Can we Reduce Morbidity and Mortality in Viper Snake Bite ?

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Abstract :

Objective: The objective of the study was to reduce the mortality and morbidity in viper snake bites by optimizing antivenin dose with clinical signs and laboratory value trends. **Methodology :** In this Retrospective study. Retrospective analysis was done in 23 severely envenomed cases to find out the various percentages of morbidity and mortality. In year 2011 immunotherapy was optimized by estimation of haemograms for trends of WBC and platelets, this resulted into reduction in the morbidity and mortality. In year 2012-2013, initial dose of antivenin was correlated clinically with epigastric tenderness and additional doses were modified using above laboratory value trends. Total 28 viper snake bite cases were treated and the morbidity and mortality was reduced substantially by using the modified protocol. **Result:** Improved outcomes correlate well with laboratory trends causing decrease in mortality and morbidity in viper snake bite. **Conclusion:** If we modify the dose schedule of immunotherapy using clinical signs and value trends as guidelines, morbidity and mortality in viper snake bite can be reduced substantially, reducing hospital stay, use of blood products and the cost.

Key words: Immunotherapy, Antivenin, Haemogram, Serial evaluation, Trends.

Introduction: Snake bite represents a major medical problem in our country. Amongst all venomous snakes vipers are the most responsible family of snakes for snakes bites producing maximum fatalities. Any loss of life due to snake bite is a severe blow to the farmer's economy which is usually dependent on youngsters.

The clinical picture of snake bite has not changed over last 100 years but, the treatment part has been subjected to much debate [1]. Even today there is no proven scientific method to decide optimum and accurate doses of antivenin. The specific treatment of snake bite venomation is to screen for systemic envenomation and administer empirical amounts of antivenin [2,3,]. The dose of antivenin is usually decided by clinician based on his experience and modified further with clinical signs and symptoms. [4,5,6]

Coagulation abnormality is a common complication of viper bite hence WHO has suggested W.B.C.T 20 a simple test to diagnose the viper bite. But we must remember that all vipers do not produce coagulation abnormalities. Hence W.B.C.T.20 has got its own limitations and many times it delays the treatment, because it is only 40% sensitive giving high false negative rates in detecting coagulopathies and its severity. [7]

Other important symptoms and signs of systemic envenomation is epigastric pain, vomiting and tenderness. It appears early and is a reliable indicator to severity of envenomation. Although it is subjective, it is consistent and definite. Its intensity is related with time and degree of venomation and associated with melena, indicating gastrointestinal bleed. Utilizing this feature, after patient admission, watch for epigastric pain and tenderness and load the patient with antivenin till it disappears. This becomes the initial loading dose in my practice of treating viper bite. Disappearance of it suggests reducing envenomation giving patient comfort and self-confidence.

Epigastric tenderness is a useful clinical sign in systemic envenomation. Another valuable laboratory feature is polymorphic leukocytosis. [8] Leukocytosis is present when WBC count >10000/cumm[8]. It is a constant feature of moderate to severe envenomation [3]. It has latent period of 5-6 hrs after the bite and is proportional to the severity of venomation. Hence its trend is used to monitor the status of envenomation. Increasing leucocyte count is suggestive of increased severity of envenomation indicating need of more antivenin, while decreasing leukocyte trend has a good prognostic value. Another important feature of envenomation is thrombocytopenia. A drop in platelet count below 1,50,000/cumm indicates thrombocytopenia.

Thrombocytopenia is of two types [9].

I) **Benign: -** Often present at the admission, probably by aggregation of platelets by venom proteins.

II) **Severe: -** Associated with DIC with abnormal values of PT. aPTT, and fibrinogen. Rate of destruction of platelets depends on the free venom present in the blood. Hence rapidly decreasing platelet count is an indication to administer higher doses of antivenin and not the platelet concentrate.

These two features can be estimated by simple investigation like Haemogram and its serial estimation

gives fair idea about the status and degree of envenomation by looking at the trends.

