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Open Access Research Paper

Ethnobotanical Indices on Medicinal Plants Used to Treat Poisonous Bites in Thiruppuvanam Region of Sivagangai District in Tamil Nadu, India

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Abstract

Poisonous bites are serious problems in tropical countries like India. Both the tribal and non-tribal people prefer herbal treatment for poisonous bites. In this manner, an ethnomedicinal investigation was carried out to explore the plants used to treat poisonous bites in Thiruppuvanam region of Sivagangai district. By this research work, a total of 16 medicinal remedies prepared from 16 species of angiosperms belonging to 15 genera comes under 13 families are in medicinal utility for the treatment of poisonous bites. It was documented that, 9 plants were used for the treatment of snake bite, 3 plants for the treatment of scorpion sting, 2 for all type of bites, 1 for dog bite, insect bite and rat bite. Among the 16 species recorded, dicots were represented with 11 species belonging to 10 genera of 9 families and monocots were 5 species of 5 genera belonging to 4 families. Aristolochiaceae, Lamiaceae and Liliaceae were found as dominant families with 2 species each (12.5%) and 10 families were noted with single species (each of 6.25%). Regarding the habits of medicinal plants, 8 species cited were herbs. It was also observed that leaves were mostly used plant part (43.75%) to treat poisonous bites. The medicinal preparation was mostly used in the form of extract (62.5%) and the administration of the medicine prepared was mainly taken as drink (64.70%). *Musa paradisiaca* (UV of 0.85 with 17 use-reports) was the most frequently and popularly used medicinal plant species in the study area. It is necessary to perform phytochemical or pharmacological studies on these traditionally used plants used for medicinal purposes to ascertain their therapeutic efficiencies.

Keywords: Ethnobotanical indices, Medicinal plants, Poisonous bites, Thiruppuvanam region, Sivagangai district, Tamil Nadu.

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1. INTRODUCTION

Poisonous bite is one of the important medical problems that affect the public health due to their high mortality. Most of the poisonous venoms produce intense lethal effects, which could lead to impermanent or permanent disability or in often death to the victims. The accessible specific treatment was using the anti-venom serum separated from envenomed animals, whose efficiency is reduced against these lethal actions but it has a serious side effects [1]. Poisonous bites have been a serious yet often overlooked public health threat especially in tropical and subtropical countries, including Asia [2]. The incidence of poisonous bites is high in India. Apart from mortality, the morbidity is due to various complications. Approximately 10000 to 50000 poisonous bites related deaths occur in India each year [3].

In India, a variety of herbal plants are used to cure against the poisonous bites, used either in alone or in combination with other herbal agents. The people living in and around Thiruppuvanam region have a healthy awareness of traditional medicine, especially herbal and folk medicine for the treatment of several ailments [4]. In this connection, the present study was designed to formulate an attempt to bring together information on medicinal plants that are grown and used for the treatment of poisonous bites in Thiruppuvanam region of Sivagangai district in Tamil Nadu.

2. MATERIALS AND METHODS

2.1. Study area

Thiruppuvanam is one of the taluk of Sivagangai district in Tamil Nadu, India. It spreads an area about 20 km^2. There are four study sites have been selected for the data collection in

the present study. They are Thiruppuvanam (78.2576º E and 9.8260º N), Thiruppuvanam – Pudur (78.2687º E and 9.8207º N), Chellapanendal (78.2792º E and 9.8148º N) and Ladanendal (78.2960º E and 9.8013º N). The longitude and latitude data were mentioned above in parentheses next to the respective study sites. The altitude of the study area is 102 m msl.

2.2. Data collection and Plant identification

The ethnomedicinal data were collected from the study sites during field surveys in different seasons from December 2019 to February 2020. The data of medicinal uses were gathered through semi-structured interviews, key informant discussions and informal conversations with herbal healers or locally called as *Vaidhiyar*. A total of 20 informants were interviewed. Information on uses of plants for treating different poisonous bites, parts used and mode of preparation as well as administration was gathered during the field surveys. The plants for which the medicinal data collected were critically studied and botanically identified by using standard literatures [5,6].

