

# Epidemiological Profile of Snake Bites over 1-Year Period from Tertiary Care Centre in Maval Region of Maharashtra, India: Original Research Article

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## Abstract

Estimated deaths rate due to snake bites are more than 46,000 annually in our country. Ninety-seven to ninety eight percent bites occur in rural or remote areas. Snake bite is a one of common problem faced in rural India. It takes a high toll of lives mainly of working male of the family. The current prospective observational study was carried out to study the clinical and management by systematic approach of snake bites. The 245 cases of snake bite were hospitalized to Rural Hospital in a period of July 2017 to June 2018.

The present data showed that majority (91.43%) of cases were encountered from rural area, in the age group ranging from 21 to 30 years (24.90%). Majority were male patients (62.04%). Most affected were the agricultural laborers and farmers (56.33%). 60.82% of the cases were presented with bite over lower extremities. Most of the snake bite (75.97%) occurred during day time. July to October was the period in which most snake bite cases were observed. It was seen that syndromic or systematic approach was more effective in early diagnosis and treatment of snake bite. The average requirement of anti-serum venom (ASV) required for cobra bite was 16, krait bite 22, Russell's viper bite 12 and saw scaled viper bite 10. The total duration of treatment in hospital for cobra bite were 6, krait bite 8, Russell's viper bite 4 and saw scaled viper 4 days.

**Key words:** *Epidemiology, Snake bite, Anti-snake venom, Syndromic approach*

## Introduction

Snake bite is a one of common medical emergency and an occupational hazard, more so in tropical region of India, where farming is a main or major source of earning. India has remained well known for its venomous snakes and the effect of their bites. Almost every year, 50,000 Indians died in 2,50,000 cases of snake bites, in spite of that India is not home for the largest number of venomous snakes in the globe, nor is there a shortage of anti-snake venom in the country. In the Maharashtra number of snake bite cases are highest i.e. 70 bites per 100,000 people and mortality of 2.4 per 100,000 per year. Main reason for high mortality and morbidity in any part of rural India is ignorance or negligence of the people. The initial approach to snake

bite and treatment given by traditional village healers or non specific options, lack of transport facilities in rural India and sleeping habits of the villagers, difficult to access or unavailability of the doctor at Primary Health Centers most of the time, time taken by the doctors to identify the snakes, the signs and symptoms of envenomation in the patient. Important to note is that these are all preventable causes. In addition to the same is unavailability of ASV and endotracheal intubation and ventilation in neurotoxic envenoming. There are very few studies available from the Maval region of Maharashtra regarding the same.

## Materials and Method

The current observational study was carried out in an Intensive Care Unit of Rural Hospital in Maval region of Maharashtra, India, in a period of July 2017 to June 2018. The aim of the study was to find out clinical profile, types of snakes and reasons to reduced decreased mortality rates at this center which may helpful to take

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appropriate management approach and prompt treatment options or care be rendered in a rest of Maval region as well.

A total of 245 cases of snakebite were admitted during the said period. A written consent from patient or relative was taken, data was collected on a pre-designed proforma by interviewing the patient or close relatives and thorough clinical examination was done. Detailed information regarding the demographic and epidemiological parameters such as age, sex, occupation, site of bite, place of bite was noted. The type of snake was identified, if the snake was brought dead or identified by Syndromic approach.

Following syndromes were identified:

Syndrome 1-Local envenomation (pain, swelling, ecchymosis); Bleeding/ clotting disturbances (haematuria, positive whole blood clotting test) = Russell's viper and saw- scaled viper.

Syndrome 2 - Neuroparalytic symptom (ptosis, ophthalmoplegia, dysarthria); minimal haematuria and local swelling = Russell's viper.

Syndrome 3-Local envenomation (pain, swelling, blebs); Neuroparalytic symptom (ptosis, dysarthria); rapid progress towards respiratory arrest = Cobra.

Syndrome 4-Neuroparalytic symptom (ptosis, dysarthria, dysphagia with respiratory arrest); no local swelling; history of severe abdominal pain and sleeping on floor = Krait.

