The Profile and Outcome of Snake-bite Envenomation in Patients Admitted to a Rural Tertiary Care Hospital in South India

Rinu Raju[1], Asha Biju[2], Anna Mathew[3], Prakash Ramasami[4]

ABSTRACT

Introduction: There are 216 species of snakes in India, of which 52 species are poisonous. The most common highly venomous snakes are cobra (*Najanaja*), Russell's viper (*Dabiolarusselii*), saw-scaled viper (*Echiscarinatus*) and the common krait (*Bungaruscaeruleus*). It is estimated that up to 20,000 people die annually in India from snake bites. Severity of symptoms is the traditional guideline used to estimate the anti-venom requirement. Study objectives were to assess the clinical profile of snake-bite envenomation, the predictors of severity and ASV usage in relation to outcomes in patients admitted with snake-bite envenomation to this rural tertiary care hospital in South India.

Material and methods: This was a cross-sectional study of snakebite patients admitted to this tertiary care hospital from April 2008 to April 2017. The subjects were stratified into two groups based on outcome. The profile of snake-bite envenomation was detailed, including demographic details, snake-bite information, symptoms, treatment and hospitalisation. The severity was graded based on the traditional symptom-based grading and using the Snake-bite Severity Score (SSS). The number of vials of Anti Snake-bite Venom (ASV) administered were compared in relation to the outcome.

Results: Snake bites are more common in summer but the mortality is greater in the monsoon season. Out of the 127 patients, 119 (93.7%) recovered and were discharged and 8 (6.3%) died in hospital. In the symptom-based grading all the patients with poor outcome were in grades 3 or 4. The SSS was above 8 in 29 (22.8%) patients, of whom 8 (27.6%) succumbed to the bite. The SSS is a good tool to predict outcome.

Conclusion: The Snake-bite Severity Score is a validated tool for assessing the extent of envenomation and predicting patient outcomes following snake-bites. This study was planned to find out the clinical profile, symptomatology and predictors of severity and polyvalent anti snake venom (ASV) usage in relation to outcomes in patients with snake-bite envenomation.

Key words: Envenomation, Snake-bite Severity Score (SSS), Anti Snake Venom (ASV), Cobra, Krait, Viper.

INTRODCUTION

There are about 236 species of snakes in India, most of which are non-poisonous. Their bites, apart from causing panic reaction and local injury, do not harm the patient. However, there are 13 known species that are poisonous and of these four, called the "Big Four", namely common cobra (*Najanaja*), Russell's viper (*Dabiolarusselii*), saw-scaled viper (*Echiscarinatus*) and common krait (*Bungaruscaeruleus*) are highly venomous and believed to be responsible for most of the poisonous bites in India.[1,2]

There are around 50,000 estimated snake bites every year in India though this may be underestimated because of lack of proper registration. The number of persons at risk of snakebite in our country during their lifetime is around 50 million people.[3] In India, it is estimated that up to 20,000 people die annually from snake bites.[4] Gautam et al found that children are usually more severely affected because of their smaller volume relative to venom dose and had a mortality of 13.3% in their study from Nepal.[5]

When a person is bitten by a poisonous snake, venom is injected, causing localized symptoms of mild pain and oedema and generalized ones including dyspnoea, ptosis, mental alteration, and tachycardia. In severe cases, patients develop acute renal failure, myocardial infarction, disseminated intravascular coagulation, and even death.[6,7]

In 2004, WHO established a snakebite Treatment Group, whose role was to develop recommendations to reduce mortality according to international norms. The protocol also includes categorizing the snakebite severity with the traditional snakebite severity scale based on symptomatology with a grade of 0 to 4. For grade 0, no anti venom is suggested. For grades 1 and 2, one vial (6,000 units) of anti-venom is recommended. For grade 3, 12,000 units are recommended, and for grade 4, 18,000 units. The group requiring additional administration of anti-venom showed a higher local effect score and a traditional snakebite severity grade at presentation, a shorter prothrombin and activated partial prothrombin time, a higher frequency of rhabdomyolysis and disseminated intravascular coagulopathy, and longer hospitalization than the group that did not need additional anti venom.[8]

