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Impact of Snakebite Envenomation on Coagulation Parameters: A Study in a Konkan Tertiary Hospital

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ABSTRACT

Background: The Konkan region situated in western India, is a tropical and subtropical area with diverse flora and fauna. Unfortunately, it is also the home to various poisonous and non-poisonous snakes. Snake bites are a relatively significant health hazard with most of the patients being treated with household remedies or under some local quack due to illiteracy. The present study aimed to evaluate patients' Prothrombin time (PT), International normalised ratio (INR) & Platelet count during hospitalization for their prognosis and overall management.

Methods: This is a record-based observational study of patients' lab parameters such as PT, INR & Platelets during the period from June 2023 to May 2024 in a tertiary care hospital ICU, where all parameters tested with quality control and having an adequate supply of ASV & blood products.

Results: A total of 61 cases of snake bite cases recorded with male preponderance (70.4%). The most affected age group was 21-60 years (60.6%). It is found that most cases belong to vasculotoxic snakes (80%) while only 20% of cases were of neurotoxic snake bites.

Conclusion: As per the literature, vasculotoxic snakes are prone to cause DIC with a deranged coagulation profile as observed in the present study conducted in the Konkan region. As most of the cases are successfully treated with ASV and blood products, coagulation parameters play an important role in their dosage calculation & overall hospital stay.

Key-words: Snake bites, Coagulation, Prothrombin time, INR, Platelets, DIC, Anti-snake venom

INTRODUCTION

Snake bites are frequently encountered in India since the country is home to different kinds of snakes. More than 60 venomous snakes are known to be seen in India. Spectacular Cobra (Naja naja), Common Krait (*Bungarus caeruleus*), Saw-scaled viper (*Echis carinatus*) and Russell viper (*Daboia russelii*) are amongst the most frequent species.[1-3]

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The Konkan region situated in Western India, is a tropical and subtropical area with diverse true nature. Unfortunately, this region is also home to various venomous and non-venomous snakes posing a significant public health threat. 10,000 to 15,000 snake bites occur annually in the Konkan region. Most of the snake bites occur during monsoon season (June–September because this is Rice farming season.[4-7] Snake bite can cause paralysis breathing problems, and bleeding disorders leading to a fatal haemorrhage & Acute kidney injury. Most affected individuals are Agricultural workers and children. Children are more prone as compared to adults.[8] Data on verbal autopsies now suggest that about 1.2 million Indians died from snakebite in the period 2000–2019 (average of 58,000/year).[9] Due to the unavailability of any snake venom detection kit (SVDK) in

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India, clinicians depend on the "Syndromic Approach" (clinical profile, i.e., hemotoxic or neuroparalytic signs and symptoms along with 20 minutes of whole blood clotting time and other blood tests) for the diagnosis of envenomation.[10] The current study was done to determine the changes in PT-INR & Platelet count in patients with bites from different species of poisonous snakes.

MATERIALS AND METHODS

Study setting- A tertiary care hospital.

Study design- Hospital Record Based Observational cross-sectional study.

Study period- Record of patients admitted between June 2023 to May 2024.

Methodology- The present study was carried out in the Central Clinical Laboratory (CCL), B.K.L Walawalkar Rural Medical College and Hospital, Dervan. It records a record-based observational type of Study. A total of 61 patients, between June 2023- May 2024 were included in the study. All the patients were diagnosed with snake bites based on history and haematological investigation in the ICU. About 6-8 ml of venous blood samples were collected in two bulbs. Around 5ml blood was collected by Sodium citrate bulb and 2-3 ml of blood was collected in EDTA by venipuncture under strict aseptic precaution as soon as the subjects got admitted as per the inclusion criteria. Sodium Citrate Blood samples were centrifuged at 3500 rpm for 10 minutes and Plasma was separated. A plasma sample was used for PT-INR estimation by a fully automated coagulation machine. Platelet count estimated on whole blood collected in EDTA bulb by hemoanalyzer.

Inclusion criteria - All the proven snake poisonous cases were admitted to the ICU.

Exclusion criteria- Unknown bite, brought death patients where investigation not done.

Instruments & methods- Estimation of PT-INR done by ACL-Elite machine and Estimation of Complete blood count done by Horiba machine.

Statistical analysis- All data was compiled in Microsoft Excel and represented as frequency and percentage.

Ethical approval- The study was approved by the Institutional Ethical Committee (BKLWRMC/LEC/121/ 2024).

RESULTS

Table 1 shows age distributions among the cases, 17% of cases belong to the children & adolescent group. 23% population belong to 21-40 years of age. 41- 60, is the most affected age group (38%), while >60 years individuals are involved to be 19%. Reflecting the fact that maximum cases are seen among adults who are mostly farmers.