Syndrome 5-History of snake bite; no development of local or systemic symptoms; bite mark and mild burning present; observe till 12-24 hours; if asymptomatic = Nonvenomous snakebite (Rat snake, wolf snake; green keelback, trinket) or it may be a dry bite (Venomous snake). Subsequent data was collected i.e. total number of average ASV requirement, total duration in a hospital.

#### **Inclusion Criteria**

Patients of any age, sex and any locality of Maval region admitted with suspected or confirmed snake bite.

#### **Exclusion Criteria**

Patients brought dead with history of snakebite.

Patient with other insect bite

## **Observations and Results**

A total of 245 cases were admitted in our hospital. Among them 152 (62.04%) were men and 93 (37.96%) were women (Table No.1). The high incidence of snakebite was observed in the age group of 21-50 years (n=155, 63.27%) and low in the age group  $\geq 51$  years (n=38, 15.51%) (Table No.1). Most of the cases were from the rural area (91.42%, n=224) and rest of cases (8.58%, n=21) were from urban area (Table No.1). The most of the cases were bitten in the farms or field (n=171, 69.80%), followed by 61 (24.90%) in the houses or residences and 13 (5.30%) in public or common areas (Table No.2). Their occupational status 138 subjects (56.32%) were farm laborers, 42 (17.14%) were farmers and 65 (26.54%) were housewives, students (Table No.1). Large number of cases 149 (60.82%) had site of bite on lower extremity followed by 87 (35.51%) on upper extremity, 5 (2.04%) on trunk and 4 (1.63%) on head, neck and face (Table No.2). Regarding activities at the time of bite, 24 were sleeping on floor, 57 were handling debris or animal waste, 124 were working in the field or farms and 40 were doing or performing other field related activities (Table No.2). Majority of the patient of krait bite were sleeping on floor. The snake bites i.e. 186 (75.92%) occurred during daytime and 59 cases during night time. The common species was krait. Because of the seasonal variation maximum snake bite 127 (51.84%) were seen during rainy season (Table No.3). On further analysis of 245 snake bite cases, 153 cases were bitten by venomous snakes found in this region (The big four) and 92 cases were bitten by non venomous snakes. Of the venomous snakes 60 (24.48%) were Cobra bites, 41 (17.74%) were Krait bites, 45 (18.36%) were Russell's viper bite, 7 (2.86%) were bitten by Saw Scaled viper (Table No. 2). Regarding the identification of snake, 153 snakes were poisonous and they were identified when they were brought dead or alive by the relatives or the snake friend (Sarpamitra) and by the Syndromic approach as per WHO guidelines while 92 snakes were non venomous snakes (Table No.2). In 245 cases of snake bite maximum patients had fear 240 (98%) as the prominent sign or symptom, 218 (89.04%) had pain at the same site followed by swelling in 186 (76%) and 32 (13%) of the patient had difficulty to open eyes and 39 (16%) had difficulty in breathing or respiratory distress, 44 (18 %) had bleeding from the site 29 (12%) had pain in abdomen and 22 (9%) had nausea and vomiting, on local examination bite marks, blister formation and necrosis were observed in 205 (83.46%), 23 (9.42%) and 12 (5.06%) cases respectively (Figure

No: 1). Maximum cases causing rapid cellulitis were of Russell's viper where as blister and necrosis were caused by Cobra, absence of bite marks was a important feature of Krait. In case of Russell's viper 23.4 % cases had both neurotoxic as well as vasculotoxic symptoms. 10 patients had mild alteration or derangements of renal function test (acute renal failure) 16 % cases of cobra bite developed ulcers, all of which healed completely by regular dressings (Table No.5). The basic or first aid treatment given before admission in most of the cases was in the form of application of tourniquet (78.36%)

proximal to the site of bite. Average ASV required for the cobra bite was 16, krait bite was 22, Russell's viper bite was 12, and Saw Scaled viper bite was 10. Average total hospital stay for Cobra bite patients was 6 days, for krait bite patient was 8 days and Russell's viper bite patients and saw scaled viper bite patient required total 4 days (Table No: 4). Overall mortality in 245 cases, one patient who died because of neurotoxic envenomation the patient was obese, diabetic and the other dying of hemotoxic envenomation had severe hypothyroidism with poor compliance.

