

Snake Bite as a Public Health Problem: Bangladesh Perspective

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Abstract

Snake bite is an important but often under-recognized public health problem in Bangladesh, with an incidence density one of the highest in the world, which may be 623.4/100,000 person years. The proportion of poisonous snake bites is 10 to 45%, with the reported mortality 0.5 to 22%. Among the 82 species of snakes, 28 are venomous; bites by green pit vipers, cobras and kraits are the most commonly identified ones. High population density, widespread agricultural activities, numerous venomous snake species and lack of functional snake bite control programs favour the high burden of snake bites. Poorer rural populations are the main victims, imposing considerable socioeconomic impact. Treatment of snake bite is largely dominated by traditional snake charmers (Ozha) or 'Kaviraj' offering unscientific practices and healers, causing undue delay and precluding standard medical management. Delayed presentation to the

hospital, lack of availability of antivenom and modern management facility are the main causes of death. Antivenoms are entirely dependent on import, are expensive, and are not 'customized' to local needs. Auxiliary intensive care facilities are not widely available; health care personnel often lack necessary expertise. However, the trend is changing. Public awareness is growing, health care personnel are being trained, and a national guideline for snake bite management has been formulated. Further research, introduction of modern diagnostic facilities, local manufacture of antivenom, and above all, integrated approach on the part of Government, policy-makers and international community can change the outlook of snake bite as a neglected tropical condition in Bangladesh.

Key words: Snake Bite, Antivenoms, Bangladesh.

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Introduction

Envenoming resulting from snake bites is a particularly important public health problem in rural areas of tropical and subtropical countries in Africa, Asia, Oceania and Latin America.¹ However, the burden of human suffering caused by snake bite remains unrecognised, invisible, and unheard by the global public health community, forgotten by development agencies and governments alike.² The problem is so underrated that it was only

added to WHO's list of neglected tropical diseases in April, 2009.¹ Being a tropical country, snake bite is a common problem in Bangladesh. But, the magnitude of the problem is largely unknown.

Rationality of the Review

Data related to snake bite in Bangladesh are often insufficient, suffer from statistical flaws and are not readily available. Some articles were published in national, non-indexed journals which are not available online and difficult to procure. Recognizing these limitations, the present review has been planned to compile the available data on this important public health issue. This review will hopefully encourage future research and act as an important source of information.

Methods

Data have been collected from the articles available from MEDLINE and BanglaJOL supported by the International Network for the Availability of Scientific

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Publications (INASP) up to the year 2014. Besides this, national journals which are not available online but recognized by the Bangladesh Medical and Dental Council have also been considered.

Case study

Case 1

A 42-year-old farmer was admitted in a tertiary hospital in the northern region of Bangladesh in March 2009 with history of snake bite. The snake was brought with, which was later identified as cobra. He was anxious, restless, pulse 112/minute, B.P. 100/60, temperature normal. He also developed features of neurotoxicity e.g., drooping of both eyelids, and broken neck sign. (Figure 1, left panel). After counseling, treatment was started. Three doses of



Fig.-1: Features of neurotoxicity (left panel) and response to antivenom therapy (right panel).

polyvalent anti-venoms were given along with other supportive measures. His condition gradually improved and within 72 hours, there was full recovery. (Figure 1, right panel). The injured snake ultimately died.

Case 2

A 30-year-old farmer was admitted in a tertiary hospital in the capital city of Bangladesh in March 2013 with history of snake bite. The patient was drowsy, with cold clammy extremities and cyanosis. His pulse was 130/minute, feeble, and B.P. unrecordable. Suddenly he developed cardiac arrest, monitor showed polymorphic ventricular tachycardia followed by ventricular fibrillation, (Figure 2) which was defibrillated successfully. Along with cardiac medications, polyvalent antivenom was given. Ultimately, there was full recovery.



Fig.-2: ECG showing polymorphic ventricular tachycardia followed by ventricular fibrillation in a snake bite case.