The traditional snake-bite scale grades snake-bites with

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no local or systemic signs or symptoms as Grade 0. Local swelling with absence of systemic sign, normal laboratory findings as Grade 1. Swelling extending past bite site (6–12 inch), ≥1 systemic sign or symptom or abnormal laboratory findings as Grade 2. Grade 3 includes snake-bites where there is marked swelling (>12 inch), tissue loss, multiple or severe systemic symptoms, immediate systemic signs, rapid progression of symptoms. The snake-bite is classified in Grade 4 when there is rapid development of local reaction, ecchymosis, necrosis, blebs, blisters, swelling severe enough to obstruct venous or arterial flow, swelling may involve ipsilateral trunk.[9]

Dart et al correlated the Snake-bite Severity Score (SSS) with the clinical assessment of physicians and found the SSS correlated well with the clinical condition of patients bitten by snakes. It provides a more objective instrument for the evaluation of severity and progression of envenomation in patients with snake-bite.[10]

The management of poisonous snake-bite envenomation includes supportive care and anti-snake-bite venom (ASV) administration. ASV is the only specific antidote to snake-bite envenomation in patients in whom the benefits outweigh the risks. Since ASV is relatively costly and often in limited supply, it should not be used indiscriminately. The risk of reactions should always be kept in mind.

This study was planned to assess the clinical profile of snake-bite envenomation, the predictors of severity and ASV usage in relation to outcomes in patients admitted with snake-bite envenomation to this rural tertiary care hospital in South India.

MATERIAL AND METHODS

After obtaining permission for this cross-sectional study, from the management and approval from the institutional review board and the ethics committee, the medical records of patients admitted to the intensive care of this tertiary care hospital with history of snake envenomation were consecutively accessed. All adult snake-bite patients over the age of 18 years admitted during the nine-year period were serially recruited to participate in the study.

Relevant history, where the bite occurred, demographic data and clinical details were collected. Examination findings, included, bite-site description if the fang marks were visible and post-bite interval or the time elapsed after snake bite till the first dose of anti-snake-venom was given.

Clinical evaluation of patient included examination of the local site of the bite and systemic examination of the patient. Bite site examination included signs and symptoms such as local pain, swelling, bite marks, lymphadenopathy. Systemic examination noted cardiovascular symptoms such as tachycardia and hypotension or bleeding tendencies; central nervous symptoms such as drowsiness, drooping of eyelid, dyspnoea with frothing, dysphasia, dysphagia, paresis of neck, jaw and body muscles leading to paralysis; respiratory failure and finally cardiac arrest.

The sample size for single proportion was calculated with nMaster computer software using the prevalence in this area of snakebite envenomation of 34% as recorded by Suchithra et al.[11] The sample size for a confidence interval of 95% and precision of 8%, was found to be 135 patients with snakebite envenomation.

All the patients were assessed using the traditional grading based on symptoms. We also graded the patients by the Snake-bite Severity Score, (Figure 1) which takes into consideration the local bite wound reactions, systemic symptoms and the haematological parameters such as prothrombin time (PT), partial thromboplastin time (PTT), international normalized ratio (INR) and activated partial thromboplastin time (a PTT).

The dose of snake venom administered, the period of hospitalisation and the outcome were also noted. The participants were grouped based on the outcome of the illness into Group A- Good Outcome, including patients who recovered and were discharged well and group B-Poor Outcome, including patients who died in hospital.

After searching all medical records, the data was entered into an Excel spread sheet, the frequencies, percentages and confidence limits were obtained for all variables and the data was summarised using tables, charts and graphs. As normality was present, the Chi square test was used to compare the categorical variables and the student t-test for continuous variables. A p value of $<.05$ was considered significant. The process of the study is detailed in the flow diagram in Figure 1

RESULTS

In this study we assessed the epidemiological and clinical profile of snake-bite envenomation in patients and compared the outcomes in relation to snakebite severity using the grading based on symptomatology and the snakebite severity score (SSS). The demographic characteristics of the patients are given in Table 1.

Over three fourths of the patients admitted were male and over 60% of the patients were below 45 years of age. Only three patients were from an urban area while all the others were living in rural areas. Most of the patients were brought to hospital in less than 2 hours (78.7%).