2.3. Data analyses

2.3.1. Use Value (UV)

The relative importance of each plant species known locally to be used as herbal remedy is reported as the use value (UV) and it was calculated using the following formula [7]. UV = Ur/N, where, Ur is the number of use reports cited by each informant for a given plant species and N is the total number of informants interviewed for a given plant. The UV is helpful in determining the plants with the highest use (most frequently indicated) in the treatment of an ailment. UVs are high when there are many use-reports for a plant and low when there are few reports related to its use.

2.3.2. Informant Consensus Factor (ICF)

The informant consensus factor (ICF) was used to see if there was agreement in the use of plants in the ailment categories between the plant users in the study area. The ICF was calculated by using the following formula [8]. ICF = Nur – Nt / Nur–1, where Nur refers to the number of use-reports for a particular ailment category and Nt refers to the number of taxa used for a particular ailment category by all informants. The product of this factor ranges from 0 to 1. A high value (close to 1.0) indicates that relatively few taxa are used by a large proportion of the informants. A low value indicates that the informants disagree on the taxa to be used in the treatment with in a category of illness.

3. RESULTS AND DISCUSSION

3.1. Demographic features of the informants

The study interviewed a total of 20 informants and among them, 65% were female and the remaining 35% were male (Fig 1). It is witnessed that female had better knowledge regarding ethnomedicine than male. The reasons behind that in many cultures women are responsible for the family's health. In general, informants with average age of 41 – 60 where mostly interviewed, accounting for 45% of the total number. This was closely followed by those whose age was between 21 – 40 (30%) and the least category age of the informants interviewed was above 60 yrs. with 25%. Majority of the informants interviewed (70%) did not attend basic education, while 30% attended basic education (primary school). From this, it was found that the literate people in the study area have less knowledge of medicinal plants as compared to illiterate ones as the former are more likely to be exposed to modernization as also revealed by studies conducted previously in Tamil Nadu [4,9 -11]. Of all the informants interviewed, 40% were grazier, 30% were farmer, 20% were agricultural labourer and 10% were government employee (Fig 1).

