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ORIGINAL RESEARCH

A cross-sectional study of patterns and distribution of snake-bite victim treatment and possibilities to improve outcome in a rural tertiary care hospital

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ABSTRACT
Snake envenomation is a significant but neglected tropical disease, particularly affecting rural areas in India. This cross-sectional study investigates the patterns of snakebite incidents and the distribution of victims treated at a rural tertiary care hospital in Bagalkot, Karnataka. The study aims to assess the demographics, snake species involved, timing, and circumstances of bites, along with the treatment outcomes. Data from 318 cases over a five-year period (2017-2022) were collected and analyzed. The results highlight that snakebites disproportionately affect agricultural workers and occur more frequently during rainy seasons and active daytime hours. While multivalent antivenoms are the primary treatment method, there are notable limitations due to the diversity of venomous species, which current antivenoms may not fully cover. The study emphasizes the need for improved diagnostic methods, region-specific antivenoms, community health education, and better preventive measures to reduce morbidity and mortality related to snakebites.

Key words: Snakebite, envenomation, snake species

INTRODUCTION

Snake envenomation is a neglected tropical disease causing considerable mortality and morbidity in various parts of India[1].Bites by venomous snakes can cause acute medical emergencies involving shock, paralysis, haemorrhage, acute kidney injury and severe local tissue destruction that can prove fatal or lead to permanent disability if left untreated. Most deaths and serious consequences from snakebite envenomation (exposure to venom toxins from the bite) are avoidable by timely access to safe and effective specific antivenomsand supportive therapies.[1,2,10].

Indian Million death study estimated that India had 1.2 million snakebite deaths (average 58,000/year) from 2000 to 2019. Nearly half occurred at ages 30-69 years and over a quarter in children <15 years. Most occurred at home in the rural areas. About 70% occurred in eight higher burden states and half during the rainy season and at low altitude. The risk of an Indian dying from snakebite before age 70 is about 1 in 250, but notably higher in some areas. More crudely, an of estimate 1.11-1.77 million bites in 2015, of which 70% showed symptoms of envenomation. Prevention and treatment strategies might substantially reduce snakebite mortality in India[3].

In India most common snake bites are ascribed to Common cobra, Russel's viper, Sawscaled viper and Krait. Even though scientific evidence shows there are numerous species which are venomous and distribution snake species and venom profiles are also different[4].

Inspite of having large literature in support of diversity in venomics and need for different diagnostic methods and treatment modalities for snake

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bites, in India multivalent antisera is used as mainstay of treatment as per accepted protocols. This management is not without a risk of associated immunogenic reactions and various other complication[17].

In the fieldof definitive diagnosis on type of snake and venom identification, and availability univalent serum much needs to be done[4, 7, 16].

India has sufficient manufacturing capacity to produce large volumes of antivenom. Better understanding of the distribution of India's many venomous snake species could help in the design and development of more appropriate antivenoms. The current Indian antivenoms neutralize venom from only spectacled cobra (there are three other Indian cobra species), common krait (there are seven other krait species), Russell's viper and saw-scaled viper. At least 12 other species that are not covered by current antivenoms are known to have caused fatal bites in India. Only in some states do emergency ambulance services equip vehicles with lifesaving equipment and drugs, including antivenom[4,5,6].

Being located in Karnataka state, Bagalkot district is an agrarian economy where predominant occupation is seasonal farming, also has considerable mortality and morbidity due to snake bites. Snake bite are very common in agrarian setups. Many times they cause lot of anguish and causemortality and morbidity. Snakebite whether venomous or nonvenomous warrant a close medical monitoring and follow-up to ensure safety of victim of bite and safety of the snakes around the environment where bite happened as they are essential part of natural setting. Currently as the in the whole nation, protocol is to use specific antivenom for big four as treatment when a venomous bite is presumed along with supportive critical care facilities wherever they are available. And where these facilities are not available many traditional healing methods are attempted [8].

There is a paucity of systematic studies to assess the patterns of snake bite among population of Bagalkot and environment in which this happens. To explore the patterns of snake bite and find out how the snake bites can be prevented and outcomes can be improved in an event of snake bite,a composite team of medical personnel with help of local snake experts conducted series of discussions and systematic survey of victims of snake bites who were treated in S.Nijalingappa Medical College and H.S.K. Hospital and Research Centre, Bagalkot [4, 5].

In the current study attempt is being made to understand the pattern of snake bites based on the species of snakes, bite time and season, bite site, activity of victims, location and situation of bite, demographic factors, available modalities of treatment, level of preparedness after the bite among the families, and communities concerned. Some cross sectional studies have been done previously which have address about the bite pattern and treatment suggest further studies into prevention and management of envenomation. In back ground of this, preparedness and preventive measures have to be studied and also evaluate methods of community health education to better the outcomes in venomous snake bites.

METHOD AND METHODOLOGY

To estimate snake envenomation as a public health challenge, data regarding snake bite management is collected from tertiary hospital which is referral center for envenomation management for the district.