The details of the snake-bite in the good outcome group and the poor outcome groups are given in Table 2.

The frequency of occurrence of renal, gastrointestinal, respiratory, central nervous system and cardiovascular system symptoms were significantly more in the poor outcome group. The frequency distribution of the systems affected is detailed in Table 3. The incidence of thrombocytopenia, leucocytosis, clotting time were significantly more in the poor outcome group.

The signs and symptoms of envenomation were graded into four grades, in the traditional way based on the signs and symptoms. Grade 0 indicating minimal severity and grade 4 indicating maximal severity based on the signs and symptoms present. All the patients who died had a severity of Grade 3 or Grade 4. (Table 4)

We also graded the severity of envenomation using the Snake-bite Severity Scale (SSS) into minimal envenomation

Demographic Variables		Good outcome n = 119	Poor outcome n = 8	Total n = 127
Gender	Male	72 (60.5%)	06 (75.0%)	78 (61.4%)
	Female	47 (39.5%)	02 (25.0%)	49 (38.6%)
Age (years)	18-44	59 (49.6%)	03 (37.5%)	62 (48.8%)
	45-65	51 (42.9%)	05 (62.5%)	56 (44.1%)
	>65	09 (7.5%)	00 (0.00%)	9 (7.1%)
Place	Rural	116 (97.5%)	08 (100%)	124 (97.6%)
	Urban	03 (2.5%)	00 (0.00%)	03 (2.4%)
Time to Hospitalisation	<2 hrs	96 (80.7%)	04 (50.0%)	100 (78.7%)
	3-5 hrs	15 (12.6%)	02 (25.0%)	17 (13.4%)
	6-24 hrs	06 (5.0%)	02 (25.0%)	08 (6.3%)
	>24 hrs	02 (1.7%)	00 (0.00%)	02 (1.6%)
Outcome	Discharged alive	119 (100%)	00 (0.00%)	127 (100%)
	Died in hospital	00 (0.00%)	08 (100%)	08 (6.3%)

Table-1: Baseline Characteristics of Study Participants

Details of Snake Bite		Good outcome n = 119	Poor outcome n = 8	Total n = 127
Snake identified	Cobra	08 (6.7%)	00 (00.0%)	08 (.6.3%)
	Krait	19 (16.0%)	00 (00.0%)	19 (15.0%)
	Viper	55 (46.2%)	05 (62.5%)	60 (47.2%)
	Not identified	37 (31.1%)	03 (37.5%)	40 (31.5%)
Snake-bite Scene	Home	47 (39.5%)	03 (37.5%)	50 (39.4%)
	Road	19 (16.0%)	00 (0.0%)	19 (14.9%)
	Field	44 (37.0%)	05 (62.5%)	49 (38.6%)
	Others	09 (7.5%)	00 (0.0%)	09 (7.1%)
Snake-bite Season	Summer	48 (40.3%)	03 (37.5%)	51 (40.1%)
	Monsoon	29 (24.4%)	05 (62.5%)	34 (26.8%)
	Winter	42 (35.3%)	00 (0.0%)	42 (33.1%)
Snake-bite Time	Morning (04.01am - 8.00am)	17 (14.3%)	0 (00.00%)	17 (13.4%)
	Day-time (08.01am - 04.00pm)	38 (31.9%)	4 (50.0%)	42 (33.1%)
	Evening (04.01pm - 08.00pm)	37 (31.1%)	4 (50.0%)	41 (32.3%)
	Night-time (08.01pm - 04.00am)	27 (22.7%)	0 (00.00%)	27 (21.3%)
Snakebite Site	Upper limb	38 (31.9%)	01 (12.5%)	39 (30.7%)
	Lower limb/ Head	80 (67.2%)	07 (87.5%)	87 (68.5%)
	neck	01 (0.8%)	00 (0.00%)	01 (0.8%)
Fang marks	Present	104 (87.4%)	6 (75.0%)	110 (86.6%)
	Absent	15 (12.6%)	2 (25.0%)	17 (13.4%)

