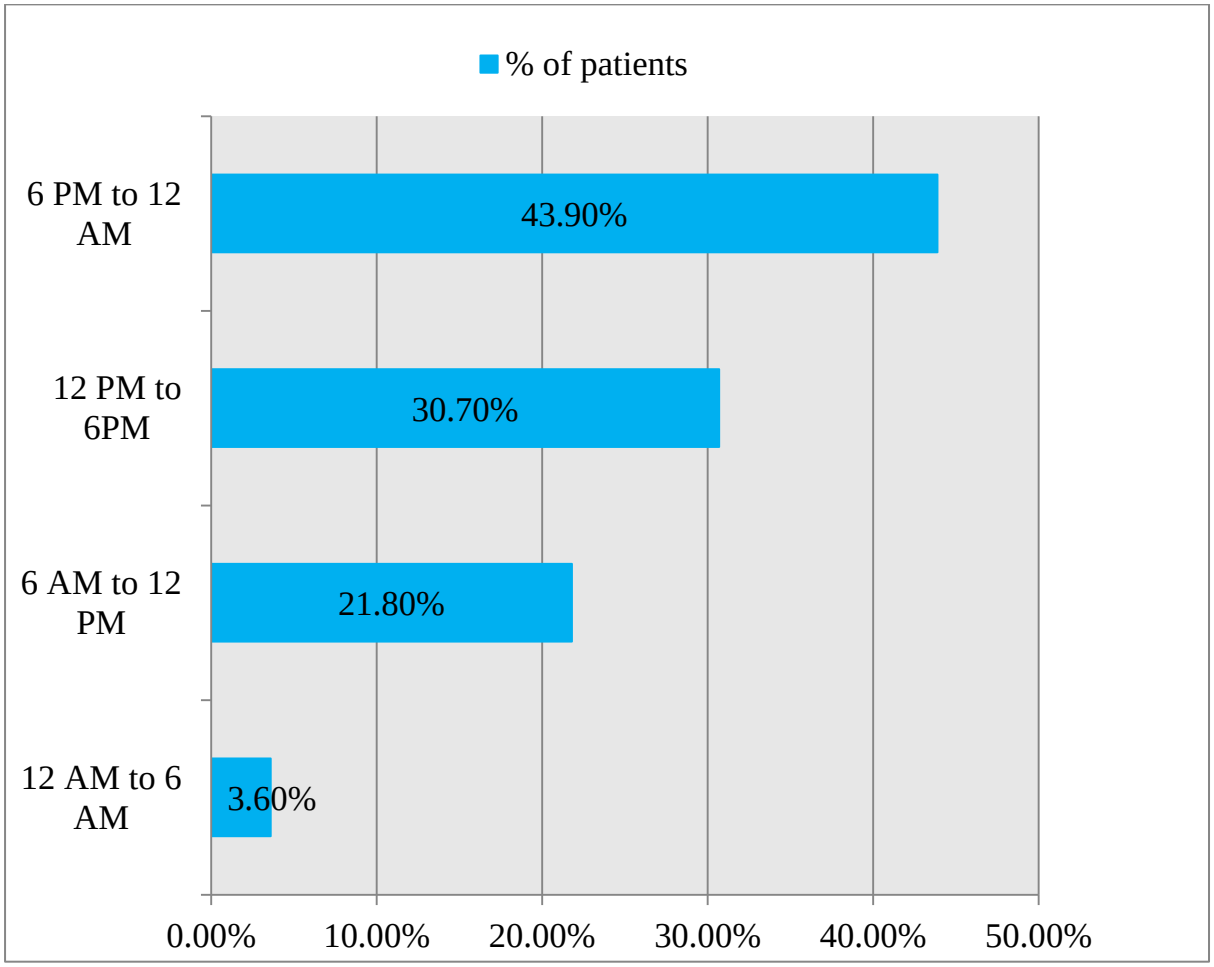
55% of the study population was exposed to snake bite between august and November.

Figure 4: OCCUPATIONAL DISTRIBITION IF THE STUDY POPULATION



342 (71.9%) Laborers were commonly affected among the study population. 43 (9.03%) students were also exposed to snake bite in this study.

Figure 5: TIME OF ADMISSION OF THE STUDY POPULATION



Around 43.9% of the patients were exposed to snake bite during the time period between 6pm to 12am.

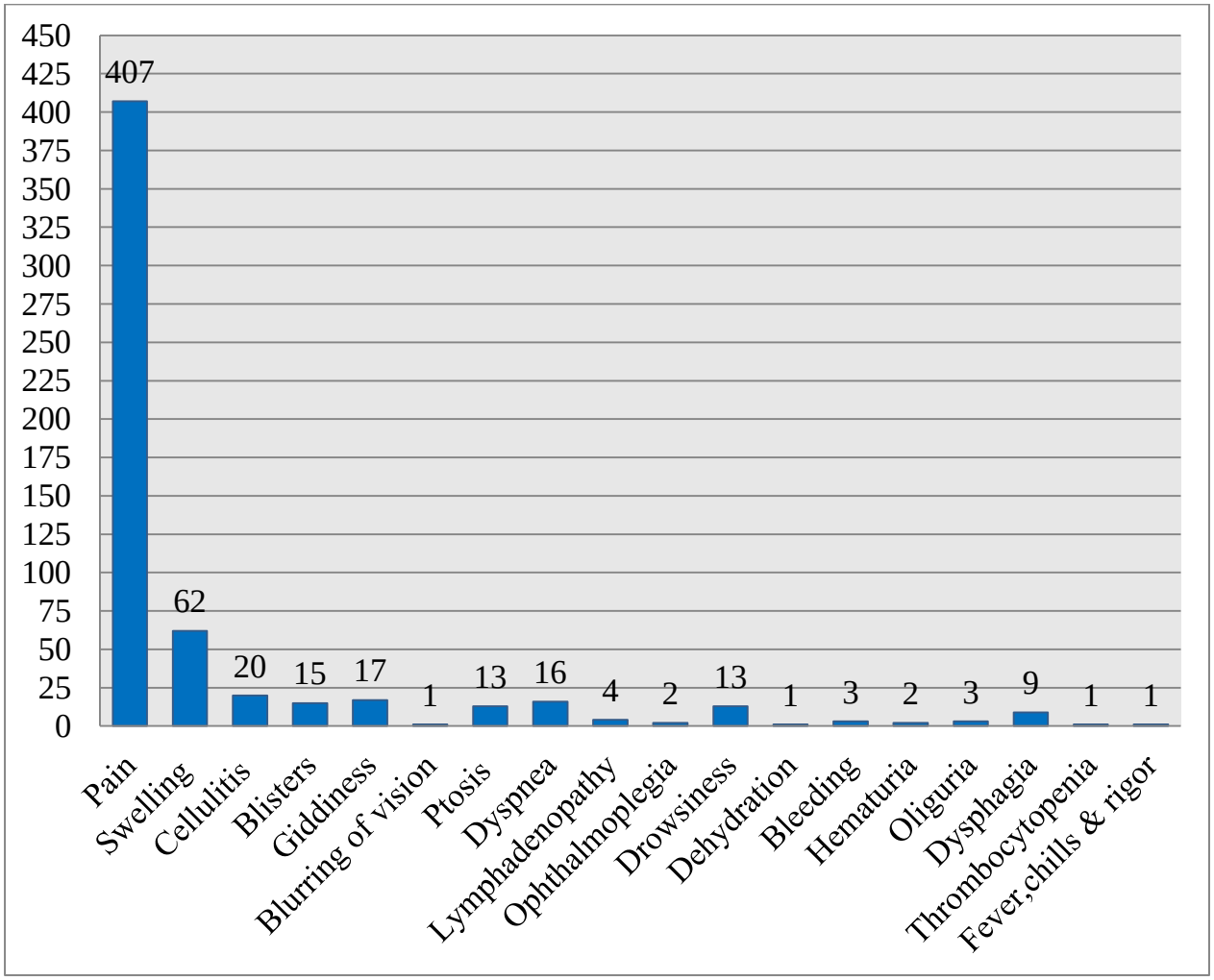
Table 5: DISTRIBUTION OF PRE-HOSPITAL INTERVENTION

AMONG SNAKE BITE VICTIMS

INTERVENTION	NO OF PATIENTS (%)
Nil	414 (87)
TOURNIQUET	21 (4.4)
INJ TT	20 (4.2)
TURMERIC (topical)	9 (1.9)
HERB *(Andrographis paniculata – Siriyanangai*)	12 (2.5)

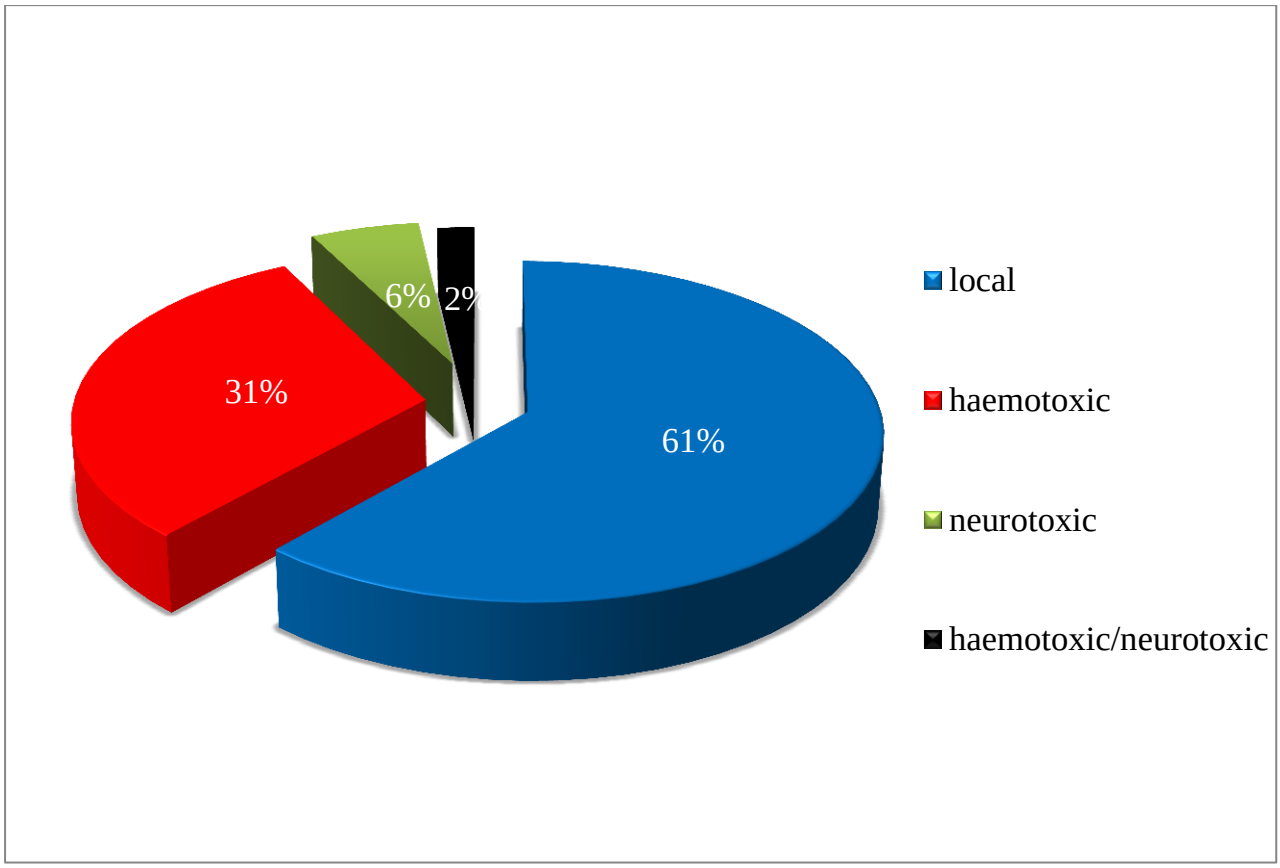
Almost 87% of the patients did not receive any pre hospital intervention. Topical application of turmeric and ingestion of herb-Andrographis paniculata (Siriyanangai) were also administered in 20 (4.2%) and 12 (2.5%) patients respectively.

Figure 6: CLINCAL MANIFESTATIONS OF SNAKE BITE VICTIMS



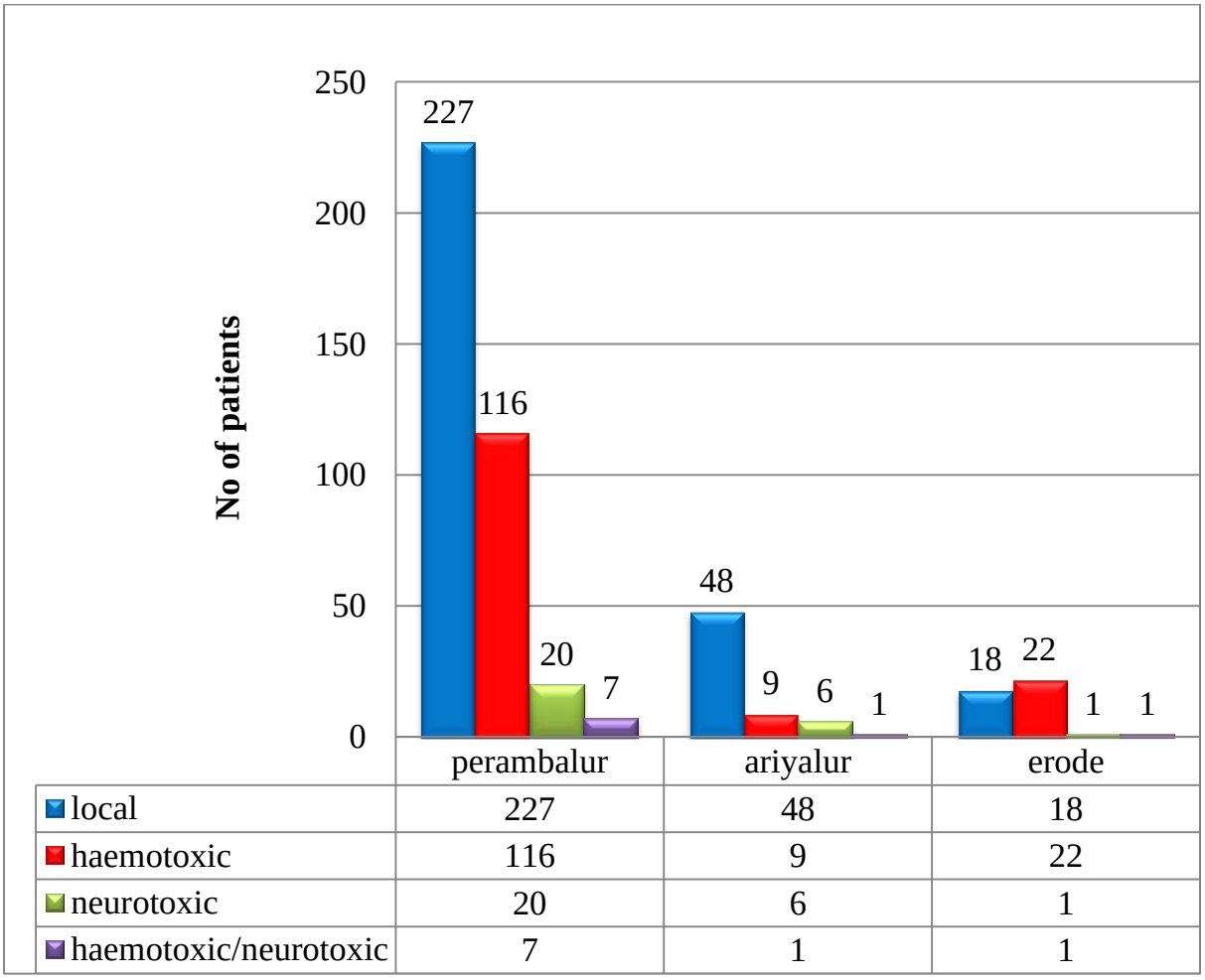
Almost 85% of the snake bite victims had pain as the most common symptom. Ptosis (13), dyspnea (16) and drowsiness (13) were most common in neurotoxic snake bites.

Figure 7: DISTRIBUTION OF SNAKEBITE VICTIMS ACCORDING TO THE TYPE OF ENVENOMATION



166 (34.9%) had WBCT > 20. 61% of the cases had local envenomation in the study population.2% had haemotoxic and neurotoxic envenomation.

