Original Article

Epidemiological profile of snake bite at a Tertiary Care Hospital Bengaluru, India

Abubakar Siddique, Githa Kishore[1], Ejaz Mohammed Ahmed, Hafeez Abdul Khader[1]

Department of Clinical Pharmacy and Pharmacy Practice, Uniazha College of Pharmacy, Qassim University, Kingdom of Saudi Arabia, [1]Department of Pharmacy Practice, Visveswarapura Institute of Pharmaceutical Sciences, Bengaluru, Karnataka, India

Address for correspondence:
Mr. Abubakar Siddique,
Department of Clinical Pharmacy and Pharmacy Practice, Uniazha College of Pharmacy, Qassim University, Kingdom of Saudi Arabia. E-mail: getabu2u@gmail.com

Key words: Epidemiology, management, snake bite, tertiary care

ABSTRACT

Objectives: The objective of the study was to determine the sociodemographic profile and the management of snake bite cases admitted at the Kempegowda Institute of Medical Sciences (KIMS) Hospital and Research Center, Bengaluru. **Materials and Methods:** A hospital-based retrospective descriptive study was carried out from medical records held at the KIMS Hospital and Research Center, Bengaluru. **Results:** Study subjects comprised a total of 93 cases (66 males and 27 females), between the ages of 1.6 years and 72 years. The majority (24.7%) of cases were found between the ages of 19 and 30 years. During the management of snake bite, 74.1% (69) of the subjects received anti-snake venom (ASV) and adjuvant therapy. About 87 of the cases were either relieved or cured, and there were six fatalities. **Conclusion:** Snake bite was seen more among adults, male agricultural laborers and farmers, with a peak occurrence during rainy seasons. Knowledge of the varied clinical manifestations of snake bite is important for effective management in hospitals by a complete health care team. The ready availability and appropriate use of ASV, close monitoring of patients, the initiation of ventilator support and if required, early referral to a larger hospital all help to reduce mortality.

INTRODUCTION

The World Health Organization estimates place the number of snake bites to be 421,000 envenoming and 20,000 deaths occur worldwide from snake bite each year, but warn that these figures may be as high as 1,841,000 envenoming and 94,000 deaths per annum.[1] In India, an estimated 200,000 persons per year fall prey to snake bite, with an estimated mortality rate of 35,000–50,000 per year. India is the country to have the highest level of mortality from snake bites worldwide.[2,3] In India, there are 216 species of snakes, although only four of these are venomous (cobra, krait, Russell's viper, and saw scaled viper).[4]

Most fatalities occur due to the victim not reaching the hospital in sufficient time for treatment to be administered. In addition, local communities are typically not well informed about the occupational risks and simple measures, which can prevent bites. Furthermore, harmful first aid practices such as

Access this article online	
Quick Response Code:	Website: www.archivepp.com
	DOI: 10.4103/2045-080X.160991

How to cite this article: Siddique A, Kishore G, Ahmed EM, Khader HA. Epidemiological profile of snake bite at a Tertiary Care Hospital Bengaluru, India. Arch Pharma Pract 2015;6:58-63.

tourniquets, cutting, and suction; continue to be frequently employed, and studies have revealed that primary care doctors are reluctant to treat snake bite patients, mainly due to lack of confidence.[5] India is thought to have more snake bites than any other country,[6] but the incidence and frequency of snake bites varies across the different geographic regions within the country depending on factors such as climate, ecology, biodiversity, distribution of snakes, and the density of the human population.[7] Based on an epidemiological survey conducted by Hati *et al*. in 1992,[8] in 26 villages of Burdwan district, West Bengal, annually, nearly 0.16%/year of the total population experienced a snake bite, with a resulting mortality rate of 0.016%/year were observed, while in Maharashtra an incidence rate of 70 bites per 100,000 population and a mortality rate of 2.4 per 100,000/year has been reported.[9] Other states in India that show high incidences include Tamil Nadu, Uttar Pradesh, and Kerala.[10]

Snake bite is an important and serious medical problem in many parts of India. Reliable data for levels of morbidity and mortality are not available, however, since there is no proper reporting system. Moreover, the records of a large number of cases do not appear in official statistics since people often seek traditional methods of treatment.[11] Indeed, it would appear that delayed presentation to hospitals frequently contributes to increased morbidity and mortality from snake bites.[12]

