

A Profile of Fatal Snakebite Cases in Rural Mandya: A Retrospective Study

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Abstract

Introduction: Deaths resulting from snake envenomation is a public health problem particularly in rural India. Varieties of venomous snakes inhabit in India which take thousands of human lives every year. Establishing the accurate database of snakebite in humans from rural areas of India lack certainty due to difficulty in the accessibility to health care, lack of proper reporting system, management of snakebite cases by untrained quacks and deaths prior to reaching hospital. Snakebite deaths are routinely subjected to autopsy for compensatory claims from the government as wild animal attacks. The WHO reported that in some countries the degree of under-reporting is greater than 70% especially in rural areas with poor infrastructure. In this context the present study was undertaken in our setup to see the extension of problem incorporated in our area. **Materials and Methods:** This is a retrospective descriptive study conducted from January 2014 to December 2017 at the Department of Forensic Medicine, Adichunchanagiri Institute of Medical Sciences, B G Nagara, Mandya district, Karnataka. The incidence and determinants of snakebite related mortality with reference to sex, age, occupation, season, time, place, site of bite, envenomation type and hospital treatment, history prior to the death and cause of death were recorded and the data was analyzed by using Excel 2010 and SPSS (Version 23) software and the results were expressed in percentages. **Results:** Amongst 23 fatal snakebite cases, 52.2% were males, the vulnerable age group were those in 31-60 years age group, farmers (43.5%) were most commonly affected, maximum number of deaths reported during rainy season (39.1%) and occurred during morning hours (30.5%) and most cases (82.6%) suffered outdoor bites. The lower limb (78.3%) was the most common site of bite and most common type of envenomation was vasculotoxic (56.6%). Haemorrhagic shock (47.8%) was the most common cause of death and only 56.5% received treatment in hospital. **Conclusion:** Snakebite is invariably an accident. As it is an accident, it can be avoided in many cases, but need some judicious, timely precautions to avoid the risk of snakebite and mortality associated with it. People should be made aware of such preventive measures by educating them.

Keywords: Snakebite; Rural Area; Death.

Introduction

There are 2400 species of snakes distributed around the world; of them 10% are venomous [1]. Amongst 52 poisonous species are reported to be found in India [2]. In this majority of bites and

consequent mortality is attributable to only 5 species viz. *Bungarus caeruleus* (krait), *Ophiophagus hannah* (king cobra), *Naja Naja* (common cobra), *Daboia russellii* (Russell's viper) and *Echis carinatae* (saw-scaled viper). WHO said, the available epidemiological data are fragmented and lack both resolution and completeness. Despite such shortfalls with the available data, it is estimated that more than 4.5-5.4 million people in the world suffer snakebite every year, among them that 1.8-2.7 million of them develop clinical illness (envenoming) after snakebite, and the death toll could range from 81,000 to 138,000 [3]. The distribution of envenoming and mortality worldwide is variable; while numerically lowest in Europe, Australia and North America, it is highest in sub-Saharan Africa, South Asia and South-East Asia. This is also where most of the world's

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population lives, bringing humans and snakes into direct conflict. Surveys in India have also shown that the scale of this problem is far greater than suggested by hospital-based statistics and that these global figures greatly underestimate the actual incidence of snakebite envenoming and the resulting mortality and disability. Further the accuracy is still more reduced by the fact that many victims in the rural areas, do not attend health centers or hospitals, and instead rely on traditional treatments. If the victim survives the incident, he/she will never turn up, but if death occurs, it will be reported to legal authority for conducting autopsy and to claim compensation from government as wild animal attacks. Such reporting helps the autopsy surgeon to know the exact number of deaths occurring in respected jurisdiction by snake bite. In this context the present was undertaken in our setup to know the incidence and determinants of snake bite related mortality.

Materials and Methods

This is a retrospective descriptive study conducted on all fatal cases of snakebite autopsied during January 2014 to December 2017 at Department of Forensic Medicine, AIMS, BG Nagara, Mandya district were included. A detailed review of the first information report, post mortem report and medical records were done to collect the information regarding the incidence and determinants of snakebite related mortality with reference to sex, age, occupation, season, time, place, site of bite, envenomation type and hospital treatment history prior to the death and cause of death were recorded. The data was analyzed

by using Excel 2010. and SPSS (Version 23) software and the results were expressed in percentages.

