**Original Paper** 

# Fatal Snake Envenomation: A Retrospective Study

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## ABSTRACT

In developed countries, incidence of snakebites is increasing amongst those who unlawfully keep snakes as pets. Whereas in developing countries, hazardous snakebites occur mainly among rural population active in agricultural work, labourers, herders, professional snake handlers, trekkers, snake charmers and fishermen. Snakebite remains an important cause of accidental death in modern India. The estimated total of 45,900 national snakebite deaths in 2005 constitutes about 5% of all unnatural deaths and nearly 0.5% of all deaths in India.

In our study of 13 cases of autopsies on death due to snakebite, maximum number of cases, i.e., 5 (38.4%) involved the age group 41–50 years, 12 (92.3%) cases happened in rural areas, of which 7 (53.8%) cases occurred while working in the field. Maximum number of incidents of snakebites, i.e., 7 (53.8%) occurred during morning hours between 8 am and 12 pm.

# Key Words: Snakebite; Autopsy

# INTRODUCTION

Snakebite is a common and frequently devastating environmental and occupational disease, especially in rural areas of tropical developing countries. Its public health importance has been largely ignored by medical science.<sup>1</sup> Snakes are ectothermic vertebrates with elongated body covered with scales and have no limbs or limb girdles, external auditory openings and movable eyelids.<sup>2</sup> Alexander the Great invaded India in 326 BC, and was greatly impressed by the skill of Indian physicians, especially in the treatment of snakebites.<sup>3</sup>

Though snakes are known to human beings since time immemorial, the actual scientific study on Indian snakes was done by Patrick Russell (1727–1805). Thus, he is known as "Father of Indian Ophiology." He was the pioneer in Indian ophiology and also the first to distinguish venomous snakes from non-venomous snakes, and to describe Russell's viper which is named after him.<sup>4</sup>

In developed countries, the frequency of snakebites is increasing among those who unlawfully keep snakes as pets. But in developing countries, hazardous snakebites occur mainly among rural population active in agricultural work, labourers, herders, professional snake handlers, trekkers, snake charmers and fishermen.<sup>5</sup>

There are 276 species of snakes in India, of which 62 species are venomous, 42 are mildly venomous and 172 are non-venomous.<sup>6</sup> Among the 62 venomous species, 20 are sea snakes and 42 are land snakes. Of the 42 species of land snakes, 38 species have very limited distribution. The remaining four are known for the vast majority of snakebites and associated mortality and morbidity. They are referred to as the "big four," and comprise Indian cobra, common krait, Russell's viper and saw-scaled viper.

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India has 13 highly venomous snake varieties. The five most deadly are the common cobra, the krait, Russell's viper, the saw-scaled viper and the hump-nosed pit viper.<sup>7</sup>

Snakebite remains an important cause of accidental death in modern India, and its public health importance has been systematically underestimated. The estimated total of 45,900 national snakebite deaths in 2005 constitutes about 5% of all injury-related deaths, and nearly 0.5% of all deaths in India.<sup>3</sup>

# MATERIALS AND METHODS

The present retrospective study was conducted in the Department of Forensic Medicine, Victoria Hospital, Bangalore Medical College and Research Institute, Bangalore. The study was done on autopsies of fatal snakebite cases, conducted in this department during the period 01 January 2013 to 31 December 2013 (1 year). After perusing the facts provided by the police, complete medicolegal autopsy was done in each case, along with relevant histopathological examination to arrive at a conclusion about the cause of death. Frequency and percentages were computed using Microsoft Excel in this survey.

## RESULTS

In this study extending over 1 year, 3844 autopsies were conducted. Of these, 13 (0.3%) were deaths due to snakebite (**Table 1**). Among these cases, 9 (69.2%) were male and 4 (30.8%) were female. Maximum number of cases, i.e., 5 (38.4%) were in the age group 41–50 years, 2 each (15.4%) were between 11–20 years, 31–40 years and 51–60 years, followed by 1 (7.7%) each between 21–30 years and 61–70 years.

