ORIGINAL ARTICLE

Pre-Hospital and Hospital Management Practices and Circumstances behind Venomous Snakebite in Northwestern Part of Bangladesh

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Abstract

Background: Snakebite is the most important cause of envenomation in South Asia particularly in Bangladesh, though there is lack of data from the rural part of the country. About 82 species of snakes (28 venomous) exist in Bangladesh. In this study, demographic characteristics of the victim, circumstances behind the bite along with pre-hospital and hospital managements and outcomes were evaluated.
Methods: It was a cross-sectional study during January 2010 to June 2012 at Rangpur Medical College Hospital. Only venomous snakebite cases were included and diagnosis was made on clinical syndrome. Descriptive statistics were presented using percentage and proportion.
Results: Out of 28 patients (mean age: 31.7 years), 20 (71.4%) were males with a significant male-female ratio (2.5:1). Majority were farmers (46.4%) and most (50%) of the bites happened during household activities. Lag period between bite and hospitalization was ≤5 hours in 50% patients; 6 to 10 hours in 39.2% and >10 hours in 10.7% cases. 82.1% patients received ligature as pre-hospital first aid. Total 21 patients received anti-snake venom (ASV) in different dose regimens. 15 (53.5%) patients recovered while 13 (46.4%) died. Among 13 patients who died, 53.8% died within 2 hours, 15.3% within 3-24 hours and 30.7% after 24 hours post-bite.
Conclusion: Snakebite has a significant impact on human health and economy through treatment-related expenditures and loss of productivity. Policy makers of Bangladesh should prioritize the issue to reduce future mortality and morbidity.

Keywords: Poisoning; Snakebite; Bangladesh; Envenomation; Management

INTRODUCTION

Snakebite particularly in the rural tropics is a major cause of mortality and morbidity, and it has a significant impact on human health and economy through treatment-related expenditures and loss of productivity (1). However, there is still a shortage of data from rural part of developing countries though they suffer the most. There are about 3,000 known species of snake found worldwide, while only 15% are considered dangerous to humans (2). There are about 82 species of snakes exist in Bangladesh including 12 species of sea snakes, although over a dozen of these have not been reported during the last few decades. Among them 28 species are venomous (3). The common snakes of Bangladesh are Asiatic water snake (Xenochrophis piscator, a non-venomous snake), Rat Snake (Ptyas spp., another common non venomous Asiatic snake), Python (Python spp.), Cobra (Naja spp.), King cobra (Ophiophagus hannah), Kraits (Bungarus spp.), and Sea Snakes (Hydrophis spp.)

(3). According to recent estimates, around 421,000 envenomations and 20,000 deaths occur annually due to snakebite in the world which can be estimated as high as 1,841,000 envenomations and 94,000 deaths considering the unreported cases (2). Most snake envenoming and related fatalities occur in south Asia, Southeast Asia, and Sub-Saharan Africa, with India reporting the highest number of deaths due to snakebite in the world (2). Recently, well-designed nationally representative surveys in India and Bangladesh produced direct estimates of 46,000 and 6000 deaths each year, respectively (4,5). In this study, the circumstances behind the bites were analyzed as primary objective. Demographic characteristics of the victim along with pre-hospital and hospital measures and outcome were also studied.

METHODS

The study included a total of 28 patients. It was a cross-sectional study carried out in the department of Medicine,

Rangpur Medical College Hospital, Rangpur. Rangpur is a divisional city situated in northwestern part of Bangladesh. Only the venomous snakebite cases were prospectively included in this study during two and half years (from January 1st, 2010 to June 30th, 2012). Cases were included irrespective of their age and sex. Diagnosis was made on patient's clinical syndrome according to national snakebite management guideline of Bangladesh. Data were collected using a structured questionnaire. Patients were treated following national management guideline without any hamper for this study purpose. In case of seriously envenomated cases, some information were collected from patient's attendant. The study was explained ahead to the patients and informed written consents were taken from them or their legal guardian. The study did not involve any additional investigation or procedures and significant risk or economic burden to the patients. Ethical permission was taken from local ethical committee of Rangpur Medical College. Data were analyzed using Statistical Package of Social Sciences (SPSS Inc., Chicago, IL, USA) and descriptive statistics were presented using percentage and proportion. Level of significance (P value) was determined using chi square and independent samples t-test.

RESULTS

Out of 28 patients, 20 (71.4%) were males with a significant predominance (P=0.01) and male female ratio was 2.5: 1. Only the venomous bite cases were included in this study. The mean age of the patients was 31.7 years with a range of 8 to 55 years. Most of the victims were farmers (13; 46.4%) followed by housewives (7; 25%), students (5; 17.8%), one shopkeeper (3.5%), one snake charmer (3.5%) and one school teacher (3.5%) (Table 1). Half of the bites involved lower limbs (foot and toes); whereas 46.4% involved upper limbs (finger, palm, hand and forearm). In one case, the bite was occurred in the lower back, while the victim was cutting jute in the field. Out of the 28 bite, in seven cases snake was brought (either dead or alive) by the victim and among them five were krait and two cobra. Considering syndromic approach, almost all cases could be attributed to neurotoxic snake group.

