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# Hump nosed viper bite in Sri Lanka-descriptive observational study of 1543 cases

Wijewantha HS, Sellahewa KH*

*National Hospital of Sri Lanka, Colombo 10, Sri Lanka*

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ABSTRACT

**Objective:** To identify the clinical manifestations of hump nosed viper envenomation and to recognize the available treatment methods to prevent complications. **Methods:** Descriptive observational study involving a series of 1 543 patients admitted with hump nosed viper bite to 5 major hospitals in Sri Lanka was conducted. Data collection was done consecutively during February 1990 and February 2008. Except *Hypnale*, identification of the biting snake was made by the corresponding author after visual examination of the dead or live snakes, which were brought to hospital. **Results:** Sixty seven (4.34%) patients developed systemic effects and two (0.1%) patients died due to effects of envenomation or complications of treatment. Systemic effects varied from coagulopathy, nephropathy to some neurological manifestations. Fifty nine (3.8%) patients had only coagulopathy and they received either, intravenous isotonic saline to ensure adequate urine out put i.e. 0.5 mL/kg /hour or 15 mL/kg of fresh frozen plasma (FFP). None of the patients that had coagulopathy developed renal failure. Contamination of the sample by mildly venomous species of *Hypnale* may have contributed to the low incidence of systemic complications. **Conclusions:** It is likely that early hydration with normal saline or FFP can prevent acute renal failure. FFP showed a tendency for early correction of coagulopathy. Role of FFP in hump nosed viper envenomation is worth studying in randomized double blind controlled clinical trials.

## 1. Introduction

Hump nosed viper bite is the commonest venomous snakebite in Sri Lanka[1]. Hump nosed viper is now classified as a highly venomous snake along with cobra, krait, russell's viper and saw scaled viper[2]. Hump nosed viper bite, unlike other species of snake bites, the occurrence of systemic effects is rare and unpredictable. It is the rarity as well as the unpredictability of the sporadic appearance of these potentially fatal systemic effects of envenoming[3] by the hump nosed viper that has made it one of the important species of venomous snakes. The problems of management of these systemic effects, apart from the poor predictability, are compounded by the non-availability of antivenom specific for hump nosed viper[4-6]

This study was carried out to identify the clinical manifestations of envenomation by the hump nosed viper and recognize the available modalities of treatment to prevent complications.

## 2. Materials and methods

Descriptive observational study involving a series of 1 543 patients admitted with hump nosed viper bites, to five major hospitals in Sri Lanka, namely General Hospital, Anuradhapura, Base Hospital (Awissawella), Teaching Hospital Colombo North, Teaching Hospital Colombo South and National Hospital of Sri Lanka, during February 1990 and February 2008. Data collection was done consecutively in the above hospitals by the corresponding author during the following period. Namely: General Hospital Anuradhapura 1990-1992; Base Hospital Avissawella 1993-1994; Teaching Hospital Colombo North 1995; Teaching

*Corresponding author: Dr. K. H. Sellahewa, Apartment 6/9, Premier Pacific pinnacle, 28, R.A. de Mel Mawatha, Colombo 04, Sri Lanka.
Tel: +94112502954, +94718433213
E-mail:kolithah@gmail.com

Hospital Colombo South 1996–2004; National Hospital Sri Lanka 2005–2008.

Identification of the biting snake as hump nosed viper was made by the corresponding author after visual examination of the dead or live snakes, which were brought to hospital at the time of admission. Species identification of *Hypnale nepa*, *Hypnale walli* or *Hypnale zara* was not done due to lack of expertise. Patients who did not come along with the biting snake to be identified at the time of admission were excluded from the study.

Informed consent was taken from all patients or from legal guardians when patients were less than eighteen years of age to participate in the study.

Detailed clinical examination was performed on all patients to gather information regarding the site of bite, signs and symptoms of local envenomation such as pain at the bite site, swelling, regional lymphadenopathy, and hemorrhagic blister. All patients were monitored with one hourly charting of blood pressure, pulse rate, respiratory rate, urine out put (UOP) and four hourly twenty minute whole blood clotting test (WBCT). In addition patients were observed for the development of double vision, ophthalmoplegia and deterioration of the level of consciousness every 4 hours.

Patients who developed features of systemic envenomation were subjected to daily blood urea, serum creatinine, prothrombin time and activated partial thromboplastin time tests.

Twenty minute whole blood clotting test was performed at the bed side by adding 2 mL of whole blood in to a previously unused glass test tube. The test tube was left undisturbed at room temperature for twenty minutes and then tilted. The test was considered positive if the blood was incoagulable and flowed on tilting and negative if the blood did not flow. Blood samples were collected for prothrombin time and international normalized ratio (PT/INR) and activated partial thromboplastin time (APTT) by adding 1.8 mL of whole blood into a bottle which contained 0.2 mL of prothrombin citrate. Blood for urea (BU) and creatinine (*Scr*) were collected into plain bottles. All investigations were done in the relevant hospital laboratories.

