Clinico-Epidemiological Study Done at a Tertiary Care Centre in Western Ghats of South India and Outcome of Snakebite Cases

Abstract

Background & objectives: Snakebite is a notable and neglected public health problem in tropical and sub-tropical geographical zones. Management of snakebites require through examination, careful monitoring of vitals and assessment of envenomation. The epidemiological and clinical management data will provide an insight on the critical management issues and varied presentation.

Methods:A retrospective observation study was conducted at Shripad Hegde Kadave Institute of Medical Sciences, Sirsi, Uttara Kannada district of Karnataka. Patients admitted to the hospital during the period from Jan 2019 to Aug 2022 were included for the study.

Results: The data from a total of 78 participants was included for the analysis. The mean age was 38.56±17.28 years. The majority of participants 50(64.10%) were male and farmers by occupation. Majority of cases had haematotoxic symptoms (42.2%) followed by myotoxicity (33.3%). Predominant neurotoxicity was seen in only 2(2.56%) of patients.57 (73%) of participants had elevated INR ratio.67(85.9%) participants were medically managed and 10 (12.82%) required surgical intervention. 3(18.75%) participants had Acute Kidney Injury. With respect to the final outcome, 71(91%) of participants were discharged after recovery.

Interpretation &Conclusion: This study provided the vital insight on clinical presentation and management of snakebite in western ghats of south India. Snakebite majorly affected male and middle-aged people. Farmers were most affected and bites occurred more during monsoon season. Due to variation in local distribution of species of snakes predominantly higher variants of vipers (lower number of krait and cobra) haematotoxic symptoms and signs were the major clinical presentation.

Keywords: Snakebite, Haematotoxic, South India, Epidemiology.

Introduction

Snakebite is an issue of public health importance in tropical and sub-tropical geographical zones. Snakebite is a neglected tropical disease. It was added to this list in 2017 [1]. The addition in the neglected tropical list results in increased efforts towards research on anti-snake venom, prevention and treatment of snake bite cases.World Health Organization estimates (WHO) about 5.4 million snake bite incidents happen each year, which results in 1.8 to 2.7 million cases of envenomation. The death estimates due to snake bite ranges between 81,410 and 1, 37,880 each year. The amputations and permanent disabilities are 3 times the deaths [2]. As per estimates of India from Indian Million death study from 2001 to 2014 and systematic reviews of studies from 2000 to 2019, the deaths due to snake bites in India is 1.2 million (average 58,000/year). The estimated snakebites are 1.11 – 1.77 million bites per year and 70% resulting in envenomation [3]. Most of the species of snakes in India (236 species) are non-venomous. Only 13 species of snakes found in India are venomous out of which maximum envenomation is due to 4 species only. The four important poisonous species are Cobra, Russell viper, Saw- scaled viper and common krait. Most venomous snake bite is from Common krait [4]. Most common population affected by snakebite are farmers, plantation workers, people living in poor environmental condition and people of low socio-economic status. The burden is sometimes underestimated as many of the victims of snakebite fail to reach health care centre and are treated by traditional healers and quacks [5]. Management of snakebites require through examination, careful monitoring of vitals and assessment of envenomation and accessibility of anti-snake venom serum (ASV). These factors have a significant impact on the outcome [6].

Snakebite incidence and mortality varies from region to region. Karnataka state situated in south India has a significant burden. In Karnataka as on year 2018-19the prevalence of snakebite is 20.3 per 100,000 population and death is 1.23 per 100,000 population [7]. The regional epidemiological data is vital in understanding the demographic and socioeconomic factors

affecting the incidence and outcomes. The clinical management data will provide an insight on the critical management issues and varied presentation. This will help in developing customized regional clinical protocols. Hence this study was performed to understand the clinical and epidemiological profile and outcomes of snakebites from Western ghat region of Karnataka.

Materials and Methods

Aretrospective observation study was conducted at Shripad Hegde Kadave Institute of Medical Sciences, Sirsi, Uttara Kannada district of Karnataka(14.632923, 74.848939). The patients admitted to the hospital following snake bite were included in the study. The details of these patients which include demographic details, clinical history, presentation and management was obtained from the hospital medical records. Patients admitted to the hospital during the period from Jan 2019 to Aug 2022were included for the study. The Institutional Ethics committee approval was taken prior to conduct of the study.