Table 1: Incidence of snakebite deaths

Number of Autopsies	Nature of Death	Percentage
3844	All unnatural causes	100.0
13	Snakebite	0.3
3831	Unnatural causes other than snakebite	99.7

Out of 4 females, all were housewives, and out of 9 males, 4 (44.4%) were farmers, 2 (22.2%) painters, 2 (22.2%) students, and 1 (11.2%) was a snake wrangler (**Fig 1**).

Of the total 13 snakebite cases, 12 (92.3%) incidents happened in rural areas, where 7 (58.3%) occurred while working in the field, 2 (16.7%) while walking, 2 (16.7%) while sleeping, and 1 (8.3%) while answering nature call in the open field. One case (7.7%) happened in an urban area when a snake wrangler attempted to catch a snake. As per the history provided, 10 (76.9%) out of 13 snakebite cases were treated in hospital and 3 (23.1) were treated by folk medicine practitioners. It was observed histopathologically that 6 (46.1%) cases had acute tubular necrosis, 3 (23.1%) had disseminated intravascular coagulation, 1 (7.7%) case each had benign nephrosis of kidney, congestion and oedema of all organs, pericardial/ intramuscular/intra-alveolar haemorrhages, while 1 case (7.7%) was not subjected to histopathological examination (Fig 2).

Maximum number of incidents of snakebite, i.e., 7 (53.8%) occurred during morning hours between 8am to



Fig 1: Occupation statistics of snakebite deceased



HISTOPATHOLOGICAL REPORT

Fig 2: Histopathological details: Snakebite deceased

12 noon, followed by 3 (23.1%) in the evening between 4 pm to 8 pm, 2 (15.4%) in the night between 8 pm to 8 am, and 1 (7.7%) in the afternoon between 12 pm to 4 pm.

## DISCUSSION

Envenoming resulting from snakebites is a particularly important public health problem in rural areas of tropical and subtropical countries situated in Africa, Asia, Oceania and Latin America. Snakebite is primarily a problem of the poorer rural populations in these regions and affects mainly those involved in subsistence farming activities. Poor access to health services in these settings and, in some instances, a scarcity of antivenom, often leads to poor outcomes and considerable morbidity and mortality. Many victims fail to reach hospital in time or seek medical care after a considerable delay because they first seek treatment from traditional healers. Some even die before reaching hospital.8

Every case of snakebite should be taken to a qualified doctor. The victim must be admitted in a hospital and observed for at least 24 hrs for signs and symptoms and treated accordingly. Even in known cases of non-venomous snakebite, the victim should be taken to a doctor for administration of tetanus toxoid.

Though application of tourniquet is not advised any more,9 in the event that a victim is brought with tourniquet, the following procedure should be followed. Sudden release of tourniquet is never to be done as it leads to massive surge of venom into systemic circulation causing sudden deterioration or rapid development of life threatening systemic envenomation such as neurological paralysis,

hypotension due to sudden generalized vasodilatation, etc. The attending doctor must be prepared to handle anticipated complications. Before removal of the tourniquet, presence of pulse distal to the tourniquet should be tested. Life saving drugs and equipment such as mechanical ventilator should be kept ready. If a tourniquet has occluded the distal pulse, then a blood pressure cuff can be applied to reduce the pressure slowly.

Snakebites can be prevented by simply learning the type of snake inhabiting in respective regions and learning their behaviour and habitat. One must always carry a torch while walking in the dark and 'mind one's step.' Clothing covering the legs such as full pants and protective footwear such as shoes or gum boots act as a barrier and minimize the venom injected. In snake-infested areas, one must make sure that snakes are not taking refuge in shoes, pockets of coats, trousers, etc., before they are worn, Tea and coffee plantation workers should be vigilant while working as bushes are a favourite habitat of snakes.6

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