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A Study on Medicinal Plants and their Uses Against Venomous Snakebite

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Study Area: Coimbatore, India

Coordinates: 11°16'N; 76°58'21"E

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Introduction:

"In India, snakebite till date remains a public health hazard. On average of 250,000 snake bites, cases are recorded in a single year. However unreported cases also even more, mostly in rural areas. Among various states in India, Maharashtra records high incidents of snake bites followed by Tamil Nadu, West Bengal, Uttar Pradesh, and Kerala (Pillay, 2008) where agricultural and farming activities are higher when compared to other states. Many deaths happened before the victim reaches the medical facilities. Most of them who had died from snakebite in developing countries like India are agriculturalists and manual laborers who are doing the nature of their works. The environment they work in and their habit of working with bare hands are short implements and of walking barefooted are more likely to suffer snake bite. They belong to the poorer section of the society and in most cases are the sole breadwinners of the family.

In Coimbatore district, many cases of snake bites were reported at Coimbatore Medical College Hospital (CMCH) in an average of 3 cases per day. Most snake bites occur during the rainy season.

Among these 4% of the cases are fatal, the remaining of the cases lead to severe complications. Herbal medicines have been widely practiced from the ancient period throughout the world. Herbal drugs obtained from plants are believed to be much safer in the treatment of various diseases. From the early to recent human beings they depend upon nature for their primary needs. Likewise, the use of medicinal plants for the treatments of the venomous animal bite was very well practiced by rural and tribal people thousands of years ago. Demand for Ethnobotany is

Abstract

Snakebite is one of the medical emergencies in developing countries like India. Systematic field surveys were carried out in different rural and tribal settlements in the Coimbatore district from January to August 2018. Tribal and rural people of this area have authenticated information about medicinal plants which are working against venomous snakebite. They have been using different plants and their parts as an antidote against snakebite. The present study provides information about 41 medicinal plants that belong to various plants families. Traditional knowledge on medicinal plants was dwindling rapidly in recent years among the people.

increasing day by day due to its vast need to cure several diseases and gained considerable attention in segments of the scientific community (Heinrich, 2000). About 200 years ago our pharmacopeia was dominated by herbal medicines (Ernst, 2005). According to World Health Organization (WHO) report, herbal medicines serve the primary health needs of about 80% of the world's population, especially people in rural areas (Azaizah *et al.*, 2003). Herbals are rich in secondary metabolites, easily available natural products, having easy formula-table and cost-effective with negligible or no side effects (Siddiqui, 1993). Application of the plants and their sap onto the bitten area, chewing leaves, and bark or drinking plants extracts or decoction or some procedures indented to counteract snake venom activity. Plants are used either singly or in combination as antidotes against snake bites by rural and tribal populations in India and in many parts of the world (Perumalsamy *et al.*, 2008).

Methodology:

Study area: Coimbatore is the second-largest city in Tamil Nadu, India. It is located in the western corner of Tamil Nadu, a short distance from the border with the neighboring state of Kerala, and is surrounded by the Western Ghats on all sides. Coimbatore is located at 11.01610N, 76.9710E. The city is at a distance of 490 KM southwest of Chennai, 190 KM south of Mysore, 330 KM south of Bengaluru. The border with Kerala is just 25 KM. The average rainfall of this district is around 600mm (23.6in) with the northeast and southeast monsoons contributing 47% to 28% respectively to the total rainfall.

Questionnaire Survey: in order to assess the herbal usage

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against snakebite by the rural and tribes, surveys were undertaken from Jan. to Aug. 2018 in the rural and tribal settlement in Coimbatore district, Tamil Nadu. Ethnobotanical data were collected according to the methodology through a questionnaire survey. Repeated inquiries were made to understand the knowledge of using medicinal plants, the dosage of crude drug, the purpose of usage, mode of preparation, and administration. Methods of diagnosis and treatment against venomous snake bites were also noted down. A short description of plants, habit, habitat, family, synonyms, local name, and other vital parameters was collected during the fieldwork. Our questionnaire allowed descriptive responses on the plant prescribed such as part of the plant used, medicinal uses, and detailed information about mode of preparation (i.e, decoction, paste, powder & juice) form of usage either fresh or dried, and mixtures of other plants used as ingredients.

