National Guideline for Management of Snakebite 2019











NCDC

Non Communicable Disease Control Programme
Directorate General of Health Services
Ministry of Health & Family Welfare

স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

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HPNSP
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Preface

Snake bite is an important occupation related public health problem particularly in rural areas of Bangladesh. The cases of snake bite until recently were being treated by traditional healers, 'Ozhas'. The patients following venomous snake bite need quick treatment in hospital. Non-venomous bite needs appropriate first aid treatment and observation only.

The aim of this '**National Guideline for Management of Snake Bite'-2019** is primarily to provide knowledge and train doctors, medical students and health professionals in Bangladesh. This guideline consists of evidence based recommendation with executive summary. The first National guideline on Management of Snake Bites' was published in 2000 by a group of specialist on this topic who was selected by Non Communicable Disease Control Program of Bangladesh. The current guideline is the extended work done by the same groups of physicians and public health expert including multi tires stakeholders. A stringent guidance of WHO standard guideline for national guideline was followed in this book. The current evidence was incorporated according to level of evidence.

The guideline provide essential information on epidemiology of snake bite including medically important venomous snakes in Bangladesh, clinical aspects and management of snake bite in a step wise manner. Few pictorials are also included. The annexure of guideline has additional information for facilitated learning of a topic. During preparation of this guieline the related literature on snake bite were also consulted particularly to mention "WHO / SEARO Guidelines for the clinical management of snake bite in the Southeast Asian region"



Message

Snake is a natural and deadly reptile but an important part of bio diversity. Snake bite has a significant medical impact due to morbidity & high mortality. Death due to snake bite stands 1st among all deaths due to poisoning and envenomation. So to reduce mortality and morbidity due to snake bite, the training and up gradation of the knowledge about snake bite is of utmost importance.

I am very glad to hear about the publication of 'National Guide line for management of Snake Bite in Bangladesh-2019' by Non Communicable Disease Control Program of Directorate General of Health Services. I would like to express my heartful appreciation to NCDC, DGHS for developing this guideline

I hope this initiative of developing the guideline by which both snake bite patients and physicians will be benefitted.

I wish this initiative of the Non Communicable Disease Control Program, Directorate General of Health Services every success.

Prof. Dr. Abul Kalam Azad
Director General
Directorate General of Health Services (DGHS)
Mohakhali, Dhaka-1212.



Message

According to Non Communicable Disease Control operational plan of 4th HPNSP, 25% reduction of snake bite related deaths by 2021 through improved management of snake bite was targeted by Government of Peoples republic of Bangladesh.

The aims of this National Guideline for Management of Snake Bite in Bangladesh-2019 are targetting prevention, first aid, hospital management & referral in Bangladesh setting. During preparation of this guideline related global and local evidence and literatures on snake bite were consulted. This guideline will provide essential information on epidemiology of snake bite including medically important venomous snakes in Bangladesh, clinical aspects and management of snake bite in a stepwise manner.

I believe the guideline will provide specific guidance and upto-date knowledge for proper treatment and prevention of Snake bite patients at all levels of medical care throughout the country and will be beneficiary for the patients and health care providers as well.

I sincerely hope that this guideline will be useful to improve the management of snake bite patients at all level of health care facilities in our country.

Dr. Nur Mohammad
Line Director
Non Communicable Disease Control (NCDC) Program
Directorate General of Health Services

Guideline for the Management of Snakebite in Bangladesh

Objectives:

To update and revise the existing national guideline on management of snakebite in Bangladesh with provision of appropriate diagnosis, prompt and appropriate treatment of cases and intervention for prevention for snakebite

Issues considered:

1. Know the importance of snakebite and its epidemiology in Bangladesh perspective
2. Snake fauna in Bangladesh and their identification
3. Diagnosis of cases of snakebite(clinically applying syndromic approach) and doing relevant investigations
4. Provision of appropriate immediate management and protocol based specific management including providing antivenom
5. Provision of appropriate respiratory support and other ancillairy support and management
6. Community oriented approach for prevention of snakebite

SCOPE

The *Guideline* provide a framework for designing specific, detailed national treatment protocols, taking into account of local evidences and existing international including WHO recommendation

The *Guideline* provide evidence-based recommendations on:

1. The preventive measures for the cases of snakebite and providing appropriate first aid during the snake human interaction
2. Syndromic approach of diagnosis of snakebite in clinical practice
3. The use of antivenom during management of venomous snakebite in Bangladesh
4. Use of neostigmine atropine combination in the treatment of neurotoxic snakebite.

Purpose and Aims of the Guideline

This guideline has been developed and updated with the aim of providing guidance on the appropriate uniform management of cases of snakebite for reducing mortality and morbidity:

1. Understanding snakebite cases in a snapshot and offers best clinical practice
2. Diagnosis and management of snakebite at all tiers of care, community to hospital
3. Uniform use of available tools in a systematic manner customized to local situation

For whom this Guideline is intended

1. Clinicians and other health care providers (nurses, sub assistant community medical officers, community health care provider and heath assistants) who are in direct care of snakebite patients
2. Program personnel who are involved for prevention and control of snakebite in Bangladesh
3. Health Care Managers' Policy Makers and Hospital Managers responsible for the planning and implementing various plans, operations, programs and activities
4. Medical Students and Residents for customizing the working knowledge as a tool for Problem Based Learning and Community Oriented Medical Education

Methodology:

This second edition of the Guideline for the management of snakebite 2019 *updated version of the 1st edition National Guideline for Management of Snake Bite 2000 (Chittagong, Bangladesh). It* was prepared in accordance with the latest WHO standard methods for guideline development (WHO handbook for Guideline Development 2012). This involves planning, "scoping" and needs assessment, establishment of a guideline development group, formulation of key questions (population, participants or patients; intervention or indicator; comparator or control; outcome: "PICO"), commissioning reviews, applying Grading of Recommendations Assessment, Development and Evaluation (GRADE) to the quality of the evidence and making recommendations. This ensures a transparent link between the evidence and the recommendations.

Declaration of interests

Participants in the National Guideline for Management of Snake bite 2019 for the review of the Guidelines for the treatment of snakebite and the external expert reviewers of the drafted Guidelines reported relevant interests, in accordance with WHO procedures.
These were discussed extensively by the committee. It was considered that none of the declared interests had direct relevance to the deliberations or recommendations of the meeting.

Levels of evidence:

Recommendations are based largely on Systematic Review(S) observational studies ("O"), expert opinion ("E") and, in some cases, comparative trials ("T"). Symbols for the evidence used as the basis of each recommendation (in order of level of evidence) are:
S: formal systematic reviews, such as Cochrane Reviews of which there is only one in the field of snakebites. These include more than one randomized controlled trial
T: comparative trials without formal systematic review
O: observational studies (e.g. surveillance or pharmacological data)
E : expert opinion/consensus.
DISSEMINATION: The guidelines will be disseminated as a printed publication and electronically on the DGHS web site in English language. A library of all supporting documentation will be also available on the web site. DGHS NCDC will arrange training program for physicians through which the document will be disseminated. There will also be dissemination through different stakeholders involved in guideline.
FUNDING: The preparation and printing of the guidelines were funded exclusively by the NCDC of DGHS. No external source of funding either from bilateral technical partners, stakeholders or from industry was solicited or used.
FEEDBACK: An online survey will be carried out to obtain feedback from users of the second edition of the Guideline for the management of snake bite in Bangladesh-2019 and the responses will be used in updating this edition and subsequent printing.

UPDATING

The evidence will be reviewed regularly and updated every 2/3 years or more frequently as new evidence becomes available. A mechanism will be established for periodic monitoring and evaluation of use of the treatment guidelines in Bangladesh

Executive Summary

Epidemiology

The snake fauna in Bangladesh is historically under studied. Medically important snakes are Cobra, Krait and Viper. There are more than 6000 deaths and 700000 bites annually imposing a great burden on health care system and also economy of the country. Most common victims are young, working rural people engaged in farming and cultivation making snakebite an important occupational health hazard. The incidence is also likely to increase during natural disasters. Recommended that snakebite should be made a notifiable health condition under reporting system of DGHS (E).

Management

First aid: Currently practiced methods are unscientific and often harmful to patient. Incision, application of herbal material, tight tourniquet and ligatures are strongly discouraged. Recommended first-aid methods are reassurance, application of a pressure-pad over the bite wound, immobilization of the bitten limb and early transport of the patient to the nearest hospital (O).

Diagnosis: Identification of offending snake is very important. This should be done by careful examination of brought snake, description of snake and circumstances and/or picture identification. Recommended that in the absence of definite identification of offending snake 'syndromic approach' and algorithm should be practiced (E).

Treatment: Antivenom is the only definitive treatment. Recommended that it should be administered by intravenous infusion when indicated and repeated if necessary (O). Premedication with adrenalin should be given to every patient receiving antivenom. Patient should be closely followed up for any feature of anaphylaxis and immediate treatment should be started.

Atropine and Neostigmine should be given to patients with neurotoxicity. In the case of neurotoxic envenoming with bulbar and respiratory paralysis, early artificial ventilation (manual or mechanical) should be instituted to prevent early death from asphyxiation. When no appropriate specific antivenom is available, judicious conservative treatment can in many cases save the life of the patient.

In the case of acute kidney injury associated particularly with envenoming by Russell's vipers and sea snakes, conservative management and, in some cases renal replacement therapy (dialysis), is an effective supportive treatment. Fasciotomy should never be carried out in snakebite patients unless or until haemostatic abnormalities have been corrected, clinical features of an intracompartmental syndrome are confirmed by direct measurement of raised intra-compartmental pressure (E).

Patient should be discharged only after explanation, reassurance, and advice about avoiding future bites, and the opportunity for follow-up and further rehabilitation/counseling in case of late antivenom reactions and persistent physical or psychological sequelae.

Research: Recommended that every case of snakebite should be documented in detail and reported to proper authority. Physician and institutions are encouraged to maintain a registry and conduct clinic epidemiological researches.

Prevention: Community education and public awareness is the method most likely to reduce the burden of snakebite and thus mortality and morbidity due to snakebite. Health care professionals are encouraged to participate in this campaign at personal and/or institutional level.

Health system strengthening, education and training: Recommended that snakebite as a separate topic should be included in the curriculum of medical and nursing colleges. Training of health care professionals in the prevention and management of snakebite by special courses and other educational events based on national guidelines and training modules should be organized regularly. At the same time measures should be taken for improvements of hospital management of snake-bitten patients (ideally in specialized units staffed by specially trained teams), provision of basic laboratory and diagnostic facilities, regular supply, deployment &conservation/storage of antivenoms, and ambulance services. At national level snakebite should be addressed under a separate control program under MOHFW having a mitigation strategy.

