

Original article:

Delayed reporting to health care facilities: a significant determinant of fatalities in cases of snake bites

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Abstract:

Context: Envenomation due to snake bites is one of the major Neglected Tropical Disease worldwide. In rural areas exposure to snake bite and reliance on traditional healing is high. Hence, there is a need to evaluate clinical characteristics to identify patients at high risk of developing fatal complications.

Settings & design: This study was carried out on 160 patients who were admitted with history of snake bite in Department of Medicine, Shyam Shah Medical College and associated S.G.M. Hospital, Rewa (MP).

Material & methods: Data was categorized into demographic characteristics, type of snake bite, history of self/home/ faith healer treatment, time lapse from the time of bite till hospital admission, clinical characteristics, severity, quantity of polyvalent anti-snake venom used, duration of hospitalisation, and clinical status at discharge. Data was analysed using the Chi-square test.

Results: The study of 160 snake bites revealed a significant demographic predilection to age ($p=0.01$), rural habitat ($p=0.03$) and farming occupation ($p=0.03$). They were significantly higher during monsoons ($p=0.01$), night time ($p=0.03$) and outdoor activity ($p=0.009$). The mean time till admission was 3.8 hours and patients most commonly presented with difficulty in eye opening (83.33%) and swallowing (77.78%).

Conclusion: The access to hospitals is low in the locality accounting for untoward deaths from snake bites. Hence, better transport facilities and provision of ASV along with adequately trained medical and paramedical staff should be made at primary health centres where patients can be protected from home remedies as well.

Keywords: Snake Bite, Fang Marks, Neurotoxicity, Anti Snake Venom

Introduction

Envenomation as a result of snake bites is one of the major Neglected Tropical Disease worldwide. It is an important public health problem in India also, especially in deprived, remote, rural areas where anti-venom is unavailable, and especially where faith healing is relied upon. Recent reports established the snake bite burden in India to range from 81399-

163051 per annum of which 10835-15000 eventually succumb to its complications¹. We must realise that many more cases go undetected as the common villager takes treatment from traditional healers. As there is no formal WHO programme for evaluation of snake bite envenomings, clinical characteristics should be evaluated to identify patients at high risk of developing fatal complications.

The 'Big Four' snakes -the Indian cobra (*Naja naja*), the common krait (*Bungarus caeruleus*), the Russell's viper (*Daboia russelii*) and the sawscaled viper (*Echis carinatus*) - are responsible for most of the envenoming in India². Yet, the major type of snake varies from region to region. Thus we aim to evaluate the clinical features, epidemiology and treatment of snake bite envenoming in Rewa, Madhya Pradesh, India – a locality whose 83.3% population is rural and at exposure to the deadly snakes of the region.

Settings & design: This study was carried out on 160 patients who were admitted with history of snake bite in Department of Medicine, Shyam Shah Medical College and associated S.G.M. Hospital, Rewa (MP).

Inclusion criteria

- Patients with history of snake bite.
- Patient deemed to be a case of snake bite based on clinical aspects:
 1. Fang marks - Double or multiple punctured.
 2. Local changes- Signs of inflammation, appearance of bullae, purpuric rashes and necrosis.
 3. Systemic manifestations –
 - a. Hemo/vasculotoxicity
 - b. Signs of neurotoxicity – Ptosis, difficulty in swallowing, respiratory distress and other signs of neuroparalysis.

Exclusion criteria

Cases of bites other than snakes were excluded by careful history, local examination for bite marks and systemic examination.

Material & methods:

Data were categorized into demographic characteristics, type of snake bite, history of self-treatment, time lapse from the time of bite till hospital admission, clinical characteristics, severity, quantity of polyvalent anti-snake venom used, duration of hospitalisation, and clinical status at discharge. Data was analysed using the Chi-square test.

Cases were subjected to routine haematological, biochemical and coagulation tests as well as other relevant investigations. Patients with poisonous bites and signs of toxicity were given supportive treatment and were administered polyvalent Anti Snake Venom (ASV). ASV used was in hospital supply manufactured by Bharat Serums and Vaccines Limited. It was polyvalent and made from equine serum, already in reconstituted form supplied in vial. According to specifications each vial contained 10 ml of ASV. Each ml of ASV neutralized 0.6mg of Cobra venom, 0.45mg of Krait venom, 0.6 mg of Russell's viper and 0.45 mg of Saw scaled viper venom.

After sensitivity testing, ASV was given in dose range of 50-200 ml (5-20 vials) according to severity of toxicity. After an initial dose of 5 vials further doses were added up to a maximum of 20 vials according to response with initial and subsequent doses. All the patients of poisonous bites were observed for complications and managed accordingly. Artificial mechanical ventilation was given to patients when indicated. Outcome was noted in the form of complications developed during management of the envenomation. End points with respect to the condition of the patient at discharge were also documented.