Overall, this means that there are very few epidemiological studies of snake bites in India, and most research has tended to deal with clinical and management aspects of the problem.[11]

In this context, the objective of our study was to determine the sociodemographic profile and the management of snake bite cases admitted to the Kempegowda Institute of Medical Sciences (KIMS) Hospital and research center, Bengaluru. This is one of the oldest multi-specialty tertiary care hospital situated in the heart of the city of Bengaluru city and having 810 beds and a well-equipped emergency department and critical care units. The wide range of specialists in the hospital is able to provide safe, excellent, patient care for emergency cases like snake bites.

MATERIALS AND METHODS

A hospital based retrospective descriptive study was carried out using records between January 2008 and December 2011 from the medical records department of KIMS Hospital and Research Center, Bengaluru. A total of 93 cases of snake bite were found to have been admitted during the study period. Patient data relevant to the study, such as patient demographics, treatment details, admission, and duration of hospital stay were obtained from the patient data collection case sheet and treatment charts, and this information was documented on a suitably designed patient data collection form and then analyzed manually using MS Excel 2007 software.

RESULTS AND DISCUSSION

Snake bite is a significant public health problem in many countries, with large numbers of envenomings and fatalities, although it is difficult to define the actual number of snake bite victims.[13] An accurate measure of the global burden of snake bite envenoming remains elusive despite several attempts to estimate it and apart from a few countries, reliable figures on incidence, morbidity, and mortality are scarce.[14]

Hospital studies are a key source of information about snake bites, however, in our hospital-based retrospective descriptive study, we observed that the proportional case rate of snake bite was 1.33/1000 admissions in the year 2008, 1.32/1000 admissions in 2009, 2.6/1000 admissions in 2010, and 1.27/1000 admission in 2011, respectively. A total of 93 cases of snake bite poisoning were admitted to KIMS Hospital Bengaluru during the study period. There were 66 (70.96%) males and 27 (29.03%) females, giving a male-female ratio of 2.4:1 [Chart 1]. Our study subjects were between the ages of 1.6 years and 72 years. The majority (24.7%) of cases, however, were found to be between the ages of 19 and 30 years [Table 1]. The

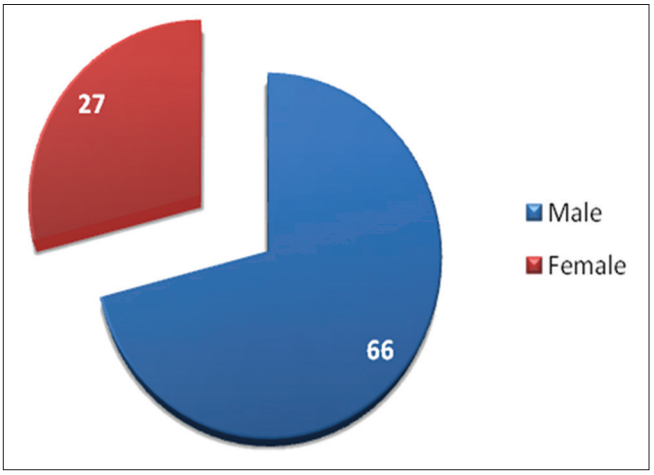

Chart 1: Gender distribution of the patient study

hospitalization time for the snake bite cases in our study varied between 1 and 66 days, with the average duration of hospital stay being 12.64 days [Table 2]. The majority of our subjects (78: 83.8%) were from rural areas. Our study showed that snake bite was commonly seen among laborers and agricultural workers, and the majority of cases were observed during the rainy season; a period of intense agricultural activity. Young men are more frequently affected and generally bites occur in the lower limbs. The incidence and mortality from snake bite also increase sharply during extreme weather events such as floods.[14]

Assessing the history of snake bite patients initially brought to the emergency department of our hospital, for most patients, treatment was started immediately with ventilation support. During the management of snake bite, 74.1% (69) subjects received anti-snake venom (ASV), followed by drugs such as antibiotics, anti-ulcer, analgesic/antipyretics, antihistamine, and adjuvant therapy [Chart 2]. About 87 (93.5%) of the cases resulted in relief or cure, and there were six fatalities (6.5%).

