

Comparative Analysis of Clinical and Laboratory Parameters in Viper Bite Cases from Northern Kerala

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Abstract

Context: India is a country with highest rates of mortalities and morbidities resulting from snake bite. There is a concept that four snake species namely *Naja naja*, *Bungarus caeruleus*, *Daboia russelii*, *Echis carinatus*, together called the 'The Big 4 snakes of medical importance' are solely responsible for morbidities and mortalities. Indian antivenom is effective against aforementioned species only. **Aims:** Aim of the study was to compare the clinical and laboratory variables in patients bitten by hump-nosed pit viper (*Hypnale hypnale*) and other vipers. **Settings and Design:** Study was conducted in Kozhikode Government Medical College, located in Northern Kerala. It was a descriptive study on various clinical and laboratory parameters. **Methods and Material:** Study was conducted comparing various clinical and laboratory parameters in among patients bitten by *Daboia russelii* and *Hypnale Hypnale*. **Statistical analysis used:** Analysis was done using EPIINFO and SPSS software. Comparisons between viper bites were done by the chisquare test. **Results:** Analysis proved that except for parotid swelling, which was seen only among *Daboia russelii* bitten patients, there were no statistically significant difference among the various parameters studied, including mortality rate. **Conclusions:** Our study emphasizes the urgent need for anti snake venom effective in *Hypnale Hypnale* envenomations.

Keywords: Hump Nosed Pit Viper; Indian Anti Snake Venom; Russell's Viper.

Introduction

Yearly about 40,000 people die in India due to poisonous snake bites, which is highest in world [1]. Four snake species namely Indian cobra (*Naja naja*), the common krait (*Bungarus caeruleus*), the Russell's viper (*Daboia russelii*) and the saw-scaled viper (*Echis carinatus*) cause most of these mortalities [2,3]. Hence the concept of the "Big 4" snakes of medical importance had evolved as these four species are causing most of the mortalities related to snakebite in the subcontinent [2-4]. However there have been recent reports

of many other snakes like hump nosed pit viper, Levantine viper causing considerable morbidity and occasional mortality [5-7].

Mortality and morbidity due to snake envenomation is a common medical emergency in Kerala. Farmers working in their rubber, paddy, and coffee plantations in hilly terrains are the most affected. Russell's viper and Hump nosed pit viper are predominant viper species envenomation, encountered in Northern Kerala. Saw-scaled viper bites are rare in the region when compared to rest of India.

Materials and Methods

Study was conducted in the snake bite treatment unit of Calicut medical college hospital during January 2011 to June 2012. Patients from northern Kerala including districts of Wayanad, Kozhikode, Kannur and Malappuram are treated in the unit for snake bite envenomation. Only envenomations due to viper bites were studied. Only those cases in which the snake which had inflicted the

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Received on 11.04.2018, Accepted on 05.05.2018

envenomation was brought to the hospital for species identification were included in the study. All cases in which the snakes were not brought to the hospital for identification or cases with ambiguity species identification were excluded from the study.

Clinical parameters studied include time since envenomation, site of bite, age, sex, first aid received or not, local swelling, or any other local reaction such as cellulitis, haemorrhagic bullae, gangrene. etc., lymphadenopathy, petechial spots, echymosis, epistaxis, haemoptysis, maleana, evidences of intracranial haemorrhage, urine volume, input output charts, haematuria (Table 1).

Laboratory parameters studied include complete blood count (using Sysmex KX-21), haemoglobin, RBC count, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, total leukocyte count, 3 part differential count, platelet count, mean platelet volume, platelet distribution width, platelet large cell ratio (Table 2).

Peripheral smear was collected by finger prick method, air dried and stained by Leishman stain.

Urine albumin was detected by the sulfosalicylic acid test. Urine microscopy was assessed after centrifuging at 1500G for 5 minutes for evidence of haematuria, RBC casts and granular casts.

Bleeding time was done using Duke Bleeding Time method.

Clotting time was assessed using 20 minute clotting time as per WHO guidelines [8].

2 ml of freshly sampled venous blood placed in a small, new or heat cleaned, dry, glass vessel and left undisturbed for 20 minutes at ambient temperature. The tube is tipped once. If the blood is still liquid (unclotted) and runs out, the whole blood coagulation time is prolonged.

Prothombin time and Activated prothrombin time were measured using 'Trinity Biotech destiny plus automated coagulometer'.

Blood urea and serum creatinine were assessed.

The study was approved by the institutional ethics committee of Government Medical College, Kozhikode.