Introduction:

Snakes and snakebites have been known to the people of Bangladesh since ancient time. Snakebite results most often from an unfortunate accidental interaction between a snake and a human victim. It is the single most important toxin-related injury, causing substantial mortality and morbidity in Bangladesh, especially in rural areas. Snakebite has a significant impact on human health and economy through treatment related expenditure and loss of productivity (Hasan S M et al 2012). Traditionally snakebite cases are treated by traditional healers, 'Ozhas' using non-scientific methods often leading to harms to the victims. The scientific management of snakebite envenomation requires appropriate first aid, quick transfer of victims to hospital, training material, training of health care professionals, availability of antivenom and other ancillary drugs and organ support systems.

Recently on May 26 , 2018 "Addressing the burden of snakebite envenoming" the World Health Assembly (WHA 71.5, Agenda item 12.1) has passed a resolution providing a strong mandate for the World Health Organization to implement an ambitious snakebite "roadmap," mobilizing governments and donors to respond to snakebite with the urgency and attention this neglected public health crisis demands (WHO agenda item 4.1; 2018).

Government of the People's Republic of Bangladesh has already taken several praiseworthy steps to deal with this important health issues even long before this resolution. For creating uniformity among the health professionals MOHFW through DGHS is sponsoring the development of updated version of a national guideline and several training modules, provision of antivenom to hospitals, training of heath care professionals. The recommendations from WHO SEARO Guidelines for the Management of Snakebites were primarily used in the development of Bangladesh guideline.

Recently the MOH&FW and DGHS have initiated a project to collect venoms from medically important local snakes with an aim to develop antivenom specific to venoms of local snakes. This project is expected to 'revolutionize' the treatment of snakebite and a great leap forward in the field of research in toxincology. Yet there are many unaddressed issues including nationwide public awareness and education.

Epidemiology

According to a nationwide community-based epidemiological study of snakebite and its socioeconomic consequences in Bangladesh (Rahman R et al. 2010) the incidence density of snakebite in rural Bangladesh (which is substantially higher than previously estimated) is 623.4 / 100,000 person years (95% C I 513.4 – 1595.3 /100,000 person – years) with an estimated 6,041 death annually. The majority of the snakebite victims are of young age. Biting happened mostly when individuals were at work outside or was within home environment. The majority of the bite (71%) happened in the lower extremities. Eighty six percent of the victims receive some form of management within two hours of snakebite, although only three percent of the victims went directly to either a medical doctor or a hospital.

Most often the victims of snakebite are poor, young and active individuals. Biting occurs mostly when individuals are at work, engaged in activities such as cultivation, fishing, plantation, wood collection, or tending crops or gardens. Snakebite envenoming in Bangladesh is thus an occupational health hazard of the rural poor people who suffer bites while engaged in physical work, most often during cultivation (Faiz M A 2004; Faiz M A et al. 1995, Faiz M A et al. 1997; Islam Q T et al. 1999). However, bites were fairly common when the victims were walking on rural foot paths or while sleeping on the floor. Children have a particularly high risk of dying or suffering permanent disability from snakebite envenoming (Faiz M A et al. 1999). During the monsoon, snakebite occurrences increase as snakes leave their shelter due to rainfall. Most of the houses in countryside of Bangladesh are not brick-built and the snakes sometimes live in the holes of the muddy floors. Moreover, most of the houses have homestead bush, which offers an ideal habitats for snakes. As a result, events of snakebite are also common when people are at home. To go to the toilet and for other domestic purposes, people often come out of their houses and become victims. Village people store grains including paddy, rice in their bedroom, and keep the poultry in the same dwelling house, which also provides shelter to the snakes, therefore increasing the risk of snakebite.

Due to its geographical location and climatic conditions Bangladesh is a disaster prone country. Based on records of the surveillance system of the Directorate General of Health Services (DGHS), Bangladesh, snakebite envenoming was identified as a leading cause of mortality in several flood disasters, second only to drowning. Clinical observation suggests increased numbers of snakebite admissions in the Chittagong region after earthquakes and minor seismic activities (Faiz et al., unpublished data). This estimate assumes an annual occurrence of extreme weather events whose consequences for the affected parts of the population in Bangladesh qualify them as natural disasters, however taking into account that the geographic area and the number of population affected as well as the severity and duration of the events are expected to be highly variable from year to year.

1. What is venomous snakebite?

A bite by a venomous snake, which produces specific symptoms and signs or a syndrome due to venom, is considered as a venomous snakebite. It is important to note that a bite by venomous snake may not always produce features of envnomation: about 50% of bites by Russell's vipers, 30% of bites by cobras and 5-10% of bites by saw-scaled vipers do not result in any symptoms or signs of envenoming.

A bite by a non venomous snake does not produce the specific features due to venom. But the care giver should be cautious about the psychological impact and effect of various commonly practiced local treatment(e.g. by 'Ozhas') or snakebite. A victim may develop some features due to anxiety or apprehension after bite by a venomous as well as non venomous snake.

Most snakebite in the community and systematically documented admitted cases in snakebite clinic of Chittagong Medical College Hospital (CMCH) are nonvenomous in nature, as high as 85% (Rahman R et al 2010; Harris J B et al, 2010).

Snakes of Bangladesh

Historically the snake fauna of Bangladesh is under collected and understudied, and mosty restricted to species identification and distribution. A literature review from 1852–2018 identifies 100 species of which the venomous ones are:16 species of sea snakes, 3 types of cobras (including 1 king cobra), 5 types of kraits, 2 coral snakes, 6 types of green pit vipers and 1 species of true viper (Russell's viper) (E). (Prof Farid Ahsan, personal communication).

Snakes of medical importance

Bites by green pit vipers (*Trimeresurus erythrurus* and other species), cobras (*Naja* species) and kraits (*Bungarus*) are the most commonly identified ones in Bangladesh. Neurotoxic envenoming by kraits and cobras is the principal cause of snakebite mortality in Bangladesh.

Recent studies revealed that at least five different species of krait contribute to snake bite mortality in Bangladesh (unpublished data): Wall's Krait (*Bungarus walli*), Greater Black Krait (*Bungarus niger*), Common Krait (*Bungarus caeruleus*), Banded Krait (*Bungarus fasciatus*) and Lesser Black Krait (*Bungarus lividus*). In Bangladesh, *Bungarus lividus* is so far known only from the northwest. *Bungarus walli* and *B. caeruleus* are known to occur in southeastern Bangladesh. *Bungarus fasciatus* and *B niger* occur throughout the country.

Among the cobras, *Naja kaouthia* is expected to occur throughout the country and to cause the majority of cobra bites. *Naja naja* is known from the area around Dhaka and expected to be continuously distributed at least to the west and north of the capital. Its southern and eastern distributional limits are not known. King Cobra (*Ophiophagus hannah*) occur wherever relatively undisturbed bamboo stands and forests remain in Bangladesh (North eastern and Southern part), but have not been documented to have caused envenoming bites in recent years.

Russell's Viper (*Daboia russelii*): its distribution is patchy and/or restricted to north-western and southern parts of the country. Since 2013 this species has been known to cause significant morbidity and mortality in this region. There is no evidence to suggest that Saw-scaled Vipers (*Echis* species) occur anywhere in Bangladesh. Green pit vipers (*Trimeresurus sp.*) are found throughout Bangladesh and create a specific problem. It constitutes the largest proportion among the venomous bite cases at least in large data set from CMCH, most present with local swelling and pain only. Recently increasing number of cases are being recognized to cause coagulopathy in the form of non coagulation of blood in 20 minute whole blood clotting test (20WBCT) and prolong Prothrombin Time (PT) and Activated Partial Thromboplastin Time (APTT).

Sea snakes also constitute an occupational hazard for fishermen in Bangladesh but the incidence of their bites is unknown.

Management of Snakebite in Bangladesh

Pre hospital Management:

1. **First aid:**

Effective first-aid treatment should be carried out immediately or very soon after the snake bite; before the patient reaches hospital. (Warrell D A 2016). It can be performed by the snakebite victim or by anyone present (bystander) who has skill to provide first aid.

Incorrect first aid may cause more harm than good.

Aims of first aid:

1. Attempt to slow down spread of venom that may have been introduced into the tissues.
2. Prevent mortality and complications before reaching hospital.
3. Control dangerous early symptoms of envenoming.
4. Not to harm the snakebite victim.

Recommended first aid methods

1. Reassurance: Patient should be advised not to get panicked. He should be told that majority of snakes are non-venomous; moreover, venomous snakes sometimes fail to inject enough venom effectively during bites.
2. Immobilization: Make sure that bitten limb (hand or leg) is immobile and the victim must be kept still. Advise:

Bite in lower limb: "Sit down, do not walk".

Bite in upper limb: "Do not move the limb". Immobilize the bitten limb with a splint or sling as practiced in fracture of long bone. Ideal is to provide pressure immobilization. (O)

Look for fang marks at bite site

1. Wash the bitten area: gently with soap and water, or wipe with a wet cloth and cover with bandage.
2. Remove as early as possible all rings, bangles, anklets, cords or clothing, 'Tabij', 'Taga' etc, which may cause constriction if swelling occur.
3. Quick transport: seek help to get the patient rapidly transferred to a hospital by motorbike or ambulance. (O)
4. Place patient in the lateral recumbent position.
5. If non-breathing, insert an oral airway or perform rescue breathing if necessary.
6. If the snake is killed somehow, bring it to hospital. Be careful and do not handle snakes bare handedly as they might pretend to be dead. Do not waste time for catching or killing the snake.

Please do not do: Some Don'ts

1. Do not apply tourniquets/ligature in the bitten limb.
2. Do not cut or prick with needles or use any topical cream.
3. Do not waste time unnecessarily seeking treatment provided by traditional healers (Ozhas).
4. Do not provide anything by mouth if the victim has difficulty in swallowing/talking, vomiting, nasal voice or excessive salivation.
5. Do not cauterize by using chemicals.
6. Do not apply herbal medicines, stones, seeds, saliva, potassium permanganate solution or cow-dung and mud.
7. Do not give herbal products like oil, ghee, pepper to induce vomiting.
8. Do not apply alcohol.
9. Do not give aspirin to relieve pain.
10. Do not panic and be tempted to do anything detrimental to the victim.
11. Do not delay in reaching health facility.

Note: There is no scientific proof of benefit (evidence) of application of torniquet. In case torniquet has already been applied they should not be released until the patient is under medical care in hospital, medical staff and resuscitation facilities are available and antivenom (if indicated) has been started.

2. How to avoid snakebites?

1. It is good to avoid keeping food items like paddy, poultry and pigeon within bedroom which might attract rats, which in turn attract snake to enter.
2. Use long shoes or boots and watch out while you walk through bushes or long grasses. Do not put your hands and legs in holes. Handle carefully piled woods or hay. Do not turn around big stones or wooden pieces. Watch out while stepping on stones or woods. If you have to walk in the grass or in the bush, watch very carefully and take long shoe boots.
3. Check out presence of snakes while handling fishing nets.
4. Take special precaution, such as, flash light, stick during walk at night. Because, snakes usually move actively at night.
5. Know about venomous snakes and their habitat in Bangladesh, so that you can try to avoid them.
6. Take special precaution during sleep: use 'cot', avoid sleeping on the floor (E). Use mosquito net during sleep. (E) Do not sleep in the floor particularly during harvesting of crops, fruits, vegetables or while watching crops, fruit garden or fish farm.
7. Clean the four sides of the house. Keep distance between dwelling house and cultivation land.

