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CLINICO-EPIDEMIOLOGICAL PROFILE AND OUTCOME OF SNAKE BITE; A PICU-BASED STUDY IN A TERTIARY CARE HOSPITAL IN WEST BENGAL, INDIA

Paediatrics

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ABSTRACT

INTRODUCTION: Snake bite remains an area which has not been properly addressed to, though it is quite common in specific regions worldwide.

BACKGROUND: Inspite of the fact that every year Snake bite take away many lives, this issue has remained one of the medically neglected topics. If a Snake bite victim can be given proper management in time, mortality rate is extremely low.

OBJECTIVES: This study was done in PICU of a Medical College Hospital with an intention to observe the epidemiological profile and the outcome of snake bite victims.

RESULTS: Out of 50 cases studied, there were 43 poisonous snake bite cases,40 cases responded well to standard management , only 4 patients required mechanical ventilation support and only 1 patient died. 2 patients were referred to more higher center for hemodialysis.

CONCLUSION: Increasing awareness has made it possible for snake bite victims to be brought to hospital early and so early treatment. This has improved the outcome in snake bite making the death rate to be significantly low.

AIMS & OBJECTIVES:

1- To study the cilinico-epidemiological profile of snake bite.
2- To observe the outcome after standard treatment and to look for different complications.
3- To note the difference in outcome between the patients in relation to the time interval between bite and initiation of treatment.

WHAT WAS ALREADY KNOWN IN THIS FIELD ?

1- Snake bite is an important public health problem till now, in a country like ours; imposing the brunt on poor and rural population.
2- Snake bite victims , if brought early to medical attention have an overall good prognosis.
3- Despite administration of ASV and other measures snake bite victim have a significant mortality and complication.

WHAT HAS BEEN REVEALED IN OUR STUDY ?

1- Same as above.
2- Snake bite victims who were brought to our hospital early had an excellent prognosis.
3- In our study the overall mortality and complication was remarkably lower than those found in other studies.

SUBJECTS: 50 Cases of envenomation by snake bite admitted at PICU of Bankura Sammilani Medical College and Hospital from June 2020 to December 2020.

KEYWORDS

ASV, Envenomation, India, Snake bite

INTRODUCTION:

The global burden of snake bite is large, disproportionately affecting children who live in low-income settings, and often leads to permanent physical and psychological sequelae.[1] In 2017, snake bite envenoming was reinstated within the list of Neglected Tropical Diseases (NTDs) of the World Health Organization (WHO).[2] The estimated global burden of snake bite is 5million people per annum with 1.8–2.7million envenomings. Between 81000 and 138000 people die each year, and about three times that many have permanent physical and psychological sequelae.[3] The burden of snake bite disproportionately falls on the world's poorest people in rural communities.[1]

A resolution on snake bite envenoming was subsequently adopted by the World Health Assembly in 2018, and a strategy for the prevention and control of this disease was launched by the WHO in 2019.[4] Ninety-five per cent of snake bites occur in Africa, Asia and Latin America, with India having the highest reported death toll (exceeding 45000 deaths per annum).[5]

The venomous snakes of the world belong to the families Viperidae (subfamily Viperinae: Old World vipers; subfamily Crotalinae : New World and Asian pit vipers) , Elapidae (including cobras, coral snakes, sea snakes, kraits, and all Atractaspidinae: burrowing asps) and Colubridae (a large family in which most species are non-venomous and only a few are dangerously toxic to humans.

India is inhabited by more than 60 species of venomous snakes – some of which are abundant and can cause severe envenoming .[6] Spectacled cobra (*Naja naja*), common krait *(Bungarus caeruleus)*, saw-scaled viper *(Echis carinatus)* and Russell's viper (*Daboia russelii*) have long been recognised as the most important, but other species may cause fatal snakebites in particular areas, such as the central Asian cobra (*Naja oxiana*) in the far north-west, monocellate cobra (*N. kaouthia*) in the north-east, greater black krait (*B. niger*) in the far north-east, Wall's and Sind kraits (*B. walli* and *B. sindanus*) in the east and west and hump-nosed pit-viper (*Hypnalehypnale*) in the south-west coast and Western Ghats.[6]

