International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Haematological Changes after Snake Bite: A Clinico - Haematological Study in a Tertiary Care Centre

Dr Tejas Kotecha[1], Dr Akashkumar Dongarwar[2], Dr Khemchandra Borole[3]

[1]Junior Resident Department of Medicine, Dr Ulhas Patil Medical College, Jalgaon Maharashtra, India

[2]Junior Resident Department of OBGY, Dr Ulhas Patil Medical College, Jalgaon Maharashtra, India

[3]Professor Department of Medicine, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, India

Abstract: ***Background: Snake bite results in local as well as systemic manifestations. Major systemic complications include acute renal failure, neurological symptoms requiring ventilator support and coagulation disorders. The coagulation disorders lead to various serious systemic complications like haemorrhage, infarction and even death if the diagnosis and treatment are delayed. Objectives: To describe the clinical profile of the snake bitten patients who developed coagulopathy and the role of coagulation markers to evaluate the morbidity and mortality of the victims.*** *Method****: A cross sectional hospital based study was carried out on patients of age group 12 years or less having neighborhood or systemic signs of envenomation and no records of bleeding or coagulation issues. This coagulation profile was then evaluated by using peripheral blood sampling and urine evaluation. Results: In the present study haemorrhagic manifestations that were noticed includes bleeding from injection site (46.7%), haematemesis (5%), haematuria (33.3%), bleeding gums (11.7%), epistaxis (1.7%), and haemoptysis (3.3%). 53.3% cases were found to be anaemic after estimating haemoglobin levels. The 20 minute whole blood clotting time (WBCT20) was positive in 86.4% of vasculo - toxic snakebites and negative in all neuro - paralytic bites. Leucocytosis was observed in 60% cases with relative neutrophilia in 63.3%, thrombocytopenia was observed in 8.3%, bleeding time was prolonged in 13.3% and clotting time was prolonged in 56.7%. Conclusions: An important test that differentiates between Viperine and Elapine snake bites is WBCT 20 as it was positive in 46.7% of Viperine bites and was negative in all Elapine bites.***

Keywords: snake bite, WBC count, bleeding time, clotting time, PT, APTT

1. Introduction

Annually 35, 000 - 50, 000 people succumb to snake bite1 in India. Out of 3500 species of snakes identified globally, less than 350 are venomous2. Snake venom happens to be one of the most complex toxins produced by plant or animal3. Haematoxin, cytolysin, neurotoxin and cardiotoxin4 being the principal toxins in snake venom. Snake venom also contains sodium, calcium, magnesium, zinc and iron5. Some snake venoms contain carbohydrates6. In Elapid venoms acetyl cholinesterase is in abundance whereas crotalid and viperoid venoms are rich in endopeptidase7. Important enzymes in snake venom include proteolytic enzymes, thrombin - like enzymes, arginase ester hydrolase, collagenase, hyaluronidase, phospholipases, lactate dehydrogenase, phosphoesterases, acetylcholinesterase, RNase, DNase, 5' - nucleotidase8. Elapid venom being chiefly neurotoxic, clinical manifestations includes neuromuscular paralysis, ptosis, ophthalmoplegia and bulbar paralysis. Contrary Viper venom produces shock, haemorrhage and disseminated intravascular coagulation (DIC) 9.

Objectives

To describe the clinical profile of the snake bitten patients who developed coagulopathy and the role of coagulation markers to evaluate the morbidity and mortality of the victims.

2. Method

A descriptive observational study was conducted in the Medicine Ward from July 2020 to July 2021 at Dr. Ulhas Patil Medical College & Hospital, Jalgaon Detailed clinical examination was done in every case. To identify the nature of the snake bite (vasculotoxic, neuroparalytic, non - poisonous) opinion was sought from the treating physician. Blood sample collection from each case was done aseptically for haematological investigations. Clotting time was assessed by Lee and White method10. Haematological investigations done immediately after clinical evaluation includes 20 - minute whole blood clotting time, haemoglobin %, total and differential white blood cell count, platelet count, red cell morphology, bleeding time, clotting time, prothrombin time and activated partial thromboplastin time. Subsequent information was collected on day of discharge or death of patient from the case notes.

Statistical analysis: Data were entered into Microsoft Excel spread sheet and analysed. p - value was calculated by Fischer's exact test.

