

Ethnomedicinal Survey of Plants Used for Oral and Dental Healthcare in Sivagangai District, Tamil Nadu, Southern India

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Abstract — The present research was conducted to enumerate the medicinal usage of plants followed by the residents of various locations in Sivagangai district of Tamil Nadu as potential drug leads for the treatment of oral and dental care. Ethnomedicinal survey was conducted from September 2019 to February 2020 among 60 key informants to gather information on medicinal plants used as a treatment for oral and dental care. Quantitative ethnomedicinal data was obtained from Use Value (UV), Citation Frequency (CF) and Family Importance Value (FIV). Present documentation enumerated the uses of 24 medicinal plants comes under 22 genera of 16 families. Trees (12 species, 50.0%) were most preferably used in the treatment of oral and dental medicine and twigs were the most commonly used plant part (41.38%). *Azadirachta indica* was found with highest UV (1.00) and CF (9.53) with 60 use reports. Meliaceae was recorded with highest FIV (161.66). Like this documentation, more ethnobotanical studies should be carried out before the traditional knowledge of indigenous people vanishes.

Keywords — Quantitative ethnobotany, Medicinal plants, Oral and dental care, Sivagangai district, Tamil Nadu.

I. INTRODUCTION

Oral ailments persist to be a foremost health problem around the world [1]. Oral health is essential to general well-being and is related to the quality of life that extends beyond the functioning of the craniofacial complex. Worldwide, there is a need for alternative cures and precautionary effects to treat many ailments especially oral and dental diseases as the pathogenic organisms are being increased their resistance to presently used antibiotics [2], [3].

Even though many chemical products are available for oral and dental care, they can vary the oral microbial association and create side-effects viz. diarrhoea, unsettled stomach and tooth discoloration [4], [5]. Therefore, the hunt for possible products continues and naturally presented chemicals derived from plants used in traditional practices are considered as good alternatives to commercially available chemicals [6]. The phytoconstituents extracted from medicinal plants have abundant source of chemicals, many of which have become the source for new drug discovery. In this regard, the present research work is carried out to enumerate the traditional uses of medicinal plants for oral and dental care in Sivagangai district of Tamil Nadu, India.

II. RELATED WORK

The rapid disappearance of usual ethnic practices and herbal remedies followed for oral hygiene and dental

diseases points towards the documentation of this precious indigenous knowledge. It was reported that the toothpastes, massage gels and mouth rinses, which are being used by most of the people living in urban and suburban areas, contains synthetic substances such as antimicrobially active benzylamine hydrochloride, triclosan, etc. [7]. But still, the rural inhabitants use plant products as tooth brush and oral gargle.

In recent times, substantial considerations have been made to document the ecofriendly plant base products for the management of oral and dental cares. In this connection, several studies have been conducted by various researchers to enumerate the medicinally important plants for oral and dental cares from various regions of India like different study sites in Tamil Nadu [7], Nandurbar District of Maharashtra [8] and other parts of world includes Tanga region in Tanzania [9], [10], Bui division in Cameroon [11], [12], and other countries [13], [14], [15].

III. MATERIALS AND METHODS

Geographical data of Sivagangai district

The study area, Sivagangai district is geographically located between 77° 47' – 78° 49' E longitude and 9° 43' – 10° 42' N latitude. The altitude is about 120 m MSL. The district has an area of about 4189 sq. km. The annual rainfall of the study area reaches 875 mm. The temperature varies from 24° to 41°C.

Methodology

Ethnomedicinal data

The ethnomedicinal data were collected by conducting intensive interviews with the people living in various localities of Sivagangai district from September 2019 to February 2020. The collected medicinal details were confirmed by conducting personal discussions with dwellers of various locations in order to validate the ethnomedicinal data. Prior Informed Consent was obtained from the resource persons previously to conversation. The collected plants were identified taxonomically with the help of regional floras [16], [17], and authenticated as per APG IV classification [18].

Quantitative ethnobotany

Use Value (UV)

The use value (UV) for each plant was assessed with the following formula. $UV = \text{Number of use-reports quoted for a plant} / \text{Total number of informants interviewed for a plant}$ [19].

Citation Frequency (CF)

The Citation Frequency (CF) was evaluated by using the following formula: $CF = (\text{Number of times a plant was stated} / \text{Total number of times that all plants were stated}) \times 100$ [20].

Family Importance Value (FIV)

Family Importance Value (FIV) was assessed using the following formula: $FIV = (\text{Number of citation for a family} / \text{Total number of informants}) \times 100$ [21].