Due to the smaller size, children often present with more severe effects of snake bite, owing to their lower volume of distribution relative to the mass of injected venom. This higher ratio of venom to body mass can result in more rapid and severe neurotoxicity, coagulopathy and severe local tissue damage.[7]

Venoms are injected by the snake either subcutaneously or intramuscularly, or rarely intravenously. Many venoms inflict local tissue damage at the anatomical site of injection. Rare cases result in areas of necrosis that occur away from the bite site, such as by some species of spitting cobras. Venom toxins are absorbed via lymphatic and blood vessels to reach the circulation, causing systemic effects.[3]

An estimated quarter of bites from venomous snakes are 'dry' bites (this proportion varies with snake species), meaning that venom is not injected and envenoming does not occur.[8]

Snake venoms are highly variable and complex mixtures of enzymes, low molecular weight polypeptides, glycoproteins, and other constituents. Among the deleterious components are hemorrhagins that promote vascular leakage and cause both local and systemic bleeding. Proteolytic enzymes cause local tissue necrosis, affect the coagulation pathway at various steps, and impair organ function. Hyaluronidases promote the spread of venom through connective tissue. Myocardial depressant factors reduce cardiac output, and bradykinins cause vasodilation and hypotension. Neurotoxins act either pre- or post synaptically to block transmission at the neuromuscular junction, causing muscle paralysis. Most snake venoms have multisystem effects on their victims.

Viperid snake venoms are particularly rich in metalloproteinases,

serine proteinases and phospholipases A2. Elapid venoms contain high amounts of proteins of the three-finger toxin family and phospholipases A2. Many other protein families are also present in venoms and contribute to their toxicity, such as C-type lectin-like proteins, disintegrins and dendrotoxins.[3]

Traditionally, antivenoms are preparations of immunoglobulins or immunoglobulin fragments prepared by immunising large animals, usually horses but sometimes sheep, with snake venom. After collection of blood and separation of plasma, antibodies are purified and preparations formulated to have a standard neutralising potency against the venoms used in the immunisation. The goal of antivenom administration is to allow antibodies (or antibody fragments) to bind and deactivate circulating venom components before they can attach to target tissues and cause deleterious effects.[9]

ASV is the only effective and specific treatment which is available for snake bite envenomation. The anti-snake venoms may be species specific (monovalent/monospecific) or they may be effective against several species (polyvalent/polyspecific). As per the recommendations of the WHO, the most effective treatment for snake bite is the administration of monospecific ASV; however , this therapy is not always available for the snake bite victims because of its high cost, the frequent lack of its availability, and the difficulty in correctly identifying the snake. As snakes inject the same amount of venom into children and adults, children should also receive the same dose of antivenom as the adults. [10]

After a venomous snake bite, the time to symptom onset and clinical presentation can be quite variable and depend on the species involved, the anatomic location of the bite, and the amount of venom injected.

Local effects at the bite site occur in bites inflicted by the majority of species with necrotizing venoms of the family Viperidae and by some species of the family Elapidae, such as the spitting cobras. These local effects are usually pain, swelling, ecchymosis and blisters, sometimes causing significant local tissue necrosis, including myonecrosis and cutaneous necrosis.[11]Swelling is often more severe and widespread in children, although does tend to recover faster than in adults, with most completely recovered in 1month.[12]There is, therefore, a risk of developing compartment syndrome, depending on the site of the bite, the volume and type of venom injected, and the local reaction.[13]

Systemic findings are extremely variable and can include nausea, vomiting, back pain, headache, abdominal pain,tachycardia or bradycardia , hypotension, generalized weakness, changes in taste, mouth numbness, muscle fasciculation, pulmonary oedema, renal dysfunction and spontaneous haemorrhage.