3. Results

Total of 8204 admissions were done during the study period to the Medicine wards of which 103 (1.3%) were due to snake bite/unknown bite. Of which, 60 (0.7%) were due to poisonous snake bite and 43 (0.5%) were due to non - poisonous bites. Of those 60 patients included in the study, 37 (61.7%) were males and 23 (38.3%) were females giving

a male: female ratio of 1.6. In the present study haemorrhagic manifestations seen were, bleeding from injection site (46.7%), haematemesis (5%), haematuria (33.3%), bleeding gums (11.7%), epistaxis (1.7%), and haemoptysis (3.3%). [Figure1].

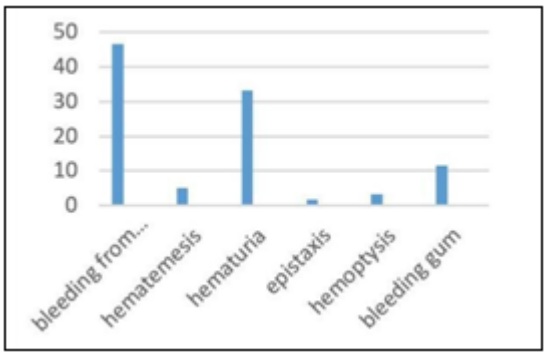

Figure 1: Case distribution based on bleeding manifestation

Neurological involvement was seen in 26.7% of these cases. The most common feature being Ptosis (20%) followed by altered sensorium (15%), dysarthria (8.3%), ophthalmoplegia (8.3%), respiratory paralysis (3.3%) and convulsions (1.7%) [Figure2]

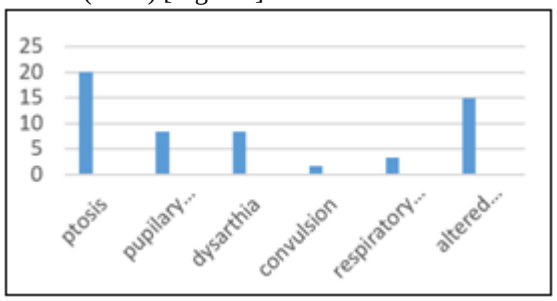

Figure 2: Case distribution based on neurological manifestations

In the present study 5 (8.3%) consulted traditional health care practitioner, 32 (53.3%) reached primary health centre and 23 (38.3%) reached tertiary hospital first after bite. Table 1 shows the distribution of cases with anaemia and thrombocytopenia whereas Table 2 shows distribution of cases depending upon the leucocyte counts. The distribution of cases depending on the 20 minute whole blood clotting time (WBCT20) with type of toxic symptoms is shown in Table 3. The distribution of cases depending on the WBCT20 with species of snake bite is shown in Table 4. The distribution of cases based on variation in bleeding time/clotting time is shown in Table 5. The distribution of cases based on variation in prothrombin time and activated partial thromboplastin time is shown in Table 6.

Table 1: Distribution of cases with anaemia and thrombocytopenia

Type of snake bite	Anaemia Number (%)	Thrombocytopenia Number (%)
Vasculo-toxic	25 (41.7)	04 (06.7)
Neurotoxic	07 (11.7)	01 (01.7)
Total	32 (53.4)	05 (08.4)

Table 2: Distribution of cases depending on the leucocyte counts

Total leucocyte count	Type of snake bite	Cases (%)
Less than 4000/cu mm	Vasculo-toxic	03 (05.0)
	Neurotoxic	02 (03.3)
4000-11,000/cu mm	Vasculo-toxic	11 (18.3)
	Neurotoxic	08 (13.3)
More than 11,000/cu mm	Vasculo-toxic	28 (46.7)
	Neurotoxic	08 (13.3)

Table 3: Distribution of cases depending on 20 minute whole blood clotting time with type of toxic symptoms

Type of snake bite	Cases (%)
Vasculo-toxic	38 (86.4)
Neurotoxic	0

Table 4: Distribution of cases depending on 20 minute whole blood clotting time with species of snake bite

20 minute whole blood clotting time result	Viperine	Elapine
Positive	28 (46.7%)	0 (0%)
Negative	16 (26.7%)	16 (26.7%)

Table 5: Distribution of cases based on variation in bleeding time/clotting time (n - 60)

Type of snake bite	Bleeding time		Clotting time	
	Normal	Prolonged	Normal	Prolonged
Vasculo-toxic	61.7%	11.7%	16.7%	56.7%
Neurotoxic	25.0%	01.7%	26.7%	0%
Total	86.7%	13.4%	43.4%	56.7%