8. Keep your yard free of clutter

1. Snakes are ambush predators, meaning they like to attack their prey from dark hiding places.

2. As such, clutter is essentially an open invitation to snakes, giving them perfect hiding spots. Piles of leaves, compost piles, straw mulch, wood chip mulch, stacks of firewood, and piles of cut grass are all comfortable places that snakes like to hide in, so these should be removed from your yard. (http://www.stretcher.com/stories/02/02feb11a.cfm#.UKKktuTLSeB)
3. Instead of wood mulch, consider crushed stone. It's not as comfortable or effective for snakes to hide in.

9. Get rid of any possible source of food-snakes will only hang around your yard if there's something there they can eat. Depending on the species, this could mean a problem with large insects such as cockroaches and grasshoppers, or small mammals such as mice and rats.
10. Patch up any holes or cracks in your building's foundations provide great hiding places for snakes.
11. Switch on the light before entering into a room.
12. Look carefully on the bed and under the pillow, make sound so that if there is any snake it can go away. Warn snakes of your approach by treading heavily. Snakes are relatively deaf to air borne sounds, but are sensitive to ground vibrations.
13. Do not put your hand into anthills, cavities in trees and thick undergrowth and under logs. It is prudent to clear sites likely to be occupied by snakes around human habitations. Destroy anthills and fill up cavities in trees. Do not let fallen trees, logs and firewood lie around. Exercise caution if you have to move logs, rocks, etc in the course of your work, as there may be snakes under these.
14. Dispose of garbage and junk regularly, and try to keep your dwelling and surroundings free of rats, mice, frogs, lizards, etc., which attract snakes.
15. Only trained persons should handle or rear snakes. An apparently dead snake should be handled with great care as it may still be alive, and even when dead, may inflict a reflex bite.

3. What to do if you see a snake?

1. Do not be afraid
2. Do not get close to them
3. Allow the snake to go away
4. Do not kill the snake unnecessarily
5. Snakes do not attack man. They bite defensively or when agitated

Hospital:

CAUTION: Delay the release of tight bands, bandages and ligatures: if the patient has already applied these, they should not be released until the patient is under medical care in hospital, medical staff and resuscitation facilities are available and antivenom treatment (if indicated) has been started (Watt et al., 1988).

Recommendations for health care workers

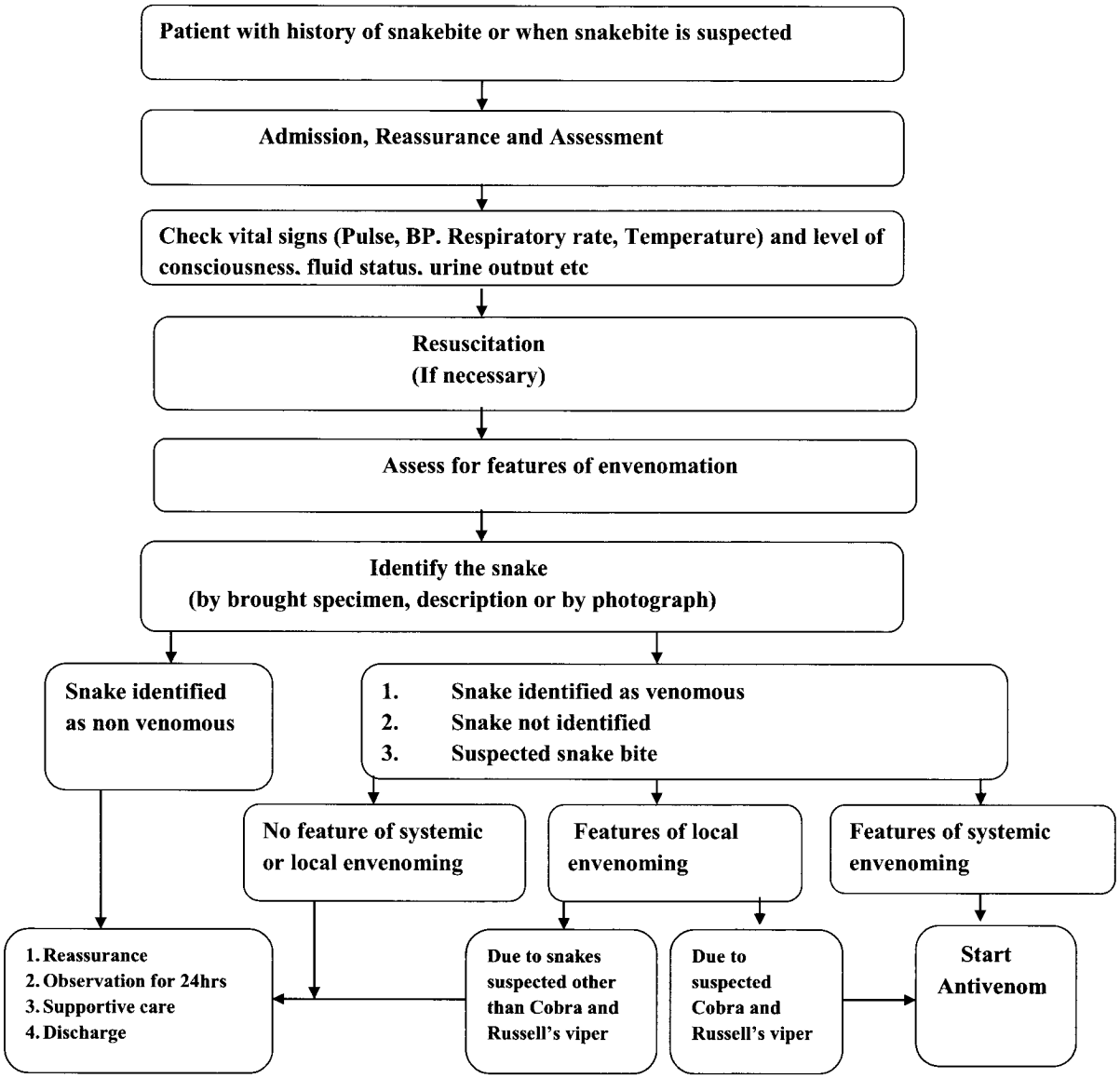
Recommendation for health care providers	Rationale
Use the months of April and May to Procure the necessary stocks of ASV Train health care workers in snakebite prevention and first aid.	80% of bites occur during the months of June-September so preparedness and prevention need particular attention in the time leading up to this "epidemic" season.
Envenomation should not be excluded by the absence of fang marks.	3.8% of people without fang marks were envenomed. Fang mark from Krait bites, in particular, can be hard to localize, even a short time after the bite.
Consider snakebite in the differential diagnosis of unexplained altered sensorium, alteration to speech and swallowing, and abdominal pain, especially during the rainy season.	Patients can present with symptoms of envenomation, without any history of being bitten by a snake.
Bites by an unknown predator need to be taken seriously and observed for signs of envenomation.	14% of people, who were unable to identify what predator bit them, were envenomed.
Don't rely solely on the ability of patients or relatives to identify snakes.	Identification of snake species is poor, although it is better for cobras.
Antivenom should only be given to patients showing symptoms of envenomation	Envenomation of patients only occurred in 63.6% of the cases where cobras were brought. To give antivenom without symptoms of envenomation exposes people to the risk of adverse reactions and is costly, especially in a setting where demand exceeds supplies.

Recommendations for Community Education

Recommendation for health care providers and community	Rationale
A large part of the public health education needs to be directed to children and young people to both genders.	The 10-19 year is the peak age group affected by bites. Numbers of males and females bitten are almost equal.
Encourage the use of footwear and longpants/trousers.	67% of bites occur on the feet and legs.

The use of a stick to scare away snakes, prior to working in an area with one hands.	This would decrease the bites and explore the microhabitat of snake without prior knowledge
Improved lighting using: • Torches when walking outside • Lighting in and around houses.	40% of bites occur between 1700-2200 hours. 59.2%of bites occur in and around the house. Lighting will enable better visualization of snakes.
Provision of toilets and education regarding their use.	8% of bites occurred when people were going to the fields for the purpose of open defecation.
Encourage people to sleep on a bed and under a well tucked-in mosquito net.	10% of people were bitten while they were sleeping. Sleeping on the ground, increases your risk of envenomation, six fold. Sleeping under a mosquito net, decreases your risk of envenomation, six fold.
Provision of buffer zones between fields and housing areas.	59.2% of bites occur in and around the house. Snakes are attracted to the rodents who come for grain being grown. Keeping these distances separate may help in decreasing the encroachment of snakes in housing areas.
Make sleeping areas separate from food storage, preparation and consumption areas.	The presence of rodents in food related areas is prone to attract snakes. If people sleep in places away from areas of the house connected with food, this may decrease the risk of people connecting with snakes.

Hospital management of snakebite



Local envenoming:

1. Local swelling involving more than half of the bitten limb (in the absence of a tourniquet) within 48 hours of the bite.
2. Swelling after bites on the digits (toes and especially fingers).
3. Rapid extension of swelling (for example beyond the wrist or ankle within a few hours of bite on the hands or feet).

SNAKEBITE

Clinical features:

Symptoms

Non-specific symptoms: Headache, nausea, vomiting, abdominal pain.

Neurological symptoms: Muscle paralysis, difficulty in moving jaw, tongue, eye, difficulty in vision, heaviness of eye lids (ptosis), weakness of neck muscle ('Broken neck sign'), difficulty in swallowing, dribbling of saliva, nasal regurgitation, nasal voice, difficulty in respiration, extreme generalized weakness, loss of consciousness, convulsions.

Haematological symptoms: Spontaneous bleeding from gum, vomiting of blood, haemoptysis, haematuria, persistent bleeding from bite site, venepuncture site and inflicted wound if any.

Others: Severe muscle pain, dark coloured urine, scanty urine volume, collapse (cardiovascular).

Signs:

Neurotoxic sign: Ptosis (partial or complete) usually symmetrical and progressive, diplopia, external ophthalmoplegia, loss of gag reflex/palatal palsy (Bulbar palsy), dysphonia / nasal voice, bilateral facial paralysis, inability to open the mouth or protrude the tongue, paralysis of chest muscles and diaphragm (shallow breathing), 'broken neck sign', weak grip, diminished tendon reflexes.

Signs of haematological abnormalities: Persistent bleeding from bite site, venepuncture site and or inflicted wound if any, multiple bruise or large blood collection, haemorrhagic blisters, bleeding from gingival sulci, haemoptysis, haematemesis, haematuria, epistaxis.