The data was analyzed by EPIINFO and SPSS software. Comparison of laboratory and clinical parameters between bites by the three different types of snakes was tabulated (Table 1 and Table 2). The difference between Russell viper (n=15) and Hump-nosed pit viper (n=19) was done by the chi square test. Since there was only one case of saw scaled viper bite, it was omitted from this analysis

Results

35 cases were studied. Hump nosed (19) and Russell viper bites (15) occurred in all most in equal frequencies. Males were the victims in most

Table 1: Comparison of clinical characteristics of different types of snake bites

	A. Russel's viper [no. (%)]	B. Hump nosed pit viper [no. (%)]	C. Saw scaled viper [no. (%)]	p (A vs B)
Total number (N)	15	19	1	
Bite mark	15 (100)	19 (100)	1 (100)	-
Fang mark	10 (66.7)	8 (42.1)	1 (100)	0.505
Site of bite				
Lower limb	13 (86.7)	17 (89.5)	1 (100)	0.603
Upper limb	2 (13.3)	2 (10.5)	0 (0)	
Renal failure	4 (26.7)	4 (21.1)	0 (0)	0.505
Need for dialysis	1 (6.7)	2 (10.5)	0 (0)	0.590
Capillary leak syndrome	1 (6.7)	0 (0)	0 (0)	0.441
Parotid swelling	4 (26.7)	0 (0)	0 (0)	0.029
Spontaneous bleeds	2 (13.3)	2 (10.5)	1 (100)	0.603
Reaction at site of bite	13 (86.7)	19 (100)	1 (100)	0.187
Oliguria (daily output <400 ml)	0 (0)	3 (15.8)	0 (0)	0.162

Abbreviations: NIL

cases (27/35). Lower limb was the predominant site of bite in males (26/27), whereas in females upper limb (4/7) was the commonest site of bite. This is due to the fact that most of snake bites are encountered during agricultural activities or by walking barefoot at night and in Indian families it is mainly the male members who work in the farmland. Whereas in females most envenomations in upper limb occurred during sweeping of the living areas or gardens with brooms. The culprit snake usually would have camouflaged among dry leaves. Similar observations have been made in previous studies [1,4,9].

Age of the patients varied from 14 to 72. The maximum numbers of bites (9) were in the age group 40-49. These represent the economically most productive age group. There were also 8 bites in age group 60 and above. This may be the population who venture out without any protective footwear.

Clinical and laboratory parameters are compared in Table 1 and Table 2. Symptoms suggestive of

renal failure was noticed in 4 (26.7%) cases of Russell viper bites and 4 (21.1%) of the hump nosed pit viper bite (Table 1). 4 out of 19 cases of Hump-nosed pit viper bite in our study developed features of acute renal failure. This suggests that *Hypnale hypnale* accounts for a major cause of renal failure complicating hemotoxic snake bites in the region, taking into consideration the fact that only 20-30% of cases patients brings the snake to the hospital. All the patients with renal failure, either from pit viper bite or Russell bite, had features of systemic envenomation such as the prolonged clotting time. 8 cases of renal failure includes two mortalities, one was due to Russell viper envenomation and one due to Hump-nosed pit viper envenomation (Table 1). In two out of four cases of renal failure due to Hump-nosed pit viper bite, patient had to undergo hemodialysis. Hemodialysis was advised in two cases of the Russell viper bite, but was done only in one case since the other patient had rapid worsening of clinical conditions. Incidence of renal failure in our study is higher than

Table 2: Laboratory features in of different types of snake bites

	A. Russel's viper [no. (%)]	B. Hump nosed pit viper [no. (%)]	C. Saw scaled viper [no. (%)]	p (A vs B)
Anemia (Hb <11 g/dl)	4 (26.7)	2 (10.5)	0 (0)	0.219
RBC count <	3 (20)	1 (5.3)	0 (0)	0.215
PCV (M <40;F <36)	6(40)	5 (26.3)	0 (0)	0.390
Microcytosis (MCV <80)	6(40)	2 (10.5)	0 (0)	0.054
MCH < 27	3 (20)	3 (15.8)	0 (0)	0.472
RDW >14.5	2 (13.3)	1 (5.3)	0 (0)	0.384
Leukocytosis (TLC >11000)	8 (53.4)	10 (52.6)	0 (0)	0.447
Neutrophilia (absolute count > 8400)	7 (46.7)	9 (47.5)	0 (0)	0.5
Thrombocytopenia(Platelet <100000)	3 (20)	4 (21.1)	0 (0)	0.639
Toxic granules	2 (13.3)	1 (5.3)	0 (0)	0.409
Shift to left of myeloid cells	6(40)	1 (5.3)	1 (100)	0.019
Eosinophila	1 (6.7)	1 (5.3)	0 (0)	0.695
Atypical lymphocytes	3 (20)	2 (10.5)	0 (0)	0.384
Blood urea > 40 mg	4 (26.7)	4 (21.1)	0 (0)	0.505
Serum creatinine > 2 mg	4 (26.7)	4 (21.1)	0 (0)	0.505
Hematuria (RBC > 15 / hpf)	3 (20)	1 (5.3)	0 (0)	0.215
Albuminuria	5 (33.3)	5 (26.3)	0 (0)	0.471
Prolongation of Clotting time	9 (60)	7 (37.9)	1 (100)	0.159
Increase in PT	6 (40)	8 (42.1)	0 (0)	0.590
Increase in APTT	6 (40)	8 (42.1)	0 (0)	0.590