Figure 8: DISTICT WISE DISTRIBUTION OF VARIOUS ENVENOMATIONS



	perambalur	ariyalur	erode
local	227	48	18
haemotoxic	116	9	22
neurotoxic	20	6	1
haemotoxic/neurotoxic	7	1	1

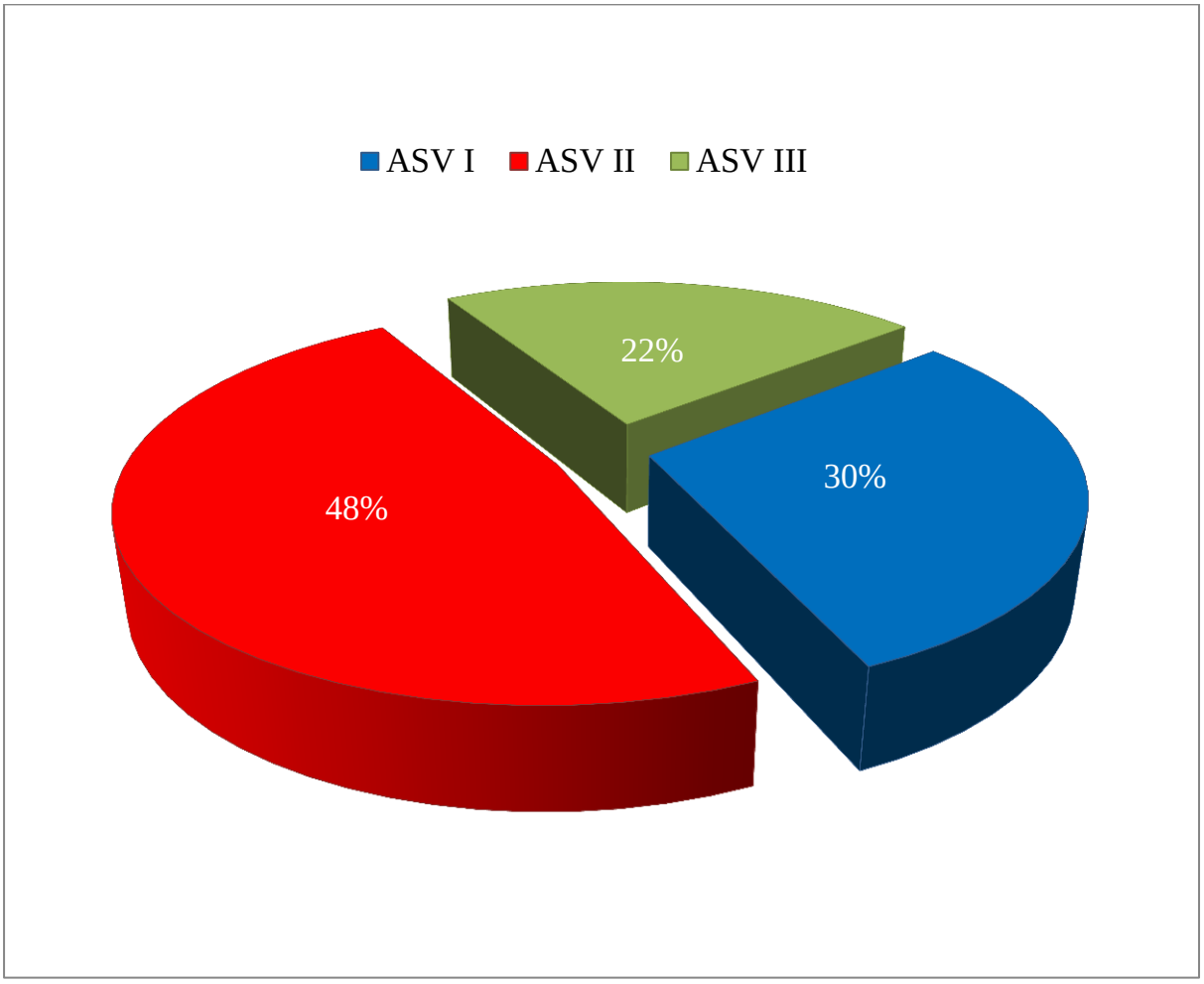
Local envenomation was more common among all the snake bite victims in the study population. Especially in Perambalur District where 61.35% patients had local envenomation.

Table 6: APPROXIMATE TIME BETWEEN SNAKE BITE AND ADMINISTRATION OF ASV

BITE TO NEEDLE TIME (hours)	NO OF PATIENTS (%)
<1	170 (82.5)
1 to <3	24 (11.6)
3 to <6	7 (3.39)
6 to <12	3 (1.4)
>12	2 (0.9)

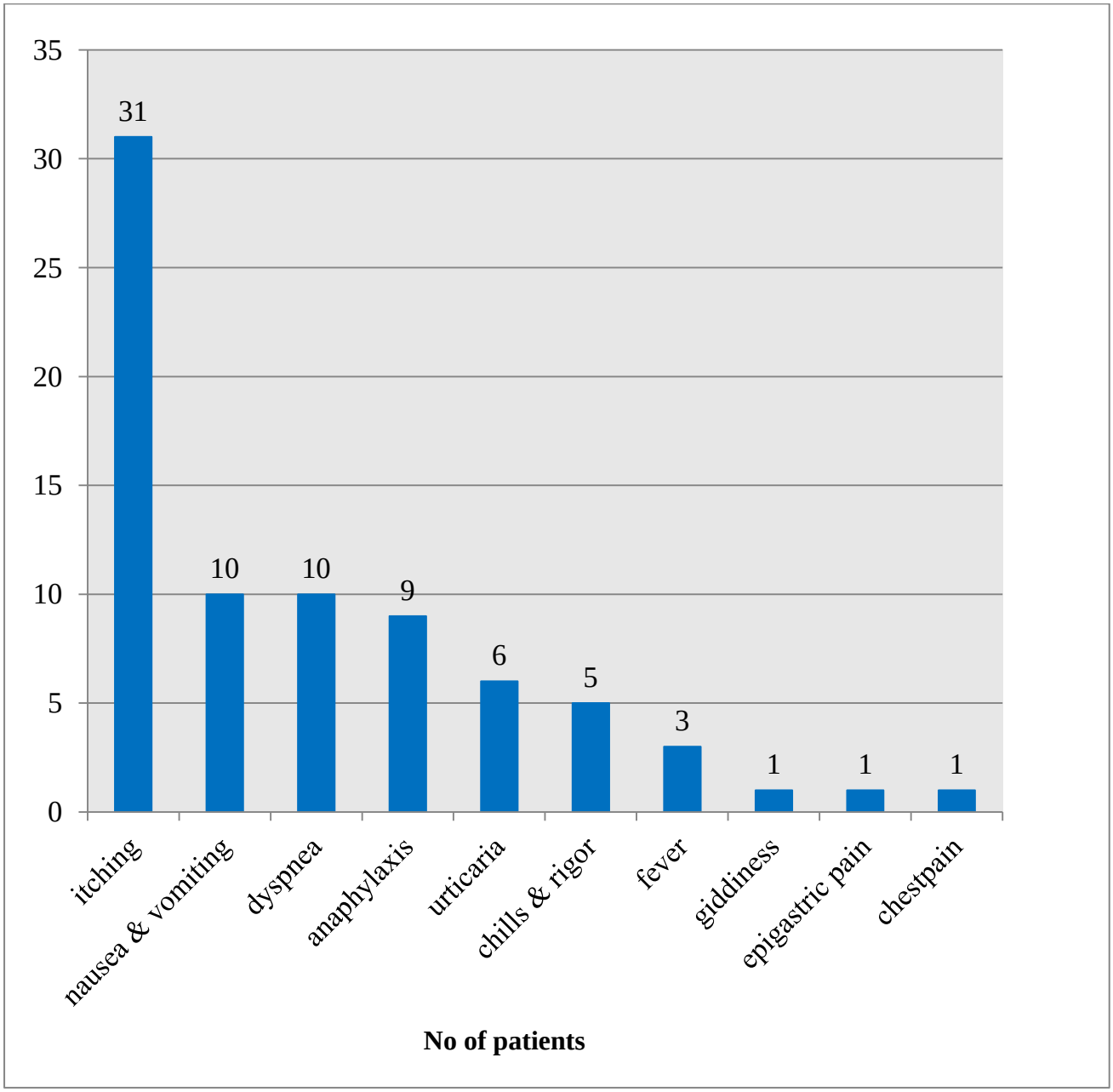
Almost 82.5% of the cases had reached the hospital within 1 hour and was administered with ASV. Only 2 patients reached after 12 hours of snake bite exposure.

Figure 9: DISTRIBUTION OF THE ASV MANUFACTURERS



All the cases who were administered ASV received it according to the availability of type of manufacturer.

Figure 10: DISTRIBUTION OF ADVERSE REACTION OF ASV



Out of 206 patients administered with Anti Snake Venom, 55 (26.7%) cases had adverse reactions in this study population.

Table 7: DISTRIBUTION OF REACTIONS AMONG THREE DISTRICTS

	DISTRICTS			TOTAL
	PERAMBALUR (%)	**ARIYALUR(%)**	**ERODE(%)**	
ASV ADMINISTERED	143 (69.41)	21 (10.19)	42 (20.38)	206 (43.3)
REACTIONS	35 (24.3)	5 (23.8)	15 (36.6)	55 (26.7)

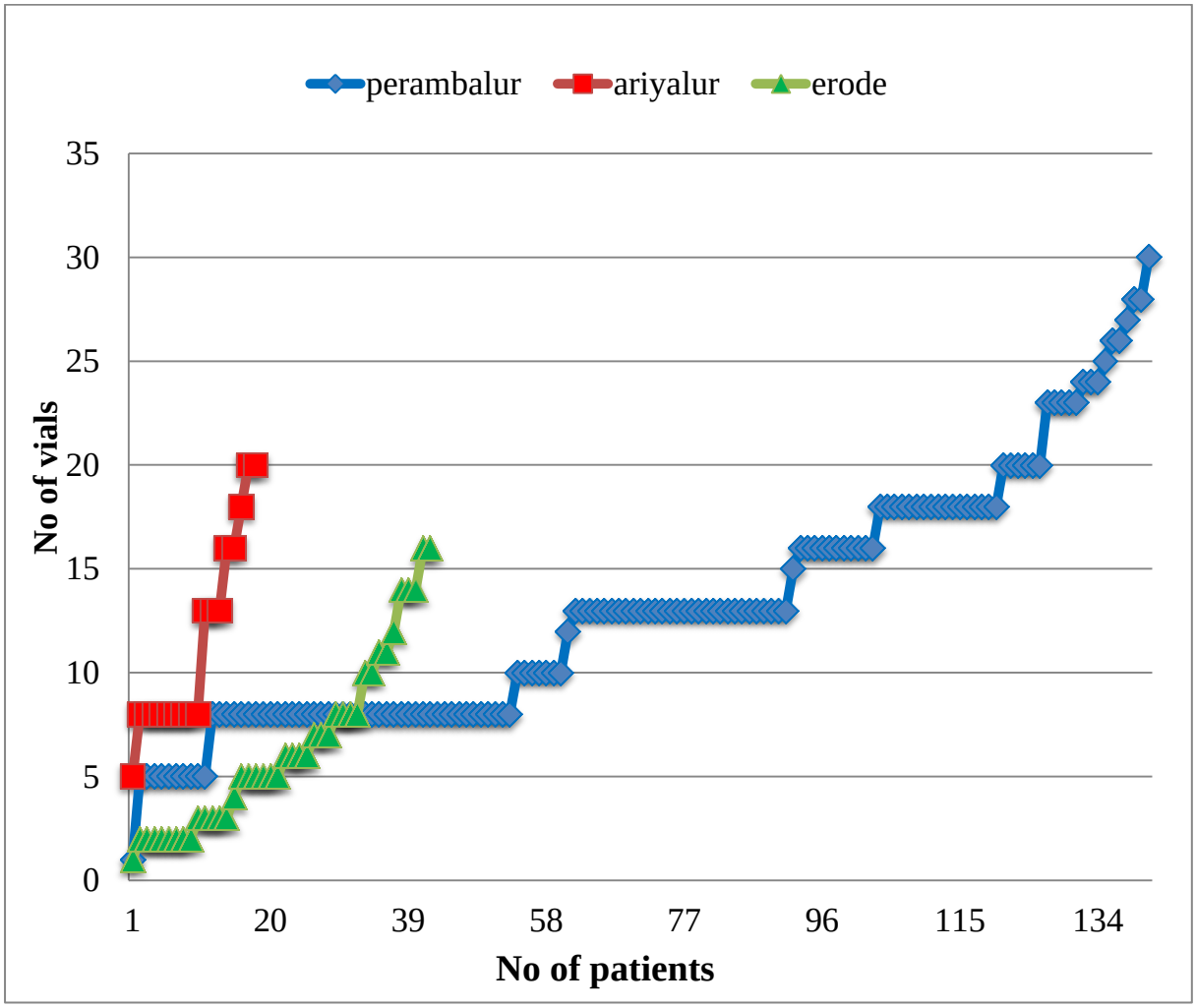
Adverse reactions were observed in 35/143 cases in Perambalur, 5/21 cases in Ariyalur and 15/42 cases in erode.

Table 8: DISTRIBUTION OF REACTIONS RELATED TO TYPE OF ENVENOMATION

TYPE OF ENVENOMATION	REACTIONS		TOTAL
	PRESENT (%)	ABSENT (%)	
LOCAL	6 (23.07)	20 (76.93)	26
HAEMOTOXIC	39 (27.08)	105 (72.92)	144
NEUROTOXIC	8 (29.62)	19 (70.38)	27
HAEMOTOXIC / NEUROTOXIC	2 (22.22)	7 (77.78)	9
TOTAL	55 (26.7)	151 (73.3)	206

39 (27.08 %) adverse reactions observed were among patients with haemotoxic envenomation. 8 (29.62 %), 6 (23.07%), 2 (22.22%) adverse reactions among local, neurotoxic and haemotoxic/neurotoxic envenomation respectively.

Figure 11: DISTRICT WISE DISTRIBUTION OF TOTAL ASV VIALS USED PER SNAKE BITE VICTIM



More number of ASV vials was used in perambalur district. A maximum of 30 vials were used.

Table 9: DISTRICT WISE DISTRIBUTION OF ASV VIALS USED PER SNAKE BITE VICTIM

DISTRICT	NUMBER OF PATIENTS	MINIMUM	MAXIMUM	TOTAL VIALS USED	MEAN±SD
PERAMBALUR	143	1	30	1853	12.76±6.29
ARIYALUR	21	1	20	206	9.81±6.01
ERODE	42	2	16	271	6.56±4.17
TOTAL	206	1	30	2330	11.59 ± 6.38

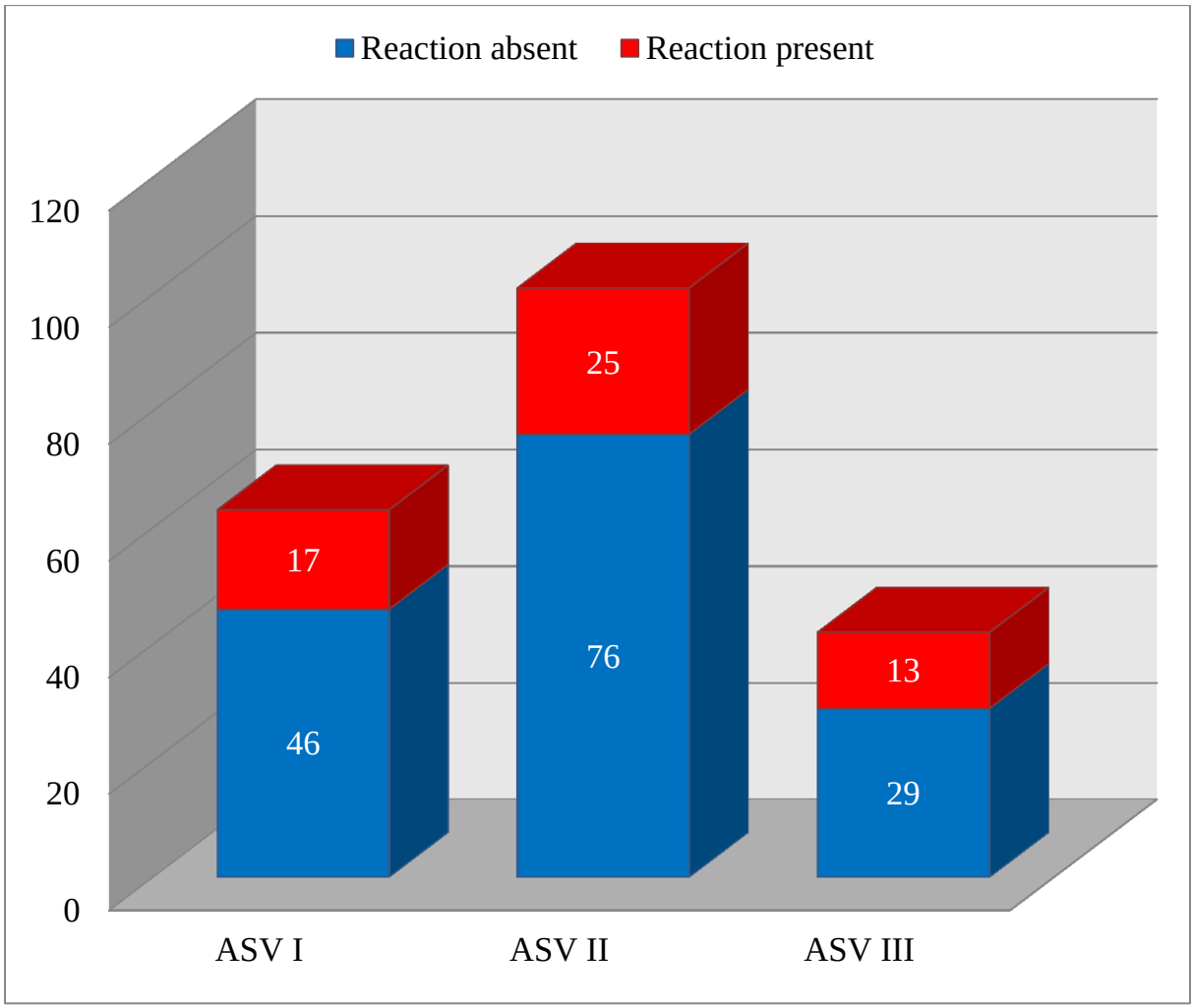
Total ASV vials used were 2330 and the Mean ASV vials used were 11.59 ± 6.38 in this study.

