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Epidemiology, Clinical Profile and Severity of Snakebite Cases in a Tertiary Care Centre in Kochi.

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Abstract

Background: Snakebite is a common life-threatening emergency in India, particularly affecting rural and economically productive populations. The clinical manifestations and severity vary according to the type of snake, time since envenomation and degree of systemic involvement. This study was undertaken to assess the epidemiological and clinical profile of snakebite cases and determine severity based on coagulopathy, renal failure and mortality. ***Methods:*** An observational study was conducted at Medical Trust Hospital, Kochi, from September 2017 to September 2018. Ninety patients admitted with a proven history of snakebite, in whom the offending snake was identified, were included. Clinical parameters including age, sex, bite site, time since envenomation, local and systemic manifestations and treatment received were recorded. Laboratory parameters including complete blood count, urine examination, blood urea, serum creatinine, 20-minute whole blood clotting time (WBCT), prothrombin time and activated partial thromboplastin time were assessed. Data were analysed using Microsoft Excel and SPSS version 22. ***Results:*** Viperine bites predominated (77%), followed by cobra (19%) and krait (2%). Males constituted 68% of cases, with most patients belonging to the economically productive age group of 25–50 years. The lower limb was the commonest bite site (87%). Local reactions were frequent, while coagulopathy and bleeding manifestations were important features of systemic envenomation. Bleeding manifestations showed a significant association with mortality (p=0.028). Prolonged time since envenomation was significantly associated with poor response to antisnake venom (ASV), increased mortality and renal failure (p=0.042). Initial derangement of blood urea and serum creatinine was significantly associated with persistent renal failure and increased need for haemodialysis (p=0.006 and p=0.001, respectively). ***Conclusion:*** Snakebite remains an important medical emergency in this region. Russell's viper was the commonest vasculotoxic snake, while cobra was the commonest neuroparalytic snake. Early hospitalization, timely ASV administration, monitoring of coagulation and renal parameters, and appropriate ventilatory and dialysis support are essential to reduce morbidity and mortality.

Keywords: Snakebite, Envenomation, Blood Urea, Serum Creatinine, Clotting Time, Antisnake Venom.

INTRODUCTION

Envenomation due to snakebite is a major global health problem, particularly in tropical and subtropical regions. Snakebite-related mortality and morbidity constitute an important public health concern in rural areas of Africa, Asia, Latin America, and New Guinea, where exposure to snakes is common and access to timely medical care may be limited.[1,2]

Snake envenomation predominantly affects rural agrarian populations in developing tropical and subtropical countries. Males are more frequently affected, accounting for approximately 59% of victims, with economically productive individuals between 15 and 50 years of age being particularly vulnerable.[2] The World Health Organization (WHO) recognizes snakebite as an occupational hazard, especially in South-East Asian countries. Individuals engaged in occupations such as rice farming, plantation work involving rubber and coffee, herding, hunting, fishing and fish farming are at increased risk. Other high-risk activities include catching and handling snakes for food, snake charming and display, leather manufacturing, particularly from sea snakes, and the preparation of traditional medicines.[3-6]

The burden of snakebite is further aggravated by delays in receiving appropriate medical treatment. In many developing countries, nearly 80% of snakebite victims initially seek treatment from traditional practitioners before approaching modern healthcare facilities, resulting in significant delays in the administration of appropriate therapy.[7] Recognizing its

substantial impact on vulnerable populations, snakebite was included in the WHO list of neglected tropical diseases in 2009.[8,9]

In Kerala, farmers engaged in rubber, paddy, and coffee cultivation, particularly those working in hilly terrains, constitute a vulnerable group. The prevailing agrarian crisis further increases their socioeconomic vulnerability.[9] Consequently, morbidity and mortality resulting from snakebite can have serious economic and social consequences, affecting not only the individual but also the livelihood and well-being of their families. Therefore, understanding the epidemiological and clinical profile of snakebite envenomation is essential for developing effective preventive strategies and improving timely medical management.

AIMS AND OBJECTIVES

The present study aims to study the epidemiology and clinical profile of snakebite cases presenting to a tertiary care centre, Medical Trust Hospital, Kochi, during the period from September 2017 to September 2018. The study also aims to assess the outcome and severity of snakebite envenomation by evaluating the coagulation profile, clinical and laboratory features of renal failure, and mortality among affected individuals.