Systemic envenoming by species of the family Elapidae are mostly characterised by neurotoxic manifestations, that is, a progressive neuromuscular paralysis which may end in bulbar paralysis and respiratory arrest. [11]

This is a consequence of neuromuscular blockade through the action of presynaptically or postsynaptically acting neurotoxins.[14, 15] Evidence of paralysis typically first appears as bilateral ptosis with or without ophthalmoplegia or diplopia

Systemic manifestations of many viperiden venomings are typically associated with coagulopathy and bleeding, owing to the disruption of microvessel wall integrity by venom proteinases[16] and to a consumption coagulopathy. Some viper bites do not cause coagulopathy. In severe cases, hypovolaemia secondary to coagulopathy, capillary leakage and vasoactive and myocardial depressant toxins can precipitate cardiovascular shock.[11] Some venoms, such as that of Russell's viper, cause a systemic capillary leakage syndrome, which contributes to hypovolaemia and shock.[17]A number of elapid and viper species can cause acute kidney injury, owing to hypovolaemia, direct nephrotoxic effects, thrombotic microangiopathy or accumulation of myoglobin in renal tubules as a consequence of rhabdomyolysis.[3] Recently, there have been increasing reports of sudden cardiorespiratory arrest associated with snake bite envenoming, due to cardiovascular toxicity of venoms.[18]

According to WHO guidelines, recommended first-aid methods for snake bite are reassurance, immobilisation of the bitten limb and movement of the patient to a place where they can receive medical care as soon as possible. [19]

The immobilised child should be transferred to a medical facility as quickly as possible, with the focus on airway and breathing support, prevention of aspiration (of vomitus or other fluids), oxygen administration and gaining intravenous access in an unaffected limb,[20] if available.

Harmful practices such as incision, suction devices, snake stones, cryotherapy and tourniquets should not be used.[2122]

Elapid venoms that are primarily neurotoxic and have no significant effects on local tissue may be localized by pressure immobilisation, a technique in which the entire limb is wrapped immediately with a bandage (e.g. crepe or elastic) and then immobilized. The wrap pressure must be precise (40-70mmHg in upper extremity application and 55-70mmHg in lower extremity application).

Photographs should be taken of the snake whenever possible to aid in identification, but snakes, including dead snakes, should never be handled .[11]

When a child arrives in hospital, an ABCDE (airway, breathing, circulation, disability, exposure) approach[23] should be followed initially.

In the hospital, the victim should be closely monitored (vital signs, cardiac rhythm, oxygen saturation, urine output) while a history is quickly obtained and a rapid , thorough physical examination is performed.

A quick bedside test for suspected bites from haemotoxic snakes is the 20min whole blood clotting test. If the blood clots, then the risk of hemotoxic envenoming is unlikely. [21]

The child should receive supportive care and be closely and frequently monitored , particularly for evidence of airway or respiratory compromise, progressive paralysis, hypotension or cardiovascular collapse, bruising or bleeding and kidney impairment. If significant neurotoxic envenoming has occurred, then early intubation and ventilation is advocated. Antivenom administration may reduce the time of ventilation from an average of 7 to 4 days. Early use of renal replacement therapy for oliguric or hyperkalemic acute kidney injury is advised where available. The use of antibiotics continues to be controversial, but broad-spectrum antibiotics may be recommended, particularly in tropical countries, where the incidence of bacterial infections of snake bite wounds is higher. Their role can also be argued in cases of cytotoxic syndromes once the necrosis is established to prevent subsequent wound infection. [24]

Tetanus toxoid and tetanus immunoglobulin should be given early if the child is not immunised.

In general, antivenom should, if available, be administered to all patients who have evidence of: 1. Systemic manifestations of envenoming. 2. Severe local and regional effects of envenoming, particularly those with substantial swelling, oedema or skin lesions extending to two major joints from the bite site (eg, past the knee following a bite on the foot or to the pelvis after a bite above the ankle)

MATERIALS AND METHODS

STUDY DESIGN: Cross –sectional observational PICU based study
PLACE: Department of Paediatrics, BS Medical College :Bankura ; West Bengal ; India

DURATION: Study period extended from June 2020 to December 2020
SAMPLE SIZE: 50 cases
STUDY POPULATION:50 cases of envenomation by snake bite admitted at PICU of Bankura Sammilani Medical College and Hospital from June 2020 to December 2020.

METHODS:
After obtaining consent , data was collected on pre-designed ,pre tested and structured questionnaire by interviewing the study subjects. A detailed information regarding demographic and epidemiological parameters such as age,sex,residence, site and place of bite, type of snake if identified. Time interval to reach the hospital after snake bite and first aid if received any was asked.