IV. RESULTS AND DISCUSSION

Socioeconomic profile of interviewees

The study encompasses of 70% male and 30% female respondents (totally 60 informants). The survey involved both households (81.67%) and herbal healers (18.33%) respondents. Many of them are literate (58.33%). In case of male informants 73.80% are literate and female informants 77.78% are illiterate. In terms of age, there is an increasing number of informants with increasing years of age as 21 – 40 years (30%), 41 – 60 years (46.67%) and decrease above 61 years (23.33%). Among informants, most of them are in the age category of 41 – 60 years in both male (45.24%) and female (50.0%). In terms of occupation, most of the key informants are farmer (31.67%) followed by agricultural labourer (30%), grazier (28.33%), and government employee (10%). The detailed informations on demographic profile of the interviewees are given in Table 1.

Table 1. Socioeconomic profile of informants

Basic characteristics	Number (percent distribution)		Total informants
	Male	Female	
Gender			
Male/Female	42 (70.0)	18 (30.0)	60 (100.0)
Current age			
21 – 40 years	12 (28.57)	6 (33.33)	18 (30.0)
41 – 60 years	19 (45.24)	9 (50.0)	28 (46.67)
Above 61 years	11 (26.19)	3 (16.67)	14 (23.33)
Category			
Households	34 (80.95)	15 (83.33)	49 (81.67)
Herbal healers	8 (19.05)	3 (16.67)	11 (18.33)
Age at becoming healer			
Below 30 years	3 (37.5)	0	3 (27.27)
Above 30 years	5 (62.5)	3 (100.0)	8 (72.73)
Educational status			
Literate	31 (73.80)	4 (22.22)	35 (58.33)
Illiterate	11 (26.20)	14 (77.78)	25 (41.47)
Occupation			
Farmer	17 (40.47)	2 (11.11)	19 (31.67)
Grazier	10 (23.81)	7 (38.89)	17 (28.33)
Agri. Labourer	10 (23.81)	8 (44.44)	18 (30.0)
Govt. Employee	5 (11.91)	1 (5.56)	6 (10.0)

Oral and dental care medicinal plants

The Table 2 highlights the particulars about recorded medicinal plants with botanical name, family, vernacular name (in Tamil), habit and therapeutic use(s). In total 24 plant species are found as used in the treatment of oral and dental care in various stud sites which belongs to 22 genera and 16 families. Among the recorded species, except one species of monocotyledon (*Phoenix sylvestris*),

all are dicotyledons. Based on the procurement of the plant products for the treatment of particular ailment, of 24 plants documented, 21 species are procured from wild, 1 species (*Phyllanthus emblica*) from cultivated farms and produces of 2 species (*Syzygium aromaticum* and *Terminalia bellirica*) are obtained from local market or nearby herbal dealers.

Table 2. List of medicinal plants used for oral and dental healthcare in Sivagangai district with Use reports (UR), Use Value (UV) and Citation Frequency (CF)