Signs of renal failure: Scanty or no urine output, dark coloured urine, hypotension.

Clinical uraemic syndrome: Nausea, vomiting, hiccups, fetor, drowsiness, coma, flapping tremor, muscle twitching, convulsions, pericardial friction rub, signs of fluid overload.

Signs of myotoxicity: Muscle tenderness, weakness, respiratory failure, black urine, renal failure

Signs of cardiovascular toxicity: Hypotension, shock

Signs of local envenomation: Swelling, tenderness, bleeding, ulceration, necrosis, local lymph node enlargement

Psychological features:

Snakebite is also known to cause significant psychological morbidity in the form of acute stress reaction and anxiety immediately and depression and post traumatic stress disorder as a sequel.



Fig 1&2: Ptosis, opthalmoplgia and broken neck sign (Neurotoxic manifestation) Copy right MA Faiz)



Fig3 &4: Blisters, Blackening and Ulceration (local envenoming) Copy right MA Faiz)



Fig 5&6: Subcounjctival haemorrhag and respiratory support with intubation and amboo bag .Copy right MA Faiz)

Clinical Syndromes: Patient may present with cluster of symptoms and signs. In many cases, confirmed identification of the offending snake may not be possible. Based on circumstances and chronology of appearance and group of symptoms and signs syndromes are categorized:

Syndrome 1
Local envenoming (swelling etc.) with bleeding/clotting disturbances = Viperidae (all species)

Syndrome 2
Local envenoming (swelling etc.) with bleeding/clotting disturbances, shock or acute kidney injury with/without neurotoxicity = Russell's viper

Syndrome 3
Local envenoming (swelling, blisters etc.) with neurotoxicity = cobra or king cobra

Syndrome 4
Neurotoxicity with minimal or no local envenoming Bitten on land or while sleeping on the ground = krait Bitten in the sea, estuary and some freshwater lakes = sea snake

Syndrome 5
Neurotoxicity with dark brown urine and acute kidney injury (no bleeding/clotting disturbances): Bitten on land or while sleeping indoors = krait (B. niger, B. candidus, B. multicinctus) Bitten in sea, estuary and some freshwater lakes = sea snake

Important Note:

Features of envenoming may be present at time of presentation or may develop simultaneously or evolve over time.

Significant local swelling (not due to ligature) without bleeding/clotting disturbance should be suspected for Pit Viper (in most cases) or Cobra. If the description, circumstance and/ or additional clinical feature (for example a bite on a digit or swelling threatening vascular supply) strongly suggest a bite by Cobra then treatment with AV may be considered.

Investigations/laboratory tests

1. 20WBCT
2. Snakebite screening tests: full blood count, urine RME, urea, electrolytes, creatinine, creatinine kinase, ECG, coagulation screen.
3. Specific tests for detection of venom is not available in Bangladesh.

ANTIVENOM THERAPY(AV)

If Systemic Envenoming or Local Envenoming:

Commence antivenom therapy immediately if indicated for the bites of:	Currently available antivenom is not recommended for the bites of:
Cobra	**Green pit viper**
Krait	**Sea Snake**
Russell's viper	

Indications for antivenom [level of evidence O,E]

Antivenom treatment is recommended if and when a patient with proven or suspected snake-bite develops one or more of the following signs:

Systemic envenoming

Haemostatic abnormalities: Spontaneous systemic bleeding **(clinical),**

Coagulopathy **(20WBCT or other laboratory tests such as prothrombin time)** or thrombocytopenia (<100 x 109/litre or 100 000/cu mm) **(laboratory).**

Neurotoxic signs: ptosis, external ophthalmoplegia, paralysis etc **(clinical).**

Cardiovascular abnormalities: hypotension, shock, cardiac arrhythmia**(clinical),** abnormal ECG.

Acute kidney injury (renal failure): oliguria/anuria **(clinical),** rising bloodcreatinine/ urea **(laboratory).**

(Haemoglobin-/myoglobin-uria:) dark brown urine (clinical), urine dipsticks, other evidence of intravascular haemolysis or generalisedrhabdomyolysis

(muscle aches and pains, hyperkalaemia) **(clinical, laboratory).**

Supporting laboratory evidence of systemic envenoming (see above).

Local envenoming

Local swelling involving more than half of the bitten limb (in the absence of a tourniquet) within 48 hours of the bite.

Swelling after bites on the digits (toes and especially fingers).

Rapid extension of swelling (for example, beyond the wrist or ankle within a

few hours of bite on the hands or feet).

Development of an enlarged tender lymph node draining the bitten limb

It is never too late to give AV provided the indications are present:

Only if features of **systemic** envenoming are present for bites of snakes mentioned in the above box

Do not give antivenom for local envenoming alone, except for cobra and Russell's viper bites when indicated

AV THERAPY

- Commence AV as soon as systemic envenoming is detected.
- Dose: 100 ml (10 ampoules) of Indian polyvalent AV mixed with 100 ml of normal saline should be infused intravenously over one hour. Adult and children should receive same dose of AV. Start infusion at a lower rate for 10-15 minutes.

Before initiating antivenom, prophylactic subcutaneous adrenaline (dose: adult 0.25 ml of 0.1% solution and in children 0.005 mg/kg) should be given to the victim (T).

CAUTION: Have Adrenaline (+Inj Hydrocortisone, Inj Anti histamine) available at bedside

Observe the patient carefully during the time of administration of antivenom and upto 3 hours for signs of anaphylaxis.

MONITOR

Pulse, blood pressure and respiration and observe for the appearance of a rash

Criteria for repeating the initial dose of antivenom:

Persisting or deteriorating signs of systemic envenoming e.g.

1. If no improvement or deterioration of neurotoxic features (Cobra or Krait) 1-2 hours after completion of antivenom.

2. Persistence or recurrence of blood incoagulability after 6 hours of antivenom treatment. **The endpoint of AV therapy is reversal of coagulopathy** as determined by serial performance of the 20WBCT

In viper bites, monitor the efficacy of AV by repeatedly performing the 20WBCT at the bedside,

Initially at the start of AV therapy. Repeat in 6 hours: if the blood does not clot in 20 minutes, repeat AV infusion and perform 20WBCT 6 hours later.

Continue the cycle till the blood clots

Do not continue AV administration for persistent neurotoxicity, provided the coagulopathy has been reversed

For known or suspected Krait bite do not repeat AV after 2/3 dose even if there is persistent neurotoxicity

Management of Special Problems

Respiratory Failure:

A major problem following krait and cobra bites. Neuroparalysis thus produced leads to acute type II respiratory failure, which is the most important cause of morbidity and mortality. Features may appear within 8 hours (in 94% of patients) and at the latest 19 hours following the bite. The neurological (respiratory paralysis, flaccid paralysis) symptoms may be dramatic in onset.

Airway problem: Chance of aspiration increases when dysphonia/nasal voice, facial paralysis, inability to open the mouth, protrude the tongue, loss of gag reflex/palatal palsy (Bulbar palsy), pooling of secretions in the pharynx, failure of the cough reflex is present

Breathing and ventilation problem:

Low respiratory rate, shallow (low tidal volume) breathing, agonal (gasping) breaths, central cyanosis, no breathing is discernable within 10 seconds,

Management:

1. Patients with respiratory paralysis require ventilatory assistance in addition to administration of antivenom.
2. Do not provide anything by mouth if the victim has difficulty in swallowing or has vomiting or nasal voice.
3. Clear the airway by suction (careful low-pressure suction to avoid bleeding)
4. Give oxygen (nasal prongs, mask).
5. Perform a chin-lift or jaw-thrust maneuver.
6. Insert an oropharyngeal airway.
7. Ventilate with a bag-mask device (Ambu) with oxygen
8. Establish a definitive airway: Cuffed endotracheal intubation (ET)
9. If ET failed, insert laryngeal mask airway (LMA)
10. Attach a pulse oximeter to the patient.
11. Place the patient to mechanical ventilation in an intensive care unit
12. If mechanical ventilation is not available continue ventilation with Ambu bag or Bain circuit with endotracheal tube.
13. Patients should be given injection neostigmine methyl sulphate or bromide IM (0.02 mg/kg for adults, 0.04 mg/kg for children) and injection atropine IV (dose- 0.6 mg for adults, 50 ug/kg for children) four hourly (O). Atropine to be given before neostigmine

Transfer:

14. Quickly transfer the victim to the nearest health facility having antivenom and ICU facility, and INFORM the referral center about the patient's condition.
15. During transfer ventilate the patient using Ambu bag / Bain circuit with oxygen during transportation or portable ventilator and accompany the patient.

In resource limited setting, where respiratory support is not available, patients can be maintained on neostigmine methyl sulphate and atropine four hourly.

Avoid- Narcotics and other respiratory depressants (benzodiazipam or dormicum, clonazepam)

Note: Endotracheal intubation is necessary for airway protection and prevention of aspiration in patient with bulbar involvement. In most of these cases, the lungs are not diseased therefore timely institution of mechanical ventilation is usually without complications. Timely institution can prevent aspiration and hypoxic injury to brain.

Acute Kidney Injury (Acute Renal Failure)

A major problem following Russell's viper bites

Signs of renal failure:

Scanty or no urine output, dark coloured urine.

Clinical uremic syndrome: nausea, vomiting, hiccups, fetor, drowsiness, coma, flapping tremor, muscle twitching, convulsions, pericardial friction rub, signs of fluid overload.

Prevention and treatment

1. Early use of AV
2. Correct hypovolemia with intravenous fluid and optimization of blood pressure (by fluid and vasopressor)
3. Ensure adequate urine output hourly (at least 0.5ml/kg/hr.) with an indwelling catheter and maintain accurate fluid balance charts.
4. Continue adequate intravenous fluids
5. Use intravenous furosemide if needed.
6. Correct metabolic acidosis with a slow intravenous infusion of 50-100 mmol of sodium bicarbonate, check and repeat ABG.
7. If rhabdomyolysis is suspected, 200 ml of 20% mannitol may be infused intravenously over 20 minutes, but this must not be repeated as there is a danger of inducing dangerous fluid and electrolyte imbalance.
8. Correct Hyperkalemia: Hyperkalaemia is a silent killer in the recovery phase of Russell's viper bite.
9. Dialysis: Dialysis is indicated in oliguria or anuria with rising blood urea or creatinine, fluid overload leading to pulmonary oedema, metabolic acidosis in addition to hyperkalaemia.

Avoid: K containing fruits like coconut water and fruit juices, NSAIDs, heparin.

Monitor: ECG and CPK, serum transaminases, blood urea and serum creatinine daily. Serum electrolytes, especially potassium, should be estimated 6 hourly in case of sea snakebite. Urine should be examined for microscopic hematuria and active sediments.

