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ASSESSING THE BITE TIME TO NEEDLE TIME AND ITS CORRELATION WITH MORTALITY AND MORBIDITY IN SUBJECTS WITH SNAKE BITE

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ABSTRACT

Background: A significant environmental and occupational hazard commonly seen in tropical countries is snakebite. Snakebite is treated with anti-snake venom administration, supportive care, and wound care. To reduce snakebite-associated mortality and morbidity, time is a vital factor.

Aim: The present study aimed to evaluate the bite time to needle time and its correlation with mortality and morbidity in subjects with a snake bite.

Methods: In 200 subjects detailed history was recorded including the symptoms of snakebite presentation, snake species, site of the bite, and time since snakebite along with bleeding manifestations, oliguria, respiratory failure, ptosis, cellulitis, and consciousness level. Bite-to-needle time was also noted. In all subjects, polyvalent anti-snake venom was administered. Associated mortality, complications, and hospitalization duration were also noted.

Results: Most common snake species involved was Krait and the lower limb was the most commonly involved site. ASV was given in 6 hours in 72 subjects and 6-12 hours in 30% of the subjects. Lesser duration of hospitalization and lesser complications were seen in subjects with a bite-to-needle time of <6 hours. In a bite-to-needle time of >24 hours, more death, hospitalization duration, and complications were seen along with more ASV vial use.

Conclusion: Increased systemic envenomation is associated with increased bite-to-needle time further increasing the mortality risk, mortality, and complications severity. In snakebite subjects, the value of ASV administration and the necessity of timings must be emphasized.

Keywords: Antisnake venom, complications, bite-to-needle time, mortality, snakebite

INTRODUCTION

Snakebite is a significant environmental and occupational hazard in tropical countries with a significant contribution to mortality. In India, nearly 58,000 deaths per annum are reported from the snakebite alone. 70 years back, snake bite-associated death risk in India was 1 in every 250 people in the Indian population.[1] Majority of snakebite-associated deaths in India are in the subjects of age range 20-39 years. Possible fatal outcomes of the snakebite are tissue necrosis, muscular paralysis, and widespread bleeding. Snakebite is shown to cause permanent disability leading to even blindness and amputation. Long-term effects of snakebite reported being renal failure from acute kidney injury.[2]

The management of snakebite is attributed to the earliest administration of anti-snake venom, supportive care, and wound care. The anti-snake venom is administered at the earliest to neutralize the snake venom effects.[3] Despite adequate management of snakebites with ASV, it is not feasible to prevent the deaths caused by snakebites. In countries like India, the treatment of snakebites is delayed owing to a lack of accessibility to healthcare facilities, the use of traditional remedies, and the under-reporting of snakebite cases. The bizarre practices in India for snakebites include venom suction from the bite site, herbal medicine application, incision, and tourniquet application.[4]

The use of these bizarre practices delays the subjects from taking adequate management from the health care personnel. The delay in administering the anti-snake venom to the victims is a crucial factor in determining the mortality and complications associated with snakebite.[5] The bite-to-needle time is vital in reducing the mortality and morbidity associated with snakebites. Previous literature research has been done on mortality and morbidity associated with the snakebite.[6] However, further studies are warranted to assess the morbidity and mortality resulting from the delay in treatment of the snakebite. The present study aimed to evaluate the bite time to needle time and its correlation with mortality and morbidity in subjects with a snake bite.

MATERIALS AND METHODS

The present study aimed to evaluate the bite time to needle time and its correlation with mortality and morbidity in subjects with a snake bite. The study population was recruited from the Outpatient department of the Institute admitted secondary to the snakebite. Informed consent was taken from all the subjects for study participation in both written and verbal format.

A total of 200 subjects admitted following the snakebite were included in the study. After inclusion, detailed history was recorded from all 200 subjects followed by a physical examination. A detailed history was recorded on a pre-structured proforma concerning the bleeding manifestations, oliguria, respiratory failure, ptosis, abdominal pain, vomiting, cellulitis, pain at the site of the bite, level of consciousness, symptoms while presenting, type of snake, site of the bite, and details concerning the snakebite timeline.

A comprehensive physical examination was done of the central nervous system, abdomen, respiratory system, and cardiovascular system. WBCT (whole blood clotting time) was also assessed. Following the pre-existing protocol of the institute, anti-snake venom was administered to all 200 subjects. Bite-to-needle time was noted in all the subjects. The ASV

administered was polyvalent ASV. The number of ASV vials administered was also noted. All subjects were closely monitored till discharge for any complications if arise. The complications recorded were oliguria <400ml/day, serum creatinine >1.5mg/dl, ventilatory support needed in neurological paralysis, sepsis, shock, cellulitis needing debridement, gangrene, compartmental syndrome, and DIC (disseminated intravascular coagulation) suggesting the AKI (acute kidney injury).

