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Original Article

Evaluation of Outcome Determinants in Snakebite Victims in A Rural Medical College of South Bengal

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Abstract
Background: *Snake bite is a neglected public health problem in India. Hence, identification of the clinical parameters as reliable determinants of mortality which may be used at peripheral levels of health care, is essential.*
Methods: *Hospital records of 232 patients (165 males and 67 females) with age ranging from 12 to 80 years, admitted to Midnapore Medical College in south Bengal during January 2015 to December 2015 were reviewed retrospectively.*
Results: *98% snakebites were on extremities; more in legs (67%) than hands (31%). Most (53.5%) bites occurred in the morning (4 am to noon). Mean (SD) time for bite-to-hospital and bite-to-injection of anti-snake venom (ASV) was 144.6 (77.6) and 169 (182.8) minutes respectively. Twenty seven cases (11.9%)had died. Case fatality ratio (CFR)was significantly higher in89 patients with un-clotted blood as compared to 143 patients with clotted blood (25.9% vs 1.8%, p<0.0005). Significantly higher CFR was observed in 112 patients who received ASV in >2 hours after the bite compared to 120 cases who received ASV within two hours (8.9% vs 0.9%, p <0.0001). Odds ratio of fatality were higher among those who had urine output of<400ml in the first 24hours (OR 26.4).*
Conclusions: *Clinical indicators could be used by healthcare providers for referral to identify snake bite patients who may have fatal outcome.*
Keywords: *Snakebite, urine output, anti-snake venom, outcome, determinants, Bengal.*

Introduction

Snake bite is a serious medical emergency, in rural population of our country, wherein level of injury may differ from local tissue damage to vital organs of the body. Most snake bites are harmless and are caused by non-poisonous species. Nonetheless, of the 3,000 different species of snakes, about 450 are found to be dangerous for humans worldwide.[1] Out of 216 Indian snake species, 52 are poisonous. [2,3] Among these, there are 4 major poisonous species *viz*. Indian cobras or *Najanaja*, krait or *Bungaruscaeruleus*, Russell's viper or *Daboiarusselli*, and saw-scaled viper or *Echiscarinatus*. [4] However, studies have shown

that the hump-nosed viper, previously considered essentially harmless and misidentified as the saw-scaled viper, is capable of delivering a fatal bite[5,6].In regions of Kerala, India, it may be responsible for nearly 10% of venomous bites.[6] Commonly used anti venoms in India do not appear to be effective against hump-nosed viper bites [5,6]. According to WHO report, the global annual incidence of snake bite and causing deaths ranges from a minimum of 421,000 to a maximum of 1,841,000 and 20,000 to 94,000, respectively. Also, it is noted that the highest burden of snakebites is in South Asia, Southeast Asia, and sub-Saharan Africa. Among these, India has the highest incidence of snakebite-caused mortality, ranging from 13,000 to 50,000 cases annually. [7,8] Attributes for such a high mortality due to snakebite are scarcity of anti - snake venoms (ASV), difficulties with rapid access to health centers, poor health services, and traditional treatments. [9,10] Furthermore, erroneous identific-ation of the snake species also leads to inappropriate treatment and outcomes. [8] At presentation, a snake-bitten victim can be promptly diagnosed and treated if the clinical syndrome of snakebites are well-defined and pre - distinguished based on analysis of a series of reliably identified bites.[8]

Methods

This retrospective study was made using hospital records. The hospital records of all snakebite cases admitted to Midnapore Medical college& hospital during the period of January 2015 to December 2015, were analysed. The clinical outcome was listed as survived or died. Those classified as absconded, discharged on request, left against advice, referred to the tertiary centre were followed up in early 2016 to classify them as alive or dead.

Descriptive characteristics of the patients and the snakebite event such as gender, age, time of bite, site of bite, bite-to-hospital time were recorded. Clinical data such as bite to-injection time of anti snake venom (ASV), urine output on first day, clotting time, unclotted to clotted time interval, initial and total anti-venom doses administered were also noted. Signs and symptoms such as hypotension, tachycardia, swelling, vomiting, epigastric pain, and renal angle pain were also documented. Majority of hospitals in india used Poly-specific Anti-Venom (mainly against the venom of "Big Four" ie cobra, krait, russell's viper & saw scaled viper, mostly produced from Chennai) in powder form(Seven pharmaceutical laboratories in India that produce ASV) . All data were analyzed using the SPSS 16.0 statistical software package for Windows.

Results

Two hundred and thirty two snake bite cases were admitted to the hospital during the one-year study period. The age of the victims ranged from 12 to 80 years with a mean (SD) of 36.3 (18.5) years. Males predominated with a ratio of 2.4: 1. The number of snakebite cases was highest in 21-30 years age group (81, 34.7%), followed by 16-20 years (41, 17.8%), 31-40 years (34, 14.8%), > 50 years (35, 14.9%), and 41-50 years age group (30, 12.9%). Lowest numbers of cases were in adolescences under 16 years of age (11,4.9%).

Snakebite occurred throughout the year but high peaks were observed September and October. Very low occurrences were observed in December to February. More than half (53.5%) of the bites occurred in the morning (4 am to noon), followed by afternoon (noon to 6 pm) (29.7%) and evening hours (6 pm to midnight) (16.8%). Most of the patients who died (70.8%) were bitten in the morning. Almost all bites were on extremities; legs were the more common site (67%) as compared to the hands (31%).