Detailed clinical examination of all patients were carried out. A quick

bedside test, 20 minute whole blood clotting test to rule out hemotoxic envenoming was done. Patients were given supportive care and vitals were frequently monitored particularly for evidence of airway or respiratory compromise, progressive paralysis, hypotension or cardiovascular collapse, bleeding and kidney impairment. If significant neurotoxic envenoming was noted, then decision regarding early intubation and ventilation was made.

Anti snake venoms were administered to all patients who showed evidence of systemic manifestations of envenoming and also in severe local and regional effects of envenoming. Any adverse reactions after ASV administration such as early anaphylactic reaction and pyrogenic reactions were noted and treated with Inj Phenergan (promethazine) and Inj Hydrocortisone as necessary.

Antibiotics were given in order to prevent bacterial infection of snake bite; Inj ceftriaxone, Inj co-amoxiclav, inj metronidazole as required.

Neuroparalytic patients were further treated with Inj Neostigmine, Inj Atropine and Inj Calcium gluconate. Laboratory investigations were sent according to the development of complications- Complete blood count, serum urea, serum creatinine, LFT, Urine RE/ME, PT, APTT, INR. Other- USG colour Doppler to rule out compartment syndrome.

RESULTS AND ANALYSIS

A total of 50 snake bite cases were studied in our paediatric ward from June 2020 to December 2020.

Out of 50 cases, 43 cases were of poisonous snake bite and 7 were of non poisonous snake bite. Out of 43 poisonous snake bite, 24 were Neurotoxic snake bite and 19 were Hemotoxic snake bite.

Table 1 Age wise distribution

Age in years	No. of snake bite cases(n=50)	No. of snake bites (%)
< 1 yr	-	-
1-5 yr	15	30%
>5yr	35	70%

Maximum incidence of snake bites were found in children more than 5yrs of age (70%) followed by 1-5 yrs (30%) and no case was seen in less than 1 yr age.

Table 2 Sex wise distribution

Sex	No. of Cases(n=50)	No. of Cases (%)
Male	29	58%
Female	21	42%

Among 50 cases, Males(29 patients,58%) were bitten more than females (21 patients,42%)

Table 3 Distribution according to locality

Locality	No. of Cases(n=50)	No.of cases (%)
Rural	38	76%
Urban	12	24%

More cases were from rural areas(76%) than in urban areas(24%)

Table 4 Distribution according to Race

Race	No. of cases(n=50)	No. of cases (%)
Tribal	10	20%
Non-Tribal	40	80%

Among 50 cases, 10 patients (20%) were tribal and rest 40 patients (80%) were non tribal.

Table 5 Time of Bite to Arrival in Hospital

Time in hours	No. of cases(n=50)	No. of cases (%)
< 3hours	11	22
>3 hours- <12 hours	37	74
>12 hours	2	4

Most of the patients 37 patients(74%) arrived between 3-12 hours from the time of bite to the tertiary care centre, 11(22%)patients arrived within 3 hours and rest 2(4%) arrived beyond 12 hours from time of bite

Table 6 Total number of ASV administered

Total no. of ASV administered	No. of cases(n=50)	No. of cases (%)
Not given	7	14%
10 vials	2	4%
20 vials	4	8%
30 vials	35	70%
40 vials	2	4%

35(70%) cases received 30vials ASV, 2(4%) cases received 40 vials, 4(8%)cases received 20 vials ,2(4%) received 10 vials and in 7 (14%)cases ASV was not given.

Table 7 Incidence of type of snake bite according to toxicity

Type of snake	No. of cases(n=50)	No. of cases (%)
Hemotoxic	19	38%
Neurotoxic	24	48%
Non poisonous	7	14%

50 Snake bite patients were studied. Out of 50 cases, 24(48%) were Neurotoxic snake bite, 19(38%) were Hemotoxic snake bite and 7(14%) were Non -poisonous snake bite.