We have analyzed the circumstances of bite and found that majority (14; 50%) of bites happened during household activities such as collecting firewood, taking care of chickens and other related activities outside the house. Seven (25%) cases happened at the time of working in field while in four (14.2%), the victims were sleeping on floor, and the 3 others were either fishing (3.5%) or playing with snake (snake charmer) (3.5%) or walking along road (3.5%). Outdoor bites occurred more than indoor bites (P=0.05).

Table 2 describes the pre-hospital and hospital related characteristics of the cases. Half of the patients brought to the hospital by less than five hours, 11 (39.2%) patients within 6 to 10 hours and 3 (10.7%) patients over 10 hours post-bite. Almost all patients (23; 82.1%) received ligature as a pre-hospital management, while 14.2% (4) had incision over the bite site along with ligature and one (3.8%) patient received nothing. Unfortunately, immobilization of the affected part was done for none of the cases.

Twenty one patients received anti-snake venom (ASV) in different dose regimens. Nine (32.1%) patients received single dose (10 vials) ASV, while three (10.7%) patients received 20 vials, four (14.2%) patients received 30 vials and five (17.8%) patients needed to be intubated along with 10 vials ASV. Seven patients did not receive ASV including one (3.5%) patient who received only atropine and neostigmine and six (21.4%) patients who did not receive any medication at all (Table 2). More than half of the patients (15; 53.5%) recovered after receiving ASV and other ancillary treatments while 13 (46.4%) patients died. The recovery time was analyzed and it was found that six (40%) patients recovered in less than 12 hours while four (26.6%) in 13-24 hours and five (33.3%) in over 24 hours. More than half (7; 53.8%) of the deceased patients died within 2 hours of bite, while two (15.3%) patients within 3-24 hours and four (30.7%) victims over 24 hours post-bite. The cause of death in all deceased patients was primarily respiratory paralysis. The recovered patients were discharged accordingly and were well on follow up.

DISCUSSION

Snakebite is the most important cause of envenoming in South Asia particularly in Bangladesh (3). Males were significantly more affected in our study. This is similar to the findings of Hasan et al. and studies from Nepal and Malaysia (6-8), while, it is different from the results of Rahman et al. which males and females were equally bitten (1.08:1) (5). This is probably because in our rural community, males are more exposed and active than females due to their occupation. In our study, outdoor bites were significantly higher than indoor bites. Most often (>75%) the

Table 1. Demographic characteristics of the patients (n, 28)

Variables	No. (%)
Sex	
Male	20 (71.42)
Female	8 (28.57)
Site of bite	
Upper limb	13 (46.42)
Lower limb	14 (50)
Others	1 (3.57)
Occupation	
Farmer	13 (46.42)
Housewife	7 (25)
Student	5 (17.85)
Shop keeper	1 (3.57)
School teacher	1 (3.57)
Snake charmer	1 (3.57)
Circumstance of bite	
Household activities	14 (50)
Working in field	7 (25)
Sleeping on floor	4 (14.28)
Fishing	1 (3.57)
Playing with snake	1 (3.57)
Walking along road	1 (3.57)

Table 2. Pre-hospital and hospital related characteristics of the cases (n, 28)

Variables	No. (%)
Lag period between bite and hospitalization (in hours)	
≤ 5	14 (50)
6-10	11 (39.29)
>10	3 (10.71)
Managements taken by the patient before referring to hospital	
Ligature	23 (82.14)
Ligature and incision	4 (14.28)
Nothing	1 (3.57)
Treatment delivered in the hospital	
a. Anti-snake venom (ASV)	
One dose (10 vial)	9 (32.14
Two doses (20 vial)	3 (10.71)
Three doses (30 vial)	4 (14.28)
b. Anti-snake venom (one dose) + intubation	5 (17.85)
c. Atropine + Neostigmine only	1 (3.57)
d. No treatment	6 (21.42)
Recovery time (in hours) after receiving ASV (n, 15)	
≤ 12	6 (40)
13- 24	4 (26.66)
≥ 24	5 (33.33)
Lag period (in hours) between bite and death (n, 13)	
≤ 2	7 (53.84)
3-24	2 (15.38)
≥ 24	4 (30.76)

victim was an active young person who were bitten during day to day occupational activity such as cultivation, fishing, plantation, wood collection, guarding the 'crop' or 'garden' lying on floor or even during usual walking. Sometimes, snakebite occurs in home surroundings such as taking care of chicken or pet birds. These findings are also consistent with two other studies done in Bangladesh (6,9). This is probably because most of our rural houses have bushes and shrubs around them which favors normal habitat for snakes. In many parts of rural areas in Bangladesh, people sleep on muddy floor. These muddy houses have a hole which is a favorite place for krait (5).