Myoglobinaemia

Severe myalgia is suggestive of myotoxicity (rhabdomyolysis) of venom. In severe myotoxicity myoglobin appears in urine giving it a red colour. In mild cases urine may look normal and should be examined in laboratory for myoglobinuria. Myoglobin could damage renal tubules leading to acute renal failure.

Haematological abnormality

Haematological symptoms: Spontaneous bleeding from gum, vomiting of blood, haemoptysis, haematuria, persistent bleeding from bite site, venipuncture site and inflicted wound if any.

Signs of haematological abnormalities: Persistent bleeding from bite site, venipuncture site and or inflicted wound if any, Multiple bruise or large blood collection, haemorrhagic blisters, bleeding from gingival sulci, haemoptysis, haematemesis, hematuria, epistaxis

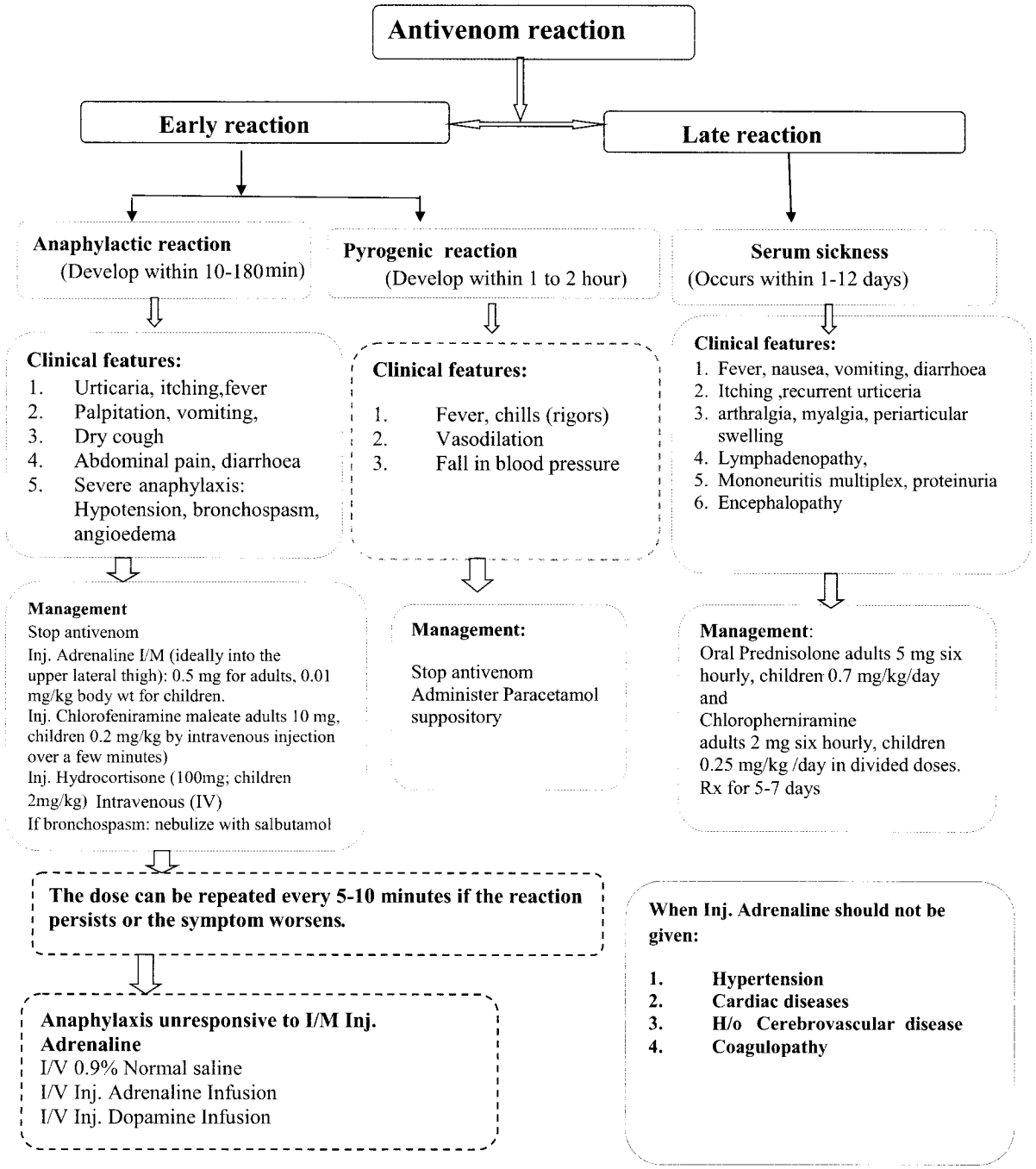
Management:

1. Strict bed rest to avoid even minor trauma;
2. Transfusion of clotting factors and platelets; ideally, fresh frozen plasma (FFP) and cryoprecipitate with platelet concentrates/platelet aphaeresis or, if these are not available, fresh whole blood.
3. Intramuscular injections should be avoided.

Detect coagulopathy in viper bites by performing the 20WBCT 2 hourly during the first 6 hours and then 6 hourly.

Coagulation profile should be tested 6 hourly (especially for viper bites). Platelet count should be estimated twice daily.

Antivenom reaction is common but rarely fatal. Appropriate timely management of antivenom reaction is shown below



Conservative treatment when no antivenom is available

Neurotoxic envenoming with respiratory paralysis: Assisted ventilation with room air or oxygen has proved effective, and has been followed by complete recovery, even after being maintained for periods of more than one month. Manual ventilation (anaesthetic bag) by relays of doctors, medical students, relatives and nurses has been effective where no mechanical ventilator was available. Anticholinesterases should always be tried (O) for neurotoxic bites of cobra and also judicially for krait.

Neostigmine/Atropine Combination: (Indicated for neurotoxic features only)

Aropine sulphate(0.6 mg for adult; 50microgram/kg for children) is given by intravenous injection followed by Neostigmin Bromide or methylsulphate by intramuscular injection 0.02 mg/kg for adult; 0.04mg/kg for children) (O).. The patient should be observed over next 30-60 min for sign of improvement (ptosis and external opthalmoplegia may improve). If patient responded convincingly

The Atropine Neostigmine methylsulphate can be maintained. Inj Neostigmine Intramuscular 0.5-2.5 mg every 4 hours upto 10 mg/24 hours for adults and 0.01-0.04 mg/kg every 4 hours in children

[N.B: A trial of anticholinesterase (e.g- '**Edrophonium test**'or bed side '**ice on eyes test**') preferably be performed in every patient with neurotoxic envenoming. However this should not delay antivenom treatment or endotracheal intubation. If test is done, then the patient should be observed closely as the clinical signs may deteriorate during the trial test.The dose of edrophonium for test will be slow intravenous 10 mg for adult and 0.25mg/kg for children]

Haemostatic abnormalities: Strict bed rest to avoid even minortrauma; transfusion of clotting factors and platelets; ideally, fresh frozen plasma (FFP) and cryoprecipitate with platelet concentrates or, if these are not available, fresh whole blood. Intramuscular injections should be avoided.

Shock, myocardial damage: Hypovolaemia should be corrected with crystalloids/colloid,(e.g-crystalloid- 0.9% Nacl ; Colloid-10%Dextran); controlled by observation of the central venous pressure. Ancillary press or drugs (dopamine or epinephrine-adrenaline)may also be needed. Patients with hypotension associated with bradycardia should be treated with atropine.

Acute kidney injury: Conservative treatment or dialysis .

Dark brown urine (myoglobinuria or haemoglobinuria): Correct hypovolaemia with intravenous fluid, correct acidosis with a slow intravenous infusion of 50-100 mmol of sodium bicarbonate and, by analogy with crush syndrome, consider a single infusion of mannitol. 200 ml of 20% mannitol may be infused intravenously over20 minutes, but this must not be repeated as there is a danger of inducing dangerous fluid and electrolyte imbalance.

Severe local envenoming: Local necrosis, intracompartmental syndromes and even thrombosis of major vessels is more likely in patients who cannot be treated with antivenom. Surgical intervention may be needed but the risks of surgery in a patient with consumption coagulopathy, thrombocytopenia and enhanced fibrinolysis must be balanced against the life threatening complications of local envenoming. Prophylactic broad spectrum antimicrobial treatment is justified.

Treatment of bitten part:

1. Elevation of limb with rest.
2. Simple washing with antiseptic solution
3. Broad-spectrum antibiotic (esp when there is features of contamination, multiple incisions etc.)
4. In case of local necrosis and gangrene:
    1. Broad spectrum antibiotic
    2. Surgical debridement and split thickness skin grafting is indicated but decision should be made with caution.
5. Fasciotomy for compartmental syndrome.

Compartmental syndrome:

Swelling of envenomed muscles in tight fascial compartment (esp. in limbs) may result in increase in tissue pressure resulting in ischaemia, called compartmental syndrome. Some important clinical features of compartmental syndrome are:

1. Disproportionately severe pain, particularly on stretching.
2. Weakness of affected muscles
3. Tense compartment on palpation
4. Loss of sensation of skin supplied by nerves passing through the compartment.

Compartmental syndrome not common and also difficult to confirm. Fasciotomy is rarely needed and should only be done after a direct estimation of compartment pressure and reversal of coagulopathy. On the other hand, unnecessary fasciotomy may result in profuse bleeding requiring blood transfusion and also may cause disastrous result particularly in viper bites

Referral

All patients with snakebite should be managed at peripheral level hospitals (UZHC, DH) and be referred if needed. All patients with known or suspected snake bite should be kept under observation for no less than 24 hours after admission. Time of bite, circumstance of bite etc should be recorded.

During observation periodic regular monitoring of the patient is important. Look for evidence of systemic envenomation: neurological as well as haematological evidence. Tests of bed site bleeding and clotting time should be done frequently in case of strong suspicion. .

If systemic envenomation is suspected 10 vials of AV is administrated. Systemic envenomation must be managed in a place where competent physician's service and trained team is available.

The patients with any of the following complications may be referred to higher centre

1. Prolonged clotting time/bleeding time(haematological)
2. Respiratory difficulty or evidence of respiratory failure/ARDS
3. Extra ocular muscle involvement(ptosis, ophthalmoplegia), encephalopathy
4. Evidence of early capillary leak

5. Features of impending renal failure
6. Any bleeding manifestations
7. Adverse reaction to AV administration

In the case of neurotoxic bites the primary concern is respiratory failure and this may need mechanical ventilation. While it is possible to maintain a neurotoxic victim by simply using a resuscitation bag and this should always be used as a last resort. The best means of support is mechanical ventilation operated by qualified staff.

Renal failure is a common complication of Russell's viper and pit viper bites and the common other complications being intravascular haemolysis, DIC, direct nephro-toxicity or hypotension. Renal damage can occur very early in Russell's viper bite and even when the patient is arrived the damage might have been already happened.

Declining renal parameters require referral to a specialist with access to dialysis facilities. Peritoneal dialysis can be undertaken in secondary level institutions. Haemodialysis is preferred in cases of hypotension or hyperkalemia.