Table 8 Incidence of symptoms in Neurotoxic snake bite

Symptoms	No. of cases(n=50)	No. of cases (%)
Ptosis	12	24%
Impaired consciousness	6	12%
Convulsion	1	2%
Respiratory muscle paralysis	4	8%

Among all Neurotoxic snake bite 12 (24%) patients presented with ptosis which was the most common presentation,6(12%) had impaired consciousness,1(2%)developed convulsion during hospital stay and 4 (8%)patients had respiratory muscle paralysis.

Table 9 Incidence of symptoms in Hemotoxic snake bite

Symptoms	No. of cases(n=50)	No. of cases (%)
Local swelling	13	26%
Bleeding from bite site	8	16%
Local discolouration	5	10%
Cellulitis	5	10%
Gangrene	1	2%
Acute Renal failure	2	4%
Hematemesis	1	2%

Among Hemotoxic snake bite cases 13(26%) presented with local swelling, 8(16%)had bleeding from bite site, 5(10%) had local discolouration, 5(10%) developed cellulitis, 1(2%) showed gangrene, 2(4%) developed Acute Renal failure and 1(2%) had hematemesis.

Table 10 Changes in haematological, urine and coagulation profile in the patients suspected to be Hemotoxic snake bite

Parameters	No. of cases(n=50)	No. of cases%(n=50)
Anemia	12	24%
Leukocytosis	9	18%
Thrombocytopenia	6	12%
Hyperkalemia	4	8%
Metabolic acidosis	5	10%
Hepatic dysfunction	None	0%
Hypoalbuminemia	None	0%
Hematuria	6	12%
Coagulation Defect	2	4%

Among the suspected hemotoxic snake bite cases, 12 (24%) cases showed anemia, 9(18%)cases had leukocytosis, 6 (12%) cases had Thrombocytopenia, 4 (8%) cases had Hyperkalemia, 5 cases(10%) had Metabolic acidosis, None of the cases showed hepatic dysfunction and Hypoalbuminemia, 6(12%) cases had Hematuria and 2 patients had coagulation defect.

Table 11 Number of patients requiring Respiratory support

Type of Respiratory support	No.of cases(n=50)	No.of cases (%)
Mechanical Ventilation	4	8%
Non-invasive support	15	30%

Among 50 cases 4(8%) required mechanical ventilator support and 15(30%) required non invasive respiratory support.

Table 12 Duration of patients on Mechanical Ventilators

Time in hours	No. of cases
<24 hrs	-
>24 hrs	4

All 4 patients needed ventilatory support for more than 24hours.

Table 13 Duration of patients on Non-invasive Respiratory support

Time in hours	No. of cases
<24hrs	10
>24hrs	5

10 patients required non invasive respiratory support for less than 24hours and 5 patients required for more than 24hours.

Table 14 Incidence in relation to condition at Discharge

Condition at discharge	No. of cases(n=50)
Discharged satisfactorily	42
Discharged with complications	7
Death	1

42 patients were discharged satisfactorily, 7 patients discharged with complication. 1 death was reported due Respiratory failure due to Neurotoxic snake bite.

Table 15 Comaparative mortality in poisonous snake bite

	No.of cases	No.of death
Neurotoxic snake bite	24	1
Hemotoxic snake bite	19	-

1 death was reported due Respiratory failure due to Neurotoxic snake bite. Patient died because the patient came late to seek medical treatment and by that time complications were beyond control.

DISCUSSION

In our study 50 snake bite patients were studied. Out of 50 cases, 24 were Neurotoxic snake bite, 19 were Hemotoxic snake bite and 7 were Non -poisonous snake bite.

Maximum incidence of snake bites were found in children more than 5yrs of age (70%). The most vulnerable age group for snake bites includes children over 5 years of age because they are engaged in outdoor games and also older children in rural areas share the responsibilities of carrying out outdoor activities like grass cutting, cattle grazing, firewood collection. Similar types of age distribution were reported by Kumaravel KS et al Chandrasekar C et al, Krishan a V Metal [25-29]

Males(58%) were bitten more than females (42%).This is in accordance with other studies where high incidence is reported in male children which can be attributed to their behaviour and nature to play more outdoor games [30,31,32]

Maximum cases were from rural areas(76%) than in urban areas(24%).There was a difference between urban and rural population, urban being more educated had better knowledge about snake bite. [33,34]

