INNOVARE JOURNAL OF LIFE SCIENCE

Vol 1, Issue 1, 2013

Review Article

SNAKE BITES: ROLE OF MEDICINAL PLANTS IN MANAGEMENT

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Received:23May 2013, Revised and Accepted:25May 2013

ABSTRACT

Snake bites possess significant amount of mortality as well as morbidity all over the world including India. Despite various species of snakes, only few of these can be potentially lethal to humans. Snake antivenom being only therapeutic option available in snake bite management, but has many drawbacks in actual clinical practice like species specificity, difficulty in availability, affordability and ideal storage conditions. The medicinal plants, available locally and used widely by traditional healers, therefore need attention in this aspects. Large number of plants and their active principles has been evaluated for pharmacological properties useful in the treatment of snake bites. However, numerous unexplored plants are claimed to have definite role in this issue need to be further studied. This review is an attempt to present a comprehensive account of various Indian herbal plants used in the treatment of snake bite in any forms like venom neutralization, topical application for local pain relief, oral formulation for pain relief etc.

Keywords: Herbal plants, Snake bite, Anti-snake, Venom neutralisation

INTRODUCTION

Since very ancient times, a poisonous animal bite is a serious issue in world. India is not an exception to this. Major animals belonging to this category are snakes, scorpions, spiders and many more. Among these, snake bites are relatively more lethal leading to vast number of mortality and morbidity issues. Snakes are remarkable animals, successful on land, in the sea, in forests, in grasslands, in lakes, and in deserts. However, most snake bites are caused by non-venomous snakes.

Snake envenomation is an important global health issue. Snakebite is declared as a "Neglected Tropical Disease" by the World Health Organization. As a result, this may be considered as a matter of global health concern for the people in general and the rural communities of the developing countries in particular. It constitutes an occupational hazard especially in field of agriculture for farmers, farm labours, villagers, migrating population and hunters. It is a major health hazard that leads to high mortality and great suffering in victims. Highest incidence and mortality due to snake bites is reported from South and Southeast Asian countries having extensive agricultural practices and diversity in snake species [1].

Consequently, no accurate study has ever been conducted to determine the frequency of snake bites on the international level. There are more than 3000 known species of snakes of which around 300 are poisonous. In India out of 216 species, approximately 53 are poisonous [2]. It is estimated that in India alone, there are more than 2, 00,000 venomous bites per year, of which 35,000-50,000 are fatal [2]. The estimates are arbitrary as majority of cases goes unreported. In rural areas, where most of the bites take place, the victims are mostly taken to traditional healers, who neither report them to the authorities nor document the cases, hence paucity of reliable epidemiological data [2]. The factors mainly responsible for high mortality associated with scorpion bite are poor health services, difficult and untimely transportation facilities, wrong traditional beliefs, delay in anti-snake venom administration.

Based on their morphological characteristics, snakes are categorized into various families. The families of venomous snakes are Atractaspididae, Elapidae, Hydrophidae and Viperidae[3]. The major families in the Indian subcontinent are, Elapidae which includes common cobra, king cobra and krait, Viperidae which includes Russell's viper, pit viper and saw-scaled viper and Hydrophidae, the sea snakes [3]. Of the 52 poisonous species in India , majority of bites and consequent mortality is attributable to 5 species viz. Ophiophagus hannah (king cobra), Naja Naja (common cobra), Daboia rusellii (Russell's viper), Bungarus caeruleus (krait) and Echis carinatae (saw-scaled viper) [3].

SNAKE VENOM- BASIC COMPOSITION

Venom is nothing but a secretion of venomous snake, which are synthesized in venom glands. It's modified saliva containing a mixture of different bioactive proteins and polypeptides used by an animal for defence or to immobilize its prey [4]. Not only the venom of every snake is different but a subtle difference exists between different species, between juveniles and adults, even among the snake of same species but of different geographical regions. Approximately 90-95% of venom's dry weight is composed of protein. These proteins may be toxic or non-toxic [5]. Venoms are sub-divided into cytotoxins, cardiotoxins, neurotoxins, and hemotoxins.[5] Cobras, mambas, sea snakes, kraits and coral snakes contain neurotoxic venom whereas viperidae family members such as rattle snake, copper heads, and cotton heads have hemotoxic venoms. Some snakes contain combinations of both neurotoxins and hemotoxins [5].

Basically snake venom is not composed of a single substance but it's a cocktail of hundreds, or even thousands of different peptides, proteins, enzymes, and chemicals. There are approximately 20 different type of toxic enzymes known to us till now found to be present in snake venom in varying combinations and concentrations. Most common snake venom enzymes include acetylcholinesterases, L-amino acid oxidases, serine proteases, metalloproteinases, and phospholipases-A(2) [5]. Many non-enzymatic toxins such as neurotoxin, cardiotoxin, myotoxin, and three-finger family of proteins present in snake venom also play an important role in venom toxicity.