Results:

The present investigation showed that 41 plants that belong to twenty-eight families have been used as antidotes against snakebite by the rural and tribal people. These plant species arranged in alphabetic order. The enumeration of the plant contains botanical name, family, vernacular name and parts used is given in (Table-1).

Table-1. Medicinal plants used for the treatment of snakebite in Coimbatore District, Tamil Nadu.

#. Plants species	Family	Vernacular Name	Parts used against snake bite
1 <i>Abrus precatorius</i>	Fabaceae	Kundumani	Root & seed
2 <i>Achyranthes aspera</i>	Amaranthaceae	Nayuruvi	Full plant
3 <i>Aerva lanata</i>	Amaranthaceae	Pula poo	Rhizome
4 <i>Ageratum racemosus</i>	Asteraceae	Chattavari	Root
5 <i>Allium sativum</i>	Alliaceae	Velli-vangayam	Bulbs
6 <i>Alternanthera sessilis</i>	Amaranthaceae	Ponnonkanni	Stem & leaf
7 <i>Andrographis paniculata</i>	Acantheceae	Siriyangai sp	Full plants
8 <i>Andrographis lineate</i>	Acantheceae	Siriyangai	Leaf
9 <i>Andrographis erphilifolia</i>	Acantheceae	Siriyangai	Root
10 <i>Aristolochia indica</i>	Aristolochiaceae	Karudakodi	Root & leaf
11 <i>Azadirachta indica</i>	Meliaceae	Veppamaram	Leaf
12 <i>Brassica juncea</i>	Brassicaceae	Kaduku	Seed
13 <i>Calotropis gigantea</i>	Asclepiadaceae	Erukala	Root & leaf
14 <i>Centella asiatica</i>	Apiaceae	Vellarai	Root
15 <i>Clitoria ternatea</i>	Fabaceae	Sangu poo	Leaf & root
16 <i>Citrus limon</i>	Rutaceae	Yalumachai	Fruit
17 <i>Curculigo orchoides</i>	Hypoxidaceae	Nelapanai	Rhizome
18 <i>Curcuma longa</i>	Zingiberaceae	Manchal	Rhizome
19 <i>Cynodon dactylon</i>	Poaceae	Arugampull	Root
20 <i>Hemidesmus indicus</i>	Asclepiadaceae	Nannari	Root
21 <i>Jasminum auriculatum</i>	Oleaceae	Kattumulli	Root
22 <i>Lebelia nicotianifolia</i>	Lobeliaceae	Kattupugaielai	Leaf
23 <i>Leucas aspera</i>	Lamiaceae	Thumbai	Leaf
24 <i>Leucas rosmarinifolia</i>	Lamiaceae	Thumbai	Leaf/root
25 <i>Mimosa pudica</i>	Mimosaceae	Thottachinungi	Full plant
26 <i>Momordica charantia</i>	Cucurbitaceae	Pavakkai	Root
27 <i>Momordica dioica</i>	Cucurbitaceae	Kattu pavakkai	Root
28 <i>Murraya paniculata</i>	Rutaceae	Chedichi	Bark
29 <i>Murraya koeingi</i>	Rapidesae	Karuveppilai	Leaf
30 <i>Musa paradisiacal</i>	Musaceae	Vaalai	Bark
31 <i>Occimum sanctum</i>	Laminaceae	Thulasi	Leaf
32 <i>Pergularia daemia</i>	Asclepiadaceae	Veeliparuthi	Leaf

33 <i>Phyllanthus emblica</i>	Euphorbiaceae	Nellikaai	Fruit
34 <i>Piper bettle</i>	Piperaceae	Vettilai	Leaf/Fruit
35 <i>Piper nigrum</i>	Piperaceae	Milagu	Seed
36 <i>Rauvolfia serpentine</i>	Apocynaceae	Serpagandhi	Root
37 <i>Rhinacanthus nasutus</i>	Acantheceae	Nagamali	Leaf & root
38 <i>Sansevieria roxburghiana</i>	Agavaceae	Marul/Paampukalli	Rhizome
39 <i>Solanum nigrum</i>	Solanaceae	Manathakali	Leaf & root
40 <i>Terminalia chebula</i>	Combretaceae	Kadukai	Seed
41 <i>Urginea indica</i>	Liliaceae	Kattupoondu	Bulb