Table 1: Gender-wise and age-wise distribution of patients

Age Groups (Y)	Male	Female	%
0-20	4	6	17%
21-40	11	3	23%
41-60	20	3	38%
>60	9	4	19%

This pie chart shows that, out of 61 snake bite cases, 49 cases (80%) belong to vasculotoxic while, 12 cases (20%) to neurotoxic snake bite. This reflects that the incidence of vasculotoxic snakes is found to be more than neurotoxic snakes in the Konkan region (Fig. 1).

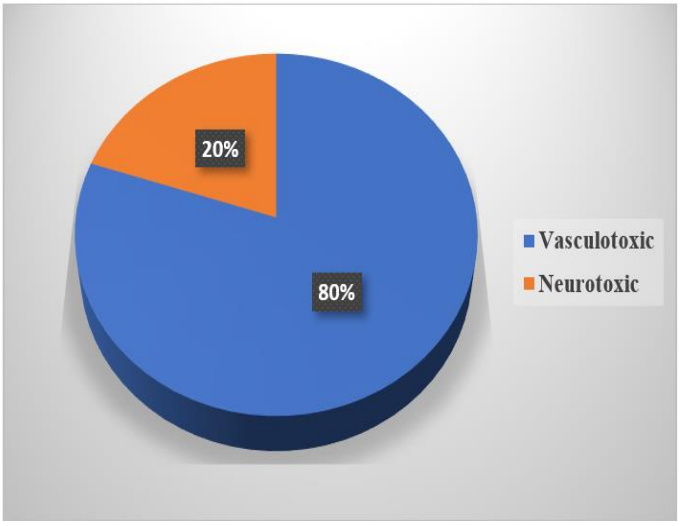

Fig. 1: Cases distributed as per the toxicity

In our study, all the cases are poisonous & are admitted to ICU. This table shows that, out of all vasculotoxic cases, 67.3% of cases show deranged PT & 33 % of cases show normal PT range. In Neurotoxic cases, 33.3% cases show deranged PT value and the majority (66.6%) cases

show normal PT range. While comparing INR values, 31 cases (51%) fall within the normal range of INR. Out of that, 22 cases are of vasculotoxic and 9 cases are of neurotoxic snake bite. 30 cases (49%) show abnormal INR values and 27 & 3 cases belong to vasculotoxic & neurotoxic snake bites respectively (Table 2).

Table 2: Cases as per deranged PT & INR value during hospital stay

Parameter	Cut-off taken	Vasculotoxic (N=49)	Neurotoxic (N=12)
Prothrombin time (PT)	10-14 seconds (Normal)	16	8
	14-170 seconds	21	4
	>170 seconds	12	-
INR Value	0.8-1.2 (Normal)	22	9
	>1.2	27	3

Out of 61 cases, the maximum cases i.e. 46 cases (75.4 %) show normal platelet count irrespective of the type of poison on admission. While, 15 cases (24.5%) show deranged platelet value, out of that 13 cases belong to vasculotoxic and 2 cases to neurotoxic snake bite. This also shows that the chances of thrombocytopenia are higher in vasculotoxic cases when compared to neurotoxic cases (Table 3).

Table 3: Distribution of Platelet count in all cases.

Platelet Analysis	On Admission	
1.5L-4.50L (Normal range)	46 (75.4%)	
<1.5L (Thrombocytopenia)	15 (24.6%)	Vasculotoxic snake bite=13 Neurotoxic snake bite=2

DISCUSSION

The present study included 61 patients. All the patients were admitted to B.K.L. Walawalkar Hospital Diagnostic and Research Centre, Dervan. In this study, patient data is collected from the Medical Records department, over the period June 2023 to May 2024.

We have compared with other studies and found that the maximum cases belong to the age group 21-60 years ago in our study results somewhat matching with Patel *et al.* [11] & Bhalla G *et al.* [12] both studies have 15-50 years being most common age group affected while Metkar *et al.* [13] & Bhagwan *et al.* [14] have concluded that16-40 & 11-40 years is the most common age group involved in snake poisoning.

While comparing INR parameters with Patil *et al.* [15] studies, the finding matched i.e. almost 50% of cases INR was found to be deranged irrespective of the type of snake bite. While comparing PT, Metkar *et al.* [13] found significant cases in 81% with abnormal values while Patil *et al.* [15] & our study observed PT derangement in 49% & 57.30%, respectively.

Regarding the prevalence of snake bites, our study has shown significant vasculotoxic (80.2%) & neurotoxic snake bite cases (19.6%) in the Konkan region when compared to Patil *et al.* [15] studies where vasculotoxic cases are 55.2% & neurotoxic cases are 4.2%, however, the study was conducted in a different region of Maharashtra.

CONCLUSIONS

After the present study, we conclude that there is a high prevalence of snake poisoning cases especially vasculotoxic bites in the Konkan region & the affected population is mostly adolescents to adults with farming as their important occupation. Lab investigations such as PT, INR & Platelet count are simple steps for early detection & initiating treatment, preventing further case fatality in the form of ASV doses & other blood products. Further coagulation studies need to be carried out such as D-dimer, and aPTT in all snake bite cases for more precision & detection.

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CONTRIBUTION OF AUTHORS

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