There are 3 possibilities:

i) Increasing leukocytes + decreasing platelets – need more antivenin.

ii) Decreasing leucocytes + Decreasing platelets – continue the treatment or wait and watch.

iii) Decreasing leucocytes + Increasing platelets – situation definitely under control.

These findings can serve as guidelines to monitor the dose of immunotherapy. We applied this simple investigation in practice to know the status of envenomation by serial estimation of haemogram at a definite interval of 12 hrs. And the antivenin treatment is adjusted according to the above situation, correlating with W.B.C.T.20.

Material and method:

Group I : In the year 2010 a retrospective study was done in my hospital in 23 severely envenomed patients. 17 males and 6 females between 15 and 65 yrs. of age group to assess the morbidity and mortality. All were given initial dose of 100ml antivenin of serum institute of India. Additional doses were guided clinically with W.B.C.T.20. A severe envenomation is said to be present when the antivenin requirement is more than 200ml along with systemic signs of venomation. ARF is present when serum creatinine level is more than 1.3mg/dl. DIC is present when PT time is >30s and INR is >3 [8,9,10].

Group 2 : In the year 2011, 23 patients, 12 males and 11 females between age group of 15 and 65 years with severe systemic envenomation were screened. All were given initial 100ml dose of antivenin (Serum institute of India). Additional doses of antivenin were given serial evaluation of haemogram and W.B.C.T.20 done at 12hrs interval.

Group 3 : In the year 2012 and 2013 28 patients 17 males 11 females between age group 14 and 65 yrs with severe systemic envenomation were included in the study. In these patients initial loading dose of antivenin was correlated with disappearance of epigastric tenderness and was administered as early as possible and as fast as possible, followed by additional doses guided by 12 hrly haemogram and W.B.C.T.20.

There were 2 deaths in the year 2012-2013. One patient was admitted 12hrs after bite and was immediately transferred to higher center where he died after 2 days. Second case was pregnancy with snake bite referred from civil hospital died within 24hrs of admission. The results of the study were analyzed by using Pearson's chi square test. The test was conducted separately for factors like ARF, dialysis, DIC, Thrombocytopenia & Mortality across the three groups.

Table-1

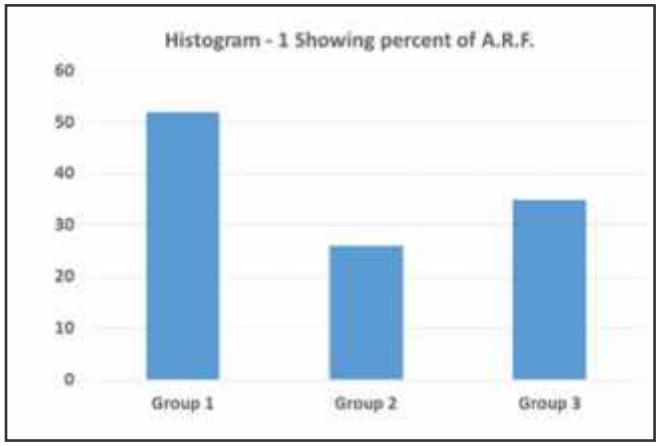
Group 1- Snake bite morbidity & mortality in yr 2010					
No. of pts.	A.R.F	Dialysed	D.I.C	Thrombocytopenia	Mortality
23	12	4	4	15	3
	52%	17%	17%	65%	13%