Botanical name (Family – Local name – Habit)	Use(s)	UR	UV	CF
<i>Achyranthes aspera</i> L. (Amaranthaceae – Naayuruvi – Herb)	Twig is used as tooth brush Infusion of leaf is used as a wash for tooth-ache	36 (27 + 9)	0.60	5.72
<i>Achyranthes bidentata</i> Blume (Amaranthaceae – Naayuruvi – Herb)	Twig is used as tooth brush	21	0.35	3.33
<i>Azadirachta indica</i> A. Juss. (Meliaceae – Vembu – Tree)	Twig is used as tooth brush	60	1.00	9.53
<i>Ficus benghalensis</i> L. (Moraceae – Aalamaram – Tree)	Twig is used as tooth brush Leaf powder is mixed with water and applied against gum swelling till cure	17 (13 + 4)	0.28	2.70
<i>Ficus religiosa</i> L. (Moraceae – Arasamaram – Tree)	Twig is used as tooth brush	9	0.15	1.43
<i>Jatropha curcas</i> L. (Euphorbiaceae – Kaattaamanakku – Shrub)	Young twig is used as tooth brush	7	0.11	1.11
<i>Ludwigia speciosa</i> Ridley (Onagraceae – Peruyeerakkumbi – Herb)	Leaf paste is applied for tooth-ache	12	0.20	1.90
<i>Melia azedarach</i> L. (Meliaceae – Malaivaambu – Tree)	Twig is used as tooth brush	37	0.61	5.88
<i>Mimosa pudica</i> L. (Fabaceae – Thottaalsurungi – Herb)	Decoction of root is used with water to gargle to reduce tooth-ache	16	0.26	2.54
<i>Morinda tinctoria</i> Roxb. (Rubiaceae – Manjanathi – Tree)	Young twig is used as tooth brush	41	0.68	6.51
<i>Ocimum tenuiflorum</i> L. (Lamiaceae – Thulasi – Herb)	Twig is used as tooth brush Leaf is crushed and placed between teeth to get relief from tooth-ache	51 (24 + 27)	0.85	8.10
<i>Oldenlandia diffusa</i> (Willd.) Roxb. (Rubiaceae – Padarsiruvaer – Herb)	Infusion of herb is used as a mouthwash for relief in tooth-ache	7	0.11	1.11
<i>Phoenix sylvestris</i> (L.) Roxb. (Arecaceae – Eecham – Tree)	Root paste is applied for tooth-ache	8	0.13	1.27
<i>Phyllanthus emblica</i> L. (Phyllanthaceae – Nelli – Tree)	Tender twig is used as tooth brush	18	0.30	2.86
<i>Portulaca oleracea</i> L. (Portulacaceae – Paruppukkeerai – Herb)	Fruit and seed paste is applied on teeth and gum to get relief from tooth-ache	4	0.06	0.63
<i>Ricinus communis</i> L. (Euphorbiaceae – Amanakku – Shrub)	Seed oil is applied for tooth-ache	5	0.08	0.79
<i>Scoparia dulcis</i> L. (Scrophulariaceae – Madhukkam – Herb)	Infusion of leaf is used as a gargle for tooth-ache	12	0.20	1.90
<i>Senna auriculata</i> (L.) Roxb. (Fabaceae – Aavaaramboo – Shrub)	Twig is used as tooth brush	25	0.41	3.97
<i>Solanum xanthocarpum</i> Schrad. & Wendl. (Solanaceae – Kandangathiri – Herb)	Seed paste is applied to gums to cure tooth-ache Fruit is burnt and fumes are inhaled to treat caries	43 (7 + 36)	0.71	6.83
<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry (Myrtaceae – Kiraambu – Tree)	Dried flower bud is crushed and placed between teeth to get relief from tooth-ache	56	0.93	8.90
<i>Terminalia bellirica</i> (Gaertn.) Roxb. (Combritaceae – Thaandrikkaai – Tree)	Decoction of fruit is gargled to cure mouth odour	49	0.81	7.79
<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb. (Fabaceae – Karuvaalam – Tree)	Young twig is used as tooth brush to clean fluoride accumulation	54	0.90	8.58
<i>Vitex negundo</i> L. (Lamiaceae – Nochi – Tree)	Tender leaf is heated and kept between teeth for tooth-ache	27	0.45	4.29
<i>Wrightia tinctoria</i> (Roxb.) R. Br. (Apocynaceae – Veppalai – Tree)	Leaf paste is prescribed to apply for tooth-ache	14	0.23	2.22

Families of medicinal plants

The medicinal plant families that dominant in this study with related to number of species are Fabaceae by 3 species similar to previous studies carried out in Tamil Nadu [22], [23] and it is followed the families Amaranthaceae, Euphorbiaceae, Lamiaceae, Meliaceae, Moraceae and Rubiaceae with 2 species each (Table 3). The reason behind the dominance of the family Fabaceae is that it is one of largest family having more number of plants among angiosperms [24] and wide range of occurrence.

Table 3. List of families with Family Importance Value (FIV)

Family	No. of genus	No. of species	FIV
Amaranthaceae	1	2	95.0
Apocynaceae	1	1	23.33
Arecaceae	1	1	13.33
Combretaceae	1	1	81.66
Euphorbiaceae	2	2	20.0
Fabaceae	3	3	158.33
Lamiaceae	1	2	130.0
Meliaceae	2	2	161.66
Moraceae	1	2	43.33
Myrtaceae	1	1	93.33
Onagraceae	1	1	20.0
Phyllanthaceae	1	1	30.0
Portulacaceae	1	1	6.66
Rubiaceae	2	2	80.0
Scrophulariaceae	1	1	20.0
Solanaceae	1	1	71.66

Habits of Medicinal plants

The most dominant life form used in oral and dental medicine is trees (12 species, 50%), followed by herbs (9 species, 37.5%) and shrubs (3 species, 12.5%) (Fig. 1) and none of the climber used for oral and dental care is reported from the study sites (Table 2). There are some reports highlighted that trees are preferably used as medicine by the traditional healers in Tamil Nadu [25],

[26], from this, it was cleared that trees are not only serve timber for mankind and also as good source of medicine.