Table 6: Distribution of cases based on variation in prothrombin time and activated partial thromboplastin time (APTT) (n=60)

Type of snake bite	Prothrombin time		Activated partial thromboplastin time	
	Normal	Prolonged	Normal	Prolonged
Vasculo-toxic	36.7%	36.7%	40.0%	33.3%
Neurotoxic	26.7%	0%	26.7%	0%
Total	63.3%	36.7%	66.7%	33.3%

3.3% cases had oliguria and renal type of oedema suggesting Acute Renal Failure. In the present study, 61.7% of cases received 1 - 10 vials, 36.7% cases 11 - 20 vials and 1.7% cases 21 - 30 vials of anti - snake venom (ASV).10% of cases had pyrogenic reaction / urticarial. In the present study death due to vasculo - toxic and neuro - paralytic snakebites were 9.1% and 12.5% respectively. The overall mortality was 10%. The *p* value is which is not significant. It indicates that elapine bites are more lethal than viperine bites.

4. Discussion

The present study reveals the most common presentation being Haemorrhagic symptoms. This includes bleeding from injection site (46.7%), haematemesis (5%), haematuria (33.3%), bleeding gums (11.7%), epistaxis (1.7%), and haemoptysis (3.3%) (Figure 1). Neurological involvement was seen in 26.7% cases (Figure 2). Ptosis (20%) was the most common feature followed by altered sensorium (15%), dysarthria (8.3%), ophthalmoplegia (8.3%), respiratory paralysis (3.3%) and convulsions (1.7%).

In the present study, Vomiting and pain in abdomen were observed in 30% and 13.3% of cases respectively. Saini et al, in 1984 reported vomiting / pain in abdomen in 16% of cases in his study in adults with snake bite11. The increase in symptoms could be due to smaller body mass of children leading to systemic envenomation or due to ingestion of herbal medicines.

In the present study, anaemia was detected in 41.7% and 11.7% of patients with vasculo - toxic and neurotoxic snake bites respectively. Leucocytosis was observed in 60% cases with relative neutrophilia in 63.3% cases. Vasculo - toxic snake bite (Table 2) contributed to the most of the cases with leucocytosis.

Severe poisoning11 in the snake bite is marked by Neutrophilia. Thrombocytopenia was observed in 8.3% cases out of which 6.7% patients were of vasculo - toxic snake bite (Table 1). Acute renal failure was observed in 3.3% cases of our study out of which two patients underwent haemodialysis and recovered.

WBCT 20 was positive in 86.4% of vasculo - toxic snake bites. According to the species of snakes. Viperine bites had 46.7 % positivity of WBCT 20 and was negative in all elapine snake bites (Table 4). The *p* value was 0.0001 which is statistically highly significant. It means it is an important test to differentiate between viperine and elapine bites.

Bleeding time was prolonged in 13.3% cases out of which 11.7% patients were of vasculo - toxic snake bites; clotting time was prolonged in 56.7% cases of which all were of vasculo - toxic snake bites (Table 5). Similar coagulation disturbances (58.6%) were observed by Kulkarni in 199412.

Prothrombin time and activated partial thromboplastin time were prolonged in 36.7% and 33.3% cases respectively. Five of our patients with clinical and laboratory evidence of disseminated intravascular coagulation (DIC) had schistocytes and fragmented red blood cells on peripheral blood smear. All the cases showing features of DIC had a thing in common – The Viperine Bite. These parameters normalised after administration of anti - snake venom.

All cases of snake bite were managed according to the national protocol13. In our study, 61.7% of cases received 1 - 10 vials, 36.7 % cases 11 - 20 vials and 1.7% cases 21 - 30 vials of ASV. Hypersensitivity to anti–snake venom was observed in 6 patients. Mild reactions like itching, urticaria, fever, vomiting were observed in all six cases while symptoms of systemic anaphylaxis like angioneurotic oedema, bronchospasm and hypotension were not seen in any of the cases. Supportive treatment with blood transfusion was given in all six cases.

Clotting time showed a mark increase after snake bite. In the present study the increase inclotting time was in 56.7% cases of snake bite. The prolongation of clotting time is very high in viper bite. This helps in the treatment by choosing monovalent anti–venom, since it is more effective than polyvalent anti–venom.

5. Conclusion

WBCT 20 is an important test to differentiate between viperine and elapine bites as it was positive in 46.7% of viperine bites and was negative in all elapine bites.

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