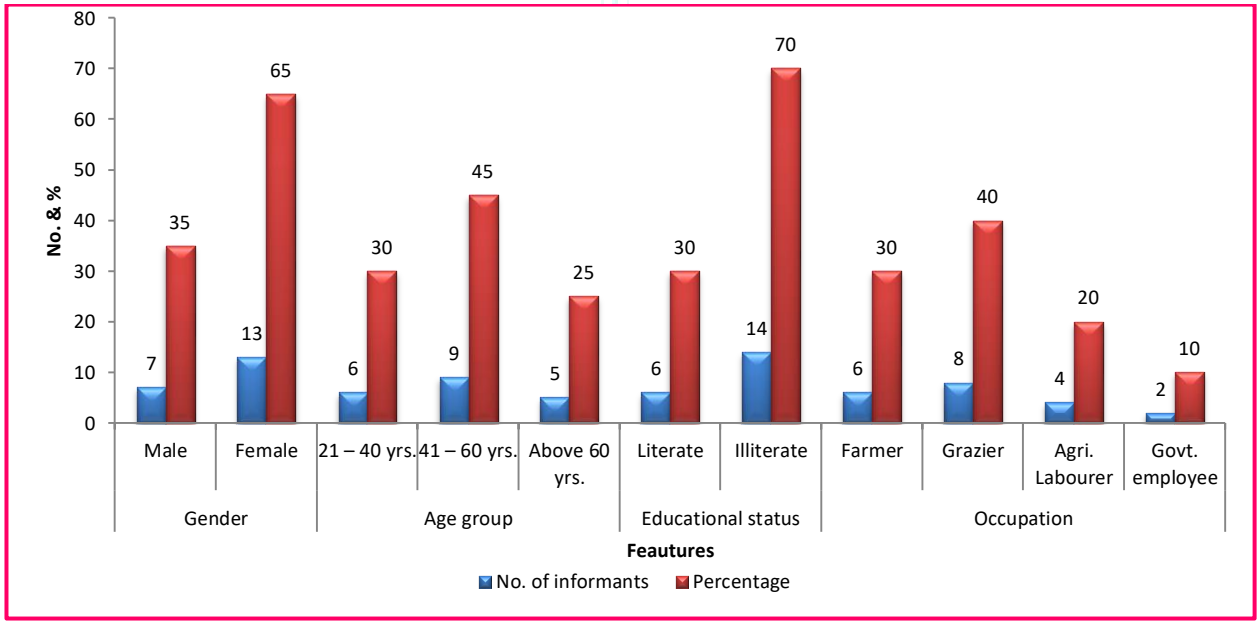

Figure 1: Demographic features of the informants

3.2. Diversity of medicinal plants for poisonous bites

The present study revealed documentation of 16 medicinal plant species belonging to 15 genera and 13 families Thiruppuvanam region used by local inhabitants for different poisonous bites (Table 1). In terms of utility, 9 plants were prescribed in the treatment of snake bite, 3 plants were used for scorpion sting, 2 plants to treat all type of poisonous bites and each one plant for dog bite, insect bite and rat bite respectively (Fig 2).

Table 1: List of anti-poisonous plants with use reports and use value

Botanical name (Family name – Local name – Habit)	Medicinal use	Use Reports	Use Value
Achyranthes aspera L. (Amaranthaceae – Naayuruvi – Herb)	Root extract is given to drink for the treatment of dog bite	13	0.65
Acorus calamus L. (Araceae – Vasambu – Herb)	Leaf extract is taken orally for insect bite	6	0.30
Allium cepa L. (Liliaceae – Vengaayam – Herb)	Bulb paste is applied on spot for rat bite	9	0.45
Alpinia calcarata Roscoe (Zingiberaceae – Chitharathai – Herb)	Rhizome extract is poured on the spot to treat snake bite	7	0.35
Alstonia venenata R.Br. (Apocynaceae – Sinnappaalai – Tree)	Fruit extract is taken orally for the treatment of poisonous bites	5	0.25
Andrographis paniculata (Burm.f.) Wallich ex Nees (Acanthaceae – Nilavaembu – Herb)	Leaf extract is taken orally to treat snake bite	16	0.80
Anisomeles malabarica (L.) R.Br. ex Sm. (Lamiaceae – Paeymiratti – Herb)	Leaf extract is poured on the spot and also given to drink for the treatment of snake bite and scorpion sting	12 (7 + 5)	0.60
Aristolochia indica L. (Aristolochiaceae - Eswaramooli – Climber)	Leaf juice is poured for scorpion sting	14	0.70
Aristolochia bracteolata Lam. (Aristolochiaceae – Aaduthinaappaalai – Climber)	Leaf juice is given to drink to treat snake bite	16	0.80
Capsicum frutescens L. (Solanaceae – Milagaai – Herb)	Fruits are eaten raw for snake bite	8	0.40
Euphorbia tirucalli L. (Euphorbiaceae – Thirukkalli – Tree)	Root extract is prescribed to treat snake bite	12	0.60
Gloriosa superba L. (Liliaceae – Kalappaikkizhangu – Climber)	Tuber extract is taken orally for the treatment of snake bite	11	0.55
Musa paradisiaca L. (Musaceae – Vaazhai – Tree)	Exudate obtained from inner stem is taken orally to treat snake bite	17	0.85
Ocimum basilicum L. (Lamiaceae – Tiruneettrupachai – Herb)	Leaf extract is taken orally to detoxify the effect of poisonous bites	9	0.45
Pavetta indica L. (Rubiaceae – Pavattai – Shrub)	Leaf extract is prescribed for the treatment of snake bite	8	0.40
Tamarindus indica L. (Caesalpiniaceae – Puli – Tree)	Seed coat paste is applied on the spot to treat scorpion bite	14	0.70