MATERIALS AND METHODS

Study Design

The present study was designed as an observational study conducted at Medical Trust Hospital, Kochi. The study was carried out over a period of one year, from September 2017 to September 2018. The study population comprised all patients admitted to the hospital with a history of snakebite during the study period, irrespective of age or sex. The epidemiological and clinical characteristics of the patients were assessed, along with relevant clinical and laboratory parameters, to evaluate the severity and outcome of snakebite envenomation.

Inclusion and Exclusion Criteria

Patients of any age or sex who were admitted to Medical Trust Hospital, Kochi, during the study period with a proven history of snakebite were included in the study. A proven history of snakebite was defined as cases in which the snake was seen and identified by the patient or accompanying persons, or the snake was brought to the hospital for identification. Cases with an unknown bite, suspected or suspicious bites, insect bites, or those with a previous history of renal failure or coagulopathy were excluded from the study.

Sample Size Calculation

Based on the previous study (A study of clinical profile of snake bite at a tertiary care center by Gaurav Bhalla) it is observed that the mortality rate due to snake bite is 5.79, precision is 5% and with 95% Confidence Interval the minimum required sample size is 84.

We used here the software n master 2.0 the following formula has been used for sample size calculation.
Formula:

$$N=z_{(1-\alpha/2)}^2 \, p(1-p)/d^2$$

Where,
P: Expected proportion=0.579
D: Absolute precision =5
A/2: Desired Confidence level=95%
N=84
Calculation
Sample size n= [1.962 *0.0579(1-0.0579)]/ {.5}2=84

Data Collection Procedure

Data collection was carried out using a structured data collection proforma for all eligible patients admitted with snakebite. Relevant clinical details were recorded, including age, sex, time elapsed since envenomation, site of bite, history of first aid received, local manifestations such as swelling, cellulitis, haemorrhagic bullae and gangrene, lymphadenopathy, and systemic bleeding manifestations including petechiae, ecchymosis, epistaxis, haemoptysis, melena and evidence of intracranial haemorrhage. Urine output and the presence of haematuria were also documented. Laboratory investigations included complete blood count haemoglobin, RBC count, packed cell volume, MCV, MCH, MCHC, total leukocyte count, three-part differential count, platelet count and mean platelet volume. Urine examination was performed for albumin and microscopic abnormalities, along with measurement of blood urea and serum creatinine. Bleeding time and clotting time were assessed, with the 20-minute whole blood clotting test performed according to WHO guidelines. For this test, 2 mL of freshly collected venous blood was placed in a clean, dry glass vessel and left undisturbed at ambient temperature for 20 minutes, after which the vessel was gently tilted once; failure of the blood to clot and its flowing out of the vessel was

considered indicative of prolonged coagulation time. Prothrombin time and activated partial thromboplastin time were also recorded.

Statistical Analysis

The collected data were entered into a Microsoft Excel datasheet and analyzed using IBM SPSS Statistics version 22 (IBM SPSS Statistics, Somers, NY, USA). Categorical variables were expressed as frequencies and proportions, while continuous variables were summarized as mean and standard deviation. The Chi-square test was used to assess the association between categorical variables, and the paired t-test was used to compare quantitative variables measured before and after treatment. Data were graphically represented using Microsoft Excel and Microsoft Word in the form of bar diagrams, pie charts and scatter plots, as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1. Demographic characteristics of the study population

Variable	Category	Count (n)	Percentage (%)
Age	<25 years	15	16.7
	26–35 years	23	25.6
	36–45 years	18	20.0
	46–55 years	23	25.6
	>56 years	11	12.2
	Total	**90**	**100.0**
Sex	Male	61	67.8
	Female	29	32.2
	Total	**90**	**100.0**
Age according to sex	Male – <25 years	10	16.4
	Male – 26–35 years	14	23.0
	Male – 36–45 years	13	21.3
	Male – 46–55 years	16	26.2
	Male – >56 years	8	13.1
	Female – <25 years	5	17.2
	Female – 26–35 years	9	31.0
	Female – 36–45 years	5	17.2
	Female – 46–55 years	7	24.1
	Female – >56 years	3	10.3
	Mean age – Male	**40.82 ± 14.218**	—
	Mean age – Female	**39.86 ± 14.591**	—
Statistical findings**:** Association between age and sex: $\chi^2 = 0.831$, df = 4, p = 0.934			

Table 1 illustrates the demographic profile of the 90 study participants. The mean age of the study population was 40.51 ± 14.264 years, with the largest proportions belonging to the 26–35 years and 46–55 years age groups (25.6% each). Males constituted 67.8% of the study population, while females constituted 32.2%. There was no statistically significant association between age and sex.