Statistical Methods

The variables were analysed using appropriate statistical test. The descriptive analysis was done using the mean and standard deviation for quantitative variables. Frequency and proportion were used to analyse categorical data. Data was analysed by using coGuide software, V.1.3.[8]

Results And Discussion

The data from a total of 78 participants was included for the analysis. The results from the study gives an insight on the clinic-epidemiological profile of snakebite cases.

Table 1: Demographic Characteristics of the Patients with Snake Bite

	Parameters	Summary
	Age (years)	38.56±17.28 (ranged 3, 82)
Gender	Male	50 (64.10%)
	Female	28 (35.9%)
Locality	Rural	74 (94.87%)
	Urban	4 (5.13%)
Occupation Category	Student	15 (19.23%)
	Farmer	43 (52.12%)
	Housewife	13 (16.67%)
	Daily Wage Worker	5 (8.255%)
	Children	2 (2.56%)

The demographic profile of the study population is shown in Table 1. Majority of participants 50 (64.10%) were male. One of the reasons for the middle-aged male predominance is they are the main bread earners of the family in India. Agriculture being the predominant occupation, to avoid exposure to excessive sun rays and heat, the practice of our farmers is to work in the field during early morning or in late evening which increases the risk of snake bite. This is similar to other studies conducted in northern and southern India wherein majority of snakebite victims were male [9,10]. The mean age of the patients in this study was 38 years. This is similar to the studies where in the majority of victims are of middle age [10,11]. In our study majority of participants 74 (94.87%) were living in rural area and 43 were farmer (52.12%). This is similar to another study conducted in Karnataka which showed that maximum 93% of snakebite patients were farmers [12]. Snakebite can be considered as one of the occupational hazards of farming

wherein there is more exposure to the field and most of these farmers will be male and of middle age.

Table 2: Description of Characteristics of The Snake Bite

	Parameters	Summary
Site of Bite	Upper Extremity	25 (32.05%)
	Lower Extremity	53 (67.95%)
Seasonality (quarterly)	1st	11 (14.1%)
	2nd	23 (29.48%)
	3rd	20 (25.64%)
	4th	24 (30.77%)
Place	Outdoor	65 (83.33%)
	Indoor	13 (16.67%)
Time of bite	Morning	25 (32.05%)
	Noon	10 (12.82%)
	Evening	38 (48.72%)
	Midnight	2 (2.56%)
	Night	3 (3.85%)
Bite Mark	Yes	76 (97.44%)
	No	2 (2.56%)
Species of snake	Unknown	23 (29.49%)
	Russell viper	33 (42.3%)
	Viper	12 (15.38%)
	Saw sculled viper	2 (2.56%)
	Cobra	4 (5.13%)

With respect to characteristics of the snakebite shown in Table 2, the site of bite was observed more in lower extremities 53 (67.95%) participants and in outdoors for 65 (83.33%) participants. With respect to time of bite 38 (48.72%) participants reported evening time of bite. These results are similar to other studies which gives an idea about the behaviour of snakes and expected

interaction with humans [13,14]. In our study we analysed the seasonality of snake bite. To assess the seasonality of snake bite the whole year was divided into 4 quartiles of 3 months each. 11 (14.1%) participants had bite in the 1st quartile, 23 (29.48%) participants had bite in the 2nd quartile, 20 (25.64%) participants had bite in the 3rd quartile, 24 (30.77%) had bite in the 4th quartile. There was no significant difference in the seasonality but maximum bites were during 2nd and 4rd quartile that is April to September. This is similar to other studies done in India which showed maximum bites happen during the monsoon season in India. There is more agriculture activity and flooding of the natural habitat of snakes thus increasing human interaction. In Southern India, Halesha BR et.al showed that majority bites happen in July to September [12]. and study in Davangere by Haladi et,al showed bites occur between May to August [15]. The bite mark was visible in 97% of cases which is more than study done in Kerala by Kumaran et.al which showed 88% of cases had bite marks [10]. With respect to species of snake, in 23 (29.49%) bites species was unknown, 33 (42.3%) were Russell viper, 12 (15.38%) were viper (local species), 2 (2.56%) were saw scaled viper, 4 (5.13%) were cobra, 4 (5.13%) kraits. The various species of vipers are predominantly found in the western ghats compared to cobra and krait.