In this study, farmers were the largest number of victims followed by housewives, though Rahman et al. found housewives as the most suffered group (5). These findings are typical as these two groups are the most active individuals of our rural community and obviously their activity makes them vulnerable to bite. In this study, average age of the victims was 31.8 years (range: 8-55), which is the most productive period of life and even some of victims, were the only breadwinner of the family. The findings are consistent with other studies done in Bangladesh and Nigeria where the mean age was 26.7 years and 27.3 years respectively (10,11). Similar observations were also noted in

Nepal and Malaysia (7,8). The loss of income due to the morbidity and mortality following snakebite can have a great impact on a family economy. The economic burden posed by venomous snakebites is more devastating, as generally low-income population is affected. Hasan et al. revealed in their study that the total healthcare costs related to snakebite varies from 4US$ (1US$ = 72Taka) to 2294US$ with a mean of 124US$ and the mean income loss was 93US$ in Bangladesh (6). Expenditure for venomous snakebites was 231 US$, which is about seven times higher than non-venomous snakebites (34US$) (6). This amount is quite a lot in Bangladesh, where still more than 40% people live below poverty line (12). Following snakebite in Bangladesh, rural people firstly seek non-scientific treatments (traditional healer, Ojha etc.), where they waste a considerable amount of money and time. Even, many of them are not aware that scientific treatments exist for snakebite. Only public education and raising awareness can improve the situation and reduce the cost of treatment and mortality.

Most (50%) of our victims were bitten in the lower extremity. This finding is consistent with other studies done in Bangladesh, Nepal, Nigeria and Hong Kong (5,7,11,13). Conversely, Plowman et al. revealed that two third of his patients were bitten in upper limbs (14). The reason behind predominance of bites in lower limbs is probably that most of our victims were farmers and bites in the agricultural fields mostly involve lower limbs. Krait bite usually occurs at night, so when the victims are sleeping on the floor at night, both upper and lower limbs are vulnerable (5,9).

Eighty-two percent of our patients received pre-hospital first aids in the form of ligature. Observations regarding first aid managements from two other studies (Bangladesh: 66%, Nigeria: 33%) were quite lower (5,11). Following snakebite, all of our patients initially consulted with the traditional healers (Ojha) and were treated with non-scientific methods including multiple tight ligatures, multiple incisions and substances in the name of different beliefs. When the condition of the patients deteriorated, they were taken to Upazilla health complex (primary health care level), where ASV and artificial ventilation are not available. The mean lag period between bite and hospitalization was 6.3 hours (range: 0.5 to 96) in our study. This finding is consistent with study of Faiz et al. reporting 6.4 hours interval until receiving treatments post-bite in Bangladesh (15). But the mean time was shown higher in Nigeria where it was 69.6 hours among deceased patients and 25.8 hours among survivors (11). Lack of good transportation facilities and infrastructure in rural Bangladesh is the main reason of such delay. It can be reduced by different alternative means such as in Nepal where the time was greatly reduced by the use of motorbike as an ambulance (16). Three quarter (75%) of our patients received ASV (maximum 30 vials by 14.2% and minimum 10 vials by 50%). The remaining could not receive it because of rapid death immediately after admission or unfortunate unavailability of ASV. The rate of ASV administration was found better (92.1%) in another study in Bangladesh (6). Thirty three percent of patients died in our study despite receiving ASV. Most (66%) of the survived patients were recovered within 24 hours. The overall mortality rate was 46.4% in this study. The rate is

quite higher comparing to study done in Nigeria (1.41%) but consistent with another study in Bangladesh which was 44% (11,15). In most cases, the cause of death was respiratory failure, which encompasses the neurotoxin-induced respiratory paralysis with a rapid fatality following elapidae snakebites (16).

All the bites in this study occurred during June to September with the highest (42.8%) number in July. This observation is quite similar to other studies done in Bangladesh and surrounding countries, where they found June to October as the peak season (5,7,9,17,18). This is because most of the agricultural activities take place during this period in Bangladesh. Moreover, movement of snakes particularly Cobra and Krait increases at the time of monsoon season when snakes come out of their dens for food and shelter during this period of mixed hot weather and rain.

Recently, World Health Organization (WHO) declared snakebite as a neglected tropical disease (19,20). It is indeed much more neglected in the developing part of the world despite high case burden. Reliance on traditional healers, delayed presentation to the hospital due to lack of transportation facility and infrastructure, limited supply of ASV, lack of modern management facilities such as ventilation support at primary or secondary health care level, lack of public awareness and finally, lack of trained medical manpower are the major obstacles to overcome high mortality and morbidity of snakebite in Bangladesh. The scenario would also be similar for other developing countries. Policy makers should immediately pay more attention to these issues for ensuring comprehensive management of snakebite envenomations.

LIMITATIONS

The following factors may have limited the validity of our findings. The sample size was small in this study. Moreover, the results are only related to rural areas of northwestern part of Bangladesh, so the situation of the whole country is not reflected.

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