Observations

TABLE 1: Demographic profile

AGE(years) (p=0.01)	Poisonous bites	Non-Poisonous bites	Total
14-20	2(5.56%)	27(21.78%)	29(18.12%)
21-40	27(75%)	71(57.26%)	98(61.25%)
41-60	4(11.11%)	24(19.35%)	28(17.5%)
Above 60	3(8.33%)	2(1.61%)	5(4.03%)
Gender (p=0.41)			
Male	22(61.11%)	66(53.22%)	88(55%)
Female	14(38.89%)	58(46.78%)	72(45%)
Habitat (p=0.03)			
Rural	31(86.11%)	84(67.74%)	115(71.88%)
Urban	5(13.89%)	40(32.26%)	45(28.12%)
Occupation (p=0.03)			
Farmer/Labourer	26(72.22%)	57(45.97%)	83(51.87%)
House Wife	5(13.89%)	44(35.48%)	49(30.63%)
Students	3(8.33%)	15(12.1%)	18(11.25%)
Others	2(5.56%)	8(6.45%)	10(6.25%)
	36	124	160

Demographic analysis of the study population revealed that the age group of 21-40 years had a significant exposure to snake bites, with 75% and 57.26% of poisonous and non-poisonous bites occurring in this age group itself. Similarly, the rural cohort had a significantly higher exposure than their urban counterparts as 86.11% of all poisonous snake

bites were seen in this population. Farmers and/or labourers were also significantly exposed to a higher risk of snake bites. 72.22% of all poisonous snake bites affected this population. The male-female ratio in our study was 1.22:1. Though more number of males were bitten by snakes, it was statistically insignificant.

TABLE 2: Distribution of snake bites

SEASONAL (p=0.01)	Poisonous bites	Non-Poisonous bites	Total
Monsoon (Jul-Sept)	32(88.89%)	84(67.74%)	116(72.5%)
Other	4(11.11%)	40(32.26%)	44(17.5%)
TIME OF BITE(p=0.03)			
Day (Presence of Daylight)	7(19.44%)	48(38.71%)	55(34.38%)
Night (Daylight absent)	29(80.56%)	76(61.29%)	105(65.62%)
CIRCUMSTANCES(p=0.009)			
Outdoor Activity	18(50%)	97(78.22%)	115(71.88%)

Indoor Activity	18(50%)	27(21.78%)	45(28.12%)
a. Sleeping	12(66.67%)	11(40.74%)	23(51.11%)
b. Others	6(33.33%)	16(59.26%)	22(48.89%)
SITE OF BITE (p>0.05)			
Upper Extremity	11(30.55%)	49(39.52%)	60(37.5%)
Lower Extremity	15(41.67%)	75(60.48%)	90(56.25%)
Others	10(27.78%)	0	10(6.25%)
	36	124	160

A significant seasonal variation was observed in our study. Whilst the total number of snake bites was significantly higher in the monsoon months (72.5%) from July to September, poisonous bites were 8-fold higher (32 vs. 4) in these same months compared to the rest of the year. Night-time bites were more common among the study group with 80.56% of poisonous bites occurring during the night. While 71.88% of all snake bites were associated with outdoor activity, poisonous bites were evenly distributed between outdoor and indoor activity. Anatomical location of the bite had no significant value although lower extremity bites (56.25%) predominated.

It is important to note that toxic features of poisonous bites developed up to 6 hours after the bite with a mean of 2.47 hours. However, the mean time of presentation of the patient, at our hospital, was 3.8 hours. Local examination of site of bite revealed fang marks in 61.88% of cases. Importantly, poisonous bites had double puncture marks only while all multiple puncture marks were seen in non-poisonous bites. The classical signs of inflammation (redness, tenderness, oedema & cellulitis) were more commonly seen in poisonous bites.

Ptosis (83.33%) was the most common clinical sign associated with poisonous bites. Bulbar palsy (72.85%), generalised weakness (55.56%) and respiratory paralysis (25%) were the next most

hours, which implies a delay of almost 90 minutes from development of toxicity to admission. Among the fatalities, the mean time was 18.5 hours from the time of bite. The remote locality of the villages, with respect to our tertiary care centre, was the reason for delay in hospitalisation in half of the cases. This goes hand-in-hand with the lack of transport facilities, especially after a night-time bite. The remaining chunk of the population (27.78%) initially relied on faith healing and superstitions.

Although patients presented to our hospital with varied complaints, local pain, giddiness and nausea/vomiting were interestingly seen more often in cases of poisonous bites. Abdominal pain, muscular weakness (difficulty in eye opening, swallowing, speaking, mouth opening and breathing) as well as unconsciousness were seen only among the patients of poisonous bites.

common clinical indicators. The total mortality of snake bite patients admitted to our hospital was 2.25%. Significantly, all these deaths were a result of poisonous bites. No fatalities were seen in non-poisonous bites. Complications developed in 52.78% of all patients and adverse outcome was significantly associated as all deaths had prior development of complications. All fatalities were also significantly associated with systemic complications such as respiratory failure, coma and aspiration pneumonitis.

Deaths were not seen among those who developed local complications only.

All deaths were seen in patients who received 200 ml (20 vials) of reconstituted ASV. This is significant

with respect to the fact that a higher dose is required in patients showing more severe signs of toxicity as well.