Table-2: Details of Snake Bite of Study Participants

Signs and Symptoms		Good outcome n = 119	Poor outcome n = 8	Total n = 127	p value
Local reactions at bite site	Mild	38 (31.9%)	3 (37.5%)	41 (32.3%)	0.236
	Moderate Severe	61 (51.3%)	2 (25.0%)	63 (49.6%)	
		20 (16.8%)	3 (37.5%)	23 (18.1%)	
Gastro-intestinal disturbances	Mild	100 (84.0%)	5 (62.5%)	105 (82.7%)	0.252
	Moderate to severe	19 (16.0%)	3 (37.5%)	22 (17.3%)	
Renal dysfunction	Mild	110 (92.4%)	1 (12.5%)	111 (87.4%)	0.000
	Moderate to severe	9 (7.6%)	7 (87.5%)	16 (12.6%)	
Respiratory symptoms	Mild	113 (95.0%)	2 (25.0%)	115 (90.6%)	0.000
	Moderate to severe	6 (5.0%)	6 (75.0%)	12 (9.4%)	
Central Nervous system signs	Mild	102 (85.7%)	2 (25.0%)	104 (81.9%)	0.000
	Moderate to severe	17 (14.3%)	6 (75.0%)	23 (18.1%)	
Cardiovascular symptoms	Mild	111 (93.3%)	1 (12.5%)	112 (88.2%)	0.000
	Moderate to severe	8 (6.7%)	7 (87.5%)	15 (11.8%)	
Thrombocytopenia	Present	01 (3.4%)	3 (9.4%)	4 (3.1%)	0.001
	Absent	118 (96.6%)	5 (90.6%)	123 (96.9%)	
Leucocytosis	Present	09 (3.4%)	4 (50%)	13 (10.2%)	0.004
	Absent	110 (92.4%)	4 (50%)	114 (89.8%)	
Clotting time prolongation	Present	17 (14.3%)	6 (75.0%)	23 (18.1%)	0.000
	Absent	102 (85.7%)	2 (25.0%)	104 (81.9%)	

Table-3: Signs and Symptoms manifested after Snake-bite by Patients

Grading	Good outcome n = 119	Poor outcome n = 8	Total n = 127	p value
Based on Symptoms				0.000
Grade 0	17 (14.3%)	00 (0.00%)	17 (13.4%)	
Grade 1	43 (36.1%)	00 (0.00%)	43 (33.9%)	
Grade 2	35 (29.4%)	00 (0.00%)	35 (27.6%)	
Grade 3	21 (17.6%)	03 (9.4%)	24 (18.9%)	
Grade 4	03 (2.5%)	05 (90.6%)	08 (6.3%)	
Using the SSS				0.000
Minimal envenomation (SSS <3)	60 (50.4%)	00 (0.00%)	60 (47.2%)	
Moderate envenomation (SSS 4-7)	38 (31.9%)	00 (0.00%)	38 (29.9%)	
Severe envenomation (SSS >8)	21 (17.6%)	08 (100%)	29 (22.8%)	

Table-4: Severity of Snake-bite Envenomation based on Symptoms and with SSS

Details of Snake Bite		Good outcome n = 119	Poor outcome n = 8	Total n = 127	p value
Ventilatory support	Provided	04 (3.4%)	08 (100 %)	12 (9.4 %)	0.000
	Not needed	115 (96.6 %)	00 (0.00%)	115 (90.6 %)	
Initial use of anti-snake venom vials	<5 vials	66 (55.5 %)	05 (62.5 %)	71 (55.9 %)	0.905
	5-10vials	52 (43.7 %)	03 (37.5 %)	55 (43.3 %)	
	>10vials	01 (0.8 %)	00 (0.00%)	01 (0.8 %)	
Total number of anti-snake venom vials	<10 vials	24 (20.2 %)	00 (0.00%)	24 (18.9 %)	0.200
	11-20 vials	45 (37.8 %)	03 (37.5 %)	48 (40.3 %)	
	21-30 vial	25 (21.0 %)	01 (12.5 %)	26 (20.5 %)	
	>30 vials	25 (21.0 %)	04 (50 %)	29 (22.8 %)	
Duration of ICU stay	<3 days	86 (72.3 %)	04 (50 %)	90 (70.9 %)	0.001
	4-7 days	31 (26.0 %)	02 (25 %)	33 (26.0 %)	
	8-14 days	02 (1.7%)	02 (25 %)	04 (3.1 %)	
Duration of hospital stay weeks	<1 week	91 (76.5 %)	06 (75 %)	97 (81.5 %)	0.837
	1-2 weeks	24 (20.2 %)	02 (25 %)	26 (20.5 %)	
	>2 weeks	04 (3. 3 %)	04 (50 %)	04 (3.1 %)	

