Clinical spectrum and outcomes of snakebite patients admitted in a tertiary care hospital. A prospective observational hospital-based study

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ABSTRACT

Background: Snakebite is a major public health problem and its prevalence is high in India. Insufficient epidemiological data and global neglect of this condition prompted the World Health organization to recognize it as a "neglected tropical disease"

Objective: To study demographic characteristics of snakebite victims, to see clinical symptoms of bite and outcomes of snakebite.

Methods: A prospective observational hospital-based study carried out from November 2016 to October 2017, in patients with a history of snakebite.

Results: Total 300 patients were included in this study, 170 (56.67%) were bitten by hemotoxic snakes and 130 (43.33%) were bitten by neurotoxic snakes. Majority of patients were in the age group of 20-39 years (n=153; 51%). Men outnumbered women (n=190; 63.33%), with male to female ratio of 1.7: 1. Higher incidence of snake bite was found in July-September (n=135; 45.00%) followed by April to June (n=124; 41.33%). Majority of patients were farmers in rural areas (n=242; 80.80%). Out of 300 patients, 80 required ICU care. In patients with neurotoxic snake bites, clinical features were: ptosis (n=126; 96.92%), ophthalmoplegia (n=98; 75.38%), respiratory paralysis (n=60; 46.15%), bulbar weakness (n=74; 56.92%) and abdominal pain (n=25; 19.23%). Clinical features in patients of hemotoxic snake bites were: bleeding from bite site (n=110; 65.29%), cellulitis (n=100; 58.82%), gum bleed (n=53; 31.18%), ecchymosis (n=49; 28.82%), epistaxis (n=27; 15.82%), gastrointestinal bleeding (n=25; 14.71%) and haemoptysis (n=19; 11.18%). Complications observed were acute kidney injury (n=62; 20.67%), respiratory failure (n=51; 17.00%), DIC (n=7; 2.33%) and ARDS (n=5; 1.67%). Out of 170 hemotoxic snake bite patients, 157 (92.35%) patients recovered and 13 (7.65%) patients died and out of 130 neurotoxic snake bites, 124 (95.39%) patients recovered and 6 (4.61%) patients died, overall mortality was 6.3%. In our study, bite to needle time was less than 1 hour in 47 patients (15.66%), less than 6 hrs in 120 patients (40%) and more than 24 hours in 45 (15%).

Conclusion: Snakebite is common in adult males between 20 to 50 years and the commonest site is the lower limb. The majority of the victims are farmers who work in fields. A maximum number of cases presented within 1-6 hours of bite using a tourniquet on the affected limb as first aid. The complications and mortality of snakebite are high.

Keywords: Neglected tropical disease, Indian cobra (Naja naja), common krait, snakebite

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INTRODUCTION

Snakebite counts significant health burden in the South East Asian Region resulting in death and/or disability of young individuals involved in agriculture work. Approximately 2,000,000 snake bites are reported in India each year. The million death study revealed 45,900 national snakebite deaths comprising 5% of all injury deaths and 0.5% of all deaths in India.¹ However there is no exact figure of mortality and morbidity associated with snakebite due to

poor reporting in the region². Among 250 species of snakes found in the South East Asian Region, only 60 species are venomous included in three families, Elapidae, Viperidae and Colubridae³. Around four million snake bites occur each

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year in Asia, resulting in 100,000 deaths per year. In South Asia, four species are responsible for most of the deadly cases of venomous snake bites. These have been referred to as the 'big four', and include the Indian cobra (*Naja naja*), the common krait (*Bungarus caeruleus*), Russell's viper (*Daboia russelii*), and the saw-scaled or carpet viper (*Echiscarinatus*)⁴. Jammu region, which lies in the sub-Himalayan region is enormously infested with various types of poisonous snakes belonging to families Elapidae and Viperidae. Those belonging to viperidae are mainly hemotoxic and the commonest in Jammu province⁵. *Echiscarinatus* (saw-scaled viper) and Russell viper account for more than 85% of poisonous bites in the Jammu region⁶. The most notorious venomous snakes can be recognized by their size, shape, color, the pattern of markings, behavior, and the sound they make when they feel threatened. Viperidae (all species) results in local envenoming (swelling) with bleeding/clotting disturbances. Russell's viper cause local envenoming with shock or acute kidney injury. King cobra causes local envenoming with paralysis while Krait cause paralysis with minimal or no local envenoming². Though snake bite is a common health problem, there is no exact nationwide data available in India. This study aimed to see the demographic characters of the snakebite victims at Jammu city and other factors like site of the bite, type of bite, envenoming signs, delay of hospital presentation, first aid measure before hospital presentation, mortality, and morbidity.