Most of the patients(74%) arrived between 3-12 hours from the time of bite to the tertiary care centre, 22% patients arrived within 3 hours and rest 4% arrived beyond 12hours from time of bite .In rural India, due to attitude of the people to seek treatment from quacks they present to the hospital late after the bite and because of lack of transport facility during night hours the primary centre is not approachable. Studies in southern India confirmed that delayed anti venom administration was associated with an increased risk of complications [35,36]. Studies in similar settings report that survival rate was significantly higher in cases where time to reach the medical facility was less than 6 hrs.[33,34]

70% cases received 30vials ASV, 4% cases received 40 vials, 8% cases received 20 vials , 4% received 10 vials and in 14% cases ASV was not given.

In our study, we have used lower loading dose of ASV and maintenance infusion through syringe pump. [37] Anticholinesterase therapy was administered to all patients to combat postsynaptic toxins as most of them reached very early (median duration of four hours) to us.No patient in our study demonstrated any hypersensitivity reaction to anti snake venom. Anticholinesterase therapy continued till the improvement of the ptosis

Among 24 Neurotoxic snake bite 12 (24%)patients presented with ptosis which was the most common presentation,6(12%) had impaired consciousness,1(2%)developed convulsion during hospital stay and 4 (8%)patients had respiratory muscle paralysis. Among 19 Hemotoxic snake bite 13(26%) presented with local swelling, 8(16%) bleeding from bite site, 5(10%) had local discolouration, 5(10%) developed cellulitis, 1(2%) showed gangrene, 2(4%) developed Acute Renal failure and 1(2%) had hematemesis. 2 patients with acute renal failure were referred to more higher centre with facility for haemodialysis. Similar types of complications were reported by Gautam P et al, Adhisivam B etal .[38,39]

Among the suspected hemotoxic snake bite cases, 12 (24%) cases showed anemia, 9(18%) cases had leukocytosis, 6(12%) cases had Thrombocytopenia, 4 (8%) cases had Hyperkalemia, 5 cases(10%) had Metabolic acidosis, None of the cases showed hepatic dysfunction and Hypoalbuminemia, 6(12%) cases had Hematuria and 2 patients had coagulation defect. The results can be compared as in other studies. [40]

Among 50 cases 4(8%) required mechanical ventilator support and 15(30%) required non-invasive respiratory support. All 4 patients needed ventilatory support for more than 24hours. 10 patients required non invasive respiratory support for less than 24hours and 5 patients required for more than 24hours. 42 patients were discharged satisfactorily, 7 patients discharged with complication. One case had cardiac arrest while was on ventilatory support on day 2 of admission and was revived after prolonged CPR.Non invasive respiratory support involved patient on high flow Oxygen .

Ready availability and appropriate use of anti snake venom, close monitoring of patients, and timely institution of ventilatory support helped in reducing the mortality[34]Immediate endotracheal intubation was done in patients with bulbar involvement to protect airway. Weaning from mechanical ventilation is relatively easy as the patients are otherwise healthy and usually responsive to ASV within short period of time as in our study. Duration of mechanical ventilation in our patients were discussed as above.

There was only one death as a result of respiratory failure due to Neurotoxic snake bite. Patient died because the patient came late to seek medical treatment, patient deteriorated rapidly and complications were beyond control. So mortality in our study was 2.0 percent.

Other similar studies showed among those envenomed by poisonous snakes, the mortality was 4.7% (n=20). [34]

CONCLUSION

At the end our study we conclude that majority of poisonous snake bite studied were Neurotoxic snake bite(Krait).Most of the patients were more than 5 years of age. We found incidence of snake bite in Males were more than the females. Patients belonged to rural population more than the urban population. The time of bite to arrival at hospital was between 3-12 hours by most of the cases 37(74%). Most of the cases 35 (70%) were administered 30 vials ofASV.

Ptosis was the most common presenting symptom in neurotoxic snake bite . Local swelling was the most common presenting feature in hemotoxic snake bite.Among hemotoxic snake bite cases, 9 showed leukocytosis, 6 cases had thrombocytopenia, 4 cases had Hyperkalemia, 5 cases showed metabolic acidosis, 6 cases had hematuria and 2 cases showed coagulation defect.