Table 10: DISTRIBUTION OF ASV VIALS AMONG THE HAEMOTOXIC AND NEUROTOXIC SNAKE BITE

TYPE OF ENVENOMATION	TOTAL ASV VIALS USED	MEAN VIALS USED	RANGE
HAEMOTOXIC	1634	11.5±5.6	1 to 30
NEUROTOXIC	392	17±6.1	5 to 26

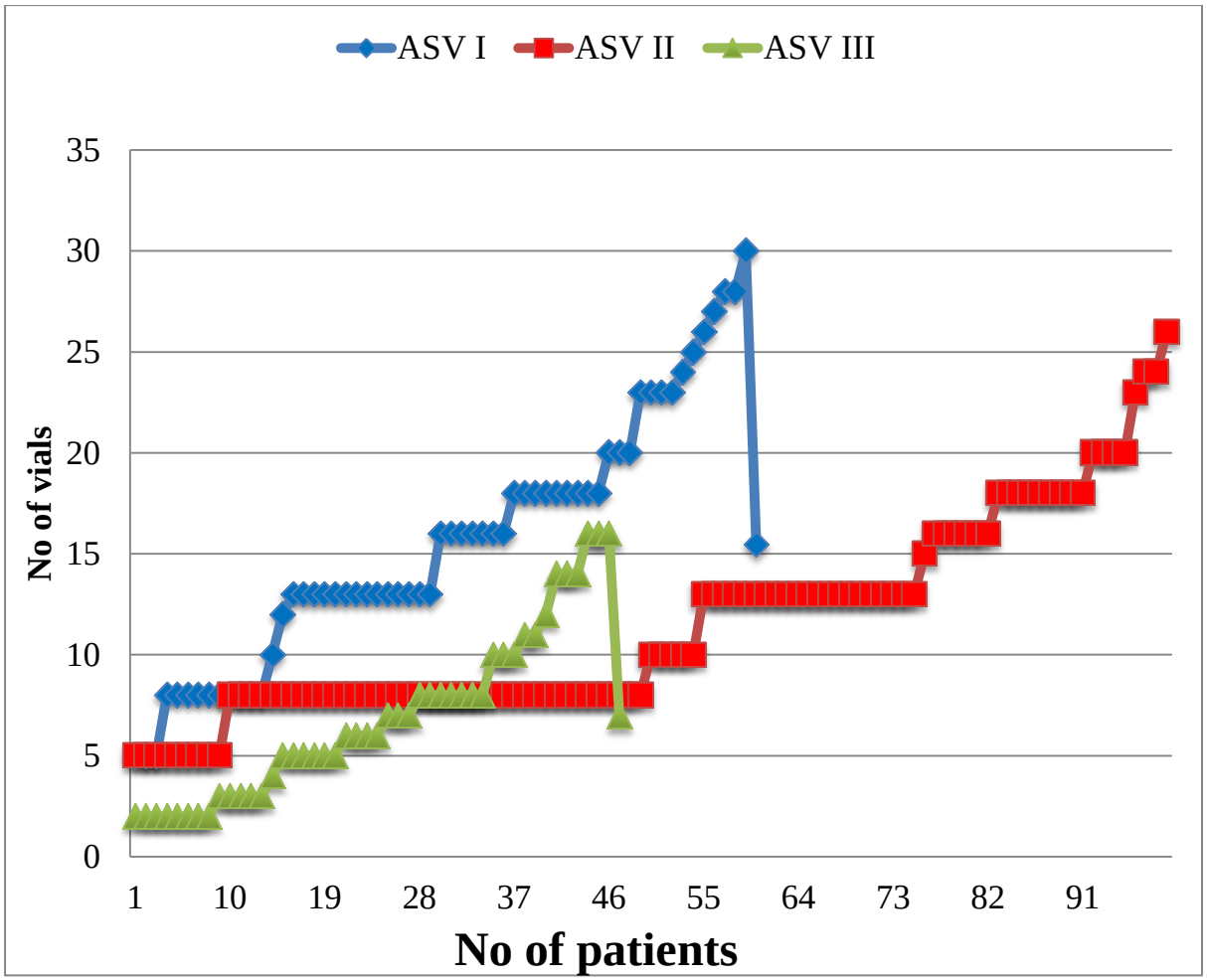
11.5 ± 5.6 and 17 ± 6.1vials were used among haemotoxic and neurotoxic snakebite.

Figure 11: DISTIBUTION OF ADVERSE REACTIONS AMONG THREE ASV MANUFACTURERS USED



ADVERSE REACTION	ASV I	ASV II	ASV III
PRESENT (%)	17 (26.9)	25 (25.74)	13 (30.9)
ABSENT	46	76	29
TOTAL	63	101	42

Figure 12: MANUFACTURER WISE DISTRIBUTION OF TOTAL ASV VIALS USED



ASV II was the most commonly used manufacturer among the study population.

Table 13: DISTRIBUTION ADVERSE REACTIONS AMONG THREE MANUFACTURERS

MANUFACTURER	REACTION PRESENT (%)	REACTION ABSENT (%)	TOTAL
ASV I	17 (26.9)	46 (73.1)	63
ASV II	25 (24.75)	76 (75.24)	101
ASV III	13 (30.9)	29 (69.04)	42
TOTAL	55 (26.7)	151 (73.3)	206

- P-value = 0.746 (>0.05).
- A non significant P value determines that there is no relationship in the incidence of adverse reaction between the type of manufacturer and adverse reactions.

Table 14: DETERMININATION THE STRENGTH OF ASSOCIATION OF ADVERSE REACTIONS BETWEEN ASV-I & ASV-II

MANUFACTURER	REACTION PRESENT	REACTION ABSENT	TOTAL
ASV I	17	46	63
ASV II	25	76	101
TOTAL	42	122	164

- P-value = 0.7501 (>0.05).
- On comparing ASV I and ASV II, there is no significant change in relationship between the manufacturer and incidence of adverse reaction.

Table 15: DETERMINATION THE STRENGTH OF ASSOCIATION OF ADVERSE REACTIONS BETWEEN ASV-II & ASV-III

MANUFACTURER	REACTION PRESENT	REACTION ABSENT	TOTAL
ASV II	25	76	101
ASV III	13	29	42
TOTAL	38	105	143

- P-value = 0.4446 (>0.05).
- On comparing ASV II and ASV III, there is no significant change in relationship between the manufacturer and incidence of adverse reaction.

Table 16: DETERMINATION THE STRENGTH OF ASSOCIATION OF ADVERSE REACTIONS BETWEEN ASV-I & ASV-III

MANUFACTURER	REACTION PRESENT	REACTION ABSENT	TOTAL
ASV I	17	46	63
ASV III	13	29	42
TOTAL	30	75	105

- P-value = 0.6592 (>0.05).
- On comparing ASV I and ASV III, there is no significant change in relationship between the manufacturer and incidence of adverse reaction.

Table 17: GENDER WISE DISTRIBUTION OF ADVERSE REACTIONS OF ASV

GENDER	REACTIONS		TOTAL
	PRESENT (%)	ABSENT	
MALE	32 (24.2)	100	132
FEMALE	23 (31.1)	51	74
TOTAL	55 (26.7)	151	206

Adverse reactions were more common among female (31.1%) in this study population.

Table 18: DISTRIBUTION OF ADVERSE REACTIONS RELATED TO PRE-HOSPITAL INTERVENTIONS

PREHOSPITAL INTERVENTION	REACTIONS		TOTAL
	PRESENT (%)	ABSENT	
NO INTERVENTION	48 (28.4)	121	169
TOURNIQUET	3 (27.2)	8	11
INJ TT	1 (11.1)	8	9
TURMERIC (topical)	1 (20)	4	5
HERB (*Andrographis paniculata* – *Siriyanangai*)	2 (16.6)	10	12
TOTAL	55 (26.7)	151	206

28.4 % of adverse reactions were observed in patients without any pre-hospital intervention.

Table 19: DISTRIBUTION OF ADVERSE REACTIONS AND NUMBER OF ASV VIALS USED

NO OF VIALS	REACTIONS		TOTAL
	PRESENT (%)	ABSENT	
1 - 10	32 (58.18)	78	110
11- 20	19 (34.54)	62	81
>21	4 (7.3)	11	15

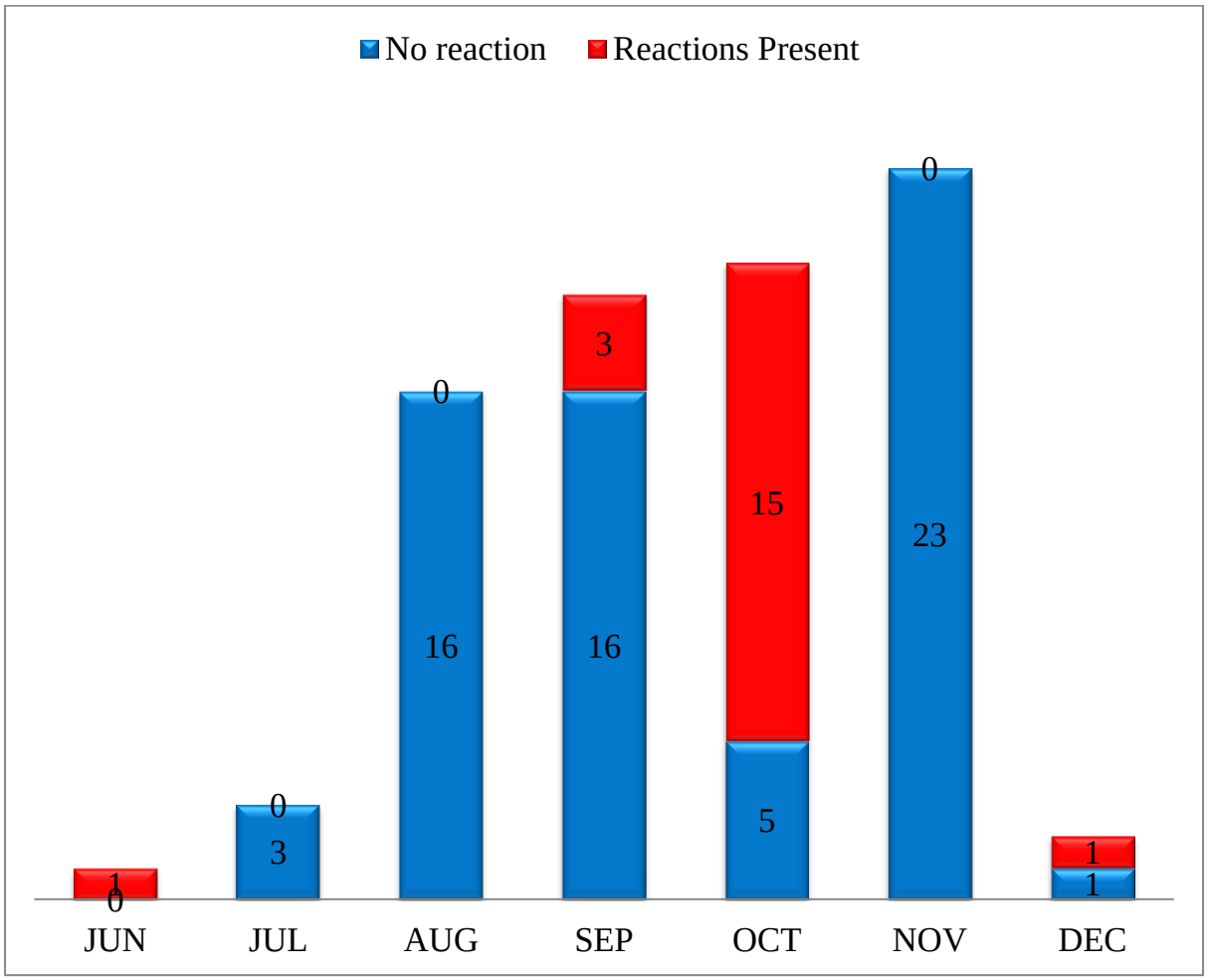
Adverse reactions was more common (58.18%) in the cases who received ASV between 1 to10 vials.

Table 20: FREQUENCY OF ASV VIALS USED IN HAEMOTOXIC AND NEUROTOXIC SNAKE BITE

DISTRIBUTION OF VIALS	HAEMOTOXIC (%)	NEUROTOXIC (%)
<10	74(51)	5(18.5)
11 TO 20	59(40.7)	15(55.6)
>21	12(8.3)	7(25.9)

40.7% cases of haemotoxic envenomation and 55% of neurotoxic envenomation required a total of 11 to 20 ASV vials.

Figure 14: MONTH WISE DISTRIBUTION OF ADVERSE REACTIONS OF ASV-II IN PERAMBALUR

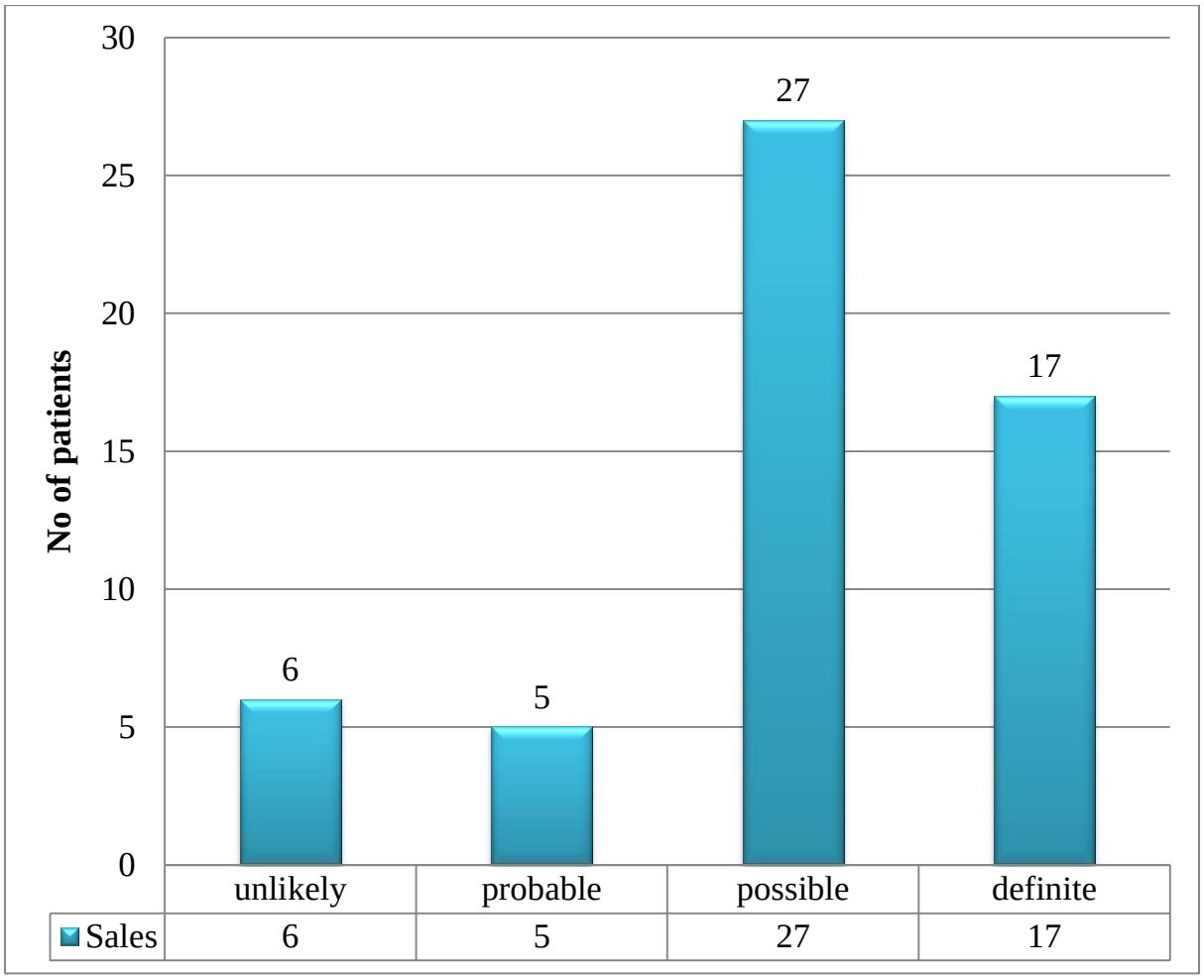


An important finding in this study revealed, 15/20 patients who received ASV-II in the study population had adverse reactions during the month of October.

Table 21: DETAILS REGARDING PATIENTS DECEASED DUE TO SNAKE BITE

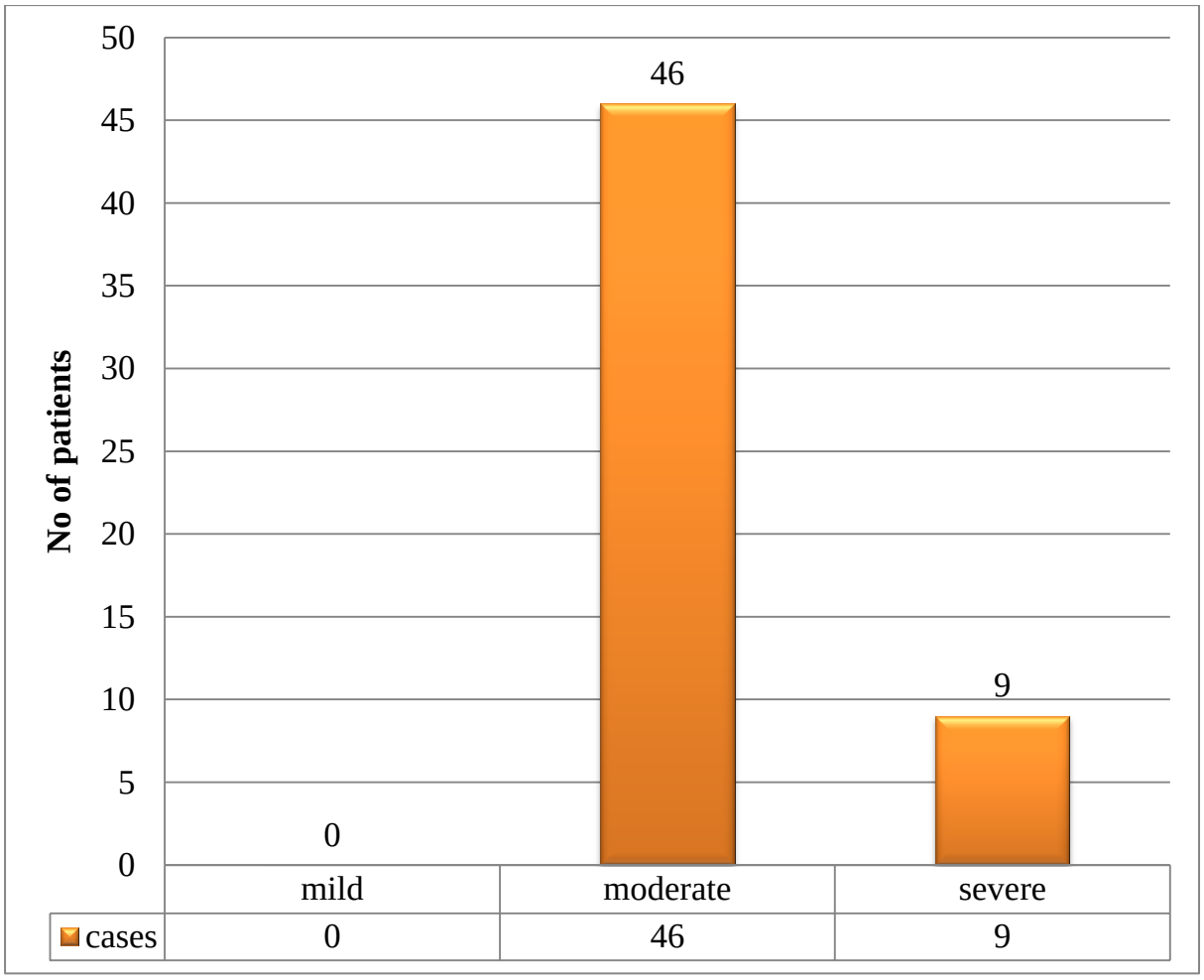
PARAMETERS	CASE 1	CASE 2	CASE 3	CASE 4
Age/Sex	20/male	55/male	37/male	70/male
District	Perambalur	Perambalur	Perambalur	Perambalur
Snake Identified	no	no	yes (common krait)	no
Pre-hospital intervention	Tourniquet application	no	no	Herb (Andrographis paniculata)
Bite to needle time (approx.)	1 hour	1 hour	45 mins	1 hour
WBCT	>20	>20	14	12
Type Of Envenomation	haemotoxic	haemotoxic	neurotoxic	neurotoxic
ASV Used	ASV-I	ASV-I	ASV-II	ASV-I
Total ASV vials Used	8	20	24 (single dose)	24
ADR	yes (anaphylaxis)	yes (itching)	no	no
Outcome	cardiac arrest	cardiac arrest	respiratory failure	respiratory failure

Figure 15: CAUSALITY ASSESSMENT OF ADVERSE REACTIONS OF ASV USING THE LIVERPOOL ALGORITHM



As per Liverpool algorithm the maximum number of antivenom reactions were possible (27) and definite (17).