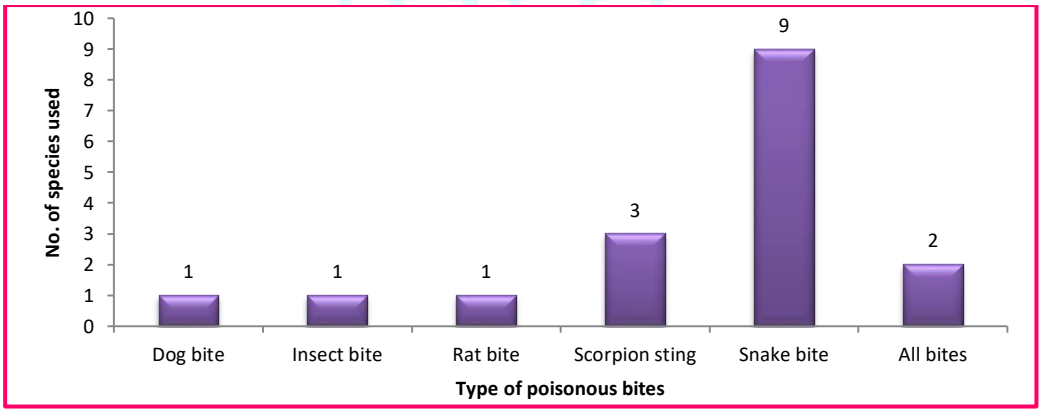

Figure 2: Number of plants used for the treatment of various poisonous bites

Out of 16 species, 11 species of 10 genera comes under 9 families were found as dicot and 5 species belonging to 5 genera of families were monocot. The families Aristolochiaceae, Lamiaceae and Liliaceae were recorded to be the highest represented families in terms of number of species (2 species and 12.5% of total species each). The other 10 families provide less 6.25% representation with single species each (Table 2). In the present study, the highly reported species were herbs (8 species) followed by trees (4 species), climbers (3 species) and shrub (1 species) (Fig 3). Several studies reported the common use of herbaceous medicinal plants [12-14], because the herbs are attributed to wide range of bioactive ingredients [15].

Table 2: List of families recorded from study sites

Family	No. of genus	No. of species	% of total species
Acanthaceae	1	1	6.25
Amaranthaceae	1	1	6.25
Apocynaceae	1	1	6.25
Araceae*	1	1	6.25
Aristolochiaceae	1	2	12.50
Caesalpiniaceae	1	1	6.25
Euphorbiaceae	1	1	6.25
Lamiaceae	2	2	12.50
Liliaceae*	2	2	12.50
Musaceae*	1	1	6.25
Rubiaceae	1	1	6.25
Solanaceae	1	1	6.25
Zingiberaceae*	1	1	6.25
Total	15	16	100.0