A widespread belief in the society is that all snake bites inevitably result in envenoming. In reality, however, bites by nonvenomous snakes are common, and bites by venomous species are not always accompanied by the injection of venom (dry bites). When envenoming does occur, it can rapidly become life-threatening. Snake venom is a complex mixture of toxins and enzymes, each of which may be responsible for one or more distinct toxic actions. In bites by South Asian viperid snakes, for example, envenoming results in local pain and tissue damage, characterized by swelling, blistering, bleeding, and necrosis at the site of the bite, sometimes extending to the whole limb.[15] Viperid venoms can also induce coagulopathy and platelet dysfunction, leading to spontaneous systemic hemorrhages and persistent bleeding from fang marks, wounds or gums. Intracranial bleeding, including anterior pituitary hemorrhage and multiple organ failure are common causes of death.[16]

Among the *Elapidae*, bites by *Naja naja* and *Naja kaouthia* can cause significant local swelling and sometimes extensive tissue necrosis of the bitten limb, whereas bites by kraits or sea snakes do not usually cause signs of local envenoming and can be virtually painless. Cobra venom contains mainly postsynaptic neurotoxins, which bind and block the acetylcholine receptors of the neuromuscular junction while krait venom, in addition, contains presynaptic toxins that damage nerve endings.[14]

Many medically important venomous snakes belong to complex groups of similar species or subspecies. Examples include the Asiatic cobras (*N. naja* species group), the *Echis carinatus* species complex, the fer-de-lance (*Bothrops utrox*) group, the Australian brown snakes (*Pseudonaju* spp.), and the sub species of the neo tropical rattle snake (*Crotulus durissus*). In some of these groups, the species or subspecies are very poorly defined and may represent artificial entities made up of heterogeneous groups of populations. Understanding the systematics of such groups is important for toxicology and clinical science,

Table 1: Age distribution of the patient study

Age in group (in years)	Number of cases	Percentage
<18	8	8.6
19-30	23	24.7
31-40	21	22.5
41-50	16	17.2
51-60	13	13.9
>61	12	12.9
Total	93	100

Table 2: Duration of hospitalization stay of the patient study

Hospitalization (in days)	Number of cases	Percentage
Up to 1-day	8	8.6
1-3	21	22.5
4-7	29	31.1
8-15	19	22.4
16-30	6	6.4
31-60	7	7.5
>60	3	3.2
Total	93	100

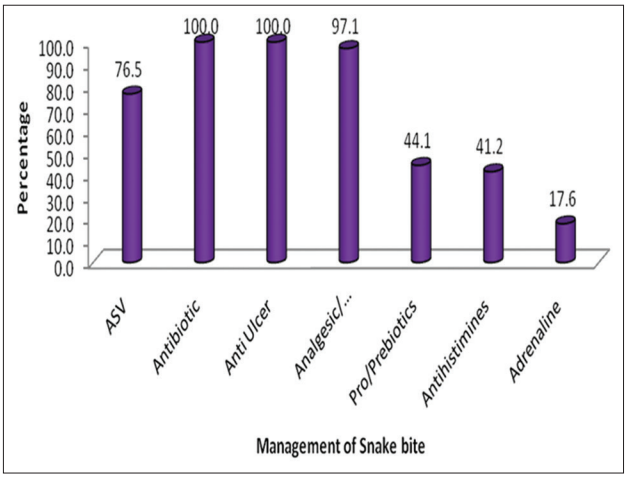

Chart 2: Treatment details of the patients study

since venom composition can vary extensively even between very closely related and similar species or subspecies. Well-known examples include *Echis* spp. and the Asiatic cobras: In these snakes, populations of very similar species have been shown to result in radically different symptoms, and the venom of one population may be poorly neutralized by anti-venom raised against the venom of another. Failure adequately to identify specimens involved in clinical cases or toxicological research can, therefore, lead to problems in treatment or to difficulties in replicating results.[17]