Figure 16: SEVERITY ASSESSMENT OF ADVERSE REACTIONS OF ASV USING MODIFIED HARTWIG AND SEIGEL SEVERITY SCALE



Our study revealed that maximum number (46) of ASV reaction were moderate in nature.

DISCUSSION

This is the first large descriptive study, from a secondary care center of Perambalur and Ariyalur districts of Tamilnadu on the clinicoepidemiological profile and the treatment outcome of the snake bite cases,. The data reported in India is less than 40% as most of the patients prefer for public hospitals[45]. During the study period, around 476 patients were admitted with snake bite. Bites were common in the adult age group of 19 to 59 years (72.4%) with males(64.3%) more affected than females (35.7%) which may be attributed to the fact that men in this age group are economically active and involved in outdoor activities compared to females. To the best of our knowledge majority of studies reported low incidence in female patients. Teenagers (36) also played an important role as snake bite victims in this study, suggest that more ambulant population is at the highest risk for snake bite in this region and have been reported in studies from different places in India. The youngest patient recorded was a 2 years old female child bitten at home.

Perambalur district topped the highest number of patients (77.7%) when compared with Ariyalur district (13.4%) in the study period. Perambalur is inland district with no coastal line. It was once a rural area under Tiruchirapalli district has been trifurcated at the 1995 and further in the 2007 was bifurcated into Perambalur and Ariyalur district. Erode is the largest district by area in the state before its division into Tirupur. Erode is bounded by the rivers Palar in the North West and Cauvery in the south east. It is characterized with scanty rainfall and a dry weather throughout except monsoon season. The study Centre at erode is present at thalavady is surrounded by reserved forest which is 244 sq.km. The private hospital was chosen in

order to differentiate the type of manufacturer of ASV used. Only 42 patients have been reported with snake bite in the private hospital at Erode district. This may be due to the fact that cost effectiveness of the ASV plays an important role in management of snake bite. Since ASV is free of cost in the government sector, patients prefer a cost effective treatment for this dangerous tropical disease.

There was a diverse distribution of cases throughout the year. The month of September topped the highest number of cases (19%). Most of the Studies which have quoted their results had a significant rainfall which was an important causative factor to epidemiological exposure to larger interaction of humans for snake bites[46]. The weather forecast in the earlier years was totally different in the year 2016. There was a wide range in the season where the monsoon season did not provide enough rainfall. There were only drizzles during the raining season which does not create a great impact in disrupting the snake habitat. 31% of cases were from the months between April and July, 55% during august and November.

All the three districts of the study areas had agriculture as the major occupation. Laborers (72.4%) were more among them. Around 9% of the snake bite victims were students of school and college going. The study area being a developing urban area has a smaller sq.km which had all the necessary institutions within a smaller geographical area. This also influenced the patients not to consider any traditional intervention or native treatment. None of the victims adopted either of the WHO-recommended first aid methods such as pressure immobilization bandaging or local compression pad immobilization. So 87% of the overall patients did not expose to any pre hospital intervention. The most common pre hospital intervention in our

study was the application of tourniquet (21) and administration of parentral tetanus toxoid (20). Nine patients used topical application of turmeric and 12 patients used topical application of extract of *Andrographis paniculata* (*Siriyanangai*). About 43.9% of the patients have reported to the hospital within 6PM and 12AM where most of the incidental exposure to snakes occurs.

In this study, we found that in majority of cases the exact snake species was not identified, even though fang marks and other symptoms suggestive of venomous bites were present in these cases. Only 10 snakes were identified in this study (common krait -3 & Russel's viper -7). The identification of snake bite is more often given a lower priority as more number of patients is unable to determine the species. The observation that bites were common in lower limb (76.3%) compared to upper limb (23.7%) suggest that in most cases the snakes were stepped on inadvertently. This may be due to the fact that these bites were quick and defensive bites and the patients were had poor visibility in nocturnal bite, unnoticed, immediate transportation to the hospital, frequently anxious, frightened to identify the species. Pain (85%) and swelling (13%) was the classical clinical manifestation of the victims in our study, followed by cellulitis in 20 patients. Ptosis and drowsiness was seen in 12 patients. Whole Blood Clotting Time (WBCT) was the gold standard laboratory investigation for determining the severity of envenomation. 166 (34.9%) patients had a WBCT >20. The geographical variation is not restricted only to the incidence and occurrence of snake bite. Species variations are also an important indicator in determining the severity of snake bite. In our study local envenomation was the commonest type of envenomation among all. 61% of the total patients had local envenomation followed

by haemotoxic (31%), neurotoxic (6%). Both the Haemotoxic and neurotoxic (2%) envenomation which is more characteristic of Russel's viper with both coagulation and neurological manifestations. A similar study in Pakistan revealed 84.7% haemotoxic, 8.7% neurotoxic and 6.5% haemotoxic/neurotoxic[47]. Most of the studies reported more number of neurotoxic snake bites in their studies[48]. India is a diverse country and so does the distribution of poisonous snakes and its toxicology varies. This may be one of the reason for the reduced number of death(4) as many studies had reported larger neurotoxic victims which caused death. Common Krait was responsible for nocturnal human bite and had a larger mortality rate in indian scenario[49]. In one of the studies from Kerala, only 34% of cases with confirmed snake bite (n=586) actually developed signs of envenomation[50]. Figure 8 depicts the district wise distribution of type of envenomation where 31%, 14%, 52% were haemotoxic and 5.4%, 9.4%, 2.4% of the cases were neurotoxic in Perambalur, Ariyalur and Erode respectively. The larger number of cases in the perambalur district has made it irrelevant to compare the epidemiological variations.

All the victims with absolute indications were administered Anti snake venom as the definitive management. Only 206 (43.3%) patients received Anti snake venom from different manufacturers and batch number. 144 out of 371 patients at Perambalur and 21/64 patients at Ariyalur were administered ASV in secondary care government hospital sector. Whereas all the snake bite victims (42/42) were administered ASV in the private hospital at Erode. This may be due to 1) non venomous snake bite, 2) dry bites, 3) progressing symptoms (common krait & hump nose pit viper), 4) no visible symptoms detected in ongoing envenomation, 5) nonspecific symptoms related to

anxiety (palpitations, sweating, tremoulessness, tachycardia, tachypnea, elevated blood pressure, cold extremities and paraesthesia). These patients may have dilated pupils suggestive of sympathetic over activity. So the initial symptoms of the patients is most important which poses a lot of difficulties to the clinicians to differentiate them from early signs of envenoming[51]. WHO had reported that Dry bites ranges between 10-80% for various poisonous snakes[52]. Three manufacturers were used in the study areas. ASV-I and ASV-II were used in both Perambalur and Ariyalur district hospitals whereas ASV-III was used only in the private hospital at Erode district. As described earlier that the smaller geographical area also influence the transportation of the victims to the hospital. Around 82.5% of the patients reached the treating hospital within 1 hour. Five patients came with organizing symptoms after 6 hours, which is more relevant to the classical late onset symptoms seen mostly in common krait and hump nosed pit viper. There was only one patient who was admitted after 24 hours.

A total of 2330 vials were used in our study. Mean of 11.59 ± 6.38 vials were given with a range of 0 to 30 vials. 1853 vials were used in perambalur district with a mean 12.76 ± 6.29 vials, 206 vials with a mean 9.81 ± 6.01 vials in Ariyalur and 271 vials with a mean 6.56 ± 4.17 was used in Erode. In a study from Rajasthan, out of total 138 patients, cobra bite was found in 15 patients and their mean ASV was 20.67 ± 12.23 vials, 28 patients had unknown bite and their mean ASV was 24.64 ± 14.78 vials while maximum patients had viper bite (n=82) and their mean ASV was 43.78 ± 30.41[53]. In an another study at Chandigarh, a neonatal snake bite was reported with 50 vials of ASV administered[54]. There has been a variation in the average total number of ASV vials used among different regions. In hilly areas like Himachal

Pradesh the existence of *Trimeresurus albolabris* (white lipped pit viper), *Gloydius himalayanus* (Himalayan pit viper) and *Naja oxiana* (black cobra) has also been documented apart from the Big 4[55]. A short comparison of different geographical regions has been compared below:

Table 22: ASV Utilization pattern in Haemotoxic and Neurotoxic snake bite

GEOGRAPHICAL AREA	STATE	MEAN ASV USED IN HAEMOTOXICITY	MEAN ASV USED IN NEUROTOXICITY
HILL	Kangra, Himachal Pradesh[56]	31.2	21.5
DESERT	Bikaner, Rajasthan[57]	43.78	20.67
GROUND LEVEL	Madurai, Tamilnadu[58,59]	12.5	12.8

The average number of ASV used for snake bite in general is relatively more in desert area like Rajasthan, when compared to the ground level/landscape. Contradictorily in high altitude areas like himachal Pradesh, the mean ASV used in haemotoxic envenomation is lesser in comparison with desert areas. This can be explained that the concentration of the venom in snakes (like the concentration of sweetness in fruits) will be lesser in high altitude when compared to desert areas.

The Maximum dose used was 30 vials in one patient. This may be due to various factors such as younger snakes/male gender/ bite after longer period/forceful bite etc. For 27.4 % of the patients 8 vials was given as total dose. In most of the

occasions ASV utilization is complete. In a study all cases of envenoming were not given 10 vials as per protocol and some received only 2 vials and recovered[60]. The use of protocol reduced the usage of ASV and the number of deaths. Locally developed protocols should be encouraged by organization like the World Health Organization and national and state level bodies can create those protocols with significant input from local experts [61]. There is no evidence in India which shows that low dose strategies have any validity. The same problem relates to high dosage regimens often based on Harrison's textbook of medicine which was written specifically for Western scenario and not intended for use in the developing countries like India[62].

There is variability in the efficacy of ASV in India between species, within the same species and between different geographical regions. An average of 11.1 ASV vials per patient in a study at Manipal[63]. Inappropriate dosage is being followed in many of the hospitals irrespective of the cost. This occurs mostly in cases of patients who are seriously ill with persistent abnormal coagulopathy and neuroparalysis with respiratory depression which has led to intensive care. Administration of fixed dose of 200ml of ASV and anticholinesterase along with ventilator support reverses neuroparalysis in severe neurotoxic snake bites[64]. One vial of Indian polyvalent ASV production costs around US$8–10, which is mostly equivalent to several days of salary for poor laborers and so many of them cannot afford the average used 10–15 vials needed to reverse envenoming[65]. Studies have proven that administration of ASV to victims with established respiratory paralysis does not reverse paralysis[66]. This was one of the important reasons where the lack of restoration of the symptoms

had let to administration of excess amount of antivenom. So cautious use of ASV with special concerns about cost and dose is essential for effective management.

Adverse reactions were seen in 55 (26.7%) patients. Only early reactions were seen in all the patients. Generalized and focal itching were most commonly seen in 31 (56.4%) patients, followed by dyspnea (10), nausea and vomiting (10). Anaphylaxis was seen in 9 (16.4%) patients. To our knowledge, none of the studies in South Asia had reported any death due to adverse reactions and are under-reported.

Table 23: Various Studies with Incidence of Adverse Reactions

STUDY AUTHOR/S [year]	DATA SOURCES OR LOCATION	CASES	REACTIONS (%)
Halesha et al[67][2012]	Bengaluru, Karnataka	180	23 (12.7%)
Mathivani et al[59][2013]	Madurai, Tamilnadu	212	127 (59.9%)
Deshmuhk et al[68] [2014]	Ambajogai ,Maharashtra	50	31 (62%)
Sheik et al[69][2016]	Chengalpet, Tamilnadu	77	17 (23%)
Kumaravel et al[70][2016]	Dharmapuri, Tamil Nadu	46 (paediatric)	3 (6%)
Poovazhagi et al[71][2017]	Chengalpattu, Tamilnadu	26 (paediatric)	18 (69.2%)
Raina et al[72] [2017]	Himachal Pradesh	200	14(7%)

The range of adverse reactions among the three districts varied accordingly. 35 (24.3%) in Perambalur, 5 (23.8%) in Ariyalur and 15 (36.6%) in Erode experienced adverse reactions to antivenom. The frequency of adverse reactions among manufactures showed that ASV-I, ASV-II and ASV-III had 17/61, 25/101 and 13/42 reactions respectively. The frequency of the adverse reactions among the three manufacturers was compared using chi-square test and was found to be insignificant ($P< 0.05$). An attempt of inter-comparison of the three manufacturers to determine the strength of association of adverse reaction was carried out.

ASV-I & ASV-II (P-0.7501), ASV-II & ASV-III (P-0.4446) and ASV-I & ASV-III (P-0.6592) stated a non significant association between the manufacturer and adverse reaction. Thus different manufacturers of ASV have no association with the incidence of adverse reactions. There was no studies traced pertaining to the difference in the efficacy of the different manufacturers. Only *in vitro* studies have been dealt with the efficacy parameters. One such study was done in Srilanka which compared the in vitro neutralization of srilankan snake venoms with Indian polyvalent ASV (VINS & BHARAT). Both the antivenoms failed to neutralize the neurotoxicity of Russell's viper and VINS antivenom was found to be superior to BHARAT antivenom at concentrations equivalent to administering 10 vials of antivenom, based on binding and neutralization studies which is inconsistent to measure relevant efficacy in the outcomes of humans[73].

A total of 84 patients received ASV-II in Perambalur district and 20 patients had adverse reactions. An important incidental finding in our study was, during the month of October patients who were administered ASV-II had the most number of

reaction (15) than the other months (5). One of the 4 deceased was among this period. This was brought to the notice to the head of the department and the batch of ASV-II was changed. The number of reactions was more, compared to the use in other months. This has occurred due to the change in the batch number thus proving that different batch number of ASV of the same manufacturer also plays an important role in the incidence of reactions. A similar scenario was observed in a study at Vellore where, batch to batch variability in the efficacy of ASV led discontinuation of that particular batch and it was replaced[74]. Only 4 patients among the snake bite victims died. Respiratory failure (2) and cardiac arrest (2) were the cause of death. This can be explained by the fact as mentioned earlier that almost 170 (82.5%) snake bite victims reached the hospital within one hour. A study in the hilly areas of Himachal Pradesh had a mortality rate of 13.3% where only 3% of the cases reaching the hospital within one hour, 45.4% cases took 1-6 hours while 52% patients presented after 6 hours of bite[75]. There was no correlation between the snake bite and time taken to administer ASV as 84% of the patients reached the hospital within one hour in our study. 32 (6.7%) absconded from the hospital. These victims were confirmed cases of nonpoisonous/dry bite victim and were under observation. Among the snake bite victims in the study area most of them were daily laborers who whose daily wages is an important factor in running their family they were hesitant to be under observation and hence absconded. Some patients also preferred for a sophisticated care and few preferred native treatment over allopathy. 4 patients (Erode private hospital) were discharged against medical advice In view of financial crisis. 11 patients were referred

for superspeciality care. 424 (89%) of the patients were discharged post treatment and reviewed after 7 days to the outpatient department.

A causality assessment was done in this study using the Liverpool algorithm to all the patients who had adverse reactions. It was noted that 49% of the patients had a score of possible and 31% were definite. The possibilities of 31% of definite score are the largest reported than in any other studies as far as our knowledge. This is due to the fact that most of the patients were readministerd with antivenom since it is the only management available for snake bite. The readministration of the antivenom equals rechallenge procedure which resulted in the more number of "definite" scores. The surprising score of unlikely (6) and probable (5) does surely predict a less likely causality between the ASV and the adverse reactions. This has occurred due to the fact that most of the signs and symptoms of the adverse reactions are equal to the clinical manifestations of the envenomation. Thus the incidence of "unlikely" and "probable" scores.

The severity score was determined by the Modified Hartwig and Siegel severity scale. This scale had three classifications of mild, moderate and severe. There are also inter-classifications among the three with levels I to VIII. In this study there were no cases with mild severity thus assuring that all reaction of the anti-snake venom are outrageous. 46 (83.6%) patients had moderate scale (level III & IV). 9 patients were graded under severe (level V, VI,VII) . This denotes the number of patients dead (4) and the patients who required intensive care with or without mechanical ventilation.

LIMITATIONS OF THE STUDY

- The storage of the ASV vials were beyond the control of the investigator as to whether the ASV used were consistent in quality and concentration which might introduce a variability in results of the study.
- The utilization pattern varied accordingly in the private hospitals and government hospitals.
- The patients were observed only during the inpatient period and the late reactions which usually occur after a mean of 7 days post treatment were missed. Even after the patients were discharged, the possibilities of the patients returning with complaints of late reactions were rare as the symptoms were often mistaken.
- No telephonic communication has been made to know the late reactions if any.
- Readmission details were not available.
- Apart from these three study areas, no permission was granted from the authorities of other secondary and tertiary care hospitals in nearby districts.

SUMMARY AND CONCLUSION

Rural agricultural and farm workers experience snake bite as the most common medical emergency. Preventive measures are still underdeveloped among the study population. Though the incidence of ADR is more troublesome, ASV the only safe and effective drug in preventing morbidity. Out of 10 snakes identified only 3 had adverse reactions. Mostly the patients had local envenomation which proves either nonpoisonous snake or dry bite. The present study was able to identify the major epidemiological and management variables in snake bite. The patients in the current study were treated with limited number of ASV vials (an average of 11.6) when compared with the Tamilnadu guidelines of snake bite 2016 (maximum of 24 vials). The current era where most of medical expenditure is rising up, optimizing the ASV usage becomes one of the important aspects in the treatment. Different manufacturers did not show any significant variations in the adverse reactions. Premedication had no role in the reduction of adverse reactions. Another important finding from our study is that the batch number should also be periodically checked with response to the incidence of ADRs.