Epidemiology of Snake Bite in Bangladesh

Snake bite is an important occupational injury affecting farmers, plantation workers, herders, and fishermen, resulting in considerable mortality and morbidity throughout the world, specially the tropics. Despite this, the exact incidence and prevalence of snake bite is not known. Few attempts have been made to quantify the burden, and recent estimates all suffer from the lack of an objective and reproducible methodology.³ An estimated 5-4-5-5 million people are bitten by snakes each year, resulting in between 20 000 and 125 000 deaths.^{3,4} These figures may be as high as 1,841,000 envenomings and 94,000 deaths.³ The highest burden of snake bites is in South Asia, Southeast Asia, and sub-Saharan Africa.³ High population density, widespread agricultural activities, numerous venomous snake species and lack of functional snake bite control programs have credited the South Asia to be the world's most heavily affected region.⁵ The epidemiology of snake bite is largely unknown in Bangladesh. The true incidence is probably substantially higher than what is known. According to a recently published epidemiological survey, the incidence density of snake bite among the rural Bangladeshi population is 623.4/100,000 person years.⁶ Previously reported incidence was 4.3/100,000 populations with upto 22% mortality.^{7,8} Between 1993 and 2003, 1666 snake bite victims attended the Chittagong Medical College Hospital (CMCH), among those victims, 28.5% were bitten by poisonous snakes and the death rate was very low i.e. 0.5%.⁹ Another hospital-based study carried out in Rangpur Medical College (RMC) found that majority of the snake bites (90.09%, n=100) did not show signs of

envenomation, and most of the venomous bites were by krait (77.78%) and cobra (22.23 %); the mortality rates were found 5.71% in general, and 54.55% in envenomated patients.¹⁰

Pattern of Snake Bites in Bangladesh

In Bangladesh, among the 82 species of snakes, 28 are venomous, 12 species of them are sea snakes.¹¹ Bites by green pit vipers (*Cryptelytrops erythrurus* and other species), cobras (*Naja* species) and kraits (*Bungarus*) are the most commonly identified ones, whereas Russell's viper (*Daboia russelii*) appears to be rare and saw-scaled vipers (*Echis* species) non-existent.¹² Sea snakes also constitute an occupational hazard for fishermen, but the incidence of their bites is unknown.¹² Recently, the greater black krait (*Bungarus niger*), has been reported as a newly recognized cause of neuro-myotoxic snake bite envenoming in Bangladesh.¹³ Majority of the snake bites are nonvenomous, or mildly poisonous. Bite by venomous snakes does not always produce clinically manifest envenomation. The proportion of poisonous snake bites in Bangladesh may be 10 to 45%.^{9,10} Mortality from snake bites is not known exactly; the reported mortality varies widely from 0.5% to 22%.^{7-10,14,15} Neurotoxic envenoming by kraits and cobras is the principal cause of snake bite mortality in Bangladesh.¹² In a series of 537 total snake bite cases in Chittagong, the neurotoxic snake bite was 10%, with 51 cobra bite and 12 kraits bite.¹⁶

Poorer rural populations are the main victims of snake bite in Bangladesh. Most often the victim gets the bite during day to day occupational activities like cultivation, fishing, plantation, wood collection, watching the 'crop' or 'garden' lying in floor or even during rural foot walk, sometimes it happens in home surrounding like while on chicken or pet bird care.¹⁷ Most bites occur in the rainy season between May and October with the highest number in June.^{14,18} Lower and upper limbs are the most common sites of snake bite. Delayed presentation to the hospital, lack of availability of antivenom and modern management facility are the main causes of death.¹⁸ In a small, hospital-based study, mean time of interval between bite and hospitalization was 7.8 ± 9.5 hours.¹⁴

Current Status of Snake Bite Management in Bangladesh

Traditionally, snake bite is a symbol of hopelessness. Ignorance, poverty, adoption of traditional modalities of treatment, poor access to health services, and, in some instances, a scarcity of antivenom, often leads to poor outcomes and considerable morbidity and mortality. Actually, the field of 'snakes and snake bite' has a mythological fragrance in the mind of people in this part of the world.¹² Treatment of snake bite was largely dominated by traditional snake charmers (Ozha) or 'Kaviraj' and even now, people are mostly unaware of the standard medical management of envenomation. On occurrence of snake bite, classically, an intense panic supervenes, which is soon followed by application of tourniquets, and rush to the traditional healers. Traditional methods of management include application of unnecessary tight tourniquets ('Taga'), multiple incisions, sucking out the 'poison' by mouth, application of herbal products and different rituals including recitation of verses or 'mantras'. In the meantime, there is a variable but significant delay, taxing on the golden time to offer definitive medical treatment. The outcome is largely determined by chance. Sometimes, the victim escapes death simply because of the fact that most snake bites are of non-venomous type, and all venomous bites do not deliver adequate poison to cause fatal envenomation every time. In addition to mortality, some snake bite victims survive with permanent physical sequelae due to local tissue necrosis and, sometimes psychological sequelae.¹² A number of medicinal plants are used for snake bites by the traditional healers in different parts of Bangladesh.¹⁹⁻²¹