Out of 41 plant species, the maximum number (n=4) plant species were belonged to the family Acantheceae, followed by Asclepiadaceae and Amaranthaceae (n=3), Fabaceae, Rutaceae, Laminaceae and Cucurbitaceae, Piperaceae (n=2) and other families of plants (n=1) (Table-2).

Table-2: Family wise classification of medicinal plants used against snake bite

S.no.	Name of families	Total	S.no.	Name of families	Total
1	Acantheceae	4	15	Hypoxidaceae	1
2	Asclepiadaceae	3	16	Zingiberaceae	1
3	Amaranthaceae	3	17	Poaceae	1
4	Fabaceae	2	18	Oleaceae	1
5	Rutaceae	2	19	Lobeliaceae	1
6	Laminaceae	2	20	Mimosaceae	1
7	Cucurbitaceae	2	21	Rapidaeae	1
8	Piperaceae	2	22	Musaceae	1
9	Alliaceae	1	23	Euphorbiaceae	1
10	Asteraceae	1	24	Apoconaceae	1
11	Aristolochiaceae	1	25	Agavaceae	1
12	Meliaceae	1	26	Solanaceae	1
13	Brassicaceae	1	27	Compretaceae	1
14	Apiaceae	1	28	Liliaceae	1

Among the 41 herbals which are used as antidotes against snakebite by the rural and tribal people of Coimbatore district, Tamil Nadu, most of the plant species were herbs 22 (53.7%) followed by climbers 10 (24.4%), Tree 6 (14.6%) shrub 2 (4.9%) and one grass species (2.4%) (Table-3).

Table-3: Plants types used as antidotes against venomous snakebite

Sl.No	Category of plants	No. of species	% wise data
1	Herb	22	53.7
2	Climber	10	24.4
3	Tree	6	14.6
4	Shrub	2	4.9
5	Grass	1	2.4

Within the plant parts which are used against snakebite, the majority of the people use root/rhizome 15 (36.6%) and leaf 12 (29.3%) followed by bark 2 (4.9%), whole plants and seeds 3 (7.3%). In few cases bulbs 2 (4.9%) fruits and stem 2 (4.9%) (Table-4)

Table 4. Plants parts used by rural/tribal people against snakebite

S.no	Plant parts	a	b	S.no.	Plant parts	a	b
1	Root/Rhizome	15	36.6	2	Leaf	12	29.3
3	Bark	2	4.9	4	Whole parts	3	7.3
5	Seeds	3	7.3	6	Bulbs	2	4.9
7	Fruits	2	4.9	8	Stem	2	4.9

a- No. of prescriptions; b- % wise data

During the study period, it was noticed that majority of the people prepare drugs against snakebite in the mode of paste 25 (61%), followed by juice 10 (24%), decoction 4 (10%) and in the form of powder 2 (5%) (Table-5).

Table 5. Preparation of different plant parts used against snake bite treatment

Sl.no	Preparations	a	b	Sl.no	Preparations	a	b
1	Paste	25	61	2	Juice	10	24
3	Decoction	4	10	4	Powder	2	5

a- No. of prescriptions; b- % wise data

In most cases, the paste applied externally on bitten areas (n=21) of the body, internally in the form of juice, decoction and powder (n=18). The heavily envenomed and serious cases the herbal made into powder and applied (externally) in bitten sites and also given internally (n=2).