Patients with coagulopathy only, received either, isotonic saline to ensure adequate urine out put i.e. 0.5 mL/kg /hour or 15 mL/kg of fresh frozen plasma (FFP) as an intravenous infusion. FFP was repeated 4 hourly until normalization of coagulopathy. Decision to give either FFP or isotonic saline was made by the corresponding author based on an individualized clinical judgment of the overall condition of the patient.

Development of clinical features and their response to treatment were observed. Decision to discharge patients included was taken by the same physician.

## 3. Results

Of the studied patients, 1 146 (74.3%) were males and 397 (25.7%) were females. Mean age of these patients was 37.3 years, ranging from 13–79 years. 1 359 (88%) patients were bitten on the feet, 155 (10%) were bitten on the hands and 29 (1.9%) were bitten on the forearms.

### 3.1. Clinical features of envenomation

All 1 543 patients complained of pain and 1 535 (99.5%) patients complained of swelling of the bite site. A hemorrhagic blister was presented in 230 (14.9%) patients and painful regional lymphadenopathy in 413(26.8%).

Out of the 1 543 patients studied, 67 patients developed systemic effects and two patients died due to effects of envenomation or complications of treatment (Table 1).

The patient who developed shock had coagulopathy, while patients with presence of diarrhea, abdominal pain and vomiting, ophthalmoplegia and coma did not.

Out of the 59 patients who had only coagulopathy, 58 patients had prolonged coagulation tests within 24 hours of the bite and one patient developed hematuria after 48 hours with prolonged clotting tests despite having serial normal twenty minute WBCTs and normal INR and APTT within 24 hours after the bite.

**Table 1**
Systemic effects of envenomation(*n*, %).

| Systemic effect | *n* (1543) |
|---|---|
| Coagulopathy alone | 59(3.80) |
| Shock | 1(0.06)* |
| Diarrhea | 1(0.06)* |
| Abdominal pain and vomiting | 2(0.10) |
| Ophthalmoplegia | 3(0.20) |
| Coma | 1(0.06) |
| Death | 2(0.10) |
| Total | 67(4.34) |

* These two patients died subsequently and are included as dead patient

One death in this series was a twenty eight year-old male in Anuradhapura who developed a profuse watery diarrhea and died on the same day of the bite. Since he remained in the hospital only for one day, the cause of diarrhea was not investigated. Clinical evaluation did not reveal any other cause for the diarrhea, and the twenty minute WBCTs was negative. He had not received any traditional medication prior to admission. The other death case was a thirty five year-old female who had incoagulable blood 2 hours after the bite. She was treated with 100 mL of polyvalent anti venom from the Serum Institute of India as an intravenous infusion over one hour diluted in 400 mL of isotonic saline. She had persistent coagulopathy, developed shock and died within 6 hours of admission. We were not sure whether her death was due to a reaction to AVS or to the effects of envenoming; the former was more likely the cause.

All patients received paracetamol only for the pain. Only eight patients in this series received antibiotics for local

**Table 2**
Summary of treatment received by patients with coagulopathy.

| Treatment | Mean duration of time taken for 20 min WBCT to normalize* (hours) | Mean duration of hospital stay(hours) | Progression to ARF | Bleeding | Shock/Death |
|---|---|---|---|---|---|
| FFP ($n$=42)[1] | 4.74 | 89.30 | 0 | 0 | 0 |
| Isotonic saline ($n$=17)[1] | 6.22 | 89.33 | 0 | 0 | 0 |
| Antivenom serum ($n$=1) | Not measured | 6.00 | N/A | 0 | 12 |

*20 min WBCT was done every 4 hours, ARF=acute renal failure, 1= these patients had only coagulopathy, 2= this patient died within 6 hours after admission.

effects which were omitted within 48 hours. No active interventions were done for local swelling, hemorrhagic blisters and regional lymphadenopathy, other than reassurance and pain relief. Treatments for patients with presence of coagulopathy were summarized in Table 2.

## 4. Discussion

In Sri Lanka snake bites are more common among males than females which is probably due to social factors such as males being more involved in out door activities[3].

All patients in this series were bitten on the extremities of the limbs ie. feet, hands and forearms which implies hump nosed viper is not an aggressive biter, reaching out to attack. Wearing foot wear to cover the feet when travelling in areas where snake bite is common and using gloves to cover the hands and forearms when reaching blindly into places where snakes may dwell will reduce the incidence of hump nosed viper bite.

Most hump nosed viper bites cause only local envenomation. All patients had pain at the bite site and almost all patients had local swelling. Less commonly there was regional lymphadenopathy and a hemorrhagic blister at the bite site.