Table 2. Clinical characteristics of snakebite cases

Variable	Category	Count (n)	Percentage (%)
Identification of snake	Viper	69	76.7
	Cobra	19	21.1
	Krait	2	2.2
Site of bite	Lower limb	78	86.7
	Upper limb	12	13.3
First aid	Received	63	70.0
	Not received	27	30.0
Local reaction – overall	Reacted	87	96.7
	Non-reacted	3	3.3
Local reaction – type	No reaction	3	3.3
	Edema + tenderness	85	94.4
	Tenderness alone	1	1.1
	Edema + tenderness + necrosis	1	1.1
Bite mark	Present	88	97.8

	Absent	2	2.2
Lymphadenopathy	Present	60	66.7
	Absent	30	33.3
Time since envenomation	<100 min	37	41.1
	100–200 min	13	14.4
	200–300 min	17	18.9
	400–500 min	10	11.1
	>500 min	13	14.4
	Median time since envenomation	**180 min**	—

Association between sex and site of bite			
Site of bite	**Male n (%)**	**Female n (%)**	**Total n (%)**
Lower limb	54 (88.5)	24 (82.8)	78 (86.7)
Upper limb	7 (11.5)	5 (17.2)	12 (13.3)
Total	61 (100.0)	29 (100.0)	90 (100.0)
$\chi^2 = 0.566$, df = 1, p = 0.452.			

Association between time since envenomation and first aid		
Time since envenomation	**First aid received n (%)**	**First aid not received n (%)**
<100 min	23 (36.5)	14 (51.9)
100–200 min	9 (14.3)	4 (14.8)
200–300 min	14 (22.2)	3 (11.1)
400–500 min	6 (9.5)	4 (14.8)
>500 min	11 (17.5)	2 (7.4)
$\chi^2 = 4.12$, df = 4, p = 0.390.		

Table 2 summarizes the major clinical characteristics of the snakebite cases. Viper bites were predominant (76.7%), followed by cobra (21.1%) and krait (2.2%). Lower-limb bites accounted for 86.7% of cases. First aid was received by 70.0% of patients. Local reactions were observed in 96.7%, with edema and tenderness being the predominant manifestation (94.4%). Bite marks were present in 97.8% and lymphadenopathy in 66.7%. The median time since envenomation was 180 minutes, with 41.1% presenting within 100 minutes. No significant association was observed between sex and site of bite or between time since envenomation and receipt of first aid.

Table 3: Bleeding manifestations, anti-snake venom response, renal failure and outcome

Variable	Category	Count (n)	Percentage (%)
Bleeding manifestations	No bleeding	67	74.4
	Bleeding from site of bite	19	21.1
	Intracranial haemorrhage	1	1.1
	Multiple sites	3	3.3
Response to anti-snake venom	Not given	57	63.3
	Given and responded	22	24.4
	Given and not responded	11	12.2
Renal failure	Present	32	35.6
	Absent	58	64.4
Outcome	Alive	87	96.7
	Death	3	3.3

Table 3 observes the distribution of important systemic manifestations and outcomes. Most patients had no bleeding manifestations (74.4%), while bleeding from the bite site was seen in 21.1%. Anti-snake venom was not given to 63.3% of patients, while 24.4% received and responded to it. Renal failure was present in 35.6% of cases. Overall, 96.7% survived and mortality was 3.3%.

