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Original Research Article

Study of clinical features, haematological changes and outcome in snake bite cases

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ABSTRACT

Background: Snake bite is a common acute medical emergency faced by rural populations in tropical and subtropical countries. In India, a large proportion of snake bites occur when people are working barefoot in the fields or while walking at night. More than 2,000 species of snakes are known worldwide, of which around 400 are poisonous. These snakes belong to the families Elapidae, Viperidae, Hydrophiidae and Colubridae.
Methods: A prospective was done at medicine department of SDH Sawantwadi, Sindhudurgh. Study duration was 3 months (May 2023 to July 2023). Study population included all cases admitted in SDH Sawantwadi with history of snake bite. Sample size was 50.
Results: Majority of cases found in the age group of 18-30 years 19 cases (38%) followed by 9 cases in 31-45 age group, 12 in 46-60 age group and 10 cases in 61 and above group. Majority of patients with history of snake bite were males contributing 27 (54%). Snake bites were more common in males as compared to females 23 (46%). 14% snake bite cases have activated partial thromboplastin time (APTT) >30 seconds, 10% of snake bite cases had prothrombin time (PT) >15 sec, 30% had platelet count <100000, increased leucocyte count >11000 was seen in 22% cases and 12% victims showed whole blood clotting test (WBCT) >20 minutes. Clinical outcome was 90% discharged after treatment and 10% death during treatment. Correlation between PT and clinical outcome is significant at $p<0.5$.
Conclusions: Association between PT and mortality among snake bite patients was statistically significant.

Keywords: Snake bite, Clinical outcome, Venomous snakes

INTRODUCTION

India being a tropical country is profound with snakes. About 216 species are identifiable in India which accounts for 10 percent of snakes found worldwide. Though most of the species are non-venomous, there are 52 species of venomous snakes found in India. The most commonly found venomous snakes of India are grouped under 5 families namely, Viperidae, Crotalidae, Elapidae, Hydrophidae and Colubridae. The snake venom is a cocktail of various components such as enzymes, proteins, carbohydrates, lipids, non-toxic proteins, nucleotides, biogenic amines and nucleotides. There is also a wide variation in the composition of venom from species to species. This leads to a wide clinical diversity of ophitoxaemia. Ophitoxaemia causes increase in the permeability of capillary walls. This leads to blood loss and loss of plasma into the extra vascular space causing edema. This edema if severe leads to compromise of the blood circulation of that affected limb.[1] Clinical effects vary from minor localized symptoms to extensive systemic manifestations that can prove fatal very rapidly. The earliest symptoms of a viperine bite are pain and swelling of the bitten area. In case of a severe poisoning, swelling can spread to the entire limb within 24 hours. This edema occurs due to exudation of blood or plasma which is a result of vasculotoxic effect on the capillary endothelium produced by the venom.[2] Discoloration of skin occurs due

to extravasation of blood into the subcutaneous tissues. Blistering and local necrosis is also observed in viper bites.[3] Hemorrhage is the major systemic symptom in any viper poisoning. It occurs approximately in 65% of the patients. Oozing of blood can occur continuously from fang marks. Patients also show bleeding from variety of sites. Other manifestations include melena, hematemesis, hemoptysis and hematuria. Bleeding also occurs into fascial compartments, muscles, subarachnoid space and serosal cavities. In severe cases, this bleeding can lead to hypovolemic shock. The most striking feature of Russell's viper and *Echis carinatus* bites are defects in coagulation and bleeding.[4] Venom of viper contains many active substances. Of these substances, some can induce bleeding and some induce clotting. Hemorrhagin a component of snake venom damages the blood vessels directly. This is due to loosening of gaps between the endothelial cells, thereby leading to the injury of the basement membrane present in the capillaries. This in turn results in spontaneous bleeding following viper bite. In-vivo, if the dose of venom is large, it leads to massive intravascular clotting, which can stop the circulation and results in rapid death. If the dose of venom is small, which occurs in snake bite, it leads to continuous activation of fibrinogen, this produces a fibrin which is fragile and more easily susceptible to lysis than the ordinary fibrin.[5] Since the venom destroys fibrinogen very quickly at the pace as the liver produces it, the blood tends to clot poorly or it fails entirely. The balance between the anticoagulant, procoagulant, fibrinogenolytic and fibrinolytic components present in the injected venom determines the final state of coagulation disturbance. Factor X gets selectively activated by venom of Russell's viper. Venom of *Echis carinatus* accelerates the conversion of prothrombin into an abnormal thrombin and also activates factor X.[6] This abnormal thrombin prevents the stabilization of fibrin and also promotes coagulation. This is achieved by stimulation of the plasminogen system and by inhibition of factor XIII activity. This results in a clinical scenario very similar to that of DIC, fibrinolysis and increased consumption of factor V. In viper poisoning, shock and hemorrhage usually resolves within a week. But the coagulation changes tend to persist for 2 weeks or longer in case the specific anti-venom is not administered on time. Intravascular hemolysis which was present in more than 50% of patients, who presented with acute renal failure (ARF), manifested as jaundice, anemia, reticulocytosis and hemoglobinuria and raised plasma free hemoglobin. Venom of Russell's viper has some enzymes which have a procoagulant effect *in-vitro*. These same enzymes have an anticoagulant effect *in-vivo*. These enzymes act on the different steps of coagulation cascade. A purified enzyme obtained from the venom can influence many coagulation factors simultaneously. These are broken down immediately by the fibrinolytic system present in the body. As this progress, all the clotting factors get depleted so that the blood does not clot, thereby resulting in consumptive coagulopathy.[7] Platelet dysfunction and thrombocytopenia are more commonly seen. This is because of the various proteins present in the venom which can directly destroy the platelets and also can cause a functional impairment of the platelets.[8-10]