FUTURE ASPECTS

Clinicians from the other parts of the world have also stated that ASV is ineffective as the geographical variations of snakes play an important role. There is a definite need to abandon the concept of “Big 4” as the incidence of hump nosed viper has been increasingly reported, which is not one among the 4 antivenom derived species. Preventive and educational program at the community level with active involvement of local organizations. Development of comprehensive check list for identification for snake species has to be suggested. Pressure immobilization methods recommended by WHO has to be notified to public.

Since 80% of the venom obtained for manufacturers of india is from single geographical region which has led to reduced efficacy rates, the need for venom collection from the nearest geographical region is of more important. Snake banks should be formed in all states by relevant authorities, thereby increasing the production of venom and reduction of manufacturing cost can be made. Improvising the quality to be focused on more purified, less allergenic and specific product at affordable cost is needed. So, an upgrade in the assessment of quality testing has to be organized. Identification of specific neutralizing antibodies for venom proteins can be developed. ‘Cocktail antivenom’ which neutralizes cobra venom proteins and a ‘pan-specific antiserum’ against elapids of Asia is under studies[76]. A novel antivenom therapy using ‘phage display technology’ is under recent advancement[77].

The other important lacunae in the management of snake bite to be effective are the identification of the snake or its species. It may be the use of monovalent ASV

to reduce the efficacy and ADR or making the clinical management easier by knowing the type of envenomation which makes the clinicians to face the known symptoms.

Table 24: Monovalent/Bivalent/Trivalent antisnake venom used and their incidence of adverse reactions

PLACE/YEAR	NO OF CASES	ADVERSE REACTIONS
Hong kong / 2017[78]	191 (Monovalent)	Green pit viper antivenom - 4.7%. Agkistrodon Halys antivenom - 1.4%.
costa rica / 1996[79]	39 (Monovalent)	14 (36%) presented early adverse reactions Urticaria (18%) was the most frequent early adverse reaction and there was no life-threatening anaphylactic reaction.
Sindh, Pakistan / 2017[80]	5 (bivalent)	Nil.
Amazon, brazil / 2012[81]	102 (58 bivalent) (44 trivalent)	Bivalent -10(17%). Trivalent -11(25%).

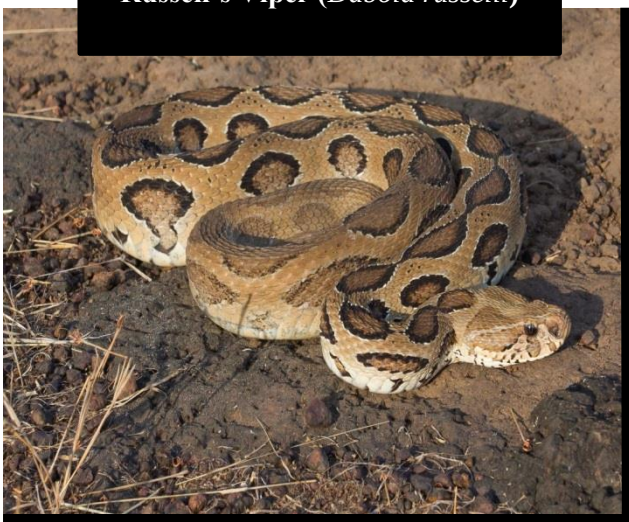
Monovalent antisnake venom is not available in India. Its advantage being the reduction in the total number of vials used and adverse reactions. Since there is a reduction in the proper identification of snake species, monovalent antivenoms are not used commonly. Most of the government hospitals in Tamilnadu have random images for identification of the most common snakes. This can still be improvised by

providing different angles and age variations of the snake photos to be displayed and interpreted by the patients.

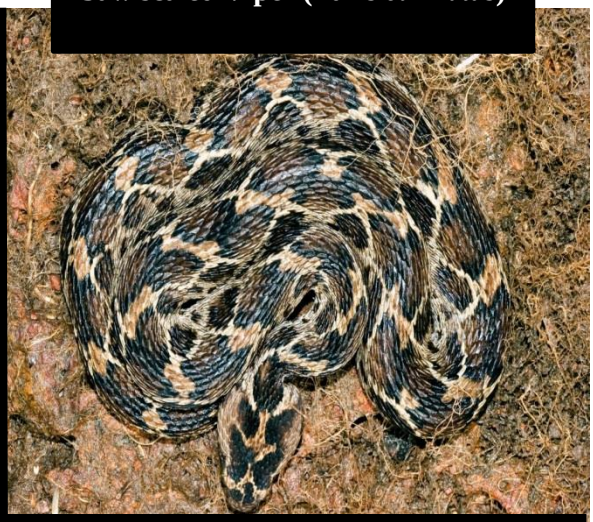
As whatsapp has made a great deal in an easier way of communication with people, its role has also been portrayed to be helpful in management of snake bite. +919745003075, +919818062986, +917828392260 are some of the trusted and self-tested contact numbers for 24 x 7 helpline to provide as much help possible which includes getting an expert doctor to talk to the doctor treating the patient and help in procuring ASV if there is a need. Indeed the evolution of applications has made a greater impact in marketing and so the mobile applications for snake bite identification by developers from government or private sectors or together can be made feasible. This also helps in avoiding the killing of the snakes, perhaps it's an offence under Wildlife Protection Act. Snake handling training for public by the forest officials is to be encouraged. The above mentioned measures can avoid the killing/depletion of this endangered species which in turn avoids the disruption of the ecosystem.

ANNEXURE – I

Russell's Viper (*Daboia russelii*)



Saw scaled Viper (*Echis carinatus*)



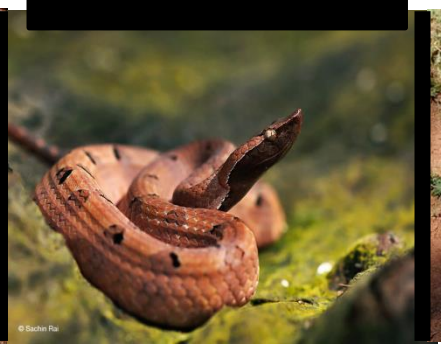
Common Krait (*Bungarus caeruleus*)

Spectacled Cobra (*Naja naja*)

Major venomous "Big 4s"

Northern Saw scaled Viper (*Echis sochureki*)

Hump nosed viper (*Hypnale hypnale*)



King cobra (*Ophiophagus hannah*)

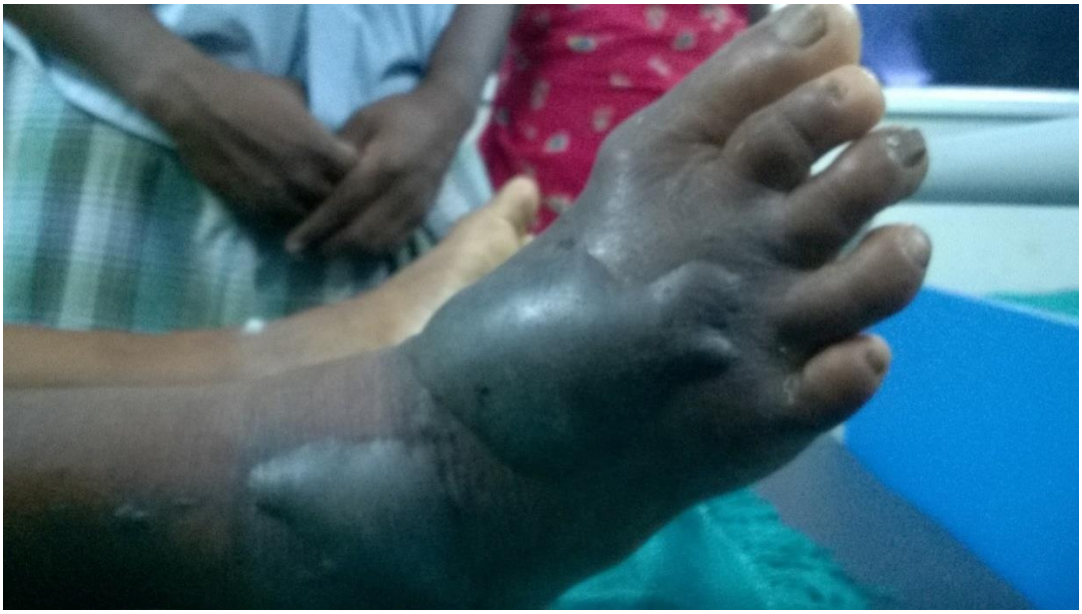
Venomous snakes not considered in ASV in India

The venom extraction area at the irula snake catchers industrial cooperative society LTD, Vadanemmeli.

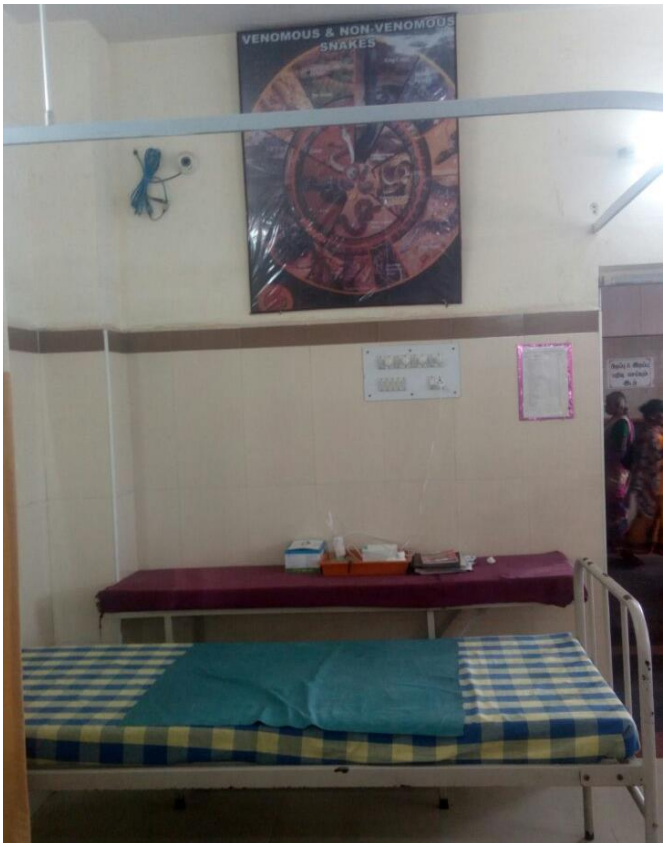
Milking of Russel's viper venom.

The picture showing the extracted venom of Russel's viper during the visit to Irula the irula snake catchers industrial cooperative society LTD, Vadanemmeli.

The photo of the killed snake (Russel's viper) taken by the attenders of snake bite victim.



Blister formation of the snake (Russel's viper) bite victim.



Picture describing the information on identification of venomous and nonvenomous snakes displayed in the government hospitals of Tamil Nadu.

ANNEXURE IIa: MASTER CHART

s.no	month	age	sex	district	occupation	bite mark	site of bite	time of bite	type/ status of snake	pre hospital interventions	clinical profile	WBCT (mins)	type of envenomation	ASV administered	batch number used	bite to needle time (approx)	adverse reactions	vials used	complications
1	jan	30	M	perambalur	farmer	yes	left foot	4:30 PM	*unidentified*	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15012	16hrs	anaphylaxis	1	referred to higher centre
2	jan	45	M	perambalur	farmer	yes	left dorsum of foot	5:00 AM	unidentified	yes	cellulitis	15	haemotoxic	yes	bio vins 01AS15012	2hrs	nil	20	recovered
3	jan	35	M	erode	labourer	yes	left leg	7.50 PM	unidentified	no	swelling	16	local	yes	Bharat sr.O12010	2hrs	no	2	recovered
4	jan	26	F	erode	housewife	yes	right hand	8.30AM	unidentified	no	swelling /blisters	12	local	yes	Bharat sr.O12010	5hrs	no	4	recovered
5	jan	60	F	perambalur	vendor	no	left middle toe	12:00 PM	unidentified	yes	giddiness	7	local	no	nil	no	no	nil	recovered
6	jan	40	M	perambalur	farmer	yes	right foot	7:00 PM	unidentified	yes	giddiness, pain	>20	haemotoxic/neurotoxic	yes	bio vins 01AS15012	2hrs	no	13	recovered
7	jan	34	F	ariyalur	labourer	yes	left foot	6:00 PM	unidentified	no	giddiness	8	neurotoxic	yes	B.E A1602116	1hr	anaphylaxis	8	recovered
8	jan	52	M	perambalur	labourer	yes	right ring finger	7:00 AM	unidentified	no	giddiness /swelling	>20	haemotoxic/neurotoxic	yes	bio vins 01AS15012	1hr	no	20	recovered
9	jan	65	F	perambalur	labourer	yes	right foot	4:50 PM	unidentified	no	pain, swelling	5	local	nil	nil	nil	nil	nil	recovered
10	jan	65	F	erode	labourer	yes	right 4 th finger	9:00 AM	unidentified	no	pain, swelling	17	local	yes	Bharat sr.212008	1hr	no	2	recovered
11	jan	28	M	ariyalur	maison	no	right hand	11:00 AM	unidentified	yes	giddiness /swelling	8	neurotoxic	yes	B.E A1602116	1hr	no	nil	recovered
12	jan	40	M	perambalur	labourer	no	left hand	6:20 PM	unidentified	no	swelling	8	local	nil	nil	nil	nil	nil	recovered
13	jan	60	M	perambalur	labourer	no	right foot	4:40 PM	unidentified	no	blurring of vision, cellulitis	8	neurotoxic	nil	bio vins 01AS15012	1hr	nil	nil	absconded
14	jan	20	M	perambalur	student	yes	left foot	4:18 PM	unidentified	yes	cellulitis, pain	>20	haemotoxic	yes	bio vins A05315117	1hr	anaphylaxis	8	death due to cardiac arrest
15	jan	51	F	perambalur	labourer	no	left leg	2:00 PM	unidentified	no	pain	7	haemotoxic	yes	bio vins A05315117	5hrs	nil	nil	recovered
16	jan	28	F	ariyalur	housewife	no	right leg	9:00 PM	unidentified	yes	pain	8	local	no	nil	nil	nil	nil	recovered
17	jan	16	M	perambalur	labourer	yes	right third toe	8:00 PM	C.krait	no	giddiness, ptosis	15	neurotoxic	yes	bio vins A05315117	1hr	yes. itching	8	referred to higher centre
18	jan	50	F	perambalur	labourer	no	left foot	11:50 PM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins A05315117	1hr	yes. itching, dyspnea, chest pain	13	recovered
19	jan	29	M	perambalur	labourer	no	left foot	1:20 AM	unidentified	yes	cellulitis	>20	haemotoxic	yes	bio vins A05315117	1 day	no	12	recovered
20	jan	45	F	perambalur	labourer	no	right hand	8:00 PM	unidentified	no	pain	6	local	nil	nil	nil	nil	nil	recovered

21	jan	42	F	ariyalur	labourer	no	right leg	9:00 PM	unidentified	yes	pain/swelling	>20	haemotoxic	yes	B.E A1602116	2hrs	yes,chills & rigor	16	recovered
22	jan	44	M	perambalur	security	no	right hand	7:45 PM	unidentified	no	mild giddiness, pain	6	local	nil	nil	nil	nil	nil	recovered
23	jan	60	F	perambalur	labourer	no	right hand	10:30 PM	unidentified	no	difficulty in breathing, , giddiness	8	neurotoxic	nil	bio vins A05315117	1hr	anaphylaxis	16	recovered
24	jan	60	F	perambalur	labourer	no	left foot	8:55 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
25	jan	60	F	perambalur	security	no	right ankle	5:30 PM	unidentified	yes	pain	7	local	no	nil	no	no	nil	recovered
26	jan	44	M	perambalur	garndener	yes	right leg	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins A05315117	1hr	no	13	recovered
27	jan	27	M	perambalur	labourer	yes	right foot	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins A05315117	1hr	no	18	recovered
28	feb	35	M	perambalur	labourer	no	left foot	7:15 PM	unidentified	no	giddiness	9	neurotoxic	yes	bio vins A05315117	30 mins	yes. itching, pruritis	20	recovered
29	feb	60	F	perambalur	labourer	no	left lower limb	2:45 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
30	feb	46	M	perambalur	labourer	no	right ankle	7:50 PM	unidentified	yes	pain	8	local	no	nil	no	no	nil	recovered
31	feb	42	M	erode	labourer	yes	right leg	11.40 AM	unidentified	no	pain, swelling	9	local	yes	Bharat sr.O12010	2hrs	no	2	recovered
32	feb	34	F	ariyalur	labourer	yes	right leg	11.40 AM	unidentified	no	pain, swelling	10	local	yes	B.E A1602116	2hrs	yes,itching	8	recovered
33	feb	44	M	ariyalur	maison	yes	right arm	12:00 PM	unidentified	yes	pain/swelling	11	local	yes	B.E A1602116	2hrs	no	8	recovered
34	feb	39	M	perambalur	labourer	no	left forearm	6:30 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
35	feb	28	M	perambalur	labourer	no	left foot	2:50 PM	unidentified	no	pain,cellulitis	>20	haemotoxic	yes	bio vins A05315117	1hr	no	10	recovered
36	feb	24	M	perambalur	labourer	no	right ankle	3:35 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
37	feb	50	F	erode	labourer	yes	left hand	12.30 PM	unidentified	no	pain, swelling	13	local	yes	Bharat sr.212008	20 mins	no	2	recovered
38	feb	46	M	perambalur	labourer	yes	right leg	7:55 PM	unidentified	no	pain,swelling	>20	haemotoxic	yes	bio vins A05315117	1hr	no	8	recovered
39	mar	28	F	perambalur	housewife	yes	left leg	7:30 PM	unidentified	yes	giddines and fall,swelling, lymphadenopathy	>20	haemotoxic/neurotoxic	yes	bio vins A05315117	1hr	yes. nausea, vomiting	16	
40	mar	23	F	perambalur	student	no	right 4th toe	1:15 PM	unidentified	no	pain,swelling	14	local	no	nil	no	no	nil	recovered
41	mar	45	F	perambalur	labourer	yes	right leg	8:00 AM	unidentified	no	pain,swelling	>20	haemotoxic	yes	bio vins A05315117	1hr	no	18	recovered
42	mar	42	F	erode	labourer	yes	right hand	4:00 PM	unidentified	yes	swelling /blisters	>20	haemotoxic	yes	Bharat sr.212008	5hrs	anaphylaxis	5	recovered
43	mar	46	M	ariyalur	labourer	yes	right ankle	9.00 AM	unidentified	no	pain,cellulitis	>20	haemotoxic	yes	B.E A1602116	1hr	no	13	recovered