Table 4: Association of clinical factors with outcome

Variable	Category	Alive n (%)	Death n (%)	χ^2	p-value
Identification of snake	Viper	67 (77.0)	2 (66.7)	0.329	0.848
	Cobra	18 (20.7)	1 (33.3)		
	Krait	2 (2.3)	0 (0.0)		
Time since envenomation	<100 min	36 (41.4)	1 (33.3)	1.948	0.745
	100–200 min	13 (14.9)	0 (0.0)		

	200–300 min	16 (18.4)	1 (33.3)		
	400–500 min	10 (11.5)	0 (0.0)		
	>500 min	12 (13.8)	1 (33.3)		
Response to anti-snake venom	Not given	55 (63.2)	2 (66.7)	1.896	0.388
	Given and responded	22 (25.3)	0 (0.0)		
	Given and not responded	10 (11.5)	1 (33.3)		
First aid	Received	61 (70.1)	2 (66.7)	0.016	0.898
	Not received	26 (29.9)	1 (33.3)		
Bleeding manifestations	No bleeding	65 (74.7)	2 (66.7)	9.094	**0.028***
	Bleeding from site of bite	19 (21.8)	0 (0.0)		
	Intracranial haemorrhage	1 (1.1)	0 (0.0)		
	Multiple sites	2 (2.3)	1 (33.3)		
Urine routine examination	Normal	44 (50.6)	1 (33.3)	0.345	0.557
	Abnormal	43 (49.4)	2 (66.7)		

Table 4 illustrates the association of major clinical variables with patient outcome. There was no statistically significant association between outcome and snake identification, time since envenomation, anti-snake venom response, first aid or urine routine examination. However, bleeding manifestations showed a statistically significant association with outcome ($\chi^2 = 9.094$, $p = 0.028$), with multiple-site bleeding being observed in 33.3% of patients who died.

Table 5: Association of bleeding manifestations and urine findings with snake type and envenomation time

Association	Category	Findings
Bleeding manifestations vs urine routine examination	No bleeding	Normal 38 (56.7%); Abnormal 29 (43.3%)
	Bleeding from site of bite	Normal 7 (36.8%); Abnormal 12 (63.2%)
	Intracranial haemorrhage	Normal 0 (0.0%); Abnormal 1 (100.0%)
	Multiple sites	Normal 0 (0.0%); Abnormal 3 (100.0%)
	Statistical test	$\chi^2 = 6.525$, df = 3, p = 0.089
Bleeding manifestations vs snake type – Viper	No bleeding	52 (75.4%)
	Bleeding from site of bite	13 (18.8%)
	Intracranial haemorrhage	1 (1.4%)
	Multiple sites	3 (4.3%)
Bleeding manifestations vs snake type – Cobra	No bleeding	14 (73.7%)
	Bleeding from site of bite	5 (26.3%)
	Intracranial haemorrhage	0 (0.0%)
	Multiple sites	0 (0.0%)
Bleeding manifestations vs snake type – Krait	No bleeding	1 (50.0%)
	Bleeding from site of bite	1 (50.0%)
	Intracranial haemorrhage	0 (0.0%)
	Multiple sites	0 (0.0%)
	Statistical test	$\chi^2 = 2.59$, df = 6, p = 0.858
Bleeding manifestations vs time since envenomation	<100 min	No bleeding 78.4%; bite-site bleeding 16.2%; intracranial haemorrhage 0%; multiple sites 5.4%
	100–200 min	69.2%; 30.8%; 0%; 0%
	200–300 min	76.5%; 23.5%; 0%; 0%
	400–500 min	80.0%; 10.0%; 0%; 10.0%
	>500 min	61.5%; 30.8%; 7.7%; 0%

	Statistical test	$\chi^2 = 11.83$, df = 12, p = 0.459
Urine routine vs snake type – Viper	Normal / Abnormal	37 (53.6%) / 32 (46.4%)
Urine routine vs snake type – Cobra	Normal / Abnormal	7 (36.8%) / 12 (63.2%)
Urine routine vs snake type – Krait	Normal / Abnormal	1 (50.0%) / 1 (50.0%)
	Statistical test	$\chi^2 = 1.678$, df = 2, p = 0.432

Table 5 summarizes the relationships between bleeding manifestations, urine abnormalities, snake type and time since envenomation. Abnormal urine findings were more frequent among patients with bleeding from the bite site (63.2%) and among those with intracranial haemorrhage or multiple-site bleeding (100% each), although the association was not statistically significant. There was also no significant association between bleeding manifestations and snake type or between bleeding manifestations and time since envenomation.