ANTISNAKE VENOM AND ITS LIMITATIONS

The most effective and accepted therapy for snakebite patients is immediate administration of specific or polyvalent antivenom following envenomation. Unfortunately, this therapy carries an associated risk of anaphylaxis and serum reactions. The ubiquity of venom variation in snakes poses special problems for the manufacture of antivenom and has undermined the commercial attractiveness of this class of therapeutic agent. In particular, it has been amply documented that both inter-specific and intra-specific variation in venom composition can affect the neutralisation

capacity of antivenom [6]. Scarcity of sufficient amount of quality venom from authorized venom dealers also poses a challenge for a reasonable amount of antivenom production to meet the national requirement. The development is a costly, time-consuming process requiring ideal storage conditions. Absolute specificity is an issue in management with ASV. The geographic and taxonomic diversity in species leads to a significant variation in composition and antigenic reactivity of venom[7-8]. In short, due to complex interplay of economic, epidemiological, therapeutic efficacy and safety issues of antivenom, the mortality of snakebite remains incongruously high in the developing countries. In this context, the only available option for scorpion bite treatment is herbal treatment as these herbs are common, easily available and cheaper.

REASONS BEHIND THE USE OF MEDICINAL PLANTS IN SNAKE BITE

It is well known from ancient times that plants are a rich source of a variety of chemicals with nutritive and therapeutic properties. Plants have traditionally been used as a source of medicine in India by indigenous people of different ethnic groups inhabiting various terrains for the control of various ailments afflicting human and their domestic animals. Nearly 80 % of the global population still depends upon the herbal drugs for their health care. In India, the use of different parts of several medicinal plants to cure specific ailments has been practiced since ancient times. Various cultural traditions are associated with use of wild plants as medicinal herbs. This medico-lore is passed over generations traditionally all over the world. Various medicinal plants are being used as folk medicines in the treatment of snake bite also. Reliance on plants is primarily due to their safety, effectiveness, cultural preferences, inexpensiveness and abundant availability all the time. The medicinal virtues of plants are identified by instinct/intuition or by trial and errors. Globally, traditional healers are using various medicinal plants for the treatment of snake bite; however, this practice is not really completely recognized by modern medicine.

This review is an attempt to present a comprehensive account of numerous Indian medicinal plants used in the treatment of snake bite in any forms like venom neutralization, topical application for local pain relief, and oral formulation for pain relief. In fact, abundant plant species are used as folk medicine to treat poisonous snake bite all over the world. Ironically, in most of the cases these species are used without proper scientific validation. However, questions have been raised on the validity of such treatments and, therefore, pharmacological reassessment of medicinal plants must be done very carefully and critically prior to their application as antidote for snakebite. A thorough literature survey highlights that plant kingdom has a tremendous resources which can be exploited for unidentified novel compounds with scorpion antivenom activity or those supplementing the action of anti-snake venom.

PLANTS USED FOR SNAKE BITE TREATMENT:

Important plants which are being used for snake bite treatment in any form i.e. venom neutralization, oral form for pain relief and local application form for pain relief are mentioned in the accompanying table. Various indexed, non indexed journals were studies for the precise information.