Table-5: Treatment and Outcomes of Snake-bite by Patients

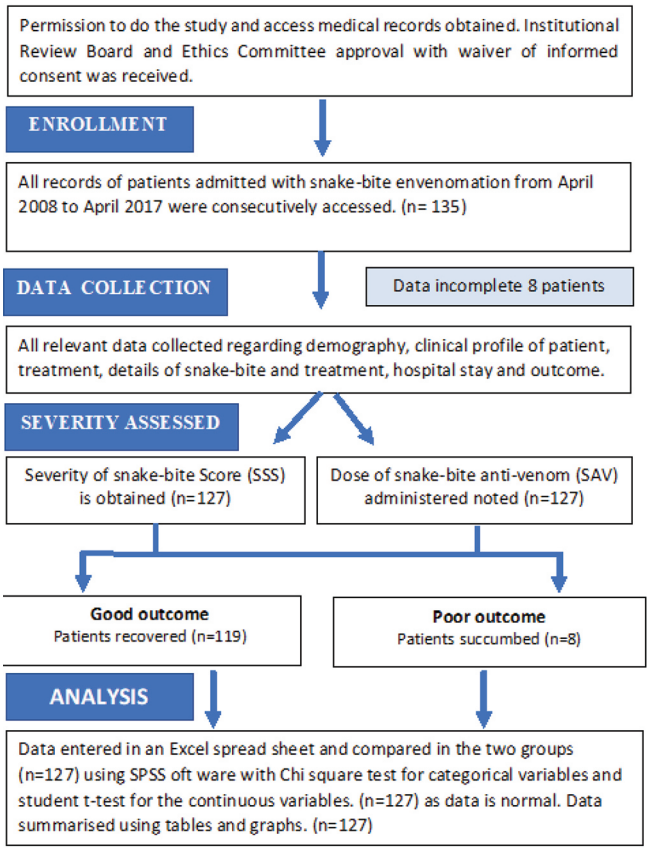

Figure-1: The study flow diagram based on strobe guidelines

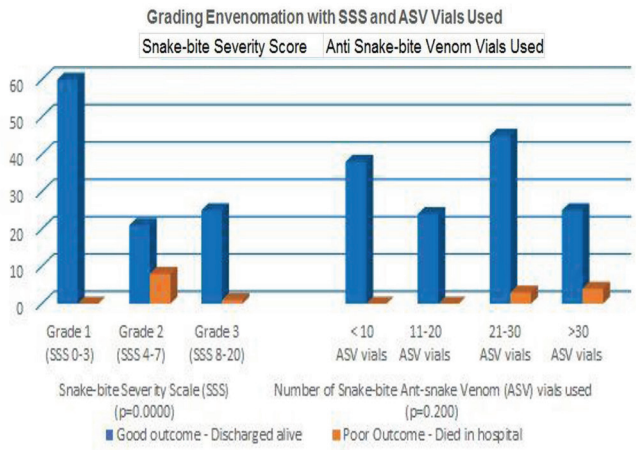

Figure-2: Legend: 25 (19.6%) had a Snake-bite Severity Score (SSS) over 8 and needed more than 30 vials of Anti Snake-bite Venom (ASV). Of these severely envenomated patients, eight (6.3%) patients succumbed to the snake-bite.

(SSS <3), moderate envenomation (SSS 4-7) and severe envenomation (SSS>8) (Table 4)

There was a significant difference between the good outcome group and the poor outcome with both the grading systems, however all the 8 patients who died were in the maximal envenomation group of 29 patients while with the traditional symptom-based grading the 8 who died were in Groups 3 and 4 consisting of 32 patients. Thus the SS is a little better

in predicting poor outcome.