Table 6: Association of renal failure with clinical and laboratory parameters

Variable	Category	Renal failure Present n (%)	Renal failure Absent n (%)	χ^2 / p-value
Snake identification	Viper	21 (65.6)	48 (82.8)	$\chi^2 = 5.572$, p = 0.062
	Cobra	9 (28.1)	10 (17.2)	
	Krait	2 (6.2)	0 (0.0)	
Urine routine examination	Normal	14 (43.8)	31 (53.4)	$\chi^2 = 0.776$, p = 0.378
	Abnormal	18 (56.2)	27 (46.6)	
Outcome	Alive	32 (100.0)	55 (94.8)	p = 0.191
	Death	0 (0.0)	3 (5.2)	
Response to anti-snake venom	Not given	15 (46.9)	42 (72.4)	**p = 0.024***
	Given and responded	13 (40.6)	9 (15.5)	
	Given and not responded	4 (12.5)	7 (12.1)	
Time since envenomation	<100 min	17 (53.1)	20 (34.5)	$\chi^2 = 5.229$, p = 0.262
	100–200 min	2 (6.2)	11 (19.0)	
	200–300 min	4 (12.5)	13 (22.4)	
	400–500 min	4 (12.5)	6 (10.3)	
	>500 min	5 (15.6)	8 (13.8)	
Bleeding manifestations	No bleeding	21 (65.6)	46 (79.3)	$\chi^2 = 6.864$, p = 0.076
	Bleeding from site of bite	11 (34.4)	8 (13.8)	
	Intracranial haemorrhage	0 (0.0)	1 (1.7)	
	Multiple sites	0 (0.0)	3 (5.2)	

Table 6 demonstrates the association between renal failure and selected clinical parameters. Among patients with renal failure, 65.6% had viper bites and 34.4% had bleeding from the bite site. No statistically significant association was found between renal failure and snake type, urine routine examination, outcome, time since envenomation or bleeding manifestations. However, response to anti-snake venom showed a statistically significant association with renal failure (p = 0.024).

Table 7: Comparison of blood urea and serum creatinine between day 1 and day 3

Laboratory parameter	Day 1 Mean ± SD	Day 1 Median	Day 3 Mean ± SD	Day 3 Median	p-value
Blood urea (mg/dL)	29.79 ± 16.90	24.00	61.81 ± 45.68	44.00	**0.006***
Serum creatinine (mg/dL)	1.17 ± 0.62	1.00	2.42 ± 1.73	1.45	**0.001***

Table 7 compares renal biochemical parameters between day 1 and day 3. The mean blood urea increased from 29.79 ± 16.90 mg/dL on day 1 to 61.81 ± 45.68 mg/dL on day 3, with a statistically significant difference (p = 0.006). Similarly, mean serum creatinine increased from 1.17 ± 0.62 mg/dL to 2.42 ± 1.73 mg/dL, which was also statistically significant (p = 0.001).

DISCUSSION

In the present males constituted the majority of the victims, accounting for 61 cases (68%), whereas females constituted 29 cases. Similar observations were reported by Kulkarni and Anees[10] from Karnataka, Bawaskar[11] from Maharashtra, Sharma et al.[12] from Punjab and Haryana, Brunda and Sashidhar[13] from Andhra Pradesh, and Mohapatra et al.[2] in a multicentric study conducted across India. The predominance of males may be explained by the nature of occupational and outdoor activities undertaken by men. Most snakebites are encountered during agricultural activities or while walking barefoot at night. In many Indian families, male members are predominantly involved in agricultural and other outdoor occupations. The lower limb was the most common site of bite, being involved in 78 cases (87%), while the upper limb was involved in 12 cases. Among the 12 patients with upper-limb bites, 5 were females and 7 were males. In females, most of these bites occurred while cleaning living areas or stores with brooms, whereas in males, bites commonly occurred while clearing backyards or handling stacked materials. Similar observations were reported by Kulkarni and Anees[10] and Rahman et al.[14] The predominance of lower-limb bites may be attributed to barefoot walking and occupational activities involving close contact with vegetation and ground-level hiding places of snakes.

The age of the patients ranged from 14 to 72 years. The maximum number of cases, 46, occurred in the 25–55-year age group, which represents the economically productive section of the population. There were also 11 cases among individuals aged 56 years and above. The predominance of snakebite in the economically productive age group may be related to greater occupational and outdoor exposure. A definite bite mark could be identified in 97.8% of cases, and fang marks were identified in most of the patients. The presence of identifiable fang marks provides useful clinical evidence supporting the diagnosis of snakebite, particularly in cases where the offending snake is not brought to the hospital or cannot be identified.