Follow up:

Detection of AV reaction (part of pharmacovigilance): Early reaction 3 hours, serum sickness-weekly once for three weeks

Detection of late sequaelae following enevneomation- physical disability or psychchiatric disability: 3 months and six months after bite

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Annexes

Annex: 1

Pressure immobilization method:

Can give pressure by simple crepe bandage or by long strips of clothes (like gamcha). The bandage is wrapped firmly around the entire bitten limbs, starting distally around the fingers or toes and moves proximally to include a rigid splint. The bandage is bound as tightly as for a sprained ankle, but not so tightly that peripheral pulse (radial, posterior tibial, dorsalispedes) is occluded or that a finger cannot easily be slipped between layers.

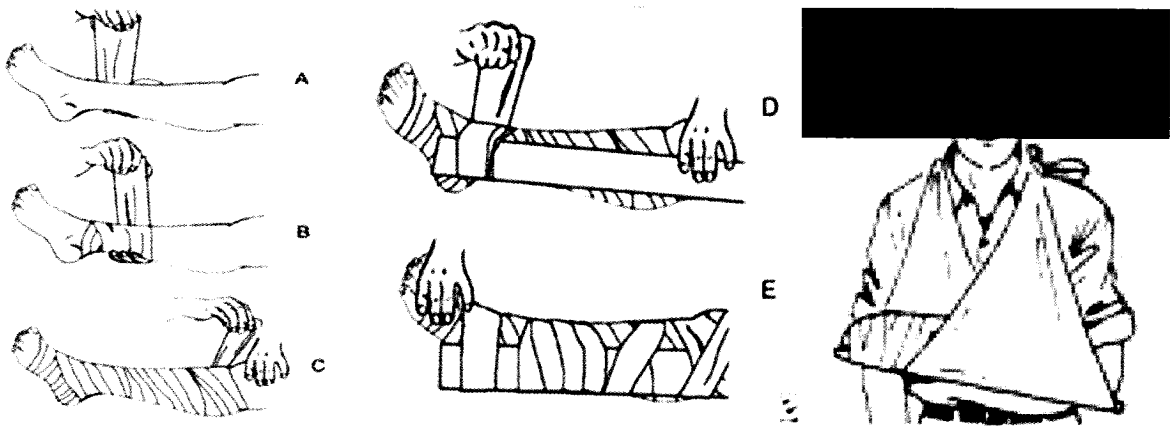


Figure 7: The pressure immobilization technique. A: Begin to wrap the limb with an elastic bandage. B: Continue wrapping up the limb. C: Wrapped limb. D: Begin to apply a splint. E: Wrapped and splinted limb.

Transport to hospital:

The patient must be transported to a hospital, where they can receive medical care as quickly, but as safely and comfortably as possible. Where a conventional motor vehicle ambulance is not available or feasible, stretcher, bicycle, motorbike (Patel and Ekkiswata, 2010) - by recruiting village-based motorbike owners/cyclists (Sharma et al., 2013).

Why traditional methods of treatment by 'Ohza'is not recommended?

From scientific point of view, these methods are simply waste of time. Moreover, they may be harmful. The patient may develop severe infection, bleeding, gangrene. Sometimes, they can damage vein, artery, muscles of the limbs; even tetanus may occur.

Sometimes they may cause more harm than the snake venom itself. Even one may not get expected result of scientific treatment due to unusual delay for persuading traditional treatment.

Annex 2: Venomous Snakes of Bangladesh

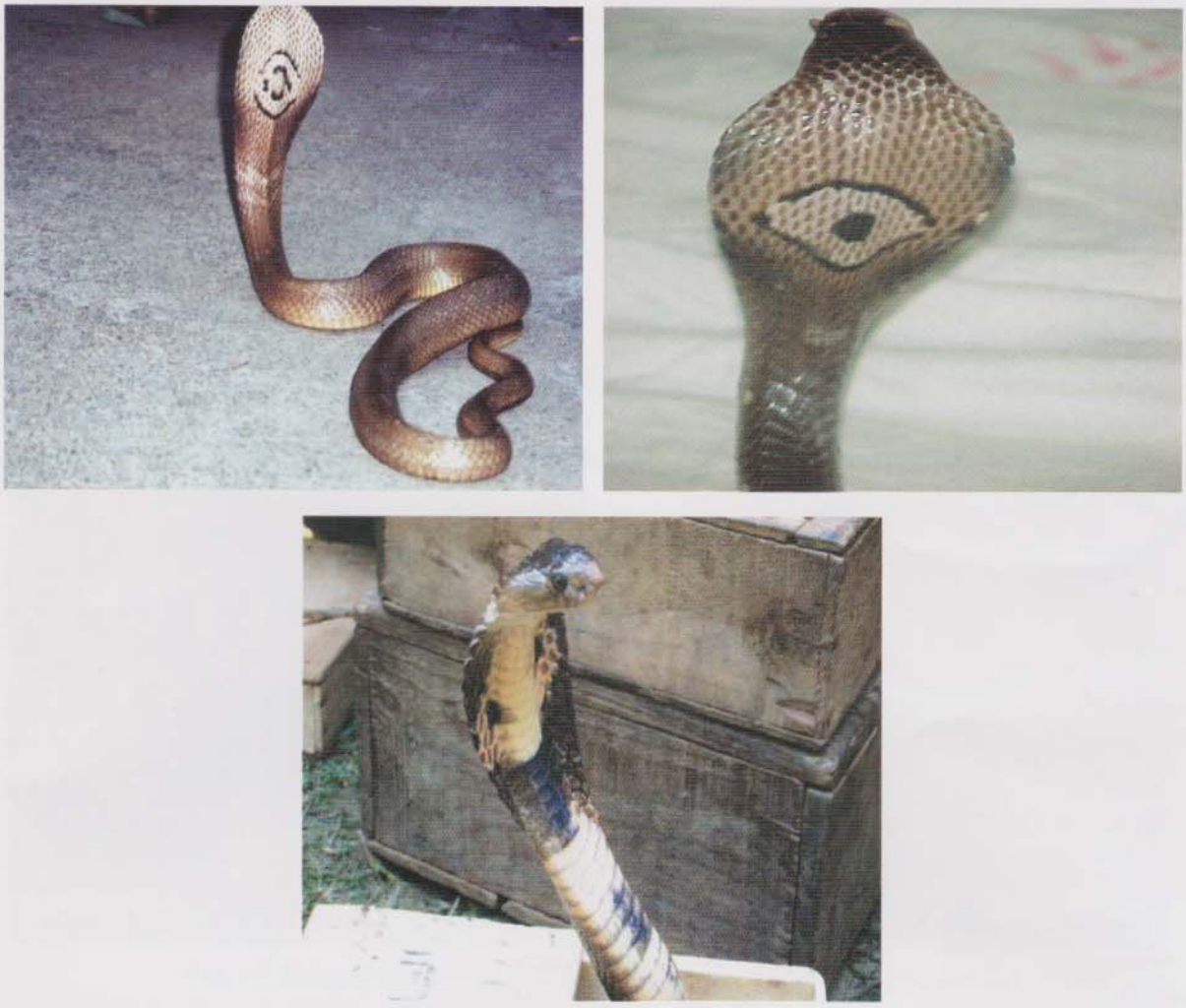


Fig 8: Common Cobra (Monocellete cobra – *Naja kauthia Copy right MA Faiz*)



Fig 9: Common Cobra (*Binocellate cobra* Copy right MA Faiz, Robed Amin)

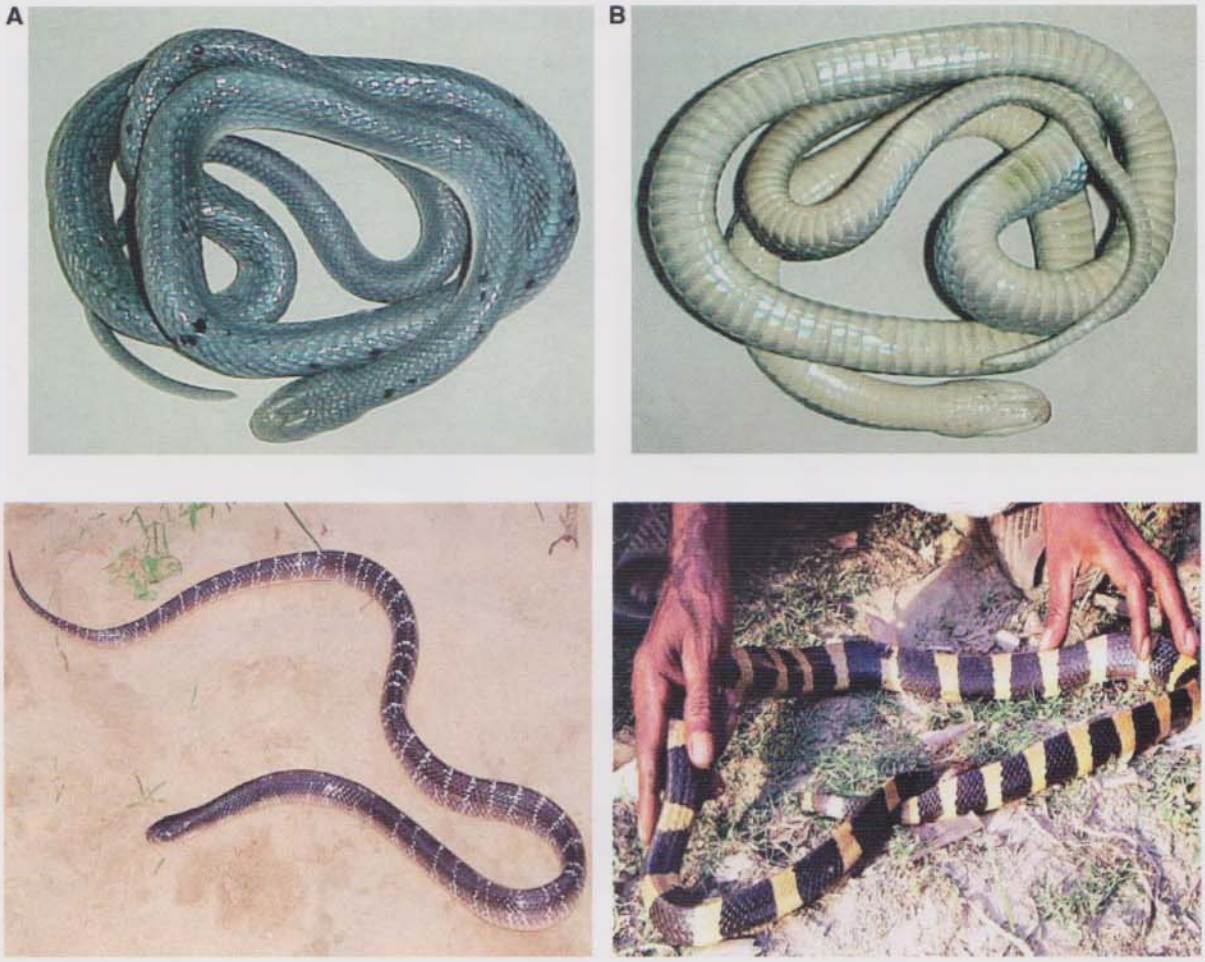


Fig 10: Common Krait and Banded Krait (*Bungarus ceruleaus* and *Faciatus*) Copy right Ulrich Kuch