The treatment administered such as ventilatory support, number of vials of ASV given, length of intensive care unit stay and duration of hospitalisation of patients are given in Table 5.

All the patients received an initial ASV dose of less than 10 vials. Of the 119 patients who recovered, 69 (58%) received less than 20 vials of ASV while all the patients who succumbed to the envenomation received more than 10 vials and half of them received more than 30 vials.

All the 29 patients who had a score over 8 in the SSS and were classified as having maximal envenomation received over 30 vials of ASV. Of these 25 recovered and 4 succumbed to the bite. Of the remaining four, three received over 20 units and one received less than 20 vials of ASV.

The SSS score and the number of ASV vials used are illustrated in Figure 2.

DISCUSSION

Of the 127 patients, admitted to the ICU in the past nine years with snake envenomation, 78 were males and 49 were females. Of the 127 snake-bites, 87 (68.5%) snakes could be identified and the remaining 40 snakes could not be identified. Snake-bites were more common in summer 51 (40.1%), however mortality was more when the bite occurred in the monsoon season. Over 40% of patients were bitten in summer, around 25% in the monsoon and 33% in the winter. All the patients who had a poor outcome were bitten in summer or the monsoon and five out of the eight who died were bitten during the monsoon season.

There is a diurnal variation in snake-bites. Most of the bites occurred in the evening between 4.00 pm and 8.00 pm. Fewest bites occurred after 12.00 pm and before 4.00 am.

There were four (3.15%) patients who required more than 8 days of intensive care unit stay and of these two (50%) patients died.

Regarding outcomes for the 127 patients, 119 recovered and were discharged while 8 (6.3%) patients died in hospital. Of the eight who died, five (62.5%) patients were classified as Grade 4 by the severity grading based on symptomatology while all 8 (100%) fell into the category of maximal envenomation by the SSS categorisation. This shows that the SSS is a more reliable tool to predict outcome in patients of snake-bite envenomation.

The common venomous snakes in this area are cobra, viper and krait.[12] Of the 127 snake-bites, 87 (68.5%) were positively identified. The most common snake responsible for snake bites in this area was the viper 60 (47.2%).

The evidence-based summary of signs and symptoms of snake bite, published after the Indian National Snakebite Conference is given below.

1. Local Pain/Tissue damage seen in cobra and viper but not krait bites
2. Ptosis/neurological signs seen with cobra and krait but not viper
3. Haemostatic abnormalities seen with viper bites not cobra and krait bites.
4. Renal complications in Russel's viper and hump-nosed viper but not cobra, krait and saw-scaled viper
5. Response to neostigmine is seen with cobra-bites but not for viper and krait bites.
6. Response to anti-snake venom in all except hump-nosed viper.[12]

In our study the renal, gastrointestinal, respiratory, central nervous system and cardiovascular system symptoms manifested were significantly more in the poor outcome group compared to those who recovered. The incidence of thrombocytopenia, leucocytosis, clotting time were significantly present in the patients who died compared to patients who were discharged from hospital.

A review on snake-bites in South Asia says that mortality rates are highly variable, ranging from 0.5% to 58%. Most fatalities occur before reaching treatment centres.[13] Studies from South India have reported mortality rates of 10.7% and 13.7%, while another similar study had a mortality rate of 3%.[4,11,14] Our study shows a mortality rate of 6.3%.

Traditionally, severity of envenomation is graded based on symptomatology into four grades to predict outcome and determine dose of ASV. Kang et al have raised the question if the traditional snakebite severity score correctly classifies envenomated patients and recommend measuring the pain and local effect and these are included in the SSS.[14]

In our study, of the eight patients who died 3 were in Grade 3 and five were in Grade 4. The SSS grades patients based on local reaction, symptomatology and coagulation parameters. All eight patients who died were in the maximal envenomation group showing that the SSS is a reliable and valid tool to predict outcome in snake-bite envenomation. (p=0.000).