MATERIAL AND METHODS

This was a prospective observational study carried out from November 2016 to October 2017. Inclusion criteria were, all the adult patients of poisonous snake bite admitted in medical wards and intensive care units. Exclusion criteria were all patients of non-poisonous snake bite & scorpion bite. The study was done at the Postgraduate Department of General Medicine, GMC Jammu. After obtaining permission from the ethical committee, the records of snake bite and suspected snakebite cases presenting to ER over a period of 1 year were collected and analyzed for demographic characteristic, site of bite; time elapsed since the bite, pre-hospital care, bite marks, presenting symptoms, clinical signs of envenoming and condition at discharge. Records of collected data were analyzed for the final outcome. Standard statistical methods were used in the

analysis of the data using Microsoft Excel.

RESULTS

Total 300 patients were enrolled in this study. There were 190 males and 110 females, with a male: female ratio 1.7:1. Majority (n=82; 27.33%) of patients were in the age group of 20-29 years followed by 30-39 years age group (n=71; 23.67%) [Figure 1]. Majority of patients were farmers (n=242; 80.80%). Next in the list were housewives (n=28; 9.20%). Majority of patients (n=203; 67.67%) were from rural areas. Higher incidence of snake bite was found in July-September (n=135; 45.00%) followed by April to June (n=124; 41.33%). 255 (85%) patients presented to emergency within 24 hrs, 45 (15%) reached after 24 hours, 47 (15.67%) reached within 1 hour while as 120 (40%) reached within 1-6 hours.

Fig 1. Distribution of patients in various age groups.

The majority of patients (n=170; 56.67%) were bitten by hemotoxic snakes and 130 (43.33%) patients were bitten by neuroparalytic snakes. In this study, the majority (n=200; 66.67%) of patients were bitten on lower extremity followed by upper extremity (n=67; 22.33%) and only 33 (11%) patients were bitten on head and trunk region. In the lower extremity, out of 200 cases, the majority (n=151; 88.82%) were hemotoxic snake bites. In the upper extremity, out of 67 cases, the majority (n=48; 36.92%) were neurotoxic snake bites. In the head and trunk region, all (n=33; 11.00%) cases were neurotoxic snake bites.

Prehospital treatment was very common (n=245; 81.67%). Among that use of tourniquet on the affected limb was the highest (n=151; 51.33%) followed by wound incision (13.6%), application of herbs (10.33%) and snake stone (6.33%) on the affected area, 55 (18.3%) patients did not receive any first aid prior to hospitalization. Among the total patients, 131 (43.67%) had local pain, tenderness, swelling and local rise of temperature, 56 patients (18.67%) had blisters, 40 patients (13.3%) had discoloration, tingling,

and burning sensation, 19(6.3%) patients had ulceration. Majority of patients (n=201; 67%) had double fang marks, 53 (17.6%) had single fang marks and only scratches were present on 18 (6 %) patients. Out of 300 patients, 80 patients with respiratory paralysis and ARDS required ICU care.

Clinical features in patients with neuromuscular snake bites are shown in Figure 2, while clinical features in patients with haemotoxic snake bites are shown in Figure 3.

Fig 2. Clinical features in neuromuscular snake bites patients.

Ptosis(n=126; 96.92%), ophthalmoplegia (n=98; 75.38%), respiratory paralysis (n=60; 46.15%), bulbar weakness (n=74; 56.92%), abdomen pain (n=25; 19.23%) and loss of consciousness (n=19; 16.15%)

Fig 3. Clinical features in haemotoxic snake bites patients.