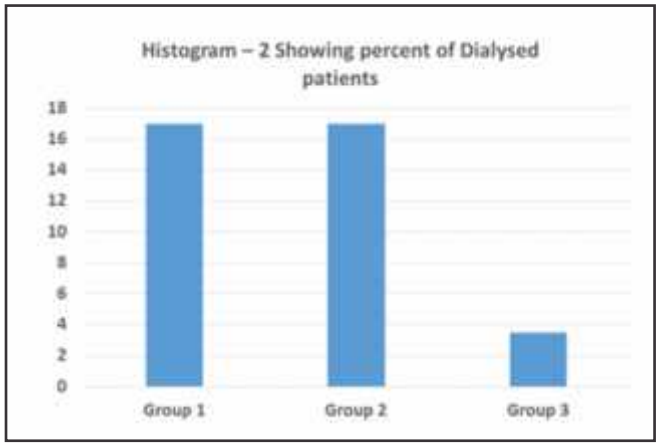
Table-2

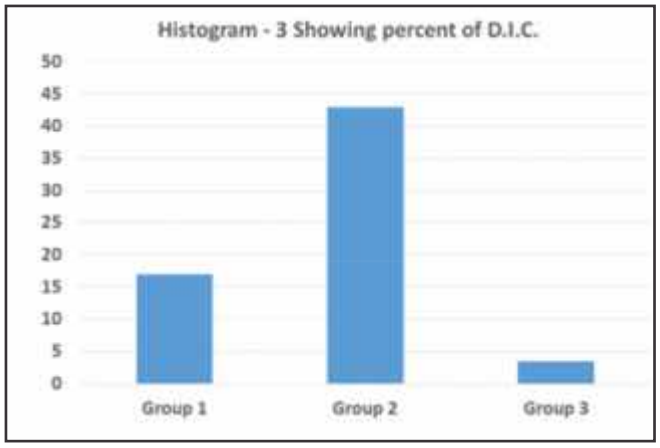
Group 2- Snake bite morbidity & mortality in yr 2011					
No. of pts.	A.R.F	Dialysed	D.I.C	Thrombocytopenia	Mortality
23	6	4	10	4	4
	26%	17%	43%	17%	17%

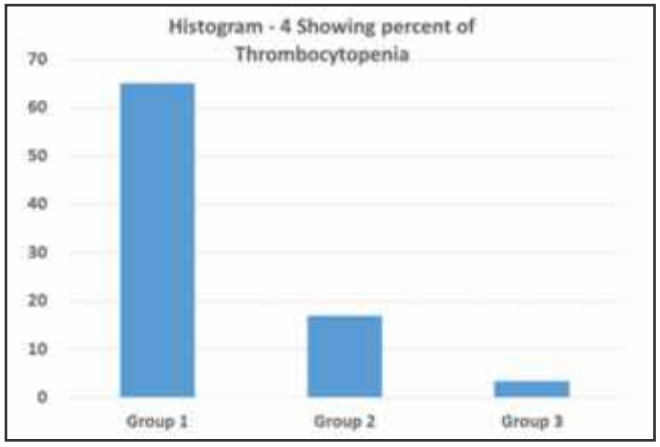
Table-3

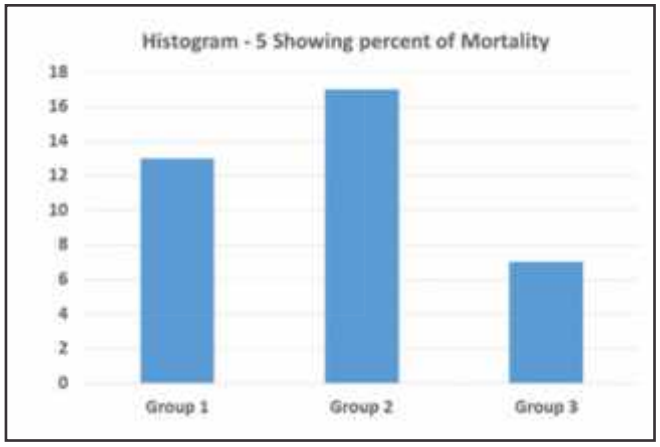
Group 3- Snake bite morbidity & mortality in yr 2012-13					
No. of pts.	A.R.F	Dialysed	D.I.C	Thrombocytopenia	Mortality
28	10	1	1	2	2
	35%	3.5%	3.5%	7%	7%











Discussion: Snake bite represents a major medical emergency in our country producing more than 10000 deaths/year. The unpredictable nature of snake bite often makes assessment and management difficult. The doses of antivenin and the degree of envenomation are difficult to predict on clinical presentation. The early use of antivenin in adequate amount is the mainstay of treatment in snakebite cases [2,12]. Local signs maybe deceptive and should not be relied upon[15]. Two factors: -ARF and coagulopathy are responsible for mortality. We cannot feel coagulopathy and that is how snake kills his prey [11]. Hence laboratory value trends and adequate and early antivenin administration becomes important in preventing the complications.