Figure 1: Cobra.[11]

Figure 2: Russell viper.[11]

Figure 3: Common krait.[11]

Figure 4: Saw-scaled viper.[11]

METHODS

A longitudinal outcome study done at Medicine department of SDH Sawantwadi, Sindhudurgh with all cases admitted in SDH with history of snake bite for a period of 3 months (May 2023 to July 2023) using sample size of 50.

Sampling method

Sampling method used was consecutive sampling method.

Inclusion criteria

All cases admitted in SDH Sawantwadi, Sindhudurgh with history of snake bite were included.

Exclusion criteria

Cases with unknown bite cases with known case of bleeding disorder, and loss to follow up were excluded.

Methods of data collection and questionnaire

Predesigned and pretested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, religion, occupation, residential address, and marital status, alcohol history, risk factors and date of admission. Medical history-chief complain, past history, general examination, systemic examination. After taking written and informed consent about enrolment in the study and maintaining adequate privacy and confidentiality, all patients were subjected to a standardized interview. Detailed medical history was taken, and complete general and systemic examinations were done to establish the diagnosis of cirrhosis of liver and rule out association of various risk factors with mortality and morbidity.

Data entry and analysis

The data were entered in Microsoft excel and data analysis was done by using statistical package for the social sciences (SPSS) demo version no 21 for windows. The analysis was performed by using percentages in frequency tables and correlation of cirrhosis of snake bite cases with various risk factors and correlation with morbidity and mortality. P<0.05 was considered as level of significance using the Chi-square test.

RESULTS

In most snakebite cases, the type of bite was not identified. While among the species identified, Russell's viper accounted for 11, followed by cobra 09 and common krait 10 and scale viper saw 20 cases. The majority of patients after being bitten showed vasculotoxic manifestations (62%) attributable to viper bites. (38%) of snakebite victims showed neuroparalytic manifestations attributable to cobra and common krait bites.

Figure 5 shows majority of cases found in the age group of 18-30 years 19 cases (38%) followed by 9 cases in 31-45 age group, 12 in 46-60 age group and 10 cases in 61 and above group. Majority of patients with history of snake bite were males contributing 27 (54%). Snake bites were more common in males as compared to females 23 (46%).

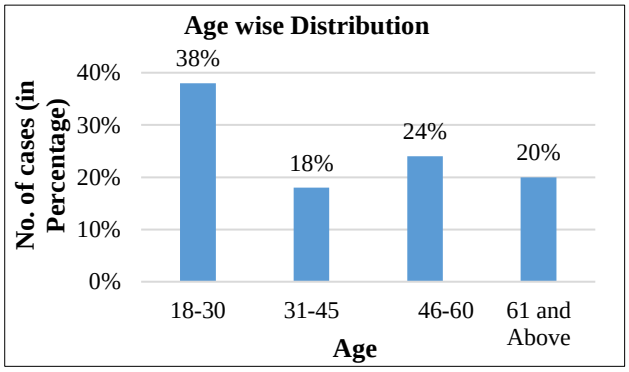

Figure 5: Age wise distribution.

14% snake bite cases have APTT >30 seconds, 10% of snake bite cases had PT>15 sec, 30% had platelet count <100000, Increased leucocyte count >11000 was seen in 22% cases and 12% victims showed WBCT>20 minutes (Figure 6).

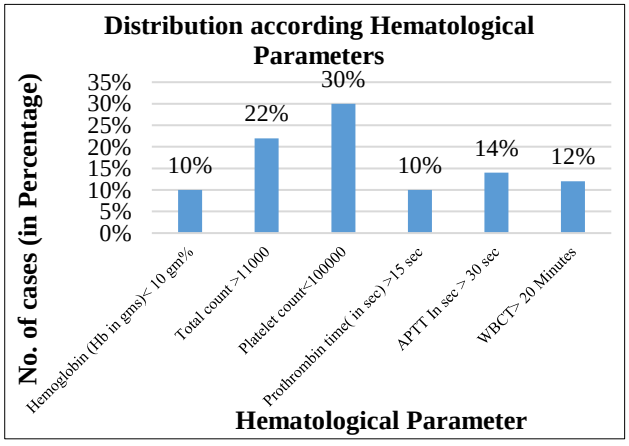

Figure 6: Blood profile of cases.