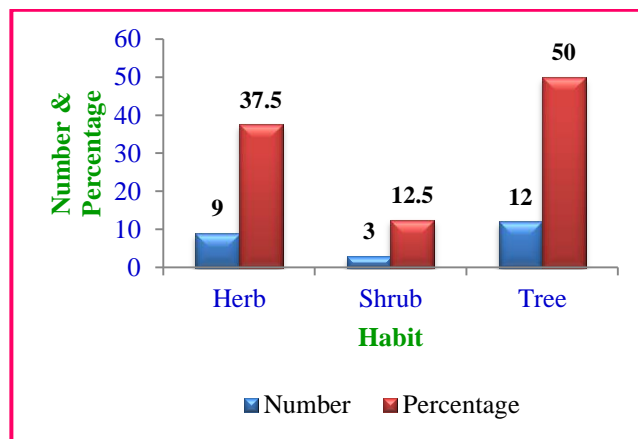


Figure 1. Number and Percent distribution of plants in various habits

Parts used and mode of medicinal preparation and administration

Twigs are the most commonly used plant part (41.38%) for oral and dental care in the study area. The twigs are used as tooth brush and rural people are believes that these plants are cure problems oral and dental care while brushing the teeth by using the young twigs of particular plant. Leaves (24.13%) are reported next to twigs, and it is followed by fruit (10.35%) and seed (10.34%). Entire plant and flower bud are recorded as least used plant parts (3.45% each) in oral and dental care. Using the twig as tooth brush is to be found most followed mode of usage (41.38%), it is followed by taking the medicine as paste (20.68%) and infusion (10.34%). The oral route of administration is used for all the remedies. The contribution of various plant parts used and mode of usages is highlighted in Table 4.

Table 4. Percent distribution of parts used and mode of usage

Parts used	Mode of usage									Total
	Brush	Crush	Decoction	Fume	Heat	Infusion	Paste	Powder	Oil	
Entire plant	—	—	—	—	—	3.45	—	—	—	3.45
Flower bud	—	3.45	—	—	—	—	—	—	—	3.45
Fruit	—	—	3.45	3.45	—	—	3.45	—	—	10.35
Leaf	—	3.45	—	—	3.45	6.89	6.89	3.45	—	24.13
Root	—	—	3.45	—	—	—	3.45	—	—	6.90
Seed	—	—	—	—	—	—	6.89	—	3.45	10.34
Twig	41.38	—	—	—	—	—	—	—	—	41.38
Total	41.38	6.90	6.90	3.45	3.45	10.34	20.68	3.45	3.45	100.0

Quantitative ethnobotany of medicinal plants

Use value (UV)

According to Trotter and Logan [19], the Use Value is greater when the number of use citations for a plant is high and low when less citation. Based on the UV analysis, the most frequently used species oral care in the study sites is *Azadirachta indica* (UV: 1.00) with 60 use reports. It is followed by *Syzygium aromaticum* (UV: 0.93, use reports: 56), *Vachellia nilotica* (0.90, 54) and *Ocimum tenuiflorum* (0.85, 51). The least used species are *Jatropha curcas* and *Oldenlandia diffusa* (0.11 UV with 7 use reports each)

(Table 2). The highest use values shown by some medicinal plants indicated that these species are highly preferred for the treatment of particular ailment. The low UV is due to the less usage significance of particular species in study sites.

Citation Frequency (CF)

The results on Citation Frequency revealed that, CF values in between the range of 1.11 – 9.53 (Table 2). The highest CF value is recorded for *Azadirachta indica* (9.53), followed by *Syzygium aromaticum* (8.90), *Vachellia*

nilotica (8.58) and *Ocimum tenuiflorum* (8.10), while lowest value of about CF (1.11) is recorded for *Jatropha curcas* and *Oldenlandia diffusa* each (Table 2). The plants having high CF value indicated that the particular plants having more number of usages and the knowledge on these medicinal usages are familiar to the inhabitants in the study area. Not only that, but also these plants are abundantly presented in the study sites and the inhabitants collected these plants frequently for the treatment as per their quick need.

Family Importance Value (FIV)

On the subject of FIV, the best represented family for oral and care is Meliaceae with highest FIV (161.66) also with even 2 species, followed by Fabaceae (158.33) with 3 species. Third highest FIV is found for Lamiaceae (130.0) with 2 species and followed by Amaranthaceae (95.0) with 2 species as tabulated in Table 3. The lower most FIV (6.66) is noted for Portulacaceae with single species. From this, it is clearly known that the members of a particular family, which is to be recorded with high FIV, are regularly used to cure oral and dental diseases in the region.

V. CONCLUSION AND FUTURE SCOPE

From the present investigations, it was clear that there was a wide usage of the native plant resources by the local inhabitants which suggested that it must be encouraged the people especially farmers to cultivate the medicinally important plants. It also necessary to make great attention on conservation of these plants by conducting awareness programmes. Clinical experiments should be conducted on these plants related to curative potential on oral and dental diseases to prove their pharmacological efficacies. Bioprospecting studies like antimicrobial analysis against specific pathogen causes particular dentistry disease should be carried out. Phytochemical analyses should also be conducted to extract, identify and characterize the particular phytoconstituent responsible for the cure of specific illness, which leads to novel drug innovation.

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CONFLICT OF INTEREST

The authors do not have any competing interest.

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