Abbreviations:

Hb - Hemoglobin, RBC count, RBC count - Red Blood Cell count, PCV-Packed Cell Volume, MCV-Mean Corpuscular Volume, MCH-Mean Corpuscular Hemoglobin, RDW- Red cell Distribution Width, TLC-Total Leucocyte count, PT - Prothrombin Time, APTT-Activated Partial Thromboplastin Time

previous observations like Ariaratnam et al from Srilanka [6]. This may be due to the fact that study was conducted in a tertiary care centre. Prolongation of clotting time, a sign of systemic envenomation is almost met with equal frequencies in bites of Russell and Hump-nosed viper bites. Almost all the patients who developed prolongation of clotting time developed simultaneous prolongation of PT and APTT also. This can be attributed to the consumptive coagulopathy and fibrinolysis. Similar observations has been made by Suchithra et al. [10]. Premawardena et al had reported normal PT and APTT values in systemic envenomation due to Hump-nosed pit viper bite [11]. Based on this, they further suggested that the bleeding in Hypnale bites is due to primary fibrinolysis. Our findings do not support this contention.

Statistically significant differences in clinical and laboratory parameters were obtained only in case of parotid swelling which were seen only in cases with Russell's viper bites.

Polyvalent Anti snake venom was given in 10 cases with Russell's viper bites, 6 cases with hump nosed pit viper bites and in the lone case of saw scaled viper bite. Response to ASV was assessed by the normalization of the clotting time. All cases of Russell's viper bite and the saw scaled viper bite responded to ASV. None of the cases of hump nosed pit viper bite responded to ASV. Similar observations were made in previous studies from Srilanka [6].

In one case a 34 year old female who had Hump nosed pit viper bite developed herpes labialis. Two cases of Russell viper bites developed features of neurotoxicity including ptosis and ophthalmoplegia. One case of Russell viper bite also had hepatitis with icterus and raised liver enzymes (Total bilirubin - 8.4mg/dl and SGOT - 484U/L). Another patient with Russell viper bite also developed pulmonary edema.

Discussion

Our study shows that snake bite is essentially an occupation hazard crippling lives of farmers. Males are predominantly involved with lower limb predominant site. Russell viper and Hump-nosed pit viper causes majority of heamotoxic envenomation in the region and saw scaled viper is rather rare, when compared to rest of India. There is not much difference in clinical and laboratory parameters studied among these viper bites, except

for parotid enlargement, which was seen only in Russell's viper bites. Though well known to clinicians, published data about parotid swelling is scanty [12]. The letter by Chakraborty and Bhattacharjee from Midnapore medical college, West Bengal in a case of Russell viper bite is one of the rare cases in literature. No significant differences were noticed among other parameters including renal failure and mortality rates. Indian ASV is not helpful in Hypnale Hypnale bites. Recently, there have been some reports of lethal envenomation caused by hypnale bites observed in Kerala by Joseph et al and from Sri Lanka by studies such as by Ariaratnam et al. [5,6]. Published data about H.hypnale envenomation in India is rather scarce. In many of cases these snakes are misidentified as Russell viper. The culprit snake could be identified in 30 to 50 percent of the cases, whereas most victims come to hospitals as 'unknown' bites [9]. Hence the real burden of hump nosed pit viper bites in India is largely under estimated. There is urgent need for development of ASV effective in hump nosed pit viper bites. Study also points to the need for better technology such as ELISA for species identification since there is considerable overlap in the clinical symptoms.

Limitation of the study was that we could study only 35 cases. Study size was small because we followed strict inclusion criteria.

Conclusion

Our study proves that hump nosed pit viper can cause morbidity and mortality comparable to Russell's viper. Present ASV is ineffective in these cases and there is urgent need for effective therapy.

Key Messages: Our study proves that hump nosed pit viper can cause morbidity and mortality comparable to Russell's viper. Present ASV is ineffective in these cases and there is urgent need for effective therapy.

Abbreviations: ASV - Anti Snake Venom, WHO-World Health Organisation

Conflict Of Interest: NIL

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