MEDICINAL PLANTS USED IN THE TREATMENT OF SNAKE BITE IN INDIA

S. No	Botanical Name	Vernacular Name	Family	Parts used In Scorpion Bite	Ref No
1	*Achyranthes aspera* L	Nayuruvi, Prickly Chaff flower	Amaranthaceae	Root	9,13.24.25
2	*Andrographis echoides* Nees.	Gopuramthangi	Acanthaceae	Leaves	9
3	*Aristolochia indica L.*	Israramuli	Aristolochiaceae	Root	9
4	*Boerhavia diffusa L.*	Mookirattai	Nyctanginaceae	Root	9
5	*Ficus benghalensis L.*	Aal	Moraceae	Bark	9
6	*Drymaria cordata Willd*	Laijabori	Caryophyllaceae	Pounded leaf	10
7	*Moringa oleifera Lam.*	Drumstick tree	Moringaceae	Roots and seeds	11
8	*Cissus repens Lamk.*	Bai fen teng	Vitaceae	Roots and stems	12
9	*Andrographis stenophylla*	River Cooba	Acanthaceae	Leaf extracts	14
10	*Leucas aspera*	Thummichittu	Lamiaceae	Entire plant	15
11	*Pandanus nepalensis*	Kewara	Pandanaceae	Young or tender leaves	16
12	*Tamarindus indica L.*	Tamarind tree	Leguminosae	Seed extract	17,21
13	*Euphorbia hirta*	Dudhi	Euphorbiaceae	Roots	18
14	*Cayratia trifolia Linn.*	Amlavetash	Vitaceae	Paste of tuberous	19
15	*Biophytum sensitivum*	Lakshmana	Oxalidaceae	Whole plant	20
16	*Rosmarinus officinalis*	Rosemary	Lamiaceae	Whole plant	21
17	*Alstonia constricta*	Devil tree	Apocynaceae	Bark	22
18	*Alstonia scholaris R. Br.*	Saptaparna	Apocynaceae	Bark	22
19	*Biophytum petersianum Klotzsch.*	Yeleni Nèloutogo	Oxalidaceae	Plant	23
20	*Parkia biglobosa Benth.*	Nèrè	Leguminosae	Methanolic extract	23
21	*Aerva lanata (L.) Schult.*	Gorakhbuti, Kapuri jadi.	Amaranthaceae	Whole plant	24
22	*Alstonia scholaris (L.) R.Br.*	Blackboard tree	Apocynaceae	Leaves, bark, latex, flower	24
23	*Cryptolepis buchananii Roem. & Schult.*	English Indian Sarsaparilla	Asclepiadaceae	Root	24
24	*Ageratum conyzoides L.*	Chick weed	Asteraceae	Seed oil, leaves, juice, root	24
25	*Eclipta alba Hassk.*	False Daisy	Asteraceae	Whole plant, root, leaves	24,25
26	*Enydra fluctuans Lour.*	Harkuch	Asteraceae	Whole plant	24
27	*Ipomoea pes-tigrdis L*	Bugu mugu	Convolvulaceae	Roots	24
28	*Bryonia laciniosa L.*	Shivlingi	Cucurbitaceae	Seeds	24
29	*Bauhinia purpurea L.*	Khairwal	Fabaceae	Flowers, seeds, bark	24
30	*Bauhinia variegata L.*	kovidara	Fabaceae	Bark, roots, leaves. seeds	24
31	*Cassia fistula L.*	Golden shower tree	Fabaceae	Fruiit pulp., root bark, flowers	24

32	*Cassia occidentalis L.*	Mpalampalan	Fabaceae	Roots, leaves. Seeds	24
33	*Desmodium gangeticum DC.*	Salaparni	Fabaceae	Whole plant	24
34	*Mimosa pudica L.*	Shameful plant	Fabaceae	Whole plant	24
35	*Mucuna prurita Hook.*	Velvet bean	Fabaceae	Root ,shoot, hairs	24
36	*Tephrosia purpurea (L.) Pers.*	Sarphonk	Fabaceae	Whole plant, root, seeds	24
37	*Azadirachta indica A. Juss*	Neem tree	Meliaceae	Bark, root, young fruit, seeds, leaves, gum	24
38	*Moringa oleifera Lamk.*	Malunggay	Moringaceae	Root, bark, leaves, flower, fruit, seeds	24
39	*Imperata cylindrica Beauv.*	Cogongrass	Poaceae	Rhizome	24
40	*Aegle marmelos Corr.*	Bengal quince	Rutaceae	Fruit, root, bark, stem, leaves, flower	24
41	*Datura metel L.*	Datura	Solanaceae	Whole plant, seeds, root, fruits	24
42	*Solanum surattense Burm. f.*	Gulakai	Solanaceae	Whole plant	24
43	*Eclipta prostrata*	Bhangra	Asteraceae	Aqueous ethanolic extract of the aerial part	25
44	*Gymnema sylvester R.Br.*	Cowplant	Asclepiadaceae	Roots	25
45	*Andrographis paniculata Nees*	Kalmegh	Acanthaceae	Whole plant	25
46	*Vitex negundo*	Five-leaved chaste tree	Verbenaceae	Root Extract	25
47	*E. officinalis*	Heikru	Phyllanthaceae	Root Extract	25
48	*Gloriosa superba*	Glory Lily	Liliaceae	Plant	25
49	*Aloe pirottae*	Indian Aloe	Liliacea	Extract	26
50	*Balanites aegyptiaca*	Desert date	Zygophyllaceae	Extract	26

CONCLUSION

Snake bite is one of the most common and many a times potentially fatal phenomenon. Anti snake venom being the only therapeutic option available, but having many drawbacks, herbal plants provide a solid platform for the natural treatment of this serious issue. Data mentioned above clearly envisage that the herbal medications have excellent potential to treat snake bite. Herbal medicinal plants are an important element of indigenous medical systems globally. Though

many of the active plant constituents are promising contenders for the development of antivenom drug molecules in future, a single purified compound may not be sufficient to completely neutralize the toxic effect of snake venom. Therefore, pre-clinical studies to evaluate the antivenom activity of suitable herbal formulations containing different combinations of these active molecules are essential. However, assessment of bio-safety and *in vivo* toxicity of the herbal formulations must be addressed before advocating their safe therapeutic application in the clinical management of snake bite patients. It is well understood now that development of herbal medicine for snake bite is a difficult task. Further studies are required to identify the phytochemicals responsible for anti-snake activity of these medicinal plants. The present review provides a base for enhancing scientist's attention towards consideration of ethnomedicinally important plants for scorpion bite treatment.

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