Fig 11: Bangurus livedus
Copy right Ulrich Kuch



Fig12: Bungurus Walli
Copy right Farid Ahsan



Fig 13: Green Pit viper (*Trimerusurus spp*) Copy right MA Faiz)



Fig 14: Russell's Viper (*Daboia Russelii*) (copyright Robed Amin)



Fig 15 (King cobra) *Opihiophagus Hannah* (Copyright- David Warrell)



Fig 16: Sea snake (*Hydrophidae spp* Copy right Professor D A Warrell, Faisal)

Annex3:

THE 20WBCT:

Bedside Diagnosis of coagulopathy by the 20WBCT

The 20-min whole-blood clotting test (20WBCT) is performed as follows:

1. Obtain a clean GLASS container
2. Collect few milliliters (at least 2ml) of fresh venous blood into clean dry glass tube or bottle
3. Allow to stand undisturbed for 20 minutes without shaking or undisturbed,
4. After 20 minutes, gently tip the tube or bottle & observe whether the blood has clot or not,

Interpretation:

1. If blood clots – negative test (there is less likely coagulopathy)
2. If blood does not clot – positive test (there is coagulopathy)

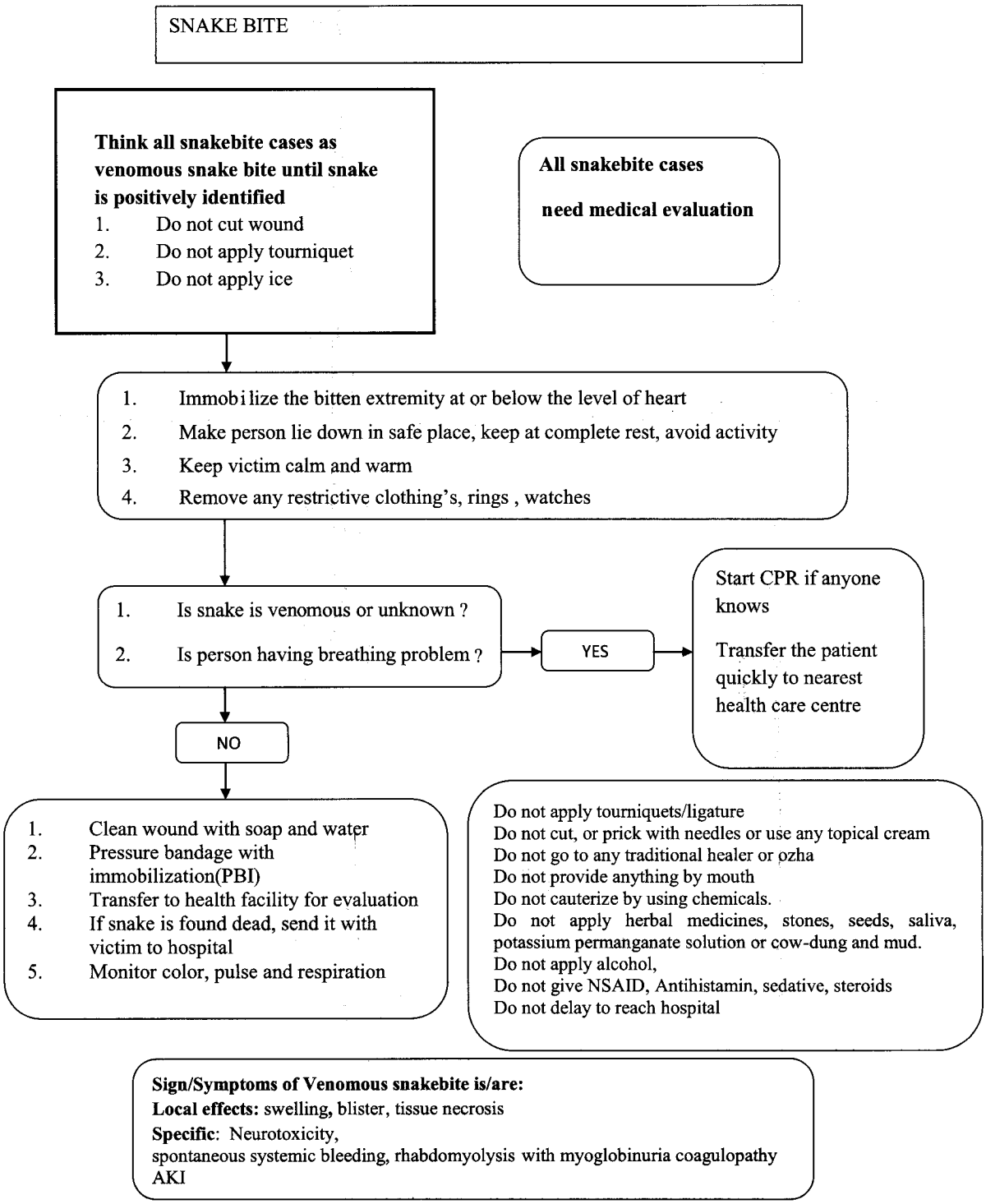
20-minute whole-blood clotting test (20WBCT)

1. Place a 2-3 mls of freshly sampled venous blood in a small, new, dry glass tube
2. Leave undisturbed for 20 minutes at ambient temperature, erect.
3. Tip the tube once
4. If the blood is still liquid (unclotted) and runs out, the patient has hypofibrinogenaemia "incoagulable blood" as a result of venom induced consumption coagulopathy.
5. In perspective of Bangladesh, incoagulable blood is diagnostic of a viper bite and rules out an elapid bite.
6. Warning: If the tube used for the test is not made of ordinary glass, or if it has been used before and cleaned with detergent, its wall may not stimulate clotting of the blood sample in the usual way and test will be invalid. If there is any doubt repeat the test in duplicate, including a "Control" (blood from a healthy person)
7. It is not indicated in case of identified Cobra and Krait bite.

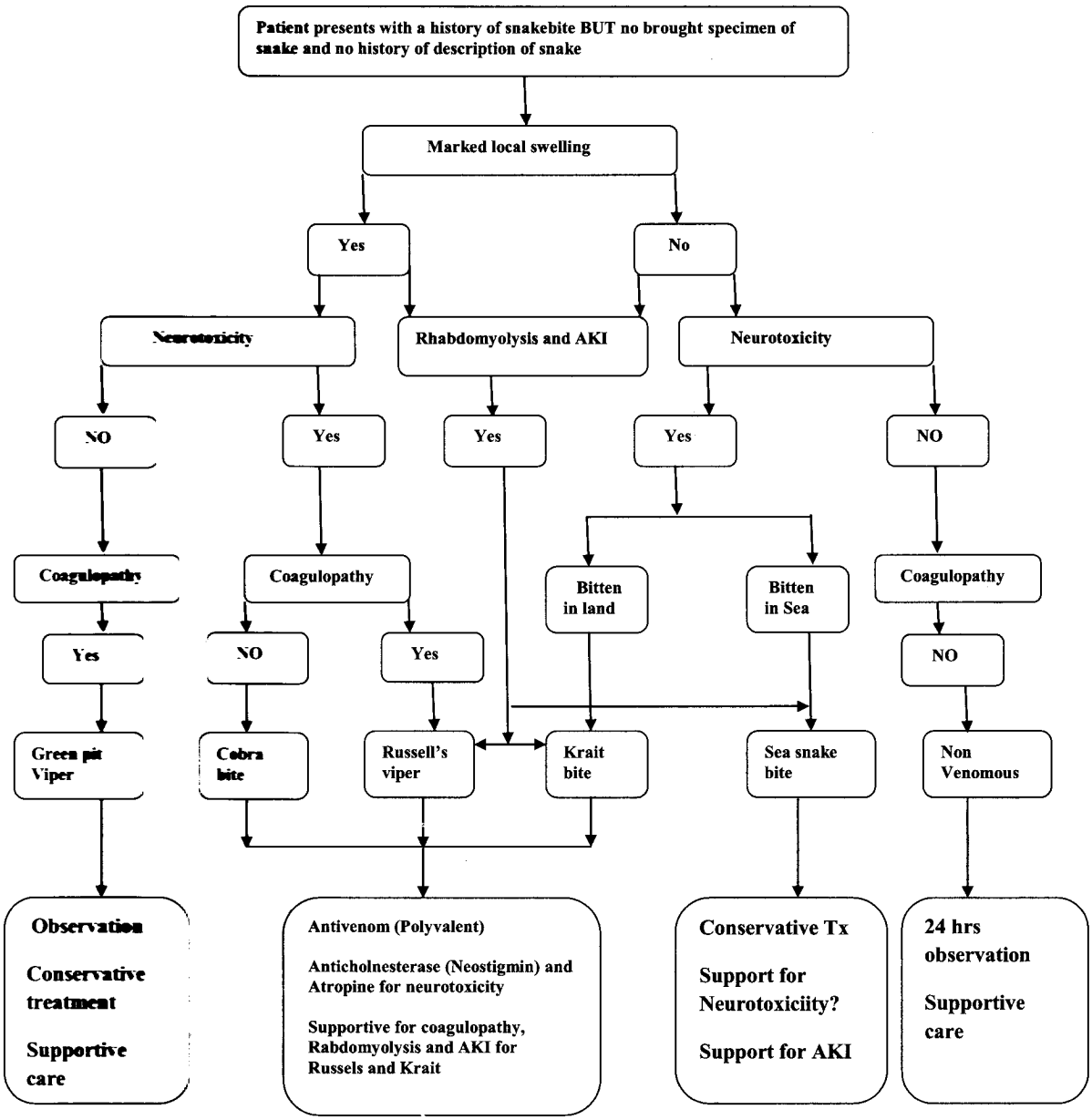


Fig 17: 20min WBCT showing incoagulable blood

Annexure 4: First Aid



Annex5 : Approach to identification of common snakebite patients of Bangladesh by clinical syndrome and treatment principle



The above clinical syndrome is applied for all areas of Bangladesh. Russell's viper is more common in northern area (Rajshahi, Chapainobabgonj etc)

Annex6:

If for health workers to deal effectively with cases of snakebite, it is important that certain essential supplies are available in their health facilities and that they are trained in the best methods for using them. Below is a list of recommended essential supplies for the management of snakebite. It can be modified to suit the needs of local health workers, depending on their specific training and attitude in dealing with snakebite victims.