The main cause of mortality is ARF. The incidence of ARF is between 13-22% [11,12]. Factors contributing to ARF are direct nephrotoxicity of venom, haemolysis, DIC, hypotension, rhabdomyolysis and thrombocytopenia. Of the total ARF cases nearly 26% cases require dialysis increasing hospital stay and use of blood product. Blood products are required in 42% cases of which 80% is FFP [9]. Death can occur in nearly 50% cases despite aggressive treatment [12,13,14].

In my study in group 1, the incidence of ARF was 52% of which 17% required to be dialysed, while rest of them recovered. While in group 2 in year 2011 the incidence of ARF was 26% which was definitely lower than group 1, of which 17% were dialysed and rest recovered with treatment. The reduction in incidence of ARF may be due to close watch on WBC and Platelet counts, preventing thrombocytopenia, a major contributing factor to DIC. In group 3, in year 2012 -13 the incidence of ARF was 35%. This fall within the percentage range found in various studies. But the remarkable fact is that there is only 3.5% incidence of dialysed patient. A significant drop in dialysis event, reducing hospital stay and use of blood product. I attribute it to the initial adequate loading dose of antivenin correlating with epigastric tenderness and serial haemogram evaluation.

Other important factor for mortality is DIC. It is said that abnormality of coagulation can occur in 73% cases of viper bite, but incidence of DIC varies between 30-40%[11]. The progress and prognosis of coagulopathy after snake bite is proportional to seriousness of bite and venomation. The factors contributing to DIC are haemolysis, rhabdomyolysis and thrombocytopenia. In group 1 & 2 the incidence of DIC was 17% but in group 3 it is only 3.5% a significant drop over previous two groups. This parallels with decreased incidence of thrombocytopenia in group 3.

Thrombocytopenia occurs in 26-40% of viper bite cases. In group 1 the incidence of thrombocytopenia was 65%, definitely more than normal. While in group 2 it was equivalent with the other studies the incidence of thrombocytopenia decreased dramatically in group 3 which is only 3.5%. DIC incidence also decreased along with the thrombocytopenia which is minimum in group 3, reducing hospital stay, use of blood products, dialysis and mortality significantly.

Incidence of mortality in various study of viper bite varies between 8-14% [12,15]. In group 1 & 2 the incidence is comparable with the other studies. But in group 3

there is significant fall in mortality which is only 7%. This I attribute to reduction in ARF less incidence of DIC and marked reduction in thrombocytopenia. At the same time early and adequate doses of antivenin prevented progress of systemic envenomation.

The statistical analysis done for each factor across all the groups shows significant difference across the three groups which shows that the efficacy of the treatment given to snake bite patients has increased from group 1 & 2 and from group 2 to group 3, and is best in group 3.

Conclusion : The study shows that it is possible to substantially reduce the morbidity and mortality following viper snake bite provided antivenin is administered early in optimum quantity at appropriate time. In my study, it may be achieved with initial loading dose correlated with epigastric tenderness preventing progress of venomation. It is better to over treat the patient than undertreat him. W.B.C.T.20 never gives false positive reports but many times it delays the treatment, increasing problems. Hence one should not solely rely on it for treatment and diagnosis of viper snake bite but must be combined with simple laboratory reports like haemogram done on 8 hourly basis so as to assess the dose of antivenin and to know the progress of venomation. Serial evaluation of haemogram has a good prognostic value. Additional research must be carried out to study the correlation of leucocytes and platelet trends with clinical manifestation and the antivenin dose with venom blood levels. Multicentric trials can help in designing a standard protocol.

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