TABLE 11: Complications of ASV

COMPLICATIONS	TOTAL
None	27(75%)
Present	9(25%)
Fever	6(16.66%)
Rashes	4(11.11%)
Hypotension	3(8.33%)
Anaphylactic Reaction	2(5.55%)
Total	36

25% of patients who received ASV developed complications such as fever, rash, hypotension and anaphylaxis in decreasing order of frequency. Anaphylactic shock was least common complication of ASV and no deaths were encountered due to administration of ASV/its complications. mReliance

of home remedies, instead to immediate hospitalisation was a significant indicator of mortality. Although the tying of a tourniquet was helpful, an incision over the bite was associated with an adverse outcome.

TABLE 13: Relation between hospitalisation delay & mortality

Delay(hours)	Survival	Death	Total
<6	18(100%)	0	18
6-12	10(90.91%)	1(9.09%)	11
>12	4(57.14%)	3(42.86%)	7
	32	4	36

p=0.008

One of the most significant factors accounting for mortality was the delay in hospitalisation. 75% of deaths were seen among those whose hospitalisation was delayed by >12 hours. No deaths were seen among patients hospitalised within 6 hours.

Discussion:

Considering the 21-40 year age group to constitute majority of the working class, our study found 61.25% of all snake bites in this age group. Similarly, Gupta³ observed the maximum incidence of snake bite in the 20-29(29.68%) and 30-39(25%) year age

groups. Redewad⁴ also reported more than 50% of snake bites in the 21-40 year age group. Although the male-female ratio favoured males in our study as well as in other studies like Bawaskars⁵, it was statistically insignificant. An important understanding of this is because in our locality, females work as labourers/farmers just like their male counterparts. Hence their risk of being bitten is proportionately even.

The significant preponderance of rural cases in our study was equitable to Gupta³ and Mohapatra⁶. The

reason is that most of the Indian population is village based, and have increased exposure due to field work. Consequentially, farmers/labourers were the single highest occupation significantly affected by snake bites. Bhalla's⁷ study also showed 122/150 cases of snake bite among farmers. Mohapatra⁶ and Redewad⁴ found a significant number of snake bites during the monsoon season. Similarly, the current study showed and 8-fold higher incidence during July to September. As monsoons cause flooding of snake holes and coincides with months of harvest, farmers are thus at greatest risk of being bitten during this season itself. Our study also correlates with Bhalla⁷ showing higher incidence of snakebites during night time. The high frequency of lower extremity bites was observed in our study (56.25%) as well as Bawaskar's⁵ (76%) and Redewad's⁴ (65%). As most farmers work barefoot in farms, the significant nature of this predilection can be explained.

The mean time for admission of patient was 3.8 hours, similar to Gupta's³ study in which patients from rural areas presented within 3.5 hours. Redewad⁴ found highest mortality among those who presented after 24 hours of bite, correlating with our mean time till death of 18.5 hours. One major reason for delay in treatment is the reliance on the village faith healer⁸ and attributed for 27.78% of delays in our study. The differentiating complaints in toxic and non-toxic bites were ptosis (83.33%) and dysphagia (77.78%). Bhalla⁷ also found the same features in neuroparalytic snake bites in 100% and 42.85% respectively. Local examination revealed fang marks in 61.88% of cases, higher than the 32.2% reported by Ahmed⁹.

Mortality noted in our study was 2.25% much lower than the 18.75% mortality in Gupta's³ study but similar to Bhalla⁷ who noted a mortality of 3

patients among 150. All deaths had developed systemic complications of snake bite such as Respiratory failure, coma and aspiration pneumonitis. Although a significant number eventually succumbed, it is in part attributed to the gravity of their presenting symptoms and subsequent life threatening complications. Up to 20 vials of ASV was used on a single patient in our study. Similarly, Ahmed⁹ used 19.6 ± 3.2 vials on severe envenomations in their study. Thus the use of ASV as a primary treatment modality for snake bite envenomations is highly successful. While 9 patients developed complications on ASV administration, 2 developed anaphylaxis – equal to that found by Bhalla⁷. However, the development of such complications was purely a matter of chance and did not adversely affect the outcome.

In Gupta's³ study, no patient tried any household or traditional remedies like tourniquet application or wound cutting. Contrastingly, 72.22% of patients in our study had resorted to the same and was significantly associated with adverse outcome. Bhalla's⁷ study found no mortality among those patients who presented within 6 hours of bite. The current study correlated the same in this respect.

Recommendations

To conclude, this study highlights that the outcome of snake bite victim was favorable if managed in time with ASV and supportive measures in hospital. The outcome worsens if patient treatment is delayed and traditional treatment relied upon. Most of the victims can be managed well with ASV dose recommended in the national guidelines. Thus, we recommend the provision of ASV at primary health centres with adequate training of medical and paramedical staff regarding its administration in rural setup. ASV appears to be a safe life saving measure to be

administered in cases of snake bite toxicity albeit with proper training, even in the rural setup. The study also highlights importance of education of the

rural population and masses as a whole so that they approach medical care facilities as early as possible rather than apply home remedies.

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