4 patients required immediate intubation and mechanical ventilation support.15 patients required non-invasive respiratory support.

In our study, there was 1 mortality by neurotoxic snake bite. We found that prolonged bite to hospital time i.e., delayed arrival to hospital was associated with mortality. Delay in seeking proper medical help is responsible for morbidity and mortality. Incidence of complications is directly proportional to the duration of venom in the blood prior to its neutralization by ASV due to late arrival of patient at hospital and as complications occur mortality will increase.

Continual research studies on ASV must go on considering the varied species of snakes in different regions of world. More and larger studies on snake bite are also necessary to create interest and awareness among medical professionals in this important though relatively neglected medical topic.

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REFERENCES

1- Harrison RA, Hargreaves A, Wagstaff SC, et al. Snake envenoming: a disease of poverty. PLoSNegl Trop Dis 2009;3:e569.
2- Chippaux J-P. Snakebite envenomation turns again into a neglected tropical disease! J Venom Anim Toxins Incl Trop Dis 2017;23:38.
3- Gutiérrez JM, Calvete JJ, Habib AG, et al. Snakebite envenoming. Nat Rev Dis Primers 2017;3:17079.
4- WHO. Snakebite Envenoming- a strategy for prevention and control, 2019. Available: https://www.who.int/snakebites/resources/9789241515641/en/ [Accessed 22 Oct 2019].
5- Mohapatra B, Warrell DA, Suraweera W, et al. Snakebite mortality in India: a nationally representative mortality survey. PLoSNegl Trop Dis 2011;5:e1018.
6- Whitaker R, Captain A. Snakes of India: The Field Guide. Chennai: Draco Books; 2004. 495 [Google Scholar]
7- Kshirsagar VY, Ahmed M, Colaco SM. Clinical profile of snake bite in children in rural India. Iran J Pediatr 2013;23:632–6.
8- Juckett G, Hancox JG. Venomous snakebites in the United States: management review and update. Am Fam Physician 2002;65:1367–74
9- León G, Vargas M, Segura Álvaro, et al. Current technology for the industrial manufacture of snake antivenoms. Toxicon 2018;151:63–73.
10- Howarth DM, Southee AS, Whytw IM, The lymphatic flow rates and the first aid in simulated peripheral snakes or in spider envenomation Med J Australia 1994 161:695-700. [Google Scholar]
11- Warrell DA. Snake bite. Lancet 2010;375:77–88.
12- Warrell DA. Treatment of bites by adders and exotic venomous snakes. BMJ 2005;331:1244–7.
13- Brenes-Chacón H, Gutiérrez JM, Camacho-Badilla K, et al. Snakebite envenoming in children: a neglected tropical disease in a Costa Rican pediatric tertiary care center. Acta Trop 2019;200:105176.
14- Barber CM, Isbister GK, Hodgson WC. Alpha neurotoxins. Toxicon 2013;66:47–58.
15- Dixon RW, Harris JB. Nerve terminal damage by beta-bungarotoxin: its clinical significance. Am J Pathol 1999;154:447–55.
16- Gutiérrez JM, Escalante T, Rucavado A, et al. Hemorrhage caused by snake venom metalloproteinases: a journey of discovery and understanding. Toxins 2016;8:93.
17- WHO. Guidelines for the management of snakebites, 2006. Available: https://www.who.int/snakebites/resources/9789290225300/en/ [Accessed 23 Oct 2019].
18- Maduwage K. Sudden cardiorespiratory arrest following Sri Lankan snake envenoming. Sri Lanka Medical Association Newsletter 2019;16.
19- Warrell D.A. Injuries, envenoming, poisoning and allergic reactions caused by animals. In: Warrell D.A., Cox T.M., Firth J.D., editors. Oxford Text Book of Medicine. 4th ed. Oxford University Press; Oxford: 2003. pp. 923–947. [Google Scholar]