44	mar	30	M	perambalur	labourer	yes	right forearm	10:30 AM	R.viper	no	drowsiness , swelling, lymphadenopathy	>20	haemotoxic/neurotoxic	yes	bio vins A05315117	8hrs	no	8	recovered
45	mar	32	M	perambalur	housewife	yes	left foot	6:00 PM	unidentified	yes	difficulty in breathing, , giddiness	>20	haemotoxic/neurotoxic	yes	bio vins A05315117	1hr	no	5	recovered
46	mar	35	F	perambalur	labourer	no	right forearm	3:19 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
47	mar	40	F	perambalur	labourer	no	left lower limb	1:00 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
48	mar	28	M	erode	farmer	yes	right third toe	1:00 PM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.O12010	2hrs	itching	7	recovered
49	mar	34	F	perambalur	labourer	yes	left ankle	11:08 AM	unidentified	no	pain,blisters	>20	haemotoxic	yes	bio vins A05315117	1hr	yes,breathllessness, epigastric pain, nausea, vomiting	18	referred to higher centre
50	mar	50	M	perambalur	security	no	right ankle	12:40 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
51	mar	25	F	perambalur	housewife	yes	right forearm	5:30 PM	kannadi viriyan	no	dehydration, sweating	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	18	recovered
52	apr	30	F	perambalur	labourer	no	right index finger	10:45 AM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
53	apr	60	M	perambalur	labourer	no	left foot	8:30 AM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
54	apr	30	M	perambalur	labourer	yes	right leg	1:40 PM	unidentified	yes	pain	11	local	no	no	no	no	no	referred to trichy for arf
55	apr	30	M	perambalur	labourer	yes	left leg	12:45 PM	unidentified	no	pain and bleeding	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	18	recovered
56	apr	70	M	ariyalur	labourer	no	right big toe	8:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
57	apr	46	M	perambalur	security	no	left lower limb	11:00 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
58	apr	38	M	perambalur	labourer	no	left foot	9:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
59	apr	39	M	perambalur	labourer	no	right leg	8:55 PM	unidentified	no	pain	16	local	no	nil	no	no	nil	recovered
60	apr	55	M	perambalur	labourer	yes	left leg	6:00 AM	unidentified	no	pain,swelling	>20	haemotoxic	yes	bio vins 01AS15040	1hr	yes. itching	20	death due to cardia arrest
61	apr	27	F	ariyalur	labourer	no	left ankle	6:00 PM	unidentified	no	pain,swelling	8	local	no	nil	no	no	nil	recovered
62	apr	7	M	ariyalur	nil	yes	right hand	11:00 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
63	apr	21	M	perambalur	student	yes	right index finger	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	10 mins	no	23	recovered
64	apr	19	M	perambalur	student	no	left lower	10:02 AM	unidentified	yes	pain	6	local	no	no	no	no	nil	recovered

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65	apr	27	M	perambalur	labourer	yes	right ankle	8:10 PM	unidentified	no	pain, cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	chills & rigor	23	recovered
66	apr	40	F	erode	labourer	yes	left leg	4.30 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.O12010	1hr	vomiting	3	recovered
67	apr	29	M	erode	driver	yes	right leg	10:00 AM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.O12040	4 hrs	no	3	recovered
68	apr	70	M	perambalur	labourer	yes	left foot	12:50 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
69	apr	25	M	perambalur	driver	yes	left forearm	10:18 PM	unidentified	no	nausea.vomiting,chil rigor ,fever	>20	haemotoxic	yes	bio vins 01AS15040	1hr	yes. itching, urticaria, fever, nausea ,vomiting	8	recovered
70	apr	75	F	perambalur	labourer	yes	right foot	7:33 AM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	30 mins	no	23	recovered
71	apr	70	F	perambalur	labourer	no	right big toe	10:43 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
72	apr	32	M	perambalur	labourer	no	left thumb	3:03 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
73	apr	50	F	perambalur	labourer	no	right index finger	9:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
74	may	58	F	erode	labourer	yes	left leg	10:00 AM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.4053140	20 mins	itching	2	recovered
75	may	25	M	perambalur	labourer	no	right leg	10:00 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
76	may	45	M	perambalur	labourer	yes	right leg	2:19 PM	C.krait	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	30 mins	no	8	recovered
77	may	45	M	perambalur	labourer	yes	right leg	2:19 PM	unidentified	no	swelling, celulitis, oliguria	>20	haemotoxic	yes	bio vins 01AS15040	1 hour	giddines	16	referred to for arf
78	may	23	F	perambalur	housewife	no	right ankle	9:25 PM	unidentified	no	pain	8	local	no	no	no	no	nil	absconded
79	may	37	F	perambalur	labourer	no	left foot	10:50 AM	unidentified	no	pain	7	local	no	no	no	no	nil	recovered
80	june	43	M	ariyalur	watchman	yes	left middle finger	11:20 PM	unidentified	yes	giddiness, ptosis	8	neurotoxic	yes	B.E A1602116	1hr	yes,itching	5	recovered
81	may	40	M	perambalur	labourer	no	left lower limb	2:53 PM	unidentified	no	pain	8	local	no	no	no	no	nil	recovered
82	may	65	M	perambalur	labourer	no	right big toe	3:00 PM	unidentified	no	pain	9	local	no	no	no	no	nil	recovered
83	may	40	M	perambalur	labourer	yes	left arm	6:50 AM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	8	recovered
84	may	35	M	perambalur	labourer	no	left big toe	8:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
85	may	69	M	perambalur	security	no	left foot	8:50 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
86	may	60	M	perambalur	labourer	yes	left leg	6:30 PM	unidentified	yes	pain, swelling, oliguria	>20	haemotoxic	yes	bio vins 01AS15040	1hr	yes, persistent vomiting	13	arf, referred to higher center
87	may	40	F	perambalur	labourer	no	right leg	11:45 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered

88	may	60	F	perambalur	labourer	no	right ankle	11:05 AM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
89	may	35	F	perambalur	labourer	no	right index finger	8:50 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	absconded
90	may	51	F	perambalur	labourer	no	left thumb	12:40 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
91	may	8	M	perambalur	student	yes	left leg	11:00 AM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
92	may	23	F	perambalur	student	yes	right arm	4:00 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	23	recovered
93	may	21	M	perambalur	student	no	left leg	6:00 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
94	may	32	F	ariyalur	housewife	no	left leg	8:00 PM	unidentified	no	pain	>20	local	yes	B.E A1602116	1hr	no	8	recovered
95	may	25	M	perambalur	labourer	yes	right forearm	3:00 PM	unidentified	yes	pain	12	local	yes	bio vins 01AS15040	1hr	no	8	recovered
96	may	38	M	erode	driver	yes	right thumb finger	11:30 AM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.212008	2hrs	no	14	recovered
97	may	18	M	perambalur	labourer	no	left lower limb	7:00 AM	unidentified	yes	dyspnea, drowsiness, dysphagia	8	neurotoxic	yes	bio vins 01AS15040	2hrs	no	18	recovered
98	may	5	M	perambalur	student	yes	right hand	11:00 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
99	may	35	F	perambalur	labourer	yes	right foot	6:30 PM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	16	recovered
100	may	38	M	perambalur	labourer	no	left foot	11:07 AM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
101	may	29	F	perambalur	housewife	no	left foot	11:45 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
102	may	37	M	erode	labourer	yes	left hand	2:30 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.31003	6hrs	no	1	recovered
103	may	10	M	perambalur	student	no	left big toe	3:00 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	absconded
104	may	10	M	perambalur	student	no	right ankle	3:00 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	absconded
105	may	40	F	perambalur	labourer	yes	right leg	8:10 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	5	recovered
106	may	36	F	perambalur	labourer	no	right leg	7:00 AM	unidentified	no	pain	5	local	no	nil	no	no	nil	absconded
107	may	40	M	ariyalur	farmer	yes	left thumb	10.40 PM	unidentified	no	pain	>20	haemotoxic	yes	B.E A1602116	2hrs	no	nil	recovered
108	may	24	M	perambalur	labourer	yes	left leg	7:35 AM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	giddines	27	recovered
109	may	70	F	erode	labourer	yes	right index finger	10:30 AM	unidentified	no	swelling	>20	local	yes	Bharat sr.O12040	2hrs	itching	11	recovered
110	may	28	F	perambalur	housewife	no	right index finger	9:20 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
111	jun	54	M	erode	labourer	yes	right leg	11:30 AM	unidentified	no	swelling	>20	local	yes	Bharat sr.4053140	7 hours	no	3	recovered
112	jun	27	M	perambalur	labourer	no	left lower limb	11:50 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered

113	jun	34	M	perambalur	labourer	no	right ankle	10:50 AM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
114	jun	60	F	ariyalur	farmer		left foot	12.05 AM	unidentified	no	drowsiness, ptosis	>20	haemotoxic/neurotoxic	yes	bio vins 01AS15040	2hrs	no	13	recovered
115	jun	3	M	perambalur	nil	no	left thumb	1:00 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
116	jun	52	F	perambalur	labourer	no	left ankle	9:00 PM	unidentified	no	drowsiness, ptosis	7	neurotoxic	yes	bio vins 01AS15040	45 mins	no	25	recovered
117	jun	63	M	perambalur	security	no	right big toe	12:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
118	jun	40	M	perambalur	labourer	no	left foot	11:40 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
119	jun	33	M	perambalur	labourer	no	left forearm	1:30 PM	unidentified	no	pain	13	local	no	nil	no	no	nil	recovered
120	jun	38	F	perambalur	labourer	no	right 4th toe	3:31 PM	unidentified	yes	pain, giddiness	5	neurotoxic	yes	bio vins 01AS15040	1hr	no	26	absconded
121	jun	55	M	perambalur	labourer	no	right leg	7:00 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
122	jun	30	M	perambalur	labourer	no	left lower limb	12:50	unidentified	no	drowsiness, ptosis	7	neurotoxic	yes	bio vins 01AS15040	45 mins	no	18	recovered
123	jun	26	M	perambalur	labourer	no	right index finger	10:30 AM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
124	jun	65	M	perambalur	labourer	no	left foot	2:50 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
125	jun	65	M	perambalur	security	no	left foot	2:50 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
126	jun	26	M	perambalur	labourer	no	left thumb	9:30 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
127	jun	43	F	perambalur	labourer	no	right ankle	3:00 AM	unidentified	no	pain, dyspnea, ophthalmoplegia	>20	haemotoxic/neurotoxic	yes	bio vins 01AS15040	no	no	16	absconded
128	jun	22	F	perambalur	housewife	no	left big toe	4:00 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	absconded
129	jun	4	M	perambalur	nil	no	left foot	7:18 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	absconded
130	jun	26	M	perambalur	labourer	yes	right foot	8:00 PM	unidentified	no	pain, ptosis, giddiness	7	neurotoxic	yes	bio vins 01AS15040	1hr	no	18	recovered
131	jun	20	M	perambalur	student	no	left ankle	9:08 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
132	jun	45	M	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
133	jun	60	F	perambalur	labourer	no	left foot	11:15 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
134	jun	70	M	perambalur	labourer	no	left lower limb	11:55 PM	unidentified	yes	difficulty in breathing, , giddiness	12	neurotoxic	yes	bio vins 01AS15040	1hr	no	24	death due to respiratory failure
135	jun	24	M	ariyalur	farmer	no	left foot	9:40 AM	unidentified	yes	pain	13	local	no	nil	no	no	nil	recovered
136	jun	26	M	perambalur	labourer	no	left foot	10:20 AM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
137	jun	65	M	perambalur	labourer	no	left foot	11:00	unidentified	no	pain	6	local	no	nil	no	no	16	recovered

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138	jun	70	M	ariyalur	farmer	no	left foot	8.20 AM	unidentified	no	ptosis, dysphagia	7	neurotoxic	yes	bio vins 01AS15040	2hrs	no	nil	absconded
139	jun	54	F	perambalur	labourer	no	right ankle	8:40 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	absconded
140	jun	25	M	perambalur	labourer	no	left big toe	6:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
141	jun	22	F	perambalur	housewife	no	right leg	7:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	absconded
142	jun	4	M	perambalur	nil	no	right big toe	8:40 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	absconded
143	jun	26	M	perambalur	labourer	no	right ankle	8:55 AM	unidentified	no	pain	13	local	no	nil	no	no	nil	recovered
144	jun	16	M	perambalur	student	no	left thumb	7:00 AM	unidentified	no	pain, swelling, lymphade nopathy	>20	haemotoxic	yes	bio vins 01AS15040	20 mins	no	13	recovered
145	jun	20	M	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
146	jun	37	M	perambalur	labourer	no	right ankle	6:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
147	jun	60	F	perambalur	labourer	no	left lower limb	6:30 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
148	jun	70	M	perambalur	labourer	no	left foot	7:00 AM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
149	jun	23	F	perambalur	housewife	no	left foot	6:00 PM	unidentified	no	pain, drowsines s, dysphagia	6	neurotoxic	yes	bio vins 01AS15040	45 mins	yes. nausea, vomiting	8	recovered
150	jun	13	M	perambalur	student	no	right ankle	8:00 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
151	jun	32	M	perambalur	labourer	yes	left leg	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	nil	recovered
152	jun	70	M	perambalur	labourer	no	right big toe	8:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
153	jun	45	F	perambalur	labourer	no	left big toe	8:40 PM	unidentified	no	difficulty in breathing, , giddiness	8	neurotoxic	yes	bio vins 01AS15040	no	no	nil	recovered
154	jun	13	M	perambalur	student	no	right ankle	11:00 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
155	jun	70	F	perambalur	labourer	no	right ankle	6:00 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
156	jun	23	M	perambalur	labourer	yes	right foot	4:00 PM	R.viper	yes	cellulitis	>20	haemotoxic	yes	B.E A1602116	1hr	chills & rigor	13	recovered
157	jul	40	M	erode	labourer	yes	left leg	2.30 PM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.4053140	1hr	itching	6	recovered
158	jul	23	F	perambalur	housewife	no	right ankle	8:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
159	jul	55	M	perambalur	labourer	no	right index finger	9:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
160	jul	23	M	perambalur	labourer	no	left forearm	6:00 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered

161	jul	60	M	perambalur	labourer	no	left foot	3:00 AM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
162	jul	55	M	perambalur	labourer	yes	left leg	7:00 AM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
163	jul	62	M	perambalur	labourer	yes	right foot	10:00 AM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	28	recovered
164	jul	34	M	ariyalur	labourer	no	left lower limb	11.00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	absconded
165	jul	75	M	ariyalur	farmer	yes	right forearm	7.30 AM	unidentified	no	pain,oliguria	>20	haemotoxic	yes	B.E A1602116	40 mins	no	8	referred to trichy
166	jul	65	F	ariyalur	farmer	yes	left big toe	7.20 AM	unidentified	yes	pain	10	local	yes	B.E A1602116	30 mins	no	8	recovered
167	jul	40	F	ariyalur	farmer	yes	right ankle	1.10 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	referred to trichy
168	jul	65	M	ariyalur	labourer	no	right ankle	11:55 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
169	jul	70	M	perambalur	labourer	no	left big toe	0:00 AM/PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
170	jul	40	M	perambalur	labourer	yes	left middle finger	10:00 AM	unidentified	no	pain, thrombocystopenia	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	28	recovered, 2platelets packed cell transfusion
171	jul	18	F	perambalur	housewife	no	left big toe	7:15 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	discharged at request
172	jul	84	M	perambalur	labourer	no	right leg	2:45 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
173	jul	49	M	perambalur	labourer	no	left thumb	7:50 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
174	jul	57	M	perambalur	labourer	yes	right leg	10:00 AM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	30	recovered
175	jul	45	F	perambalur	labourer	no	left ankle	7:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
176	jul	35	M	perambalur	labourer	no	left foot	7:00 AM	unidentified	no	pain	10	local	no	nil	no	no	nil	absconded
177	jul	20	M	ariyalur	labourer	yes	left foot	4.50 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	ama
178	jul	30	F	perambalur	labourer	no	right index finger	10:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
179	jul	50	M	perambalur	labourer	no	left lower limb	8:55 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
180	jul	50	M	perambalur	labourer	no	right ankle	5:30 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
181	jul	47	F	perambalur	labourer	no	right foot	7:45 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
182	jul	43	F	perambalur	labourer	no	left foot	3:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
183	jul	35	F	perambalur	labourer	no	right foot	7:15 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
184	jul	30	M	erode	labourer	yes	left hand	10:00 AM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.31003	3hrs	no	8	recovered
185	jul	55	F	perambalur	labourer	no	right foot	7:00 AM	unidentified	no	pain, swelling	11	local	no	no	no	no	nil	absconded
186	jul	55	M	perambalur	labourer	no	left foot	0:00 AM/PM	unidentified	no	pain	10	local	no	no	no	no	nil	recovered