Results

A total of 596 autopsies were conducted during the study period, amongst 23 (3.86%) fatal snakebite cases were reported (Table 1). Maximum number of fatal snakebite cases occurred in the year 2017 (39.1% cases). In relation to sex 52.2% were males and 47.8% females, the vulnerable age group among both men and women were those in the 31- 60 years age group (65.2%), (Table 2). By occupation, 43.5% were farmers, 26.1% were homemakers, 21.7% were children and 8.7% were labourers, (Table 3). In relation to season (Table 4), maximum number of deaths reported during rainy season (39.1%) followed by autumn and summer (21.7% each). The peak incidence of snakebite occurred during morning hours (30.5%) and most cases (82.6%) suffered outdoor bites (Table 5,6). The lower limb (78.3%) was the most common site of bite (Table 7). The most common type of envenomation was vasculotoxic (56.6%). Haemorrhagic shock (47.8%) was the most common cause of death followed by respiratory failure (39.1%), multi organ dysfunction (8.8%) and neurogenic shock (4.3%), (Table 8). Among the victims, 56.5% received treatment in hospital, 17.3% from quacks and the remaining 26.1% not received treatment in time and /or died before reaching hospital (Table 9).

Table 1: Profile of fatal snakebites among autopsy conducted during study period

Year	No of Post Mortem conducted	Total fatalities due to snakebite
2014	130	3
2015	157	5
2016	151	6
2017	158	9
Total	596	23

Table 2: Age and Sex wise distribution of cases

Age (Years)	Male	Female	Total	Percentage
0-18	3	2	5	21.7
19-30	1	0	1	4.3
31-60	7	8	15	65.2
>61	1	1	2	8.7
Total	12	11	23	100.0

Table 3: Occupation wise distribution of cases

Occupation	Frequency	Percentage
Farmers	10	43.5
Laborer's	2	8.7
Homemakers	6	26.1
Children	5	21.7
Total	23	100.0

Table 4: Distribution of cases based on season

Season	No of cases	Percentage
Summer season (Mar to May)	5	21.7
Rainy season (Jun to Sep)	9	39.1
Autumn season (Oct to Nov)	5	21.7
Winter season (Dec to Feb)	4	17.4
Total	23	100.0

Table 5: Distribution of cases based on time of occurrence

Time of Occurrence	Frequency	Percentage
Morning	7	30.5
Afternoon	6	26.1
Evening	5	21.7
Night	5	21.7
Total	23	100.0

Table 6: Distribution of case based on place of victim at the time of bite

Indoor	4	17.4
Outdoor	19	82.6
Total	23	100.0

Table 7: Distribution of case based on site of bite

Site of Bite	Frequency	Percentage
Head and Neck	1	4.3
Upper limb	4	17.4
Lower limb	18	78.3
Trunk	0	0.0
Total	23	100.0

Table 8: Distribution of case based on type of envenomation of toxin and cause of death

Envenomation	Causes of Death	Frequency	Percentage	Total percentage
Neurotoxin	Respiratory failure	9	39.1	43.4
	Neurogenic Shock	1	4.3	
Vasculotoxic	Haemorrhagic Shock	11	47.8	56.6
	Multiple organ failure as a result of DIC	2	8.8	
Total		23	100.0	

Table 9: Distribution of case based on whether patient was treated in hospital or not

	Frequency	Percentage
Treated in hospital	13	56.5
Treated by quack medicine	4	17.4
Not treated	6	26.1
Total	23	100.0

Discussion

A death due to snake envenomation is a public health problem particularly in rural India. The accurate database of snake-bites in rural areas is a necessity in spite of lack in certainty due to the well known facts like difficulty in the accessibility to health care, treating by quacks, lack of proper reporting system and death occurring outside health care facilities. Mohapatra B, et al., conducted a nationally representative study of 123,000 deaths from 6,671 randomly selected areas in 2001–03. A total of 562 deaths (0.47% of total deaths) were reported due to snake bites, of which 97% occurred in rural areas itself [4]. Since our medical college and hospital, a tertiary centre located in rural area, the present study thought to spot light exact extension of problem.

In the present retrospective descriptive study, all fatal cases of snake bite autopsied during January 2014 to December 2017 were included, a total of 596 autopsies were conducted during the study period and amongst, 23 cases were fatal snakebite cases. Table 1, shows increase in the rate of incidence every year towards the maximum number (39.1%) of cases in the year 2017. Of total, 52.2% were males and 47.8% were females with sex ratio of 1.09:1. The vulnerable age groups among them were those in the 31- 60 years (65.2%). The reason could be attributed to the fact that they form the productive age group and population (Table 2).

In an epidemiological field survey by Hati AK et al., on snake bite was conducted on 26 randomly selected villages with a population of 18,892 in the district of Burdwan, West Bengal India. He reported, males (54.72%) were bitten more than females (45.23%) and highest incidence of snake bite was found in the age group of 21-30 years [5]. In a similar study by Kumar AGV et al., reported, 69.1% of cases involved were males and 30.9% cases were females and maximum number of victims were in the age group of 41-50 years (33.8%), followed by 21-30 years (25%) [6]. In another study, Mohapatra B, et al., reported that, death is more common in males (59%) than females (41%) and peaked at ages 15–29 years [4].