The management of envenomed snake bites is not limited to the administration of anti-venoms. In the case of neurotoxic envenoming, artificial ventilation and careful airway management are crucial to avoid asphyxiation in patients with respiratory paralysis. Cases of complete recovery from severe neuromuscular paralysis without anti-venom have been reported after prolonged artificial ventilation.[18] A few cases of successful anticholinesterase use have also been reported in krait bite envenoming in India.[19] Bacterial infections can develop at the bite site, especially if the wound has been incised or tampered with using nonsterile instruments, and these may require antibiotic treatment. Currently, however, there is no data supporting their systematic use.[20]

Anti-snake venom is an immunoglobulin (usually the enzyme refined F(ab)2 fragment of IgG) purified from the serum or plasma of a horse or sheep that has been immunized with the venoms of one or more species of snakes. Anti-venoms may be species specific (monovalent) or effective against several species (polyvalent), usually the most important species from a medical point of view, in a particular geographical area. The correct use of anti-venom is the most important component of hospital care, although not every bite merits its use. Administration of anti-venom should be selective and based on the severity of the clinical symptoms. The main concern about the empirical use of anti-venom is the risk of allergic reaction, its relative scarcity in some centers and the cost factor.[21]

The potential for mortality and the finely balanced medical judgments that need to be made when treating snake bites (as described above) argue for more effort to be devoted to encouraging effective first aid and then rapid hospitalization of victims of snake bite. Improving the knowledge of caregivers and local communities is crucial in this. Health workers are usually poorly trained to deal with this complex emergency. Education of local communities on snake bites, avoidance of useless or dangerous first-aid measures, and the importance of the rapid transfer of victims to treatment centers should be widely implemented to reduce morbidity and mortality. In fact, the time taken to reach a hospital has been shown to be a crucial determinant of snake bite mortality and delayed anti-venom administration was associated with an increased risk of complications.[23,24]

Criteria for anti-snake venom therapy

- Prolonged or recurring hypotension
- Persistence or recurring shock in spite of treatment
- Pronounced leukocytosis
- Protected gastrointestinal symptoms
- Acidosis
- ECG changes
- Raised serum creatine phosphokinase
- Early extensive swelling in adults
- Hemolysis
- Pregnant women, small children.[22]

Education should focus on the following key points: The bite victim should be reassured, the bitten limb immobilized with a makeshift splint or sling, and the patient transported. Walking is contraindicated because muscular contractions promote venom absorption. These simple recommendations are unfortunately rarely followed and vital time is often lost. The majority of victims first report to traditional healers. Popular traditional treatments include chanting, incisions, attempts to suck the venom from the bite site, and the application of herbal medicine or snake stones.[14]

CONCLUSION

Snake bite is a neglected, life-threatening emergency in developing countries such as India and demands immediate anti-venom therapy. It is a disease of poverty, endemic to farming regions. There is a need for the enactment of a national programmed aimed at the preventions of snakes and improving the quality of care and health education.

In this study, snake bites were more often seen among adults, male agricultural laborers and farmers, with a peak occurrence during rainy seasons. Knowledge

of the varied clinical manifestations of snake bite is important for effective management in hospitals by a complete health care team. The ready availability and appropriate use of ASV, close monitoring of patients, the institution of ventilator support and if required, early referral to a larger hospital all help to reduce the mortality.

A clinical pharmacist as a vital member of a health care team and a key person in drug and poison information centers (PIC), who should be familiar with current snake bite treatments, both local and systemic, and should be prepared to provide important information and dispel any myths about snake bite poisoning. Establishing a PIC, this should be networked with other PICs in India and also with developed countries, can help in the early identification of poisoning and can also improve case management by enabling the sharing of information.