Clinical outcome was 90% discharged after treatment and 10% death during treatment (Figure 7).

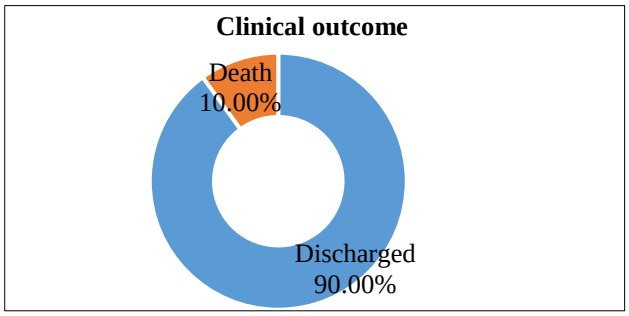

Figure 7: Clinical outcome.

Correlation between PT and clinical outcome is significant at p<0.5 (Figure 8).

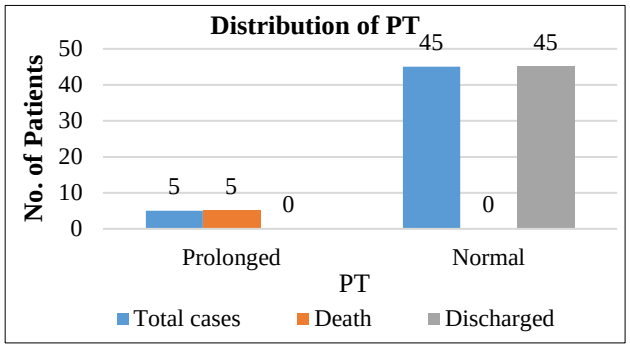

Figure 8: Correlation between PT and clinical outcome.

DISCUSSION

This prospective study was conducted among 50 snakebite victims at sub District Hospital Sawantwadi. The aim of the study was to study the role of coagulation markers in morbidity and mortality in snakebite victims. In the current study, most cases were found in the age group of 18-30 years 19 cases (38%) followed by 9 cases in 31-45 age group, 12 in 46-60 age group and 10 cases in 61 and above group. These findings are consistent with the findings of a study by Nagaraju et al.[12] In this study it was observed that the most common age group among snakebite victims was 30-50 years which contributed 52.6%. In this study, Majority of patients with history of snake bite were males contributing 27 (54%). Snake bites were more common in males as compared to females 23 (46%). These findings are similar to the study by Haleshy et al in which the predominant snakebite victims were males, with 60.5% involved, with a male to female ratio of 1.5:1.[13]

In the current study, 14% snake bite cases have APTT >30 seconds, 10% of snake bite cases had PT>15 sec, 30% had platelet count <100000, Increased leucocyte count >11000 was seen in 22% cases and 12% victims showed WBCT>20 minutes. Similar results were observed in a study by Harshwardhana et al, in which 13 patients (26%) were observed to have a hemoglobin less than 10 gm% and 32 patients (64%) had a total leukocyte count greater than 11,000. 24 patients (48%) had a platelet count less than 1,00,000. 28 patients (56%) had a prothrombin time greater than 15 seconds. 31 patients (62%) had an aPTT greater than 30 seconds. 24 patients (48%) had an INR greater than 1.5. FDP was positive in 22 patients (44%). WBCT was more than 20 minutes in 30 patients. These findings are consistent with the current study. In the current study, clinical outcome was 90% discharged after treatment and 10% death during treatment. A similar study by Harshwardhan et al observed a mortality of 4%.[5] In the current study, correlation between PT and clinical outcome is significant at p<0.5. A study by Agrawal et al concluded that PT, aPTT, fibronogen, and thrombin should be considered as the first line of investigation for any suspected coagulation abnormality in snakebite patients.[14] PT and APTT were the first abnormal test result after snake envenomation. 12 hours, so the observation was a safe period to rule out any complications after poisoning.

Limitations

In this study duration is only for three months. Snake bite patients with known hematological disorders such as hemophilia, patients with comorbidities such as diabetes are not considered in this study. If these cases are taken into consideration the outcome may vary.

CONCLUSION

First line of coagulation markers PT and aPTT considered as first line of investigations for any suspected coagulation abnormality in snake bite patients. PT and aPTT were the first abnormal test result after snake envenomation. 12-hours observation was the safe period to rule out any complications following envenomation. Association between Prothrombin time and mortality among snake bite patients was statistically significant.

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