The occupations (Table 3) of the majority of the cases in our study were farmers (43.5%), followed by homemakers (26.1%), children (21.7%) and labourers (8.7%). 39.1% of snakebite fatalities occurred during rainy season, i.e. in the month of June to September followed by 21.7% each in autumn and summer season (Table 4). The peak incidence of

snakebite occurred during morning hours (30.5%) and most cases (82.6%) suffered outdoor bites (Table 5,6). The lower limb (78.3%) was the most common site of bite (Table 7).

However it is as well known fact the majority of the rural population in India is dependent on the farming. Hence adults and children are often employed in the farm fields in early hours during raining season. Snakes tend to get attracted to agricultural areas, such as paddy fields, where they can find abundant food sources, such as rodents, which results in increase risk of making contact with snakes and this coupled with bare foot walking in the fields makes foot an easy accessible area for snake bite.

In a study by Hati et al., said snake bite cases occurs during the months of July and August.

Majority of the snake bites (53%) were encountered in the lower extremities [5]. Kumar AGV et al., reported maximum number of cases occurs during rainy season (60.3%), majority of the farmers (45.6%) become victims because during this period there is intense agricultural activity in the field. The peak incidence of snake bite occurred during night hours (63.2%) and most cases (70.6%) suffered outdoor bites and affected mainly the lower limbs (70.6%) [6].

Even though the incidences occurred commonly in farmer's peaking during the monsoon and outdoor bites as mentioned in other studies, contrarily, Snake bites were common in the day time hours in our study. This result was in accordance with Chattopadhyay et al., in his study reported that "Majority of the incidences occurred during the monsoon periods and at day time with male preference of age group 21–30 years [7].

Aramani CS et al., in his study quoted that snake bites and snake bite fatalities peak during the monsoon season, probably reflecting agricultural activity, flooding, increased snake activity, and abundance of their natural prey [8].

In our study, the most common type of envenomation was vasculotoxic (52.2%). Haemorrhagic shock (47.8%) was the most common cause of death followed by respiratory failure (43.5%), multi organ dysfunction (8.8%) consequent upon disseminated intravascular coagulopathy and neurogenic shock (4.3%) (Table 8). Among the victims, 56.5% received treatment in hospital, 17.3% from quacks and the remaining 26.1% did not receive treatment in time and/or died before reaching hospital (Table 9).

In a study by Kumar AGV et al., The most common type of envenomation was neurotoxic (76.5%) and cause for death was respiratory failure. Common krait was responsible for maximum mortality (61.8%) [6]. It is in contrast to our findings, however our results were corresponding to the findings of the study by Aramani CS et al. In his study, the most common type of envenomation was vasculotoxic (37.02%), only 6.14 were neurotoxic and remaining were nonpoisonous snakes [8]. However, in our study, the exact type of snake was not known in most of the cases, among known, 4 cases had cobra bite and 3 cases had common krait bite and 2 cases were due to saw-scalded viper bite. It may be attributed to lack of awareness of the public or snake could not be traced out. In the present study, we observed an increase in number of deaths due to snake bite every year and nearly half of fatal cases (43.5%) still failing to reach hospital within the reasonable time to get a proper care and or they depend on potentially dangerous traditional treatments such as tight ligatures (tourniquets), incisions, suction and application of herbs, ice, chemicals, "snakestones" etc. and this situation is not different in any rural part of India. At the same time, the lower level of health care facility which often are inadequately equipped and staffed in rural areas must be made to cope with the emergency services which may include adequate staff, a range of medical skills, equipment's, anti-venom etc [9].

Conclusion

Snakebite is invariably an accident. As it is an accident, it can be avoided in many cases, but need some judicious, timely precautions to avoid the risk of snakebites. People should be made aware of such preventive measures by educating about the local snakes, sort of places where they like to live and hide, at what times of year, at what times of day or in what kinds of weather they are most likely to be active. This helps to curtail many numbers of fatal incidences.

Still due the lack of knowledge and awareness among the public, the effort of government is going

in vein in reducing deaths due to snake bite. So creating awareness and knowledge through media, street plays, or by educators/health workers, NGO's etc. may help to reduce such cases.

Recommendation

Systematic reporting on snake bite must be made mandatory throughout the country to generate accurate burden of snake bite incidences in different localities. Such database can play a significant role in making better health policy by identifying the regions which require urgent attention.

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