Based on the bite-to-needle time, study subjects were divided into 4 groups. Any existing correlation in WBCT, outcome, ASV need, stay duration, the time between complications development, and ASV administration.

The data gathered were assessed statistically using SPSS software version 25.0 (IBM, USA) and the chi-square test. The data were expressed in frequency and percentage and mean and standard deviation. The significance level was taken at $p<0.05$.

RESULTS

The present clinical study assessed 200 subjects where there were 32% (n=64) were females and 68% (n=136) were male subjects. There were 9% (n=18) subjects aged <20 years, 19% (n=38) subjects in the 21-30 years of age range, 26% (n=52) subjects from the age range of 31-40 years, 20% (n=40) subjects from 41-50 of age range, and 26% (n=52) subjects from age of more than 50 years as shown in Table 1.

The hospitalization time was <5 days in 28% (n=56) study subjects, 5-10 days in 51% (n=102) study subjects, and>10 days in 21% (n=42) study subjects. Total vials of anti-snake venom administered were 10 in 4% (n=8) subjects, 20 in 35% (n=70) study subjects, and 30 in 61% (n=122) study subjects. Bite to needle time was <6 hours in 36% (n=72) study subjects, 6-12 hours in 30% (n=60) study subjects, 12-24 hours in 22% (n=44) study subjects, and>24 hours in 12% (n=24) study subjects. The site of the snakebite was the upper limb in 37% (n=74) study subjects and was lower limb in 63% (n=126) study subjects. WBCT was >20 minutes in 84% (n=168) of study subjects. The snake species involved was unknown in 18% (n=36) study subjects, a viper in 30% (n=60) study subjects, a cobra in 12% (n=24) study subjects, and Krait in 40% (n=80) study subjects. The outcome/complications were cellulitides in 50% (n=100) study subjects, AKI in 34% (n=68) study subjects, septic shock in 12% (n=24) study subjects, DIC in 10% (n=20) study subjects, respiratory failure in 10% (n=20) study subjects, and death in 9% (n=18) study subjects respectively (Table 2).

On assessing the correlation of outcome and complications to bite-to-needle time, death was reported in 2 subjects from Group III and 16 subjects from group IV which was significant with p=0.001, respiratory failure in 12, 6, and 2 subjects from Groups II, III, and IV respectively which was non-significant with p=0.001, DIC in 8 and 18 subjects from groups III and IV respectively, septic shock in 2, 8, and 14 subjects from Groups II, III, and IV respectively with p=0.001. AKI was seen in 8, 16, 20, and 24 subjects from Group I, II, III, and IV respectively which was significant with p=0.001, and cellulitis in 2, 34, 42, and 22 subjects from groups I, II, III, and IV respectively which were significant with p=0.001. Hospitalization duration was <5 days in 54 and 2 subjects from Groups I and II, 5-10 days in 18, 40, 30, and 14 subjects from Groups I, II, III, and IV respectively, and>10 days in 18, 14, and 10 Groups II, III, and IV respectively these differences were significant with p=0.001.

WBCT >20 minutes was seen in 64, 50, 36, and 18 subjects from groups I, II, III, and IV respectively which were statistically non-significant with p=0.67. Total ASV vials administered were 10 in 8 subjects of Group I, 20 vials in 58, 8, and 4 subjects from groups I, II, and III respectively, and 30 vials in 6, 54, 40, and 24 subjects respectively from Groups I, II, III, and IV which was significant with p=0.001 as shown in Table 3.

Discussion

The present study aimed to evaluate the bite time to needle time and its correlation with mortality and morbidity in subjects with snake bites The present clinical study assessed 200 subjects where there were 32% (n=64) were females and 68% (n=136) were male subjects. There were 9% (n=18) subjects aged <20 years, 19% (n=38) subjects in the 21-30 years of age range, 26% (n=52) subjects from the age range of 31-40 years, 20% (n=40) subjects from 41-50 of age range, and 26% (n=52) subjects from age of more than 50 years. These demographics were comparable to the previous studies of Kasturiratne A et al[7] in 2008 and Ahmed SA et al[8] in 2008 where authors assessed subjects with demographics comparable to the present study.

The study results showed that hospitalization time was <5 days in 28% (n=56) study subjects, 5-10 days in 51% (n=102) study subjects, and>10 days in 21% (n=42) study subjects. Total vials of anti-snake venom administered were 10 in 4% (n=8) subjects, 20 in 35% (n=70) study subjects, and 30 in 61% (n=122) study subjects. Bite to needle time was <6 hours in 36% (n=72) study subjects, 6-12 hours in 30% (n=60) study subjects, 12-24 hours in 22% (n=44) study subjects, and>24 hours in 12% (n=24) study subjects. These data were in agreement with the studies of Narvencar K et al[9] in 2006 and Saravu K et al[10] in 2012 where authors reported the clinical parameters comparable to the present study in their study subjects.