Symptoms suggestive of renal failure were observed in 21 (22.3%) cases of Russell viper bite. Mittal[15] reported that the incidence of acute renal failure following poisonous snakebite varies from 13% to 22% in cases of Russell viper bite. In his study, renal failure was mainly attributed to tubular necrosis and cortical necrosis, which were associated with the formation of microthrombi in small- and medium-sized renal vessels. Other pathological changes included ballooning of capillaries, endothelial swelling, splitting of the glomerular basement membrane, mesangiolysis, and mild mesangial proliferation. Thrombotic microangiopathy has also been identified as a cause of renal failure following hump-nosed pit viper bites by Herath et al.[18] Similar cases of systemic envenomation complicated by renal failure have been reported from Kerala by Joseph et al.[19] Hypnale hypnale accounts for a major proportion of renal failure complicating haemotoxic snakebites in certain regions of Kerala. Considering that only approximately 20–30% of patients bring the offending snake to the hospital, identification of the species may not always be possible. In the present study, all patients who developed renal failure had features suggestive of systemic envenomation, including prolonged clotting time, supporting the possibility of haemotoxic envenomation.

Among the 32 cases of renal failure, no mortality was recorded. This favorable outcome may be attributed to timely haemodialysis, appropriate treatment, and regular monitoring of renal function. Among the 21 cases of renal failure associated with viper bite, four patients required haemodialysis, of whom one developed severe oliguric renal failure that persisted for several months. Similar observations were reported by Suchitra et al.[20] These findings emphasize the importance of early recognition of renal involvement and timely initiation of renal replacement therapy in patients with systemic snake envenomation. Local reactions at the site of the bite, including tenderness and edema, were observed in 94.4% of viper bite cases, while 97% of all cases had some form of local reaction. One patient with Russell viper bite developed cellulitis, while two patients developed marked limb edema. One patient with viperine envenomation developed a hemorrhagic bleb. Regional lymphadenopathy was identified in 60 cases (66.7%). This observation is comparable with the findings reported by Suchithra et al.[20] The relatively high frequency of lymphadenopathy may reflect the local inflammatory response following venom inoculation and associated tissue injury.

Spontaneous bleeding was observed in 17 cases of viperine bites, including the two cases that resulted in mortality. These observations indicate that prolongation of clotting time, which is an important marker of systemic envenomation, is particularly associated with viper bites and may be accompanied by clinically significant spontaneous bleeding. A significant association was observed between bleeding manifestations and mortality, with a P value of 0.028. Patients who developed bleeding manifestations, prolongation of clotting time, features of renal failure, and those who received Anti Snake Venom (ASV) had more severe disease. Patients presenting only with local manifestations and without evidence of systemic envenomation generally do not require ASV. Therefore, the requirement for ASV in the present study may itself indicate more severe systemic envenomation. Similar findings were reported by Joseph et al.[19]

A significant association was also observed between time since envenomation and response to Anti Snake Venom, with a P value of 0.042. Patients presenting after a prolonged interval following envenomation had a poorer prognosis, with increased mortality and a higher incidence of renal failure, even after receiving adequate ASV treatment. This finding

highlights the importance of early diagnosis, prompt referral, and timely administration of ASV in patients with suspected systemic snake envenomation. Delayed treatment may allow progressive venom-mediated coagulopathy, tissue injury, and renal damage to develop, thereby adversely affecting the outcome.

LIMITATIONS

As this was a tertiary care referral hospital, it was difficult to assess the first-aid measures received before referral and determine whether delays in presentation were due to referral-related delays. Additionally, the urban setting and referral of patients from surrounding areas and other districts may have influenced the study population and limited the generalizability of the findings to rural populations.

CONCLUSION

Snakebite is a common and potentially life-threatening emergency in the study area, with Russell's viper being the predominant vasculotoxic snake and cobra the common neuroparalytic snake. Delayed hospitalization was associated with increased morbidity and mortality. Early administration of ASV was associated with better outcomes, while the 20-minute whole blood clotting test served as a simple and reliable tool for detecting coagulopathy. Early recognition of respiratory insufficiency, renal dysfunction and timely interventions such as ventilatory support and haemodialysis are essential to reduce complications and mortality. Adequate availability of ASV, close monitoring and prompt management of complications, along with public education regarding prevention, first aid and early hospital referral, are crucial for improving outcomes in snakebite envenomation.

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