Acknowledgments
The authors disclose no potential bias or conflict of interest relating to this article. We are thankful to Visveswarapura Institute of Pharmaceutical Sciences and KIMS Hospital and Research center for guidance and support for the study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Kasturiratne A, Wickramsinghe AR, De Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, *et al*. Estimation of global burden of snake bite and deaths. PLoS Med 2008;5:e218.
2. Brunda G, Sashidhar RB. Epidemiological profile of snake-bite cases from Andhra Pradesh using immunoanalytical approach. Indian J Med Res 2007;125:661-8.
3. Singh J, Bhoi S, Gupta V, Goel A. Clinical profile of venomous snake bites in north Indian Military Hospital. J Emerg Trauma Shock 2008;1:78-80.
4. Warrell DA. WHO/SEARO Guidelines for the clinical management of snakebite in the Southeast Asian region. Southeast Asian J Trop Med Public Health 1999;30:1-85.
5. Simpson ID. A study of the current knowledge base in treating snake bite amongst doctors in the high-risk countries of India and Pakistan: Does snake bite treatment training reflect local requirements? Trans R Soc Trop Med Hyg 2008;102:1108-14.
6. Mohapatra B, Warrell DA, Suraweera W, Bhatia P, Dhingra N, Jotkar RM, *et al.* Snakebite mortality in India: A nationally representative mortality survey. PLoS Negl Trop Dis 2011;5:e1018.
7. Bhatia BD. Scorpion sting and snake bite. In: Sachdev HP, Puri RK, Bagga A, Choudhury P, editors. Principles of Pediatric and Neonatal Emergencies. New Delhi: Jaypee Brother Medical Publishers (P) Ltd.; 1994. p. 257-64.
8. Hati AK, Mandal M, De MK, Mukherjee H, Hati RN. Epidemiology of snake bite in the district of Burdwan, West Bengal. J Indian Med Assoc 1992;90:145-7.
9. Gaitonde BB, Bhattacharya S. An epidemiological survey of snake bite cases in India. Snake 1980;12:129-33.
10. Cesaretli Y, Ozkan O. Snake bites in Turkey: Epidemiological and clinical aspects between the years 1995 and 2004. J Venom Anim Toxins Incl Trop Dis 2010;16:579.
11. Lal P, Dutta S, Rotti SB, Danabalan M, Kumar A. Epidemiolagical profile of snake bite cases admitted in JIPMER Hospital. Indian J Community Med 2001;XXVI: No. 1, Journal, 2001.
12. Warrell DA. Guidelines for clinical management of snake bites in South East Asian region. SEAMEOTROPMED – Regional Centre for Tropical Medicine, WHO; 1999. Available from: http://www.searo.who.int/LinkFiles/SDE_mgmt_snake-bite.pdf. [Last accessed on 2014 Nov 14].
13. Chippaux JP. Snake-bites: Appraisal of the global situation. Bull World Health Organ 1998;76:515-24.
14. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F. Snake bite in South Asia: A review. PLoS Negl Trop Dis 2010;4:e603.
15. Warrell DA. Clinical toxicology of snake bites in Asia. In: White MA, editor. Handbook of Clinical Toxicology of Animal Venoms and Poisons. United States of America: CRC Press; 1995. p. 493-588.
16. Warrell DA. Snake venoms in science and clinical medicine 1. Russell's viper: Biology, venom and treatment of bites. Trans R Soc Trop Med Hyg 1989;83:732-40.
17. Wtister W, Harvey AL. Reviews of venomous snake systematics in Toxicon. Toxicon 1996;34:397-8.
18. Pochanugool C, Limthongkul S, Sitprija V, Benyajati C. Management of cobra bite by artificial respiration and supportive therapy. J Med Assoc Thai 1994;77:161-4.
19. Bawaskar HS, Bawaskar PH. Envenoming by the common krait (*Bungarus caeruleus*) and *Asian cobra* (*Naja naja*): Clinical manifestations and their management in a rural setting. Wilderness Environ Med 2004;15:257-66.
20. Kularatne SA, Kumarasiri PV, Pushpakumara SK, Dissanayaka WP, Ariyasena H, Gawarammana IB, *et al.* Routine antibiotic therapy in the management of the local inflammatory swelling in venomous snakebites: Results of a placebo-controlled study. Ceylon Med J 2005;50:151-5.

21. Ray G, Parija BL, Ravi Kumar L. Advances in management of snake bite. Med Update 2011;540.
22. Pillay VV. Modern Medical Toxicology. 3rd ed. New Delhi: Jaypee Brothers Medical Publisher (P) Ltd.; 2005. p. 136.
23. Suchithra N, Pappachan JM, Sujathan P. Snakebite envenoming in Kerala, South India: Clinical profile and factors involved in adverse outcomes. Emerg Med J 2008;25:200-4.
24. Narvencar K. Correlation between timing of ASV administration and complications in snake bites. J Assoc Physicians India 2006;54:717-9.