Snake envenomation cases that occurred during the period of 2017-2022 were collected. All envenomation cases that were suspected to be snake bite were involved in study irrespective of outcome.

After demographic data, management data collected, the victim's firstfamily contact was contacted over telephone, an informed consent was obtained for telephonic interview and a structured pretested questionnaire was used to collect knowledge, attitude and practice information. Data regarding levels of preventionsand knowledge of preparedness was also collected. Suggestions and expectations regarding the snake bite and its management by victim families were also collected.

RESULTS

Epidemiological and management data of 318 snake bite victims managed in Tertiary care Medical College Hospital, Bagalkot was collected and analyzed for patterns of snake species involved in bite based on history and symptomology. where data was deficientor not available it has been recorded. Data on bite site, victim activity and time and season of bite were collected and are as in the tables below.

Sl. No.	Age	Male	Female	Total
1.	0-5	10	8	18
2.	5-10	13	17	20
3.	11-20	31	19	50
4.	21-30	50	30	80
5.	31-40	44	26	70
6.	41-60	36	28	64
7.	60 and above	10	6	16
Total		197	126	318

Sl. No	Category	Numbers

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1	Children	21
2	Agricultural workers	9
3	Homemakers/Housewifes	51
4	Work related	193
5	Students	48
6	Cement factory worker	1

- Involvement of vulnerable age groups and work related SBE formed a bigger section of victims which can be easily preventable by proper preventive and protective. measures.

Case distribution based on the time of bites

Sl. No.	Time Ranges	
1.	12-3AM	38
2.	3-6 AM	24
3.	6-9AM	24
4.	9-12 PM	35
5.	12-3PM	48
6.	3-6PM	41
7.	6-9PM	57
8.	9-12PM	35

- In the paucity of data on type snake bites and specific diagnosis methodologies which if to be developed specific preventive, curative measures can be adopted.
- Bites during active hours of victims are more while during night hours also bites are common when snakes enter houses and people go out for activities.

Sl.No.	Season	
1.	Summer	78
2.	Rainy	112
3.	winter	133

Seasonal variation overlaps with human activity and snake habitat overlapping.

Inspite of asking specific questions data collected by survived victims and attendants on type of snake was not reliable and appeared biased by traditional beliefs and religious ethos.

Time taken to reach the tertiary centre varied from1 hour to 1 week depending on distance, and referral systems.

Number of days of hospital stay varied from short duration as 24 hours in non-venomous bites to 67 days where envenomation happened. With critical care monitoring from 24 hours to 3 days on an average.79 cases needed advanced supports as dialysis, ventilator support and continued critical care along with blood transfusion and rehabilitation[9, 12].

Even though very few victims and attendants could identify venomous snake features in general most of them failed to identify which snake actually bit them.In an emotionally charged environment for safety the victim and attendants generally failed to provide data to id snake based on field observation.

Most of them accepted lack of personal Protective equipments while agricultural labour and general unhygienic practice of not handling domestic waste (promoting increase in number of rats, mouse, mosquito breeding and frogs-attracting snakes, which are their predators)in appropriate manner.

Most of them expect government to give free and or full support to underprivileged communities in ameliorating the problem of snake bite.

CONCLUSIONS

Catchment of a tertiary medical centre is much wider than geographical boundaries as it involves migrants and reverse migration. Bagalkot is also a tourism centre attracting international tourists.

Snake bite envenomation is a preventablehigh mortality and morbidity topical disease affecting rural economies where snake -human contact is common.

Prevailing environment is featured with lack of infrastructure, adequate research on envenomation, venomics and lack of specific preventive, promotive, curative and rehabilitative measures[11].

As the population involved is underprivileged and also less sensitized regarding the preventive, curative and rehabilitative aspects.

It demands multidimensional approach and considerable measures to be taken by all the stake holders if a better outcomes are desired.

Funding is abarrier to achieving rapid positive and sustainable change. Whether establishing protocols for treatment and diagnosis, development of specific diagnostic kits and antivenom serum and specific antibodies produced by recombinant technology needs high level engagements[12-14].

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Region specific diagnostic kits and antivenom production programs can be long term solution [16].

Appropriate speciation of envenoming snakes and specific diagnostic kits preparation, specific antidote preparation at regional levels are to be considered.

The challenge of a neglected tropical disease for which there is no one universal solution is resource intensive task. It involves essentially building a preventive, promotive, curative and rehabilitative environments both institutionally and at community level in substantial levels to reduce mortality and morbidity. Even with global multilateral agencies as WHO and other national and international institutions working towards reducing mortality and morbidity,lot needs to be done[14].

In contrast to some other NTD vectors, venomous snakes cannot be eliminated, but SBE can be effectively prevented and controlled so that the burden of injury and the impact on those affected are substantially reduced.

Health system empowerment, community behavioural change projects in tandem with local, regional, and global public-private partnerships to mitigate this problem can be transformational[17].

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