The snakebite protocol includes proper dressing, tetanus immunization, pain control, and elevation of the wounded part. The protocol also includes categorizing the snakebite severity to determine requirement of ASV. We found the Snake-bite Severity Score a valid and reliable tool of severity of envenomation which can predict outcome. All the patients in the poor outcome group had a Snake-bite Severity Score (SSS) over 8 and were classified in the maximal envenomation group (p=0.000). All patients with SSS over 8 received over 30 vials of polyvalent ASV. We found 69 (58%) of the 119 patients who recovered received less than 20 vials of ASV while 50 (42%) received over 20 vials of ASV. All the eight patients who succumbed to the envenomation (poor outcome group) received more than 10 vials and half of them received more than 30 vials.

CONCLUSION

The mortality rate due to snake bite envenomation in our study was 6.3%. Mortality due to snake envenomation is greater in the monsoon months. Snake-bite Severity Score (SSS) is a good tool to predict patient outcomes in snakebite envenomation and to estimate anti-snake venom requirement.

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REFERENCES

1. WHO/SEARO Guidelines for the Clinical Management of Snakebite in the Southeast Asian Region. SE Asian J Trop Med Pub Health. 1999;30:1-85.
2. Ram Reddy CR, Bharath Reddy CRV. A Follow up Study on Hospitalised Cases of Snake Bite Victims Osmania General Hospital, Hyderabad. International Journal of Pharmaceutical and Medical Research. April 2015;3:2:49-56.
3. Ghosh S, Mukhopadhyay P, Chatterjee T. Management of Snake Bite in India. Editorial in Journal of The Association of Physicians of India August 2016;64:11-14.
4. K Sam, M Khan, S Peerally, P Kumar, P Rao. Snake-bite Envenomation: A Comprehensive Evaluation of Severity, Treatment and Outcome in a tertiary Care South Indian Hospital. The Internet Journal of Emergency Medicine. 2008; 5:1.
5. Gautam P, Sharma N, Sharma M, Choudhary S. Clinical and Demographic Profile
6. of Snake Envenomation in Himachal Pradesh, India. Indian Pediatrics 2014;51:934-35.
7. Jin SC, Lee JW, Yang SJ, Joo MD, Choi WI. Consideration of factors associated with complications and systemic symptoms of snake-bites. J Korean Soc Emerg Med 2008;19:686-96.
8. You KM, Kwon WY, Kwon TH, Shin JH, Lee HJ. Optimal dose of antivenon for asymptomatic or minor envenomation patient with Korean viperidae injuries. J Korean Soc Emerg Med 2013; 24:420-7.
9. Warrell DA. Guidelines for the Clinical Management Of Snake Bites in South- East Asia Region Written and edited by David A Warrell published by WHO, 2005. Available at <https://www.who.int/snakebites/resources/9789290225300/en/>
10. Kim OH, Lee JW, Kim HI, Cha KC, Kim H, Lee KH, Hwang SO, Cha YS. Adverse Cardiovascular Events after a Venomous Snakebite in Korea. Yonsei Med J 2016;57:512-517.
11. Dart, R.C., Hurlbut, K.M., Garcia, R., Boren, J. Validation of a severity score for the assessment of crotalid snake bite. Ann Emerg Med 1996;27:321-6.
12. Suchithra N, Pappachan JM, Sujathan P. Snakebite envenoming in Kerala, South India: clinical profile and factors involved in adverse outcomes.Emerg Med J. 2008:4:200-4.
13. Indian National Snakebite Conference July 2006. Amrita Institute of Medical Sciences Cochin, Kerala. Snakebite Prevention Snake-bite First Aid and Treatment Support Concepts. Available at http://www.imaapstate.com/dwd/standardtreatmentprotocol/Indian%20National%20Snakebite%20Treatment%20Protocol.pdf>.
14. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F. Snake Bite in South Asia: A Review. PLoS Negl Trop Dis. 2010;4:1:1-9.e603.
15. Lal P, Dutta S, Rotti SB, Danabalan M, Akshay K. Epidemiological profile of snake bite cases admitted in JIPMER hospital. Indian J Community Med 2001; 26: 1:36-8.
16. Kang S, Moon J, Chun B. Does the traditional snakebite severity score correctly classify envenomated patients? Clin Exp Emerg Med 2016;3:34-40.

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