The economic impact of snakebite can be considerable.¹² Most of the victims are active adults, sometimes the only earning member of the family; death or handicap of the snake bite victim may deprive the family of regular livelihood. In a recent study in Bangladesh, the total expenditure related to snake bite varies from US\$ 4 (US\$ 1 = Taka 72) to US\$ 2294 with a mean of US\$124 and the mean income loss was US\$ 93. Expenditure for venomous snake bite was US\$ 231, which

is about 7 times higher than non-venomous snake bite (US\$ 34). So, the treatment imposes a major economic burden on affected families, especially in venomous snake bite cases.¹⁵

Identification of snake species is crucial for optimal clinical management, because it allows clinicians to choose the appropriate treatment, anticipate complications, and therefore to improve prognosis. Moreover, as specific antivenoms are not available for South Asian pit vipers and most krait species, identifying these species would help to avoid wasting this expensive treatment and exposing patients to antivenom-induced adverse reactions.⁵

But in many cases, the biting snake cannot be identified, or even misidentified.^{5,22}

Physicians, in general, are not well trained through guideline in our country and have no experience in dealing cases of snake bite before.²³ Immunoassays for detecting venom antigens in body fluids have been described for a number of species²⁴⁻⁶, and attempts have been made to develop ELISA tests for South Asia²⁷⁻⁹. PCR amplification and sequencing of snake DNA obtained from bite-site swabs has recently been used to identify biting snakes.⁵ However, at present, none is available for clinical use in Bangladesh.

The mainstay of treatment of venomous snake bite is the infusion of appropriate antivenom. Antivenoms used currently for the treatment of snake bite in Bangladesh are not locally produced, rather imported from the neighboring country. Sometimes, they are not readily available, and are relatively expensive. The currently available antivenoms are polyvalent, contain antibody against cobra, Russell's viper, common krait and saw-scaled viper, but not against uncommon kraits, pit vipers and sea snakes.³⁰ Moreover, in Bangladesh, antivenom is often utilized poorly due to lack of experience and training. Many times it is avoided in indicated cases due to fear of anaphylaxis but administered to patients when there is no indication.²³ In addition to antivenom therapy, management of snake bite also includes supportive therapy, such as ventilation for respiratory paralysis, which is often lifesaving for victims bitten by species which cause

severe neurotoxicity. These facilities are mostly available in large cities in the country at present.

Snake bite management in Bangladesh is a history of ignorance and neglect; probably the breakthrough in this regard was the first initiative undertaken by Professor MA Faiz, a renowned internist and medical researcher of the country.¹² He established a snake bite study clinic in CMCH, started using polyvalent antivenom, and conducted public awareness meeting in rural areas involving the snake charmers and traditional healers. Seeing the 'miraculous' recovery of nearly-dead people, it soon became popular in public. A national guideline was formulated and a training module was developed for the general physicians. So far, more than 1000 physicians have been trained through an ongoing program of Directorate General of Health Services (DGHS). Snake bite is now recognized as an eminently treatable medical condition in Bangladesh.¹²

Future Directions

Data related to different aspects of snake bite in Bangladesh are inadequate. Large, preferably nationwide epidemiological and clinical studies should be carried out to gain reliable information on this important public health issue. Collaboration with international organizations may be helpful. Snake bite management should be integrated with primary health care. Side by side, physicians and allied personnel should be methodically trained. The existing misbeliefs and taboos should be removed. Public awareness should be raised regarding modern scientific management of snake bites, and it may be part of the national media strategy and the health education curriculum.

Most important is to ensure adequate supply of antivenom at an affordable price. Both mono- and polyspecific antivenoms should better be in supply. Measures should be taken to produce antivenom locally based on local pattern of snakes and snake bites. This may reduce cost, aid in more specificity in action and reduce adverse reactions. A snake venom research lab can be established so that local pattern of snakes and snake bites can be studied for better management of envenomation. Besides antivenom,

intensive care facilities with ventilators are often essential for management of snake bites, so these should be available.

Prevention of exposure to snake bites should be promoted. Public awareness should be created regarding lying on the floor, occupational activities in bare foot etc.

Conclusion

Snake bite is an important but under-recognized public health issue in Bangladesh. Many aspects of snake bite are yet to be explored. Historically, snake bite management was the domain of the traditional healers; however, the trend is changing. We have no more time to lapse. Large-scale, preferably, nation-wide survey and clinical research should be conducted to determine the different aspects of snake bite in Bangladesh. The information available thereby, would help to formulate national policy to combat the deadly public health problem more efficiently in future.

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