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A comparative study on ethanobotanical usage of plants for twenty selected diseases by six tribal communities in Malappuram district

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Abstract

An ethnobotanical survey was conducted to explore the indigenous knowledge of the Arnadan, Cholanaikkan, Kattunaikkan, Kuruman, Muthuvan and Paniya tribes of Malappuram District, Kerala, India and to highlight the uses of the diverse flora. This paper provides information about 103 medicinal plant species of 51 families used by the six tribes to manage 20 ailments / conditions. The indigenous knowledge of these tribal traditional healers has been disappearing due to lack of followers for this valuable knowledge, as well as their migration to places outside of the forest. Use of plants among the six tribes reflects their interest in ethno-medicine and further investigation on under-explored species may lead to the discovery of novel pharmaceutical products. Due to its efficacy, safety and low cost traditional medicines are more preferable among common people.

Keywords: Ethnomedicine, Six tribes, twenty diseases, Malappuram district

1. Introduction

The Indian subcontinent represents one of the greatest treasures of ethnobotanical knowledge. The Convention for Biological Diversity ^[1] urges the role of indigenous knowledge in biodiversity conservation and sustainable utilization. Information on local knowledge of native plant species helps in the identification of research priorities for better, sustainable management of natural resources ^[2]. The World Health Organization estimates that about 80% of people living in developing countries depends conventional medicines for their primary health care needs and medicinal plants are the backbone of traditional medicines. About 3300 million people in the under developed countries utilize medicinal plants on a regular basis. Indian traditional medicines are classified in to two groups. Ayurveda, Siddha and Unani belong to the first group and folk medicines to the second group. Traditional medicine apparently is perceived as efficient, safe, cost effective and affordable. People living in remote areas tend to depend more on traditional and herbal medicines than urban people ^[3].

India have 30,000 traditional/ethnomedicinal formulations and which require immediate attention, documentation and scientific validation as well as intellectual property protection and serious efforts to convert them in to green medicines for the benefit of all. Indigenous knowledge system acquired by the tribal's are unique to a given culture or society. Traditional knowledge can be termed as a community based functional knowledge developed, preserved and maintained over many generations by indigenous people through continuous interactions, observations and experimentations with their surrounding environment. It is an influential tool for bio-prospecting of plant wealth and converting it to value added products. Nutraceuticals and medicinal plants can create considerable economic value for a nation. Traditional knowledge plays a very important role in the development of economy. 4.5 billion people rely on plants as their primary source of medicine. About 75,000 of plants are being utilized for several therapeutic and aromatic purposes. Tribals are the grass root innovators and have generated extremely rich pool of ethnomedicines. In present era due to globalization this knowledge is being vulnerable. There is an urgent need to protect and preserved this ethnobotanical knowledge ^[4].

Ethnobotanists could play very useful roles in rescuing disappearing knowledge and returning it to local communities. Several wild medicinal plants are declining in number due to the destruction and unscientific collection of plants from forests. Except for the documentation of the ethnobotanical knowledge in the Malappuram district by Thomas *et al.* (2010; 2011; 2012; 2013) ^[5, 6, 7, 8], Haridas *et al.* (2015) ^[9] and Pius *et al.* (2015) ^[10] not much work is being done in

this area. There is a very limited and scattered scientific record of the traditional medicines, used by the tribes of Malappuram district. The present work is the result of an ethnobotanical survey, conducted among the six different tribes viz, Arnadan, Cholanaikkan, Kattunaikkan, Kuruman, Muthuvan and Paniyan in Malappuram district of Kerala, India to explore and document the indigenous knowledge for twenty selected ailments / conditions, through an integrated approach of botanical collections and interview schedules.

2. Materials and methods

2.1 Study area

Kerala state of India, at the southernmost boundary of the Malabar Coast, has Western Ghats on the east and Arabian Sea on the west and has a land area of 38,863 Km². The area of the present study was Malappuram district, is a hilly terraced tract situated on the Calicut- Madras road, 12 km. south-west of Manjeri and 52 km south-west of Calicut in the Western Ghats between 10⁰-12⁰ N latitude and 75⁰-77⁰ E longitude. (Fig.4).