The majority of patients required only paracetamol as an analgesic for the local pain and swelling which all envenomed patients developed. Neither the swelling nor the hemorrhagic blisters at the bite site, which is developed in some patients, were treated with antibiotics. It is a chemical inflammation and resolved spontaneously without any adverse outcome[6]. The hemorrhagic blisters are often mistaken for gangrene, particularly when it develops at bite sites related to toes and fingers, Inappropriate surgical interventions can lead to unnecessary extensive surgical debridement of tissue. This diagnostic pit fall can easily be avoided by careful examination of the bite site and attention to detail. It will then be clearly discernible that it is the black color imparted by altered blood underlying the thin layer of skin epithelium that has given a wrong notion of gangrene.

Development of systemic envenomation was rare in hump nosed viper bites (67/1543 – 4.34%) which is not related to bite sites or the severity of local envenomation. Most interestingly none of the patients who had coagulopathy developed renal failure. It is likely that early hydration with normal saline or fresh frozen plasma can prevent acute renal failure due to hump nosed viper envenomation. However this needs to be clarified by further studies.

We used FFP for patients with prolonged twenty minute WBCT on the premise that early correction of coagulopathy by replenishment of clotting factors could arrest the cascading vicious cycle leading to disseminated intravascular coagulation (DIC) and attended depletion of clotting factors and platelets. Fibrin degradation products will perpetuate the bleeding tendency by its antihemostatic effects. Fibrin deposition in the renal microcirculation and microvascular coagulation would contribute to acute renal failure[7]. None of the 42 patients treated with FFP in this series developed any adverse sensitivity reactions. FFP showed a tendency for early correction of coagulopathy. Further studies are needed to test for a clinically significant additional benefit of FFP over normal saline in patients presenting after hump nosed viper bite.

It was found that a positive twenty minute WBCT is a reliable and early predictor of systemic envenomation. It detects coagulopathy which is the most important factor with regard to mortality. All patients who develop coagulopathy as evidenced by a positive twenty minute WBCT should be selected for intensive monitoring and aggressive therapy, aimed in the early detection, prevention, and treatment of disseminated intravascular coagulation (DIC) and thereby retard the advent of acute renal failure. All envenomed patients should be observed for at least 48 hours for the development of systemic effects due to the possibility of delayed or recurrent manifestation of coagulopathy.

Systemic effects of envenomation by the hump nosed viper are rare and vary from coagulopathy, nephropathy to some neurological manifestations, raising the possibility of variations in the venom composition of the same species from different geographical locations in the same country[2,5]. It is possible that this is due to variations in the content of the enzyme phospholipase A2 which is implicated in the systemic effects due to snake venom[2].

Contamination of this series by mildly venomous species of *Hypnale* could have contributed to the low incidence of complications in this study. The same reason could have been responsible for the diversity of the systemic effects as well. It is worth studying the features of systemic envenomation of each species of Hypnale and their

prevalence in different geographical regions.

Currently available antivenom in Sri Lanka is imported from India and utilizes in its preparation the venom from Indian species of *Naja naja*, *Bungarous caeruleus*, *Daboia russelli* and *Echis carinatus* but not the venom of hump nosed viper *(Hypnale hypnale)*. The only patient who received anti venom in this case series had persistent coagulopathy and developed shock despite treatment, and died within 6 hours of admission. It is not clear whether the death was due to envenomation or as an anaphylactic reaction to anti venom. Present study is underpowered to study the effectiveness of currently available antivenom against hump nosed viper. But there is ample evidence to suggest that it does not reduce complications of hump nosed viper envenomation[3]

Thrombocytopenia in association with a positive twenty minute WBCT in this clinical setting implies DIC and should be treated as such. Determination of APTT, PT/INR, D Dimmers, fibrinogen degradation products and fibrinogen assays will only serve to increase the precision of the diagnosis. However in resource poor settings where snake bite is common none of these tests are necessary to manage the patients. On the contrary these tests can add to the cost of management and delay interventions with disastrous and often fatal consequences.

Local effects of hump nosed viper bites can be managed without antibiotics. Paracetamol is a useful drug for pain relief. Systemic effects of envenomation by the hump nosed viper are rare and diverse raising the possibility of variations in the venom composition of the same species from different geographical locations in the same country. Clinical effects may vary with the species of *Hypnale* as well. Any attempt in the development of an antivenom against hump nosed viper must utilize venom from hump nosed vipers from all the different regions of Sri Lanka and venom from all 4 species of *Hypnale*, i.e *Hypnale hypnale*, *Hypnale nepa*, *Hypnale walli*, and *Hypnale zara*, to ensure greater efficacy and less chance for therapeutic failures. Twenty minute WBCT is a reliable means of detecting coagulopathy which is the commonest and most important systemic effect contributing to morbidity and mortality in hump nosed viper bite victims. It should be serially performed in all patients for at least 48 hours due to the possibility of late development of coagulopathy. Early detection of coagulopathy, adequate hydration and/or treatment with FFP at the inception of coagulopathy may reduce the mortality and morbidity due to hump nosed viper envenomation. Role of fresh frozen plasma in hump nosed viper envenomation is worth studying in randomized double blind controlled clinical trials.

## Conflict of interest statement

We declare that we have no conflict of interest.

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