The time to reach the hospital ranged from 30 minutes to 8.5 hours with a mean (SD) of 134.6 (78.6) minutes (median 120 minutes). Among them, 188(81.2%), 149(64.5%) and 90 patients (38.8%) failed to reach the hospital within one, two, and three hours of snakebite. About a third (32%) of the cases had swelling at bite site, 36% complained of epigastric pain with or without

vomiting and 12% had renal angle pain. Although, mean (SD) urine output during the first 24 hours was 794.4 (576.6) ml (median 600 ml), 109cases (47%) passed less than 400 ml of urine in the first 24hours.Eighty-nine cases(38.6%) had 'non-clotted' coagulation status. A significantly higher mortality was observed in cases with 'non-clotted' coagulation status as compared to those with 'clotted' blood status (26.6% vs 1.8%, p <0.0001).

The mean (SD) bite-to-injection time of the initial dose of ASV was 177 (197.8) minutes (range 30 to 1570 minutes; median 130 minutes). ASV was administered to 44, 39 and 59 cases within one, two, and three hours respectively and 97 cases failed to receive ASV within three hours. The initial amount of ASV received was 20 ml in141 cases (61%), 40 ml in 47 (20%), 10 ml in 39(17%) and 50 ml in 5 case (2%). On an average (SD), 23 (10.3) ml of ASV was given initially; median dose being 20 ml. twenty cases received ASV at the village-based primary health care centre before they were referred to the hospital. During the course of the treatment up to 140 ml of ASV was given at the hospital. On average (SD), 43.9 (39.0) ml of ASV was used per snakebite case (median 40 ml). A significantly larger amount of ASV (almost three times) was used in 'non-clotted' cases as compared to 'clotted' cases (Table 1). Also, a significantly larger amount of ASV per case was used in those who died as compared to those who survived (7.5% vs 4.0%, p <0.002). Among 39 cases with 'non-clotted' blood status, 32 cases reverted to 'clotted' stage following ASV therapy. The median clotting time on hospital admission was 540 minutes (range - 60 to 1110 minutes).

Table 1: Total amount of ASV used (ml) per case P < 0.001

Coagulation status (No.)	Mean	SD
Non clotted (89)	69.8	25.7
Clotted (143)	26.2	17.2
All cases (232)	42.9	36.9

Eighty-six patients recovered and were discharged from the hospital. The average (SD) duration of stay in hospital was 6.9 (3.2) days with a range of 1 to 21 days and a median of 7 days. Some of the patients (6) had to be referred for further management. Among them, three patients died and three survived. One patient, who had absconded from the hospital, was later confirmed to be alive and well. One patient who left against advice was later confirmed as died. Thus a total of 27 cases had died and 205 cases survived. Although a higher case fatality ratio (CFR) was observed in males (11.4%) than females (9.7%), the difference was not statistically significant. Higher CFR was also observed in adolecences under years of 16 age (20%) as compared to adults (Table 2). The odds of fatality were higher among those victims who had urine output less than 400 in first 24 hours (OR 26.4).

Table 2 Relation of Case fatility ratio (CFR) with age group of snake bite patients:

Age group (years)	Number of cases	Motality	CFR (%)
< 16	12	3	25
17-20	30	5	16.6
21-30	53	4	7.5
31-40	45	6	13.4
41-50	48	4	8.3
>51	44	5	11.3
All	232	27	11.6

Discussion

India is reported to have the highest number of snake bites (81,000) and deaths(11,000). Although there is no doubt that the disease course may be fulminant and lethal, recognition of predictor signs with prompt necessary action could reduce the mortality.

In this study we found that oligurea, 'unclotted blood status' on admission to the hospital, delayed bite-to-injection time, delayed bite-to-hospital interval, and morning bites have association with increased mortality for snakebite in south Bengal though only oligurea was found to be statistically significantly associated with mortality. Butearly institution of ASV is beneficial in preventing

complications.[9] Factors such as the length of snake, characteristic of snakes are associated with risk of mortality have been studied at Myanmar. It has been documented that longer snakes cause more severe envenoming and more extensive swelling than the snakes with shorter length [11].We have a plan to include this factor in our future study. Bleeding tendency is well recognized as an indicator of greater risk of death. [12,13,14] The present study also indicates blood incoagulopathy as a predictor of mortality. The importance of bite-to-injection time is also well known as a significant factor influencing mortality. A published report from Nepal showed that the delay in receiving treatment was significantly longer for victims with a worse outcome. [15] Bite-to-injection time of less than 4 hours is associated with rapid recovery of renal function. [16] Although we were not able to determine the renal function of our patients, we found that bite-to-injection time of more than two hours could increase the mortality by four times than those who receive ASV within two hours. Viper bites is one of the most common causes of acute renal failure in hospital practice in south Bengal. [17]

In our study, we found that peak seasonal pattern of snakebites is September –October as people spend maximum time working in paddy fields for hervesting and males are in a large numbe, so male victims' percentage more than female. We also found that case fatality ratio was high in adolecent victims' as victims informed their guardian with delay so more delayed bite to injection time. Snakebite is a phenomenon which varies with seasonal change.

We have found that if victims are treated with traditional healers, delayed ASV administration, and krait bites final outcome is not good. Majority of snake envenomation resulted from hemotoxic viper snakebites. Significant local reaction and systemic manifestations due to coagulation abnormalities has seen in viper bites. The presence of neurological symptoms and signs with absence of local reaction, presence of abdominal pain favors a diagnosis of krait envenomation. Avoidance of consultation with traditional healers as well as prompt medical intervention can reduce both the morbidity and mortality in snakebites.

Conclusion

Snakebites are still a common medical crisis encountered in rural based hospitals. Early treatment is the mainstay for reduction of mortality. Recognition of predictor signs is essential for clinical management and early referral which could lead to a significant decrease in mortality, which is shown in our study.

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