187	jul	34	M	erode	tailor	yes	right leg	2:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Bharat sr.31003	30 mins	no	16	recovered
188	jul	40	F	perambalur	labourer	yes	right leg	8:00 PM	unidentified	yes	cellulitis	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
189	jul	32	M	perambalur	labourer	yes	left leg	7:45 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	15	recovered
190	jul	59	M	perambalur	labourer	no	left lower limb	8:55 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
191	jul	32	M	perambalur	labourer	no	right big toe	5:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
192	jul	27	F	perambalur	labourer	no	left ankle	6:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
193	jul	57	F	perambalur	labourer	no	left thumb	8:40 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
194	jul	35	F	perambalur	labourer	no	left foot	7:00 AM	unidentified	yes	pain	8	local	no	nil	no	no	nil	recovered
195	jul	43	F	perambalur	labourer	no	right ankle	6:00 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
196	jul	42	F	perambalur	labourer	no	left foot	7:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
197	jul	50	M	perambalur	labourer	no	left foot	8:55 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
198	jul	30	F	perambalur	labourer	no	right foot	8:40 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
199	jul	40	F	perambalur	labourer	yes	left foot	8:55 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
200	aug	60	F	ariyalur	farmer	yes	left lower limb	1.10 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
201	aug	40	F	perambalur	labourer	yes	left forearm	5:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
202	aug	40	M	perambalur	labourer	yes	left foot	12:40 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	5	recovered
203	aug	40	M	perambalur	labourer	no	left foot	7:00 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
204	aug	75	F	ariyalur	labourer	no	left foot	8.30 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
205	aug	46	M	ariyalur	labourer	no	right ankle	9.00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
206	aug	83	M	perambalur	labourer	no	right foot	7:00 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
207	aug	65	M	perambalur	labourer	yes	left thumb	7:20 AM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	18	recovered
208	aug	29	M	perambalur	labourer	no	left foot	8:40 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
209	aug	40	F	perambalur	labourer	no	left big toe	7:15 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
210	aug	45	M	perambalur	labourer	yes	right 4 th finger	2:45 PM	unidentified	no	drowsiness,ptosis,swelling	>20	haemotoxic/neurotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered

211	aug	45	F	perambalur	labourer	yes	left leg	10:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	16	recovered
212	aug	17	F	perambalur	student	yes	right index finger	7:50 PM	unidentified	no	respiratory distress, poor gcs, intubated	8	neurotoxic	yes	Biological E limited A1602116	1hr	no	8	respiratory failure, referred to highr center
213	aug	35	M	perambalur	labourer	no	left leg	7:15 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
214	aug	50	M	perambalur	labourer	no	right ankle	2:45 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
215	aug	13	M	perambalur	labourer	no	left lower limb	7:50 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
216	aug	40	M	erode	labourer	yes	left hand	11:00 AM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.4053140	1hr	no	5	recovered
217	aug	50	F	erode	labourer	yes	left middle finger	6:15 PM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.O12040	3hrs	itching	8	recovered
218	aug	17	M	perambalur	student	no	right big toe	7:15 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	absconded
219	aug	50	F	perambalur	labourer	no	left foot	2:45 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
220	aug	50	F	perambalur	labourer	no	right ankle	7:50 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
221	aug	80	M	ariyalur	labourer	yes	right forearm	11.45 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
222	aug	7	F	ariyalur	student	no	left foot	9.00 PM	unidentified	yes	pain, ptosis, giddiness	9	neurotoxic	no	Biological E limited A1602116	30 mins	no	16	recovered
223	aug	18	M	ariyalur	student	no	right foot	7.10 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
224	aug	29	F	perambalur	labourer	no	right 4th toe	6:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
225	aug	35	F	perambalur	labourer	no	left foot	12:40 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	absconded
226	aug	50	M	perambalur	labourer	yes	left foot	2:25 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
227	aug	24	M	ariyalur	student	no	right foot	11.OO PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
228	aug	34	F	ariyalur	farmer	yes	right ankle	12:40 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
229	aug	55	F	perambalur	labourer	yes	right leg	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	23	recovered
230	aug	37	F	perambalur	labourer	yes	left leg	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
231	aug	37	F	perambalur	labourer	no	left lower limb	6:00 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
232	aug	42	M	perambalur	labourer	no	right ankle	7:00 AM	unidentified	no	pain	13	local	no	nil	no	no	nil	recovered
233	aug	38	M	ariyalur	farmer	no	left foot	6.00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered

234	aug	52	M	perambalur	labourer	no	right leg	12.22 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
235	aug	3	F	perambalur	nil	no	right foot	1.56 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
236	aug	20	M	perambalur	student	yes	right leg	1:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
237	aug	28	F	erode	housewife	yes	left little finger	2:00 PM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.O12040	30 mins	no	10	recovered
238	aug	19	F	perambalur	student	no	right index finger	11.20 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
239	aug	55	M	ariyalur	farmer	yes	right ankle	1.30 AM	unidentified	no	cellulitis	9	local	no	nil	no	no	nil	recovered
240	aug	43	M	perambalur	labourer	no	left lower limb	6:50 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
241	aug	20	M	perambalur	student	no	left foot	8:40 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
242	aug	53	F	perambalur	labourer	no	left forearm	6:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	20	recovered
243	aug	75	F	perambalur	labourer	yes	left middle finger	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
244	aug	59	M	perambalur	labourer	yes	left leg	3:30 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	10	recovered
245	aug	75	F	ariyalur	labourer	yes	right forearm	12.05 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	2hrs	no	8	recovered
246	aug	35	F	ariyalur	farmer	yes	left foot	8:40 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
247	aug	25	M	perambalur	labourer	no	left big toe	6:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	absconded
248	aug	25	M	ariyalur	student	yes	left ankle	12.22 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	absconded
249	aug	50	M	ariyalur	farmer	yes	right leg	1.56 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
250	aug	48	M	perambalur	labourer	no	left foot	8:40 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
251	aug	75	M	perambalur	labourer	no	left thumb	11.20 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
252	aug	28	M	erode	labourer	yes	left leg	5:00 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.Q50531003	3hrs	itching	6	recovered
253	aug	36	F	ariyalur	labourer	no	right leg	10.30 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
254	aug	70	M	ariyalur	farmer	yes	right foot	3.10 AM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	30 mins	no	8	recovered
255	aug	68	F	ariyalur	farmer	yes	right lower limb	7.05 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	18	2pffp given
256	aug	45	M	ariyalur	farmer	no	left foot	1.35 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
257	aug	75	M	ariyalur	farmer	no	left forearm	3.10 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered

258	aug	68	F	perambalur	labourer	yes	right leg	7:45 PM	unidentified	yes	swelling /blisters	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	18	recovered, 2p packed cell & 2p ffp
259	aug	70	M	perambalur	labourer	yes	right foot	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
260	aug	40	M	ariyalur	farmer	no	left foot	4.15 PM	unidentified	no	pain	9	local	yes	Biological E limited A1602117	45 mins	no	8	recovered
261	aug	60	M	perambalur	labourer	yes	left leg	4:10 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
262	sep	27	F	perambalur	housewife	yes	right foot	11.20 AM	identified (russels viper)	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	anaphylaxis	18	recovered
263	sep	40	F	perambalur	labourer	no	right ankle	8:40 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
264	sep	40	F	perambalur	labourer	yes	right big toe	1.30 AM	unidentified	no	dyspnea, drowsiness, dysphagia	>20	neurotoxic	yes	Biological E limited A1602116	1hr	no	20 single dose	referred to higher centre
265	sep	40	F	ariyalur	farmer	yes	right foot	4.00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	30 mins	no	20	recovered
266	sep	42	F	perambalur	labourer	no	right ankle	5:30 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
267	sep	15	M	perambalur	student	no	left foot	6:00 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
268	sep	31	M	ariyalur	labourer	yes	right ankle	10.50 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
269	sep	38	F	erode	labourer	yes	right leg	10:00 AM	unidentified	no	drowsiness/bleeding /haematuria	>20	haemotoxic/neurotoxic	yes	Bharat sr.4053140	1hr	giddines	10	recovered
270	sep	40	F	erode	labourer	no	unknown	4:00 AM	unidentified	no	nil	10	local	yes	Bharat sr.4053140	8hrs	no	2	recovered
271	sep	40	M	erode	driver	yes	right hand	2.40 PM	unidentified	no	pain, swelling	9	local	yes	Bharat sr.4053140	3hrs	no	2	recovered
272	sep	65	M	perambalur	labourer	no	left lower limb	3:35 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
273	sep	52	F	perambalur	labourer	no	right leg	6:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
274	sep	40	F	perambalur	labourer	no	left foot	11.20 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
275	sep	12	F	perambalur	student	no	left big toe	8:40 PM	unidentified	no	ptosis,dyspnea	12	neurotoxic	no	Biological E limited A1602116	25 mins	no	18	recovered
276	sep	40	F	perambalur	labourer	no	right foot	5:45 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered
277	sep	27	F	ariyalur	student	yes	right index finger	8.45 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	dis at request
278	sep	18	M	perambalur	labourer	no	left foot	2:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
279	sep	52	M	perambalur	labourer	yes	right foot	7:00 AM	unidentified	no	pain	>20	haemotoxic	yes	Bharat sr.Q52421200	1hr	fever, chills &	10	recovered

														7		rigor		
280	sep	37	M	perambalur	labourer	yes	left leg	11.20 AM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
281	sep	50	M	perambalur	labourer	yes	left leg	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	16	recovered
282	sep	50	M	perambalur	labourer	yes	right ankle	7:45 PM	unidentified	no	dyspnea, drowsiness, dysphagia	>20	neurotoxic	yes	Biological E limited A1602116	1hr	no	18	recovered
283	sep	35	M	perambalur	labourer	yes	left foot	10:30 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
284	sep	33	M	perambalur	labourer	no	left thumb	8:55 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
285	sep	26	F	perambalur	housewife	no	right leg	5:30 PM	unidentified	yes	pain	10	local	no	nil	no	no	nil	recovered
286	sep	40	F	perambalur	labourer	no	left ankle	2:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
287	sep	47	M	perambalur	labourer	no	right foot	7:00 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
288	sep	50	F	ariyalur	farmer	yes	right index finger	10.20 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
289	sep	45	F	erode	farmer	no	unknown	11.30 AM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.O12040	30 mins	no	11	recovered
290	sep	50	M	erode	farmer	yes	right little finger	11.40 AM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.O12040	30 mins	no	5	recovered
291	sep	60	M	perambalur	labourer	no	left lower limb	5:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
292	sep	45	F	erode	farmer	yes	left foot	12:45 PM	unidentified	no	swelling /blisters	6	local	yes	Bharat sr.212008	1hr	itching	16	recovered
293	sep	36	M	ariyalur	farmer	yes	left thumb	12.00. PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
294	sep	45	M	ariyalur	labourer	no	left foot	11.30 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
295	sep	28	M	erode	labourer	yes	left leg	9.30 AM	unidentified	no	pain, swelling	14	local	yes	Bharat sr.O12039	3hrs	itching	8	recovered
296	sep	12	M	perambalur	labourer	no	right big toe	11.20 AM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
297	sep	27	M	ariyalur	farmer	no	right 2th toe	2.35 AM	unidentified	no	pain	15	local	no	nil	no	no	nil	recovered
298	sep	2	F	ariyalur	nil	yes	right ankle	10.00 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	absconded
299	sep	50	M	perambalur	labourer	no	left ankle	7:45 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
300	sep	35	M	perambalur	labourer	no	right foot	3:30 PM	unidentified	yes	pain	10	local	no	nil	no	no	nil	recovered
301	sep	45	M	perambalur	labourer	yes	left leg	6:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	5	discharged ama
302	sep	40	F	ariyalur	farmer	yes	left forearm	11.20 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered

303	sep	60	M	perambalur	labourer	no	left ankle	10:30 PM	unidentified	yes	pain	13	local	no	nil	no	no	nil	recovered
304	sep	60	F	perambalur	labourer	no	left ankle	8:55 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
305	sep	48	F	ariyalur	farmer	no	left foot	5:30 PM	unidentified	no	pain	13	local	no	nil	no	no	nil	recovered
306	sep	22	M	perambalur	labourer	no	left thumb	7:45 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
307	sep	12	M	perambalur	student	yes	right foot	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
308	sep	38	M	perambalur	labourer	yes	right 4 th finger	7:15 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	18	recovered
309	sep	65	F	ariyalur	farmer	yes	right hand	12.40 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
310	sep	38	M	perambalur	labourer	yes	left leg	11.20 AM	unidentified	no	pain	>20	local	yes	Biological E limited A1602116	1hr	yes, itching	24	recovered
311	sep	42	F	ariyalur	farmer	yes	right ankle	5.15 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	referred to gh
312	sep	50	M	perambalur	labourer	no	left foot	11.20 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
313	sep	40	F	ariyalur	farmer	yes	right forearm	9.40 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
314	sep	33	M	perambalur	labourer	no	right leg	3:00 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
315	sep	45	F	perambalur	labourer	yes	right foot	7:45 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
316	sep	45	F	perambalur	labourer	yes	right foot	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	5	recovered
317	sep	33	M	perambalur	labourer	no	right big toe	6:00 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
318	sep	50	F	perambalur	labourer	no	left thumb	7:15 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
319	sep	35	M	perambalur	labourer	yes	right index finger	2:45 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
320	sep	19	M	perambalur	labourer	no	right ankle	7:50 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
321	sep	43	M	perambalur	labourer	no	left lower limb	7:00 AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
322	sep	27	M	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
323	sep	59	M	perambalur	labourer	yes	left foot	6:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	13	recovered
324	sep	45	M	erode	labourer	yes	right leg	4:30 PM	unidentified	no	pain, swelling	>20	local	yes	Bharat sr.31003	4 hrs	no	3	recovered
325	sep	55	F	perambalur	labourer	no	left ankle	7:15 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
326	sep	55	F	perambalur	labourer	no	left big toe	2:45 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered

327	sep	49	M	perambalur	labourer	no	left foot	7:50 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
328	sep	43	M	ariyalur	labourer	yes	left ankle	3.00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
329	sep	27	M	perambalur	labourer	no	right foot	2:45 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
330	sep	51	M	perambalur	labourer	no	right 2th toe	7:00 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
331	sep	16	M	ariyalur	farmer	yes	left forearm	10.40 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
332	sep	53	M	perambalur	labourer	yes	left foot	2:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
333	sep	23	F	perambalur	student	no	right leg	7:50 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
334	sep	30	F	perambalur	labourer	no	right ankle	3.00 PM	unidentified	yes	pain	9	local	no	nil	no	no	nil	absconded
335	sep	14	M	perambalur	student	yes	left thumb	10:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
336	sep	60	M	perambalur	labourer	yes	right index finger	8:55 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
337	sep	60	M	perambalur	labourer	yes	left leg	5:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
338	sep	40	M	perambalur	labourer	yes	left leg	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes,itching	8	recovered
339	sep	10	M	perambalur	labourer	no	right foot	3:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	absconded
340	sep	23	F	perambalur	housewife	no	right big toe	7:15 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
341	sep	65	M	ariyalur	farmer	no	left lower limb	8.45 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
342	sep	45	M	ariyalur	farmer	yes	left big toe	11.20 AM	unidentified	no	drowsiness, dysphagia	10	neurotoxic	yes	Biological E limited A1602116	45 mins	yes, fever, chills& rigor	20	recovered
343	sep	11	F	ariyalur	student	yes	left foot	7.30 AM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
344	sep	40	M	perambalur	labourer	no	right foot	9.50 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
345	sep	60	M	perambalur	labourer	no	left ankle	7:00 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
346	sep	43	M	ariyalur	farmer	yes	right leg	3.00 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
347	sep	55	M	erode	farmer	yes	left leg	8:30 PM	unidentified	no	swelling / hematuria	>20	haemotoxic	yes	Bharat sr.O12039	3hrs	itching	5	recovered
348	sep	58	M	perambalur	labourer	no	right foot	5:45 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
349	sep	35	M	ariyalur	labourer	yes	right ankle	11.10 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
350	sep	18	M	ariyalur	student	yes	right ankle	11.35 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
351	sep	38	M	perambalur	labourer	no	left foot	6:15 AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered

352	oct	14	M	ariyalur	student	yes	left foot	9.50 PM	unidentified	yes	pain	8	local	no	nil	no	no	nil	recovered
353	oct	21	M	perambalur	labourer	no	left thumb	2:35 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
354	oct	20	M	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
355	oct	50	M	perambalur	labourer	no	right index finger	7:00 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
356	oct	50	M	perambalur	labourer	yes	left foot	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
357	oct	13	M	perambalur	student	no	right foot	6:20 PM	unidentified	no	pain	6	local	no	nil	no	no	nil	recovered
358	oct	53	M	perambalur	labourer	no	left ankle	4:40 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	absconded
359	oct	15	F	perambalur	student	yes	right leg	4:18 PM	unidentified	no	pain	>20	local	yes	Biological E limited A1602116	1hr	no	8	recovered
360	oct	53	M	perambalur	labourer	no	left lower limb	2:00 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	absconded
361	oct	65	M	perambalur	labourer	yes	right foot	8:00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	nausea, vomiting, itching	13	recovered
362	oct	65	M	perambalur	labourer	no	right foot	11:50 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
363	oct	60	F	perambalur	labourer	yes	right forearm	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	nausea, vomiting	10	recovered
364	oct	55	M	erode	farmer	yes	right leg	10:00 AM	R.viper	no	pain, swelling	10	local	yes	Bharat sr.O+Q43412039+Q506+Q524	1hr	no	5	recovered
365	oct	35	M	perambalur	labourer	yes	left lower limb	2:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	nausea, vomiting, itching	8	recovered
366	oct	40	F	perambalur	labourer	yes	right ankle	7:50 PM	unidentified	no	swelling	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes. , anaphylaxis	8	recovered
367	oct	60	F	perambalur	labourer	yes	left foot	3.00 PM	unidentified	no	pain, swelling, lymphadenopathy	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes. itching, urticaria	5	recovered
368	oct	30	M	perambalur	labourer	no	left thumb	6:00 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
369	oct	40	F	perambalur	labourer	no	right ankle	7:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
370	oct	19	M	perambalur	student	no	left lower limb	7:00 AM	unidentified	yes	pain	10	local	no	nil	no	no	nil	recovered
371	oct	35	M	perambalur	labourer	no	left foot	10:30 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
372	oct	37	M	perambalur	labourer	no	left ankle	8:55 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
373	oct	35	M	perambalur	labourer	yes	right foot	5:30 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited	1hr	anaphylaxis	10	recovered