| <b>Table No. 1: Socio-demographic factors of study subjects</b> |               | <b>Total number<br/>n=245(100%)</b> |
|---|---------------|-------------------------------------|
| Age (in years)  | ≤20           | 52 (21.22%)                         |
|   | 21-50         | 155 (63.27%)                        |
|   | ≥51           | 38 (15.51%)                         |
| Sex   | Male          | 152 (62.04%)                        |
|   | Female        | 93 (37.96%)                         |
| Residence   | Rural         | 224 (91.42%)                        |
|   | Urban         | 21 (8.58%)                          |
| Occupation  | Farm laborers | 138 (56.32%)                        |
|   | Farmers       | 42 (17.14%)                         |
|   | Others        | 65 (26.54%)                         |

| <b>Table No.2: Snake bite related factors</b>                            |                   | <b>Total number<br/>n=245(100%)</b> |
|--|-------------------|-------------------------------------|
| Place of bite  | Farm              | 171 (69.80%)                        |
|  | House             | 61 (24.90%)                         |
|  | Public Place      | 13 (5.30%)                          |
| Activity during bite   | Sleeping on floor | 24 (9.80%)                          |
|  | Handling debris   | 57 (23.26%)                         |
|  | Farming           | 124 (50.62%)                        |
|  | Other             | 40 (16.32%)                         |
| Type of snake  | Cobra             | 60 (24.48%)                         |
|  | Krait             | 41 (16.74%)                         |
|  | Russell's Viper   | 45 (18.36%)                         |
|  | Saw Scaled Viper  | 07 (2.86%)                          |
|  | Non-venomous      | 92 (37.56%)                         |
| Anatomical site of bite  | Head, neck & face | 04 (1.63%)                          |
|  | Upper limb        | 87 (35.51%)                         |
|  | Lower limb        | 149 (60.82%)                        |
|  | Trunk             | 05 (2.04%)                          |
| Identification of snake<br>(brought dead/alive or by syndromic approach) | Poisonous         | 153 (62.44%)                        |
|  | Non-poisonous     | 92 (37.56%)                         |

| <b>Table No.3: Environment related factors related to bite</b> |                    | <b>Total number<br/>n=245(100%)</b> |
|--|--------------------|-------------------------------------|
| Seasonal variation   | Winter (Nov – Feb) | 52 (21.22%)                         |
|  | Summer (Mar-Jun)   | 66 (26.94%)                         |
|  | Rainy (Jul- Oct)   | 127 (51.84%)                        |

| <b>Table 4: Average ASV requirement &amp; Hospital stay</b> |                               |                       |
|---|-------------------------------|-----------------------|
| Type of snake   | Average vials of ASV required | Average Hospital stay |
| Cobra   | 16                            | 6                     |
| Krait   | 22                            | 8                     |
| Russell’s viper   | 12                            | 4                     |
| Saw scaled viper  | 10                            | 4                     |

| <b>Table 5: Complications</b> |                 |
|-------------------------------|-----------------|
| Complication                  | No. of patients |
| Acute renal failure           | 10              |
| Respiratory paralysis         | 24              |
| Shock                         | 3               |
| Infection                     | 1               |
| Gangrene/limb loss            | 1               |
| Chronic ulcer                 | 12              |

### Discussion

In the present study, most of the snakebite cases were in the age group of 21-50 years and from rural areas (91.42%) these factors have great impact on the psychosocial and economical status of the family. Loss of the earning family member, most commonly male (62.04%) has long lasting effect on the family status. Majority of cases were reported from the farms during their routine work. Similar observations were reported in earlier studies.<sup>5,6,7,8</sup> It was noted that 62.44% cases were bitten by venomous snakes, found in this area. The venomous snakes identified were – Cobra, Krait, Russell’s viper and Saw scaled viper. Syndromic approach was found to be useful in identification of species of snake. Regional signs and symptoms or syndromes should be identified and syndromic approach