The site of the snakebite was the upper limb in 37% (n=74) study subjects and was lower limb in 63% (n=126) study subjects. WBCT was >20 minutes in 84% (n=168) of study subjects. The snake species involved was unknown in 18% (n=36) study subjects, a viper in 30% (n=60) study subjects, a cobra in 12% (n=24) study subjects, and Krait in 40% (n=80) study subjects. The outcome/complications were cellulitides in 50% (n=100) study subjects, AKI in 34% (n=68) study subjects, septic shock in 12% (n=24) study subjects, DIC in 10% (n=20) study subjects, respiratory failure in 10% (n=20) study subjects, and death in 9% (n=18) study subjects respectively. These results were consistent with the studies of Inamdar IF et al[11] in 2010 and Bhalla G et al[12] in 2014 where authors reported comparable clinical parameters in snakebite subjects as in the present study.

On assessing the correlation of outcome and complications to bite-to-needle time, death was reported in 2 subjects from Group III and 16 subjects from group IV which was significant with p=0.001, respiratory failure in 12, 6, and 2 subjects from Groups II, III, and IV respectively which was non-significant with p=0.001, DIC in 8 and 18 subjects from groups III and IV respectively, septic shock in 2, 8, and 14 subjects from Groups II, III, and IV respectively with p=0.001. AKI was seen in 8, 16, 20, and 24 subjects from Group I, II, III, and IV respectively which was significant with p=0.001, and cellulitis in 2, 34, 42, and 22 subjects from groups I, II, III, and IV respectively which were significant with p=0.001.

These results were in line with the studies of Harshavardhan L et al[13] in 2013 and Gadwalkar S et al[14] in 2014 where authors reported similar results in their respective studies.

The study results showed that the Hospitalization duration was <5 days in 54 and 2 subjects from Groups I and II, 5-10 days in 18, 40, 30, and 14 subjects from Groups I, II, III, and IV respectively, and was >10 days in 18, 14, and 10 Groups II, III, and IV respectively these differences were significant with p=0.001. WBCT >20 minutes was seen in 64, 50, 36, and 18 subjects from groups I, II, III, and IV respectively which were statistically non-significant with p=0.67. Total ASV vials administered were 10 in 8 subjects of Group I, 20 vials in 58, 8, and 4 subjects from groups I, II, and III respectively, and 30 vials in 6, 54, 40, and 24 subjects respectively from Groups I, II, III, and IV which was significant with p=0.001. These results were comparable to the studies of Nigam R et al[15] in 2015 and Halesha BR et al[16] in 2013 where similar correlation outcome and complications to bite-to-needle time was reported by the authors.

CONCLUSION

Considering its limitations, the present study concludes that an increase in systemic envenomation is associated with increased bite-to-needle time further increasing the mortality risk, mortality, and complications severity. In snakebite subjects, the value of ASV administration and the necessity of timings must be emphasized. However, further multi-center clinical studies are warranted.

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TABLES

Characteristics	**Percentage (%)**	**Number (n)**
Gender		
Females	32	64
Males	68	136
Age range (years)		
<20	9	18
21-30	19	38
31-40	26	52
41-50	20	40
>50	26	52

Table 1: Demographic data of the study subjects

Factor	**Percentage (%)**	**Number (n)**
Hospitalization duration		
<5	28	56
5-10	51	102
>10	21	42
Total ASV administered (vials)		

10	4	8
20	35	70
30	61	122
Bite-to-needle time		
<6	36	72
6-12	30	60
12-24	22	44
>24	12	24
Site of the bite		
Upper limb	37	74
Lower limb	63	126
WBCT		
>20 mins	84	168
Snake species		
Unknown	18	36
Viper	30	60
Cobra	12	24
Krait	40	80
Outcome/complications		
Death	9	18
Respiratory failure	10	20
DIC	10	20
Septic shock	12	24
AKI	34	68
Cellulitis	50	100

Table 2: clinical feature of snakebite in the study subjects

Parameter	Group I	Group II	Group III	Group IV	p-value
Outcome/complications					
Death	-	-	2	16	0.001
Respiratory failure	-	12	6	2	0.06
DIC	-	-	8	18	0.001
Septic shock	-	2	8	14	0.001
AKI	8	16	20	24	0.001
Cellulitis	2	34	42	22	0.001
Hospitalization duration					
<5	54	2	-	-	0.001
5-10	18	40	30	14	0.001
>10	-	18	14	10	0.001
WBCT >20 minutes	64	50	36	18	0.67
Total ASV administered (vials)					
10	8	-	-	-	0.001
20	58	8	4	-	0.001
30	6	54	40	24	0.001

Table 3: Correlation of outcome and complications to bite-to-needle time