														A1602116				
374	oct	52	F	perambalur	labourer	no	left forearm	7:45 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
375	oct	35	M	perambalur	labourer	yes	right leg	3:30 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes, itching	13	recovered
376	oct	53	M	perambalur	labourer	no	right foot	7:15 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
377	oct	40	M	perambalur	labourer	yes	left foot	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	urticaria	18	recovered
378	oct	60	M	perambalur	labourer	no	left thumb	3:30 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
379	oct	19	M	perambalur	labourer	yes	left foot	8:00 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes,itchin g	10	recovered
380	oct	52	M	perambalur	farmer	yes	right index finger	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes, itching	16	recovered
381	oct	29	M	perambalur	labourer	yes	right ankle	10:30 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes. itching , urticaria	8	recovered
382	oct	59	M	perambalur	labourer	no	left foot	8:55 PM	unidentified	yes	pain	12	local	no	nil	no	no	nil	recovered
383	oct	20	F	perambalur	labourer	yes	right big toe	5:30 PM	unidentified	no	pain, dyspnea, ophthalm oplegia	>20	neurotoxic	yes	Biological E limited A1602116	1hr	itching	26	recovered
384	oct	17	M	perambalur	labourer	yes	left foot	2:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes, itching	8	recovered, absconded
385	oct	47	M	perambalur	labourer	no	left leg	7:50 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
386	oct	15	M	perambalur	labourer	no	left lower limb	3.00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
387	oct	28	M	erode	labourer	yes	left leg	6:00 AM	unidentified	no	swelling /blisters	>20	haemotoxic	yes	Bharat sr.O12039	2hrs	itching	6	recovered
388	oct	42	M	perambalur	labourer	no	right ankle	7:00 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
389	oct	55	M	perambalur	labourer	no	left big toe	4:30 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
390	oct	36	M	perambalur	labourer	yes	left ankle	5:00 AM	unidentified	no	pain, blisters	>20	haemotoxic	yes	Biological E limited A1602116	1hr	yes. urticaria	8	recovered
391	oct	40	F	perambalur	labourer	no	left ankle	7.50 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	absconded
392	oct	32	F	perambalur	housewife	no	left thumb	8.30AM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
393	oct	29	M	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
394	oct	2	M	perambalur	nil	no	right big toe	7:45 PM	unidentified	no	pain	13	local	no	nil	no	no	nil	absconded
395	oct	55	F	perambalur	labourer	yes	right ankle	3:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	giddines	8	recovered

396	oct	37	M	perambalur	labourer	no	right index finger	6:00 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
397	oct	40	F	perambalur	labourer	no	left thumb	2:45 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
398	oct	55	M	perambalur	labourer	yes	right forearm	7:50 PM	unidentified	no	pain	15	local	no	nil	no	no	nil	recovered
399	oct	37	M	perambalur	labourer	yes	right foot	3.00 PM	C.krait	no	giddiness, ptosis,drowsiness	14	neurotoxic	yes	Biological E limited A1602116	45 mins	no	24	death due to respiratory failure
400	oct	50	M	perambalur	labourer	yes	right leg	8:00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	5	recovered
401	oct	40	M	perambalur	labourer	no	left lower limb	7:45 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	absconded
402	oct	36	F	perambalur	labourer	yes	left leg	10:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A1602116	1hr	no	8	recovered
403	oct	25	M	perambalur	labourer	no	left ankle	8:55 PM	unidentified	no	pain	15	local	no	nil	no	no	nil	recovered
404	oct	56	F	perambalur	labourer	no	right 2th toe	5:30 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
405	oct	42	M	perambalur	labourer	no	right ankle	2:00 AM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
406	nov	35	M	erode	driver	yes	unknown	2:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Bharat sr.4053160	30 mins	no	12	recovered
407	nov	40	M	perambalur	labourer	yes	left thumb	8:55 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
408	nov	50	M	perambalur	labourer	no	right ankle	5:30 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
409	nov	45	F	perambalur	labourer	no	left foot	6:00 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	absconded
410	nov	32	M	perambalur	labourer	yes	right leg	10:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	13	recovered
411	nov	57	M	perambalur	labourer	yes	left foot	8:55 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
412	nov	32	M	perambalur	labourer	no	left foot	5:30 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
413	nov	33	M	perambalur	labourer	yes	right big toe	7:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	13	recovered
414	nov	57	M	perambalur	labourer	no	right leg	3:30 PM	unidentified	no	pain	12	local	no	nil	no	no	nil	recovered
415	nov	62	M	perambalur	labourer	no	left big toe	7:15 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
416	nov	80	M	perambalur	labourer	no	left foot	8:55 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
417	nov	58	M	perambalur	labourer	yes	left lower limb	5:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	18	recovered
418	nov	23	M	perambalur	student	yes	left leg	6:20 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered

419	nov	13	M	perambalur	student	yes	left leg	4:40 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	5	recovered
420	nov	35	M	perambalur	labourer	yes	left foot	4:18 PM	unidentified	no	ptosis, dysphagia	>20	neurotoxic	yes	Biological E limited AS16003	1hr	no	16	recovered
421	nov	25	F	perambalur	housewife	yes	left thumb	2:00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
422	nov	55	M	perambalur	labourer	no	left ankle	8:00 PM	unidentified	yes	pain	12	local	no	nil	no	no	nil	recovered
423	nov	25	F	perambalur	housewife	yes	right ankle	11:50 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
424	nov	35	M	perambalur	labourer	yes	right foot	6:25 PM	unidentified	no	pain, hypotension	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
425	nov	40	M	erode	labourer	yes	unknown	2:10 PM	unidentified	no	ptosis, dysphagia	15	neurotoxic	yes	Bharat sr.4053160	30 mins	no	14	recovered
426	nov	50	M	perambalur	labourer	no	left foot	3:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
427	nov	70	M	perambalur	labourer	no	right ankle	6:00 PM	unidentified	no	pain	11	local	no	nil	no	no	nil	recovered
428	nov	40	F	perambalur	labourer	no	left ankle	4:00 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
429	nov	55	M	erode	labourer	yes	right leg	5:45 AM	unidentified	no	swelling /blisters /bleeding	>20	haemotoxic	yes	Bharat sr.4053140	30 mins	no	8	recovered
430	nov	62	M	perambalur	labourer	yes	left foot	6:00 AM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	5	recovered
431	nov	65	M	perambalur	labourer	no	right ankle	7:00 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
432	nov	35	F	perambalur	housewife	no	left lower limb	6:20 PM	unidentified	yes	pain	9	local	no	nil	no	no	nil	absconded
433	nov	60	M	perambalur	labourer	no	left foot	4:40 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
434	nov	4	M	perambalur	nil	no	left forearm	4:18 PM	unidentified	no	pain	4	local	no	nil	no	no	nil	recovered
435	nov	37	F	perambalur	labourer	yes	left ankle	2:00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	10	recovered
436	nov	17	F	perambalur	student	no	right index finger	8:00 PM	unidentified	no	pain	14	local	no	nil	no	no	nil	recovered
437	nov	26	F	perambalur	housewife	yes	right ankle	11:50 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	5	recovered
438	nov	15	M	perambalur	labourer	yes	left foot	4:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
439	nov	23	F	perambalur	housewife	no	left thumb	5:00 AM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
440	nov	28	F	perambalur	labourer	no	right big toe	7.50 PM	unidentified	no	pain	5	local	no	nil	no	no	nil	recovered

441	nov	45	M	perambalur	labourer	yes	right foot	8.30AM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	16	recovered
442	nov	48	F	perambalur	labourer	yes	left foot	8:55 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited AS16003	1hr	no	8	recovered
443	nov	45	M	perambalur	labourer	no	left lower limb	5:30 PM	unidentified	yes	pain	8	local	no	nil	no	no	nil	recovered
444	nov	28	F	perambalur	housewife	no	right ankle	6:00 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
445	nov	47	M	erode	labourer	yes	right middle finger	6:00 PM	unidentified	no	pain, swelling	12	local	yes	Bharat sr.4053140	3hrs	no	3	recovered
446	nov	12	F	perambalur	labourer	yes	left ankle	10:30 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	8	recovered
447	nov	40	M	perambalur	labourer	yes	left big toe	8:55 PM	unidentified	no	cellulitis	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	8	recovered
448	nov	39	M	perambalur	labourer	no	right ankle	5:30 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
449	nov	28	M	perambalur	labourer	no	left foot	7:45 PM	unidentified	no	pain	15	local	no	nil	no	no	nil	recovered
450	nov	32	F	perambalur	labourer	no	right big toe	3:30 PM	unidentified	no	pain	1	local	no	nil	no	no	nil	recovered
451	nov	28	F	perambalur	labourer	no	right index finger	7:15 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered
452	nov	36	F	perambalur	labourer	yes	left big toe	2:45 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	13	recovered
453	nov	27	M	perambalur	labourer	yes	left thumb	7:50 PM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	13	recovered
454	nov	24	M	perambalur	labourer	yes	right leg	3.00 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	13	recovered
455	nov	26	M	perambalur	labourer	yes	right leg	8:55 PM	unidentified	yes	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	8	recovered
456	nov	26	M	perambalur	labourer	yes	left lower limb	5:30 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
457	nov	45	M	erode	labourer	no	unknown	11.30 AM	R.viper	no	swelling	15 minutes	local	yes	Bharat sr.4053160	2hrs	no	14	recovered
458	nov	36	M	perambalur	labourer	no	right leg	6:20 PM	unidentified	yes	pain	11	local	no	nil	no	no	nil	recovered
459	nov	21	M	perambalur	labourer	no	left thumb	4:40 PM	unidentified	no	pain	10	local	no	nil	no	no	nil	recovered
460	nov	55	M	perambalur	labourer	no	left foot	4:18 PM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
461	dec	75	M	perambalur	labourer	no	left ankle	2:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
462	dec	65	M	perambalur	labourer	no	left forearm	8:00 PM	unidentified	no	pain	8	local	no	nil	no	no	nil	recovered

463	dec	42	F	erode	farmer	yes	left foot	8:30 PM	unidentified	no	swelling	>20	haemotoxic	yes	Bharat sr.Q524212008	30 mins	no	5	recovered
464	dec	50	F	perambalur	labourer	yes	left foot	8:20 PM	unidentified	no	cellulitis	>20	haemotoxic	yes	Biological E limited A160696	1hr	yes. itching followed by anaphylaxis	13	recovered
465	dec	60	M	perambalur	labourer	yes	left thumb	8:00 AM	unidentified	no	pain	>20	haemotoxic	yes	Biological E limited A160696	1hr	no	8	recovered
466	dec	65	F	perambalur	labourer	no	left lower limb	7:00 AM	unidentified	no	pain	>20	local	no	nil	no	no	nil	recovered
467	dec	47	M	perambalur	labourer	yes	right index finger	4:30 PM	unidentified	no	drowsiness, dysphagia	>20	neurotoxic	yes	bio vins 01AS15040	1hr	no	18	recovered
468	dec	37	F	perambalur	labourer	yes	right forearm	5:00 AM	unidentified	no	cellulitis	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
469	dec	57	M	perambalur	labourer	yes	left foot	7.50 PM	unidentified	no	pain	>20	haemotoxic	yes	bio vins 01AS15040	1hr	no	13	recovered
470	dec	21	M	perambalur	labourer	no	left foot	8.30AM	unidentified	no	pain	9	local	no	nil	no	no	nil	recovered
471	dec	40	M	perambalur	labourer	no	right ankle	6:00 PM	unidentified	no	pain	7	local	no	nil	no	no	nil	recovered
472	dec	45	F	perambalur	labourer	no	left lower limb	6:00 PM	unidentified	yes	pain	8	local	no	nil	no	no	nil	recovered
473	dec	11	M	erode	student	yes	right third toe	2:00 PM	unidentified	no	pain, swelling	>20	haemotoxic	yes	Bharat sr.212008	30 mins	itching, giddiness	7	recovered
474	dec	35	F	erode	farmer	yes	right foot	9.30 AM	unidentified	no	pain, swelling	9	local	yes	Bharat sr.4053140	6hrs	itching	6	recovered
475	dec	32	M	erode	labourer	yes	right hand	3:30 PM	unidentified	no	pain, swelling	10	local	yes	Bharat sr.4053140	3hrs	no	7	recovered
476	dec	28	F	erode	housewife	yes	left hand	11:00 AM	unidentified	no	pain, swelling , blisters	7	local	yes	Bharat sr.4053140	1hr	no	2	recovered

ANNEXURE IIb: PROFORMA

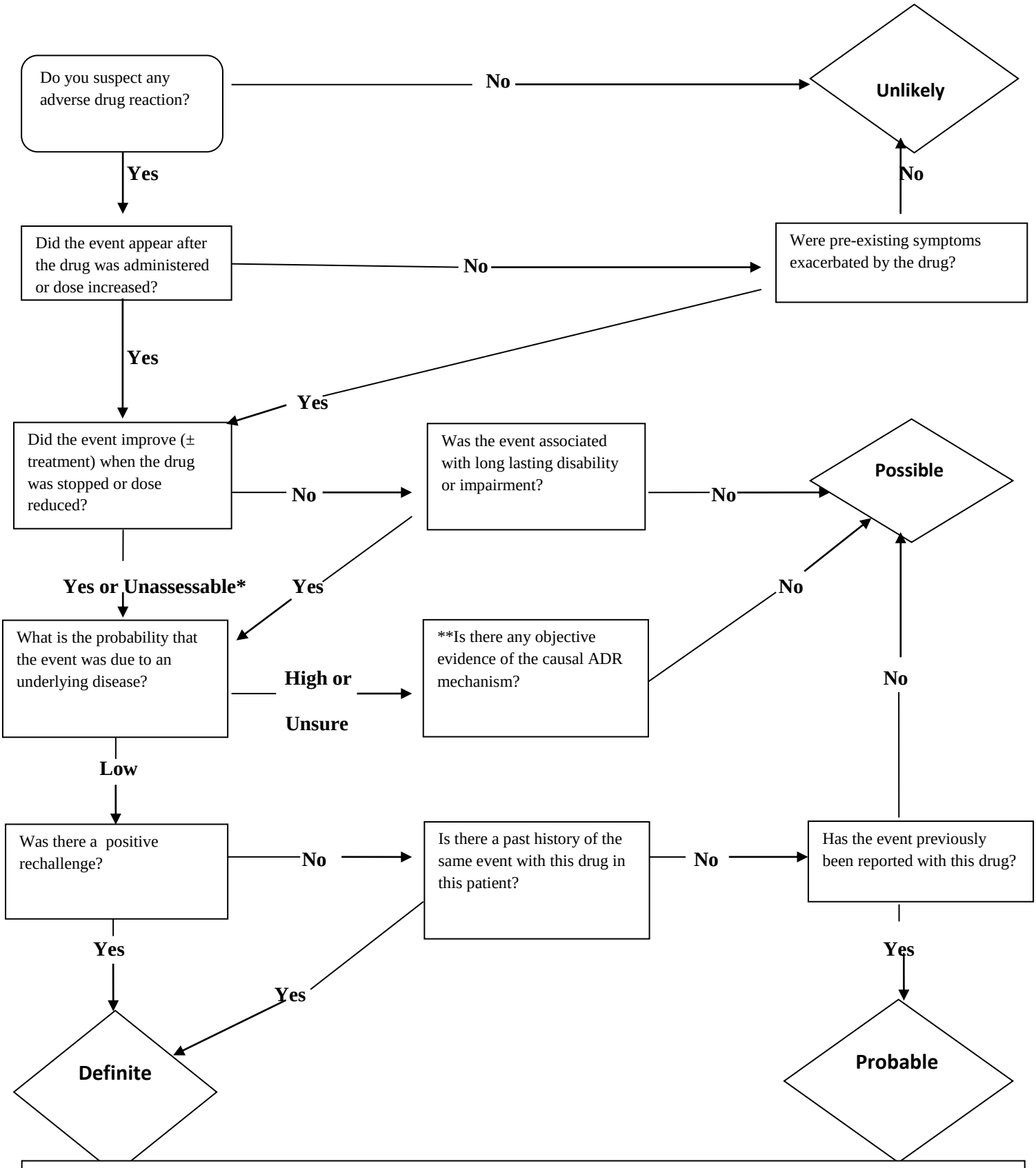
DEMOGRAPHIC PROFILE	**DATE**
Age/Sex : ***Occupation:*** ***Type Of Snake*:***	
Time Of Snake Bite: ***Site Of Bite:***	
CLINICAL PARAMETERS	
INITIAL CLINICAL PRESENTATION • Local envenomation ○ Swelling ○ Blisters / bullae ○ lymphadenopathy	• Systemic envenomation ○ Ptosis ○ Drowsiness ○ Visual disturbances ○ Dyspnea, dysphagia ○ Hypotension ○ Bleeding ○ Haematuria/Oliguria/anuria
○ Haemotoxic ○ Neurotoxic ○ other(specify)*:	
INVESTIGATIONS	Initial WBCT : ☐☐ Other positive data(if any):
TIME OF ASV ADMINISTRATION	

REACTIONS WHILE ON ASV	YES /NO

EARLY	**PYROGENIC**	**LATE**
○ Itching ○ Urticaria ○ Fever ○ Nausea,vomiting ○ Anaphylaxis (hypotension ,bronchospasm ,angioedema)	○ Chills ○ Rigor ○ hypotension	○ fever ○ nausea, vomiting ○ arthralgia ○ recurrent urticaria ○ myalgia ○ lymphadenopathy ○ proteinuria

OUTCOME OF REACTION **○ FATAL ○ RECOVERED ○ REQUIRED INTERVENTION TRANSFUSION* (if any) :**	OTHER SPECIFIC REACTIONS *(if any):
TOTAL DOSE OF ASV ADMINISTERED	+ + + + +
COMMENTS (if any) :	Details of ASV used :

ANNEXURE IIc: LIVERPOOL ALGORITHM



***** Unassessable refers to situations where the medicine is administered on one occasion (e.g. Vaccine), the patient receives intermittent therapy(e.g. Chemotherapy), or is on medicationwhich cannot be stopped(e.g. Immunosuppressants)****** Examples of objective evidence: Positive laboratory investigations of the causal ADR mechanism(Not those merely confirming the adverse reaction), Supra-therapeutic drug levels, good evidence of dose-dependent relationship with toxicity in the patient

ANNEXURE IId: ADR Severity Assessment Tool (Modified Hartwig and Siegel)

MILD
Level I: The ADR requires no change in treatment with the suspected drug. OR Level II: The ADR requires that the suspected drug be withheld, discontinued or otherwise changed. No antidote or other treatment is required, and there is no increase in lenght of stay.

MODERATE
Level III: The ADR requires that the suspected drug be withheld, discontinued or otherwise changed, and/ or an antidote or other treatment is required. There is no increase in lenght of stay. OR Level IV (a): Any level 3 ADR that increases lenght of stay by at least one day. OR Level IV (b): The ADR is the reason for admission.

SEVERE
Level V: Any level 4 ADR that requires intensive medical care. OR Level VI: The ADR causes parmanent harm to the patient. OR Level VII: The ADR either directly or indirectly leads to the death of the patient

ANNEXURE –III

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