Note: *Monocot families: Others are dicot

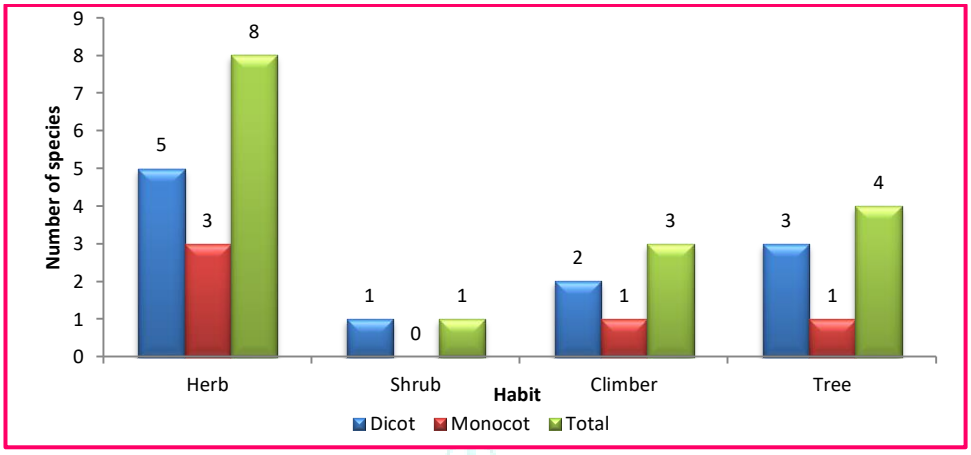

Figure 3: Number of plants in different habits

The present study showed that the plant parts used for the treatment of poisonous bites in the study sites were mainly leaves, fruits and roots. Leaf was found to be most frequently utilized plants part (43.75%), followed by fruit and root (12.5%). The least use percentage (6.25) was noted for bulb, inner stem, rhizome and seed coat (6.5% each) (Fig 4). The predominant use of leaf used by various people for different therapies has been attested by other studies [16-18].

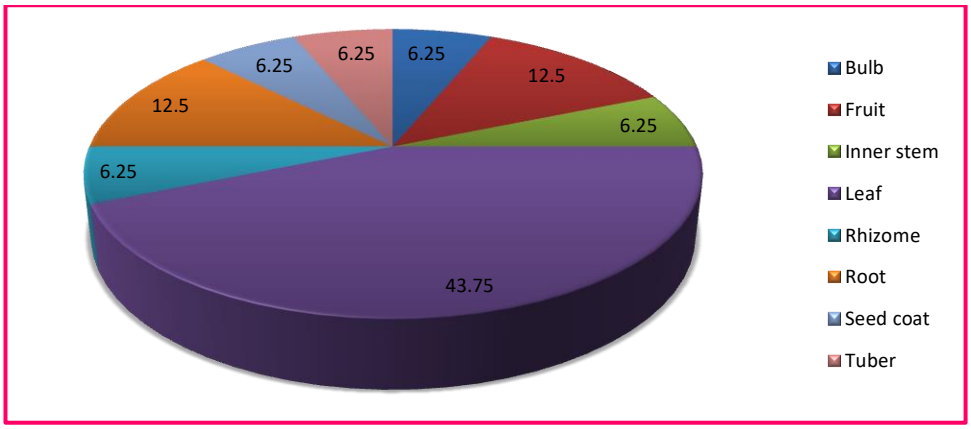

Figure 4: Percent distribution of plant parts used

The modes of preparation of herbal medicines were in the forms of extract, exudate, juice, paste, and raw. The majority of the plant remedies were prepared by extract (62.5%) followed by juice (12.5%), paste (12.5%), exudate (6.25%) and raw (6.25%) (Fig 5). In terms of administration, oral administration was found as the principal mode of intake of medicine as drink (64.7%) followed by apply externally (11.76%), pour (17.66%) and eat (5.88) (Fig 6). These observations are in accordance with the results of previous studies conducted in Tamil Nadu [19,20].