Table 3: Description of the Presenting Symptom of Snake Bite

	Parameters	**Summary**
Symptoms		
• **Local Envenomation**	Swelling	67 (85.9%)
	Cellulitis	12 (15.38%)
• **Neurotoxic symptoms**	Breathlessness	3 (3.84%)
	Neck weakness	2 (2.56%)
	Unconscious	2 (2.56%)
	Ptosis	4 (5.13%)
	Slurring of speech	1 (1.28%)
• **Other Symptoms**		14 (17.95%)

20 min Whole Blood Clotting Test	Normal	42 (53.85%)
	Abnormal	36 (46.15%)
Toxicity	Haematotoxicity	33 (42.27%)
	Myotoxicity	26 (33.33%)
	Neurotoxicity	2 (2.56%)
	Non toxic	6 (7.69)
	Neurotoxicity and haematotoxicity	6 (7.69%)
	Haematotoxicity and myotoxicity	5 (6.41%)

The presenting symptoms and toxicity are shown in table 3 above. In this study majority of cases had haematotoxic symptoms (42.2%) followed by myotoxicity (33.3%). Predominant neurotoxicity was seen in only 2 (2.56%) of patients. These features are similar to studies done in South India where haematoxicity was predominant [10,13,15]. The Northern part of India shows predominant neurotoxic presentation due to the variation in distribution of species of snake between north and south India [16]. Local swelling at the site of bite was the main clinical presentation in this study. This is similar another study by Thapar et.al in South India which showed localised swelling as the main clinical presentation [17].

Table 4: Description of Biochemical Parameters of Snakebite Patients

Parameters	Summary
Elevate INR ratio	57 (73%)
Hepatic dysfunction	3 (3.84%)
Hypoalbuminemia	2(2.6%)
Hyperkalaemia	1(1.28%)

In this study, elevated INR ratio was seen in 73% of the patients, this is high compared to study conducted in North India which showed 20% of snakebite patients had increased INR ratio [9]. This variation maybe due to difference in snake species. (Table 4)

Table 5: Description of Management of Snake Bite Patients

Parameters	Summary
Intervention	
Conservative	1 (1.28%)
Medical	67 (85.9%)
Medical and surgical	10 (12.82%)
Neostigmine used	8 (10.26%)
Anti-snake venom used	66 (84.61%)
ICU support	39 (50.00%)
Ventilator requirement	4 (5.13%)
Blood or blood product transfusion	7 (8.97%)
Dialysis therapy	2 (2.56%)
Length of stay in hospital in days (N=77)	2.55±1.60 (0.5, 8)
Type of complications (N=16)	
AKI	3(18.75%)
Debridement after 1 week	11 (68.75%)

In this study 8 (10.26%) participants required ICU support, 4 (5.13%) participants were on ventilator, 4 (5.13%) participants required blood product transfusion, 2 (2.56%) participants had dialysis therapy. In type of complications, 3(18.75%) participants had Acute Kidney Injury. A study from North India showed that the complications followed by snake bite included respiratory failure requiring mechanical ventilation (41.6%), bleeding manifestations (haematuria) 28.3%, hypotension (28.3%) and acute kidney injury in 6.6% cases[18]. Mean duration of stay in hospital is 2.55 days in our study. Patients with more complications stayed longer in hospital. Duration of hospital stay (4 days) was comparable with other studies [16]. (Table 5)

Table 6: Description of Outcomes of Snake Bite Patients

Final outcome	Summary
Discharged	71 (91%)

Discharged Against Medical Advice (DAMA)	3 (3.84%)
Referred to other centres	2 (2.56%)
Not admitted	1 (1.28%)
Death	1 (1.28%)

With respect to the final outcome, 71 (91%) of participants were discharged after full recovery. 1 participant who was referred to other center died following disseminated intravascular coagulation (DIC) and acute kidney injury (AKI). In a study conducted in North India showed death in 9.3% of cases and major reason was neurotoxic symptoms with respiratory failure [9]. Study done in Kerala showed that 13.5% death with haematotoxic symptoms succumbed to DIC and AKI [10]. Other studies done in Karnataka did not report any death in their studies.

Conclusion

Snakebite is a public health issue in the tropical and subtropical countries. This study provided the vital insight on clinical presentation and management of snakebite in western ghats of south India. Snakebite majorly affected male and middle-aged people. Farmers were most affected and bites occurred during monsoon season. Due to variation in local distribution of species of snakes (predominantly vipers) haematotoxic symtpoms and signs were the major clinical presentation. Increased INR ratio was seen in 73% of patients. Acute kidney injury complication was seen in 3 patients. The outcome was relatively better compared to other studies in India with 91% recovery.

Declarations:

Ethical and informed consent: Ethical approval was obtained from the institutional review board of the centre concerned.

Conflict of interests: The authors declare no conflicts of interest.

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