20- Parker-Cote J, Meggs WJ, Aid F. First aid and pre-hospital management of venomous snakebites. Trop Med Infect Dis 2018;3:45.
21- WHO Regional Office for Africa. World Health organization guidelines for the prevention and clinical management of snakebites in Africa, 2010. Available: https://www.who.int/snakebites/resources/9789290225300/en/ [Accessed 23 Oct 2019].
22- Blaylock RS. The identification and syndromic management of snakebite in South Africa. SA FamPract 2005;47:48–53.
23- The ABCDE Approach. Resuscitation Council guidelines 2014-2018. Available: https://www.resus.org.uk/resuscitation-guidelines/abcde-approach/ [Accessed 7 Jan 2020]
24- Avau B, Borra V, Vandekerckhove P, et al. The treatment of snake bites in a first aid setting: a systematic review. PLoSNegl Trop Dis 2016;10:e0005079.
25- ChandrashekarC,Shariff MA,Gopal K, RavichanderB. Clinical profile of snakebite in children. J Evidence Based Medi Healthcare. 2015;2(29):4176-84.
26- Krishana VM, Sheikh NA, Soren C. Clinical profile and outcome of snake bite envenomation in children: a retrospective study in a tertiary care centre KIMS Narketpally. Int J Information Res Rev. 2014;1 (11): 155-8
27- . Sani UM, Jiya NM, Ibitoye PK, Ahmad MM. Presentation and outcome of snake bite among children in Sokoto. Northwestern Nigeria. Sahel Med J. 2013; 16 (4):148-53.
28- Reddy MP,Sudharshan RC. Clinical, epidemiological and hematological profile of snake bite in children in rural teaching hospital. Int J Health Sci Res. 2015;5(7):5863.
29- Lingayat AM, Wankhade PR. Study of clinical profile complications and outcome in patients of snake bite in pediatric age group. Int J Healthcare Biomed Res. 2015;3(3):203-8
30- Digra S, Singh V. A clinical profile of neurotoxic snakebite in pediatric population of Jammu region. JK Sci. 2016;18(2):67-70.
31- Chew KS, Khor HW, Ahmad R, Rahman H. A five year retrospective review of snakebite patients admitted to a tertiary university hospital in Malaysia. Int J Emerg Med. 2011;4:41.
32- Wang JD, Tsan YT, Chiao M, Wang LM. Venomous snakebites and antivenom treatment According to a protocol for pediatric patients in Taiwan. J Venom Anim Toxins Incl Trop Dis. 2009;15(4):667-79.
33- Inamdar IF, Aswar NR, Ubaidulla M, Dalvi SD. Snakebite: Admissions at a tertiary health care centre in Maharashtra, India. S Afr Med J. 2010 Jul 5;100(7):456-8. PubMed PMID:20822595. [PubMed]
34- Punde DP. Management of snake-bite in rural Maharashtra: a 10-year experience. Natl Med J India. 2005 Mar-Apr;18(2):71-5. PubMed PMID: 15981441.
35- Suchithra N, Pappachan JM, Sujathan P. Snakebite envenoming in Kerala, South India: clinical profile and factors involved in adverse outcomes. Emerg Med J. 2008 Apr;25(4):200-4. doi:10.1136/emj.2007.051136. PubMed PMID: 18356348. [PubMed]
36- Narvencar K. Correlation between timing of ASV administration and complications in snake bites. J AssocPhysicians India. 2006 Sep;54:717-9. PubMed PMID: 17212020. [PubMed]
37- Agarwal R, Aggarwal AN, Gupta D, Behera D, Jindal SK. Low dose of snake antivenom is as effective as high dose in patients with severe neurotoxic snake envenoming. Emerg Med J 2005;22:397- 9
38- Gautam P, Sharma N, Sharma M, et al. Clinical and demographic profile of snake envenomation in Himachal Pradesh, India. Indian Pediatr. 2014 Nov;51 (11): 934-5.
39- Adhisivam B, Mahadevan S. Snakebite envenomation in India: a rural medical emergency.IndianPediatr. 2006 Jun;43(6):553-4.
40- Vikrant S, Jaryal A, Parashar A. Clinicopathological spectrum of snake bite-induced acute kidney injury from India. *World J Nephrol*. 2017;6(3):150-161. doi:10.5527/wjn.v6.i3.150