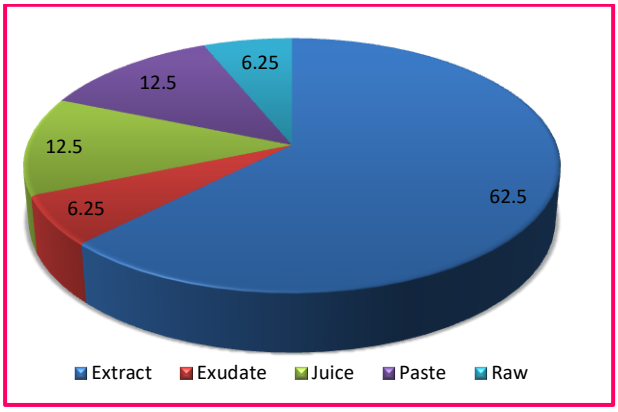

Figure 5: Percent distribution of mode of medicinal preparation

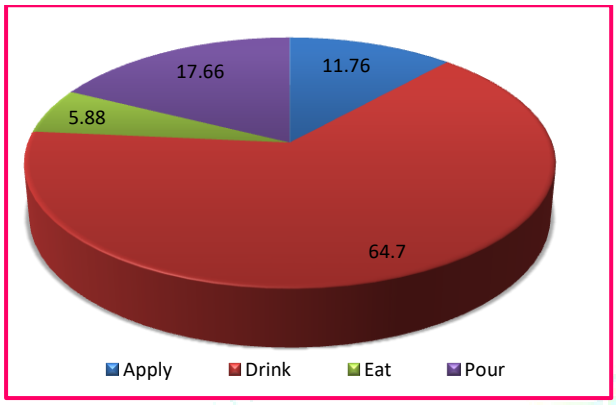

Figure 6: Percent distribution of mode of medicinal administration

3.3. Ethnobotanical Indices

3.3.1. Use Value (UV)

The most commonly used species was *Musa paradisiaca* with 17 use-reports, giving the highest use value of 0.85. *Musa paradisiaca* is attributed to its use in the treatment of snake bite and it is well recognized by all informants as the plant having the highest medicinal value (Table 1). Other important plants with a high use value were *Andrographis paniculata* (16 use-reports with a use value of 0.80), *Aristolochia bracteolata* (16 use-reports with a UV value of 0.80), Aristolochia indica (14 use-reports with a use value of 0.70), *Tamarindus indica* (14 use-reports with a use value of 0.70) and *Achyranthes aspera* (13 use-reports with a use value of 0.65). The plant with a very low use value was Alstonia venenata, which was reported with a UV of 0.25 by 5 use-reports (Table 1). In general, scarce availability of the plants in the study area leads to a low UV.

3.3.2. Informant Consensus Factor (ICF)

In general, the evaluation of ICF ranges from 0 to 1. A high value indicates the agreement of selection of taxa between informants, whereas a low value indicates disagreement [21]. Commonly ICF of local knowledge for disease treatment depended on the availability of the plant species in the study area [22]. The ICF values in present study ranged from 0.92 to 1.0 (Table 3). In the present study, dog bite, insect bite and rate bite had the highest ICF of 1.0 each; whereas scorpion sting had the next ICF of 0.93 and snake bite and all type of bites were recorded least agreement between the informants with low ICF of 0.92 each (Table 3). It may be due to lack of communication among the informants in the study area who are practicing these ailment categories [22].

Table 3: Informant Consensus Factor (ICF) for different poisonous bites

Ailment	Name of the plant(s) used (use reports)	Total no. of use reports	Total no. of taxa used	ICF
Dog bite	*Achyranthes aspera* (13)	13	1	1.00
Insect bite	*Acorus calamus* (6)	6	1	1.00
Rat bite	*Allium cepa* (9)	9	1	1.00
Scorpion sting	*Anisomeles malabarica* (5); *Aristolochia indica* (14); *Tamarindus indica* (14)	33	3	0.93
Snake bite	*Alpinia calcarata* (7); *Andrographis paniculata* (16); *Anisomeles malabarica* (7); *Aristolochia bracteolata* (16); *Capsicum frutescens* (8); *Euphorbia tirucalli* (12); *Gloriosa superba* (11); *Musa paradisiaca* (17); *Pavetta indica* (8)	102	9	0.92
All type of bites	*Alstonia venenata* (5); *Ocimum basilicum* (9)	14	2	0.92

4. CONCLUSION

The efficacy and safety of all the reported ethnomedicinal plants needs to be evaluated for phytochemical and pharmacological studies, especially the plants with high UV and ICF should be given priority to carry out bioassay and toxicity studies.

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CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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