should be applied. In this study, we discussed with physicians, intensivists, resident doctors and paramedical staffs about identification of snake and Syndromic approach. It was helped in early recognition and prompt management. The most common presenting symptoms include fear (98%), pain (89.04%), swelling (76%), difficulty to open eyes (13%), difficulty in breathing (16%), bleeding from the site (18%), pain in abdomen (12%) and vomiting (9%) of the observed cases. Bite marks were observed in 83.46% of the cases and bite marks were absent in Krait. Blister formation was seen in 9.42% cases, all of which were cobra bites. Tissue necrosis was found in 5.06% of the cases. The Most common site was lower extremities followed by the upper extremities this is consistent with the occupational exposure. The krait bites occurred during mid night and

while sleeping over floor. The preventive measures were discussed with people about the mode of bite of these poisonous snakes and recommended to sleep on a bed and avoid sleeping on the floor. Use of mosquito nets is an effective preventive measure for krait bites. Average ASV required were 16 for cobra bite cases, 22 for krait bites cases, 12 for Russell's viper and 10 for saw scaled viper cases. The total hospital duration for cobra was observed to be 6 days, 8 days for krait and Russel's viper and saw scaled viper to be 4 days. Similar findings were made by Kulkarni and Annes<sup>5</sup>. The overall mortality was 2 in 245 total snake bite cases (0.81%). One patient who died because of neurotoxic envenomation the patient was obese, diabetic and the other dying of hemotoxic envenomation had severe hypothyroidism with poor compliance. Higher rates of mortality were observed by Kulkarni and Anees, Hansdak et al, and Punde. Lower mortality at our hospital could be attributed to the dedicated Intensive Care unit, trained staff and early recognition of envenomations by Syndromic Approach and early endotracheal intubation.

### Conclusions

Snake bite is a one of common problem in rural areas of India, taking a high toll of lives mainly of working male of the family. In the present study 245 cases of snake bite were analysed who were admitted to Medical Intensive Care unit of Rural Hospital. The data showed that majority (91.42%) of cases were belong to rural area, in the age group of 21 to 50 (63.27%), out of total cases, majority were male patient (62.04%). Most commonly affected was the agricultural laborers (56.32%) and 60.82% of the cases had bite over lower extremities. Most of the cases (75.97%) occurred during day time in the month of July to October. It was observed that Syndromic approach was very effective in early diagnosis and treatment of snake bite. Average number of ASV required for cobra bite cases was 16, krait bite 22, Russell's viper bite 12 and saw scaled viper bite 10. Average hospital stay in days for cobra bite was 6, krait bite was 8, russell's viper bite was 4 and saw scaled viper was 4. All cause mortality was 1.67% for neurotoxic and 2.43% for vasculotoxic snakes.

### Recommendations

1. It is strongly recommended to make snakebite a specific notifiable disease and should be formally recognized as an important occupational disease in Maval region.

2. As most snakebite occurred during the agricultural work, strict protective measures should be practiced by the farmers.

3. Sleeping on floor should be discouraged to prevent specially krait bite.

4. Anti-venom alone cannot be relied upon to prevent early death from respiratory paralysis. Artificial ventilation is essential in such cases. In this region more doctors should be trained to carry out endotracheal intubations, as it was found to decrease the mortality rate in neurotoxic envenomations.

5. Syndromic Approach should be followed for management of snakebite, when snake is not brought.

6. Training of Physicians, resident doctors and paramedical staff regarding Syndromic Approach is necessary.

7. Establishment of dedicated snakebite management units, at least at every district hospital, where the incidence of snake bite is high, as dedicated snakebite management units have positive impact on mortality rates.

8. Community education about snakebite is strongly recommended as the method most likely to succeed in preventing bites. Use of flip charts or videos related to awareness about symptoms of snake bite and first aid measures in schools and colleges will definitely help in sensitizing the people in rural area.

**Conflict of Interest:** There is no conflict of interest; the author does not have financial or other relationship with other people or organization that may inappropriately influence the author's work.

**Ethical Clearance:** Research was approved by the institutional ethical committee.

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