Bleeding from bite Site (n=110; 65.29%), cellulitis (n=100; 58.82%), gum bleed (n=53; 31.18%), ecchymosis (n=49; 28.82%), epistaxis (n=27; 15.82%), gastrointestinal bleeding (n=25; 14.71%), haemoptysis (n=19; 11.18%) and intracranial bleeding (n=3; 1.76%)

Complications observed were acute kidney injury (62; 20.67%), respiratory failure (51; 17.00%), gangrene at the bite area (10; 3.33%), DIC (2.33%), ARDS (1.67%) and intracerebral haemorrhage (1.00%). In the present study, the

majority of patients (n= 170; 56.67%) had 3-7 days of hospital stay, 76 (25.33%) had a hospital stay of <3 days and 54 (18.00%) had a hospital stay of >7 days. Out of 170 haemotoxic snake bites, 157 (92.35%) patients recovered and 13 (7.65%) patients died. Out of 130 neurotoxic snake bites, 124 (95.39%) patients recovered and 6 (4.61%) patients died, overall mortality was 6.3%. In our study, bite to needle time was less than 1 hour in 47 (15.6%) patients, less than 6 hrs in 120 (40%) patients and more than 24 hours in 45. The majority of patients (40 %) presented to an emergency within 1-6 hrs of bite followed by 29.33% in 6-24 hrs, 15 % of patients presented after 24 hours.

DISCUSSION

In India, there is yet no large nationwide data bank to show the exact snakebite incidence and its sequelae i.e. morbidity and mortality. WHO has recommended that snake-bite should be formally recognized as an important occupational disease in the South East Asian region. And it is shown in studies that in South Asia, Southeast Asia, sub-Saharan Africa exists the highest burden of morbidity and mortality due to snake bites⁷. Despite its importance, there have been fewer proper clinical studies and there is a lack of reliable epidemiological data nationwide.

In this study, most of the snakebite patients were young males (63.33%) which is in corroboration with previous studies⁸. Individuals in this age group are actively involved in farming & outdoor activity thus vulnerable to this occupational hazard. The commonest site of the bite was in the lower limb in our study (n=200) and finding correlates with the previous literature^{3,7}. The mortality rate was around 6% in our study, In a North Indian study by Sharma et al mortality rate was 3%⁹. The complications encountered in our study were bleeding from bite site (65.29%), cellulitis (58.82%) and AKI (20.67%). In their study Bhat RN et al.⁶ and Saini et al⁹ recorded bleeding tendency in 65% and 47.80% respectively.

In a study by Nagnath R et al. in Central India, most vasculotoxic bites were associated with cellulitis (90.60%), coagulopathy (19%), and respiratory paralysis was encountered in 19.20% of the cases¹⁰. In our study, respiratory paralysis was noted in 60 (20%) patients and bulbar weakness in 74 (24.66%) patients, 10% of the cases required mechanical ventilatory support. The incidence of AKI was 14.4% and 43.3% in studies by Halesha BR et al¹¹.

and Nagnath R et al¹⁰ respectively. These differences in the complications found in different studies imply differences between the venoms of the subspecies unique to that geographic area. The importance of bite to needle time is a significant factor in influencing mortality. A study from Nepal showed that the delay in receiving treatment was significantly longer for victims with a fatal outcome¹². The optimum time for administration of ASV has been previously suggested as “as soon as possible” or within 6 hours. Correlation between the door to needle time and mortality is similar to those observed by Kavitha Saravu et al¹³. and I F Inamdaret al¹⁴. In the study by Nagrath et al¹⁰, mortality was high (66.7%) in patients with a bite to needle time more than 24 hours, as compared to patients whose bite to needle time was less than 24 hours and lowest when the bite to needle time was less than 6 hrs (7.2%). In our study, bite to needle time was less than 1 hour in 47 patients and less than 6 hrs in 120 patients, more than 24 hours in 45 patients and overall mortality was 6.33 %

The chief limitation of our study is that it is based on a prospective analysis of a small number of cases (n = 300). It is imperative to carry out a larger clinical study to better understand about clinical spectrum and outcomes.

CONCLUSION

Snakebite is a common medical emergency, where timely treatment can reduce morbidity and mortality and save precious human lives. Lack of information about simple measures of prevention, occupational hazard risks, and inappropriate first-aid measures all magnify the risk. Poor access to health care services, difficult transportation, and consequent delay in ASV administration results in a high fatality. The time elapsed after the bite is of vital importance because with the passage of time more venom gets bound to the tissues and is thus less manageable for neutralization by ASV. Many bites could be avoided by educating the population at risk. Sleeping on a cot (rather than on the floor) and under bed nets decreases the risk of nocturnal bites. Many bites occur when people walking barefoot or wearing only sandals accidentally step on a snake. Using a torch/ flashlight while walking on footpaths at night, and wearing boots and long trousers during agricultural activities, could significantly reduce the incidence of bites. Thus, we need an organized effort to cope with important aspects of snakebite management; foremost being, to educate the rural population, first-aid management of the

patient, and prompt medical management of emergencies, especially in rural areas.

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