1. Antivenom (with sterile water for reconstituting lyophilized antivenom)
2. Tetanus toxoid
3. Epinephrine (adrenaline) injection 0.1% (1:1,000) (1 mg/ml)
4. Parenteral antihistamine and hydrocortisone
5. Pain killers e.g. paracetamol and codeine NOT aspirin or nonsteroidal antiinflammatory agents
6. Antipyretics (paracetamol tablets, syrups and suppositories)
7. Local anaesthetic agents (1-2% lidocaine)
8. Intravenous (IV) fluids e.g. normal saline (0.9% NaCl)
9. Vasopressor drug e.g. phenalephrine, adrenaline and nonadrenalin
10. Injection atropine and neostigmine (Prostigmin)
11. Fresh frozen plasma or cryoprecipitates
12. Blood platelets
13. Oxygen cylinders with spanners, gauges, necessary connectors
14. Antibiotics (chloramphenicol, benzylpenicillin, flucloxacillin, metronidazole,gentamicin, amoxicillin-clavulanic acid)
15. Laryngoscope (adult and paediatric sizes) with spare batteries and bulbs
16. Cuffed endotracheal tubes (various sizes)
17. Ambu bag with connectors to endotracheal tube and face mask that fit
18. Face masks and oral airways
19. Suction apparatus and catheters
20. Urine dip sticks
21. New, clean, dry glass vessels for 20WBCT
22. Syringes, needles, intravenous cannulae
23. IV administration set
24. Sticking plaster
25. Scissors
26. Splints
27. Uretheral catheters
28. Bathroom type weighing scales
29. Stretchy, elasticated crepe bandage and splint

List of Essential Logistics for Snakebite Management

Trolley with tray- dedicated for snakebite logistics/ Crash Cart

Circulation equipment's/IV supplies & tubing:

1. syringe: Five 10 cc (5),5cc (5), 20 cc (2), 50 cc (2)
2. Insulin syringe (For collection of wound swab)
3. IV infusion set- two sets
4. IV blood transfusion set – One set
5. IV canula (JMS): two sets
6. IV Normal Saline -500 ml ×6
7. Indwelling Foley's catheter
8. Urinary meter bag
9. BP machine& stethoscope
10. Sterile vials (for collection of swab, blood etc.)
11. Ten (10) cc dry test tube with holding stand (For 20 min WBCT)
12. Sterile test tube (For blood sample)

Emergency Medications:

1. Antivenom -10 vials with diluents
2. Tetanous Toxoid- 1amp
3. Inj Atropine – 6- 10 amp: 15 mcg/kg
4. Inj Neostigmine (500 mcg)- 20-25 amp (For adults)- 50mcg/kg
5. Inj Adrenaline (1:1000)- 2-3 amp
6. Inj. Norepinephrine
7. Inj. Dopamine
8. Inj antibiotics- amoxycillin/ceftriaxone
9. Inj Chlorphenarmine- 1-2 amp
10. Paracetamol Suppository- 1-2 stick
11. Inj Hydrocortisone- 4-5 vials
12. Inj Ranitidine- 4-5 ampoules
13. Hexisol solution/ Antiseptic lotions or cream

Airway & Breathing equipment :

1. Cuffed Endotracheal tube- (size- 7, 7,5, 8ID)
2. LMA (laryngeal mask airway, size 4, 5)
3. Umbo bag-
4. Bain circuit (modified)
5. Orogastric tube (NG tube)

6. Laryngoscope set (different size for adult and child)
7. Battery for laryngoscope
8. Suction catheter & suction machine
9. Oxygen Cylinder& flow meter
10. Nasal cannula & face mask

Miscellaneous:

1. Gloves
2. Pulse oximeter (portable)
3. Water and soap
4. Gauze and cotton (For wound care and sling)

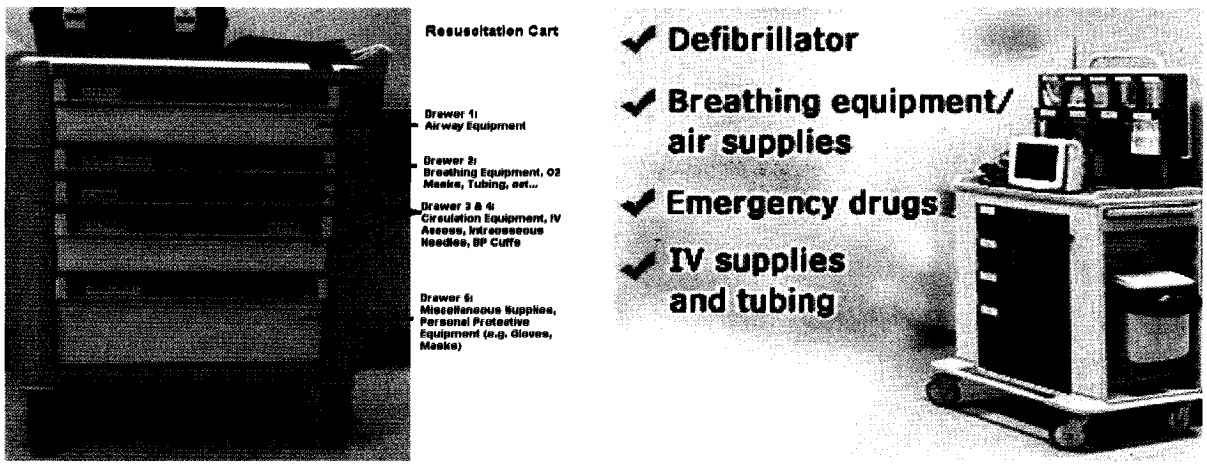


Fig 18: Emergency Cart/Crash cart Future directions:

National strategies for management of snakebite

1. A National Strategy for Snakebite mitigation should be developed.
2. Snakebite should be a notifiable disease with surveillance system in place at community and health care facilities
3. Availability of trained human resources, AV and essential logistics in all Upazilla, district Sadar and tertiary hospitals.
4. Compulsory BLS (basic life support) training of all health workers and advanced life support (ALS) training to doctors (Multi system use).
5. Availability of multipurpose quick ambulance/transport system in rural areas
6. Creation of awareness regarding prevention, harmful first aid & treatment seeking to 'Ohza' following snake bite, apprpropriate first aid and modern scientific treatment of snake bite, through school education, poster, leaflet, Jari ghan, Utan Baitak, electronic& social media, popular writing.
7. Rehabilitation of traditional healers ('Ozha') in alternate livelihood and snakebite victims who are differently abled.

Annex 7:

Name of the participants selected from DGHS in the workshop for the preparation of National Guideline and Training Module for doctors on Management of Snake bite in Bangladesh -2000

1. Dr. A. K. M. Rafiq Uddin, Professor of Medicine, Dhaka Medical College
2. Dr. Abul Kashem Khandakar, Professor of Medicine, Sir Salimullah Medical College
3. Dr. Abu Azhar, Professor of Medicine, Rajshahi Medical College
4. Professor / Associate Professor of Medicine, Barisal Medical College
5. Dr. Abdul Gani Professor of Medicine, Mymensingh Medical College
6. Dr. Manobandra Nath Nag, Associate Professor of Medicine, Rangpur Medical College
7. Dr. Faisal Ahmed, Associate Professor of Medicine, Sylhet Medical College
8. Dr. Mahtab Uddin, Associate Professor of Medicine, Dinajpur Medical College
9. Dr. R K Saha, Professor of Medicine, Chittagong Medical College
10. Dr. Md. Enamul Karim, Associate Professor of Medicine, Faridpur Medical College
11. Sayed Rezaul Karim, Associate Professor of Medicine, Khulna Medical College
12. Dr. Md. Gofnarul Hoque, Associate Professor of Medicine, Comilla Medical College
13. Md. Rafiqul Islam, Associate Professor of Medicine, Bogra Medical College
14. Mrs. Sajeda Akther, Biochemist, Antisera Section, Institute of Public Health. Mohakhali
15. Mohammed Abdullah, Civil Surgeon (in charge), Chittagong
16. Head of Department, Community Medicine, Chittagong Medical College
17. Head of Department, Forensic Medicine, Chittagong Medical College
18. Head of Department, Paediatrics, Chittagong Medical College
19. Professor Nazmun Nahar, Professor of Paediatrics, Dhaka Medical College
20. Professor Khalilur Rahman, Professor of Anaesthesiology, Dhaka Medical College
21. Professor Hamidur Rahman, Head of the Department of Paediatrics, Rangpur Medical College
22. Professor A B Siddique, Head of the Department of Paediatrics, Rajshahi medical College
23. Dr. Selim Md. Jahangir, Associate Professor of Anaesthesiology, Sir Salimullah Medical College.
24. Dr. M A Faiz, Professor of Medicine, Chittagong Medical College.
25. Dr. Md Ridwanur Rahman, Assistant Professor of Medicine. Chittagong Medical College.
26. Dr. Md Amir Hossain, Associate Professor of Medicine. Chittagong Medical College.
27. Professor M A Wahhab Chowdhury, Professor of Pathology. Chittagong Medical College.
28. Professor A Y Fazle Elahi Chowdhury, Professor of Anaesthesiology. Chittagong Medical College.

29. Professor Margub Hossain, Professor of Surgery. Chittagong Medical College.
30. Dr. Emran Bin Yunus, Associate Professor and OSD, DGHS
31. Dr. Sheikh Md. Hasan Mamun, IMO, Chittagong Medical College Hospital.
32. Dr Md. Robed Amin, Assistant Registrar, Chittagong Medical College Hospital Other participants
33. Dr. Faridul Islam, Associate Professor, Medicine, Chittagong Medical College
34. Dr. Salahuddin Mahmood, UH &FPO, Fatikhchari THC, Chittagong
35. Dr. Md. Zakir Hossain, Associate Professor, Medicine, Sir Salimullah Medical College
36. Mr. Milon Kanti Datta, Associate Professor of Zoology, Chittagong College
37. Dr. M A Jalil Chowdhury, Senior Consultant, Medicine, BSMMU
38. Dr. Md. Abid Hossain Mollah, Associate Professor of Paediatrics, Dhaka Medical College
39. Mrs. Qamar Banu, Professor of Zoology, Chittagong University, Chittagong
40. Dr. Mohibur Rahman, IMO, Chittagong Medical College Hospital
41. Professor Farid Ahsan, Department of Zoology, Chittagong University
42. Dr. Dilip Kumar Dhar, Associate Professor, Medicine, Dinajpur Medical College.
43. Professor Nurul Huda, Department of Zoology, Chittagong University
44. Dr. Rajib Palit, R/A, Malaria Research Group, Chittagong Medical College Hospital
45. Dr. Sazzad Hossain Chowdhury, R/A, Malaria Research Group, Chittagong Medical College Hospital
46. Dr. Shahnoor Sarmin, A/R, Chittagong Medical College Hospital
47. Dr. Kamrul Hasan Lohani, R/A. Snake Bite Study Group, Chittagong Medical College Hospital