During the survey period, a total of 26 (20 -30 age group) were contacted for an interview, 60 persons belong to the age of 30-40 were interviewed. Among them, 7 persons provided information on anti snakebite plants. 42 persons belong to the age 40-50 were interviewed. Among them, 31 persons provided information on anti snakebite plants. A total of 58 persons the age of above 50 are interviewed, among them, 52 persons had good knowledge and provided much more information about anti-snakebite plants and their various uses. Hence the present study concludes that elderly people (56.5 %) practising herbals against snakebite when compared to the younger generation. Women of most of the tribal community had little knowledge of medicinal plants which act as antidotes against snakebite (Table-6)

Table-6: Age-wise data on tribal information

Sl.no	Age group	Total persons interviewed	Total persons gave information	% wise data
1	20-30	26	2	2.19
2	30-40	60	7	7.60
3	40-50	42	31	33.69
4	Above 50	58	52	56.54

Discussion:

This study provided 41 species of antidote plants and their usage against snake bite. Among these plants, some plants were previously reported against snake bite (Prasad *et al.*, 1987; Karuppusamy, 2009; Shanmugam *et al.*, 2009; Revathi & Parimelazhagan, 2010; Jain *et al.*, 2011; Alagesaboopathi, 2011; Nayak *et al.*, 2020; Silva *et al.*, 2017). Eight species of medicinal plant such as *Ageratum racemosus*, *Brassica juncea*, *Centella asiatica*, *Cynodon dactylon*, *Lebelia nicotianifolia*, *Momordica dioica*, *Terminalia chebula*, and *Urginea indica* were used for various ailments according to Gomes *et al.*, 2010; Ayyanar *et al.*, 2011, but the present study shows that herbs were the primary source of medicine followed by climber, tree,

shrub, and grass.

Among the different plant, parts used the root and rhizome were most frequently used for the preparation of medicine solely or mixed with other plant parts. The leaves are also used by the tribals. The common use of leaf is also due to the easy availability of these parts in the area (Panghal *et al.*, 2010). Many indigenous communities elsewhere also utilized mostly leaves for the preparation of herbal medicines (Gonzalez *et al.*, 2010). The reason why the leaves are used mostly is that they can be collected very easily than underground parts, flowers, and fruits, etc., (Giday *et al.*, 2009) and leaves remain green and available in plenty for the most month of the years.

From a scientific point of view, leaves are active in the photosynthesis and production of metabolites (Ghorbani, 2005).

Preparation of paste and juice for the treatment of snakebite is a common practice along with the tribal communities in India (Rajkumar & Shivanna, 2009; Tushar *et al.*, 2010; Upadhyay *et al.*, 2010) and other parts of the world. The paste was prepared by grinding the fresh or dried plant parts with oil or water. The powder was prepared by the grinding of shade-dried plant parts.

The decoction was obtained by boiling the plant parts in water until the value of the water was reduced to a minimum or required amount. The inhalation was done by the burning of plant parts and inhaled the smoke through the nose or mouth. External use was predominating over internal or topical uses and nasal application.

Most of the medicines were given orally which is agreed with some other studies conducted elsewhere, (Perumalsamy *et al.*, 2008; Lee *et al.*, 2008). The uses of a mixture of plant species and also diluting in water, cow milk, and curd for mixing various ingredients available in the treatment period. This report is related to various studies in the state and other parts of the country (Lal & Yadav, 1983; Ayyanar & Ignacimuthu, 2005). It was reported that the healers prescribed the medicine either based on single plant parts or a combination of several plant parts and a similar result was also reported in various studies conducted in India (Upadhyay & Kumar, 2010).

The growing disinterest in the use of folk medicine and its significance among the younger generation of the tribes may lead to the disappearance of this practice as it was reported by several previous workers (Jain & Agarwal, 2005; Pradheeps & Poyyamoli, 2013; Guimbo *et al.*, 2011; Sharma, 1977). The educated younger generation of the tribes should be encouraged to protect and cultivate these valuable herbal plants before they get lost due to urbanization and deforestation. The older age group above 50 years believes in herbal medicine and indigenous methods of treatment. This study brought to light the immense hidden knowledge of tribes on venomous snakebites and remedies to cure with the help of some herbals. Tribals have been employing

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these plants in the form of paste, powder, juice, and decoction and also in crude form to treat venomous snake bites. Under this situation, if we are able to standardize herbal medicine for the treatment of snakebite victims it will be helpful to reduce the mortality rate of snakebite cases. Thus, this study is of great importance in the management of snakebite.

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