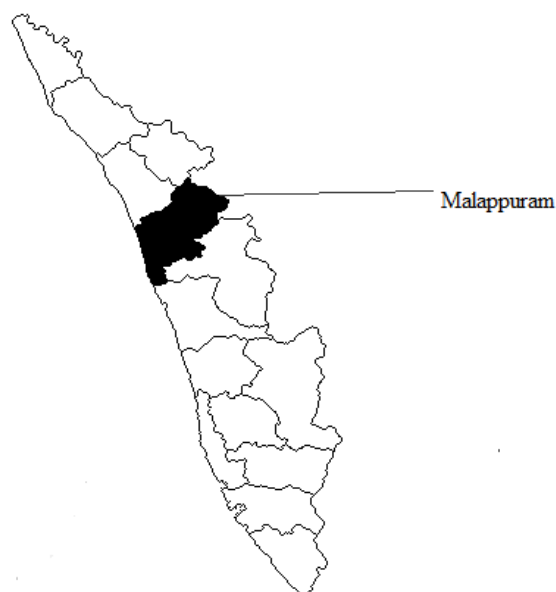


Fig 4: Map of Kerala state showing Malappuram district

2.2 Ethnobotanical data collection

Several field visits were conducted between 2010 and 2016 in the tribal settlement of Malappuram District among the Arnadan, Cholanaikkan, Kattunaikkan, Kuruman, Muthuvan and Paniya tribes to collect information on medicinal plants used by them using a questionnaire survey, interviews with key informants (knowledgeable elders, religious leaders and other individuals), and field observations. A total of 30 key informants were interviewed. A range of ethnobotanical information including local names, habit and habitat, uses, parts used, and mode of utilization of the plant were covered. Botanical names were established by comparing specimens with those at the herbarium of Centre for Medicinal Plants Research (CMPR) and final identification was done after detailed laboratory studies, using stereomicroscopes and light microscopes and after consulting relevant floristic literature and their uses were carefully recorded in the field data book. The specimens are preserved in the CMPR Herbarium.

3. Results and Discussion

A total of 103 plants named by the respondents was collected, identified and documented for their therapeutic use against 20

diseases / conditions by six tribal groups. These 103 species corresponded to a total of 51 families and the most represented families were Leguminosae (12 species), Apocynaceae (9 species), Lamiaceae (9 species), Zingiberaceae (5 species), and Acanthaceae (5 species). Other families were represented by 1-4 species (Table 1).

Differences observed in the number of species used for the 20 selected diseases are represented in Fig. 1. Out of the 20 diseases selected, highest number of species was described for rheumatism (15), followed by post-partum health and snake bite (13 species each). Lowest number of plant species was reported for anemia and sprains.

Differences were observed in the level of knowledge endowed upon various communities and are evident from the variation in the treatment described for selected diseases. Considering all use categories, there was a significant difference between the total number of species reported by the six groups (Fig. 2). All the six tribes described treatments for asthma, leprosy, rheumatism and snake bite. Paniyans described remedies for all the 20 diseases / condition selected for this study. Out of the 20 selected ailments; Kattunaikkans, Cholanaikkans, Kurumans, Muthuvans and Arnadans described solutions for only 17, 16, 11, 10 and 8 ailments / conditions respectively. Similarly the total number of plants described by Paniyans, Kattunaikkans, Cholanaikkans, Kurumans, Muthuvans and Arnadans were 40, 34, 20, 16, 14 and 11 respectively (Fig. 3).

Out of the 30 key informants consulted in this study, Paniyans, Kattunaikkans, Cholanaikkans, Kurumans, Arnadans and Muthuvans were in the order 8, 6, 5, 4, 4 and 3 respectively (Fig. 3). Based on the collected data, Paniyans are rich in their knowledge followed by Kattunaikkans, in terms of number of species for a particular condition / ailment and the total number of plants described. Kurumans, Muthuvans and Arnadans always kept a low profile in their knowledge. Arnadans listed a lower total number of species in all use categories. Considering the fact that we could consult with more number of informants from Paniya community, this interpretation may not be appropriate, but the previous reports on richness of ethnobotanical knowledge of Paniya community from Wayanadu district supports this view [11].

Paniya tribes of Malappuram district use *Rotula aquatica* for kidney stone [12] and Kattunaikkans use *Aristolochia indica* and *Rauvolfia serpentina* against poisonous bites [9] which supports our findings. The plant uses reported in the present paper for the treatments of rheumatism (*Justicia gendarussa*, *sida* species), eye diseases (*Tabernaemontana divaricata*), jaundice (*Phyllanthus amarus*), epilepsy (*Bacopa monnieri*), diabetes (*Momordica charantia*, *Gymnema sylvestre*), poisonous bites (*Aristolochia indica*, *Curcuma longa*, *Gloriosa superba*), skin diseases (*Hydnocarpus pentandrus*), urinary disorders (*Hibiscus rosa-sinensis*), postpartum health (*Holostemma ada-kodien*) etc. supports earlier works about the plant knowledge of Mulla kuruma tribes of Wayanad district [13]. Among the reported medicinal plants four of them (*Tabernaemontana divaricata*, *Gymnema sylvestre*, *Hydnocarpus pentandrus*, *Holostemma ada-kodien*) are used by the Kurichar tribe of Wayanadu for the same purpose [14]. Out of thirteen plant species in our study for the treatment of postpartum health eight of them are mentioned in a paper titled ethnobotanical plants used for postnatal care by traditional practitioners from Kozhikode district, Kerala, India [15]. Ethnobotanical studies on medicinal plants used for skin diseases in Malabar region of Kerala also support our view in terms of the use of four species viz, *Ixora coccinea*, *Indigofera tinctoria*, *Calycopteris floribunda*, *Datura*

stramonium from the present study [16]. Commonality in usage of same plants by same or different tribes of different localities could be established.

Among the six tribes, Arnadans are mostly living outside the forest, mingling more with the outside community and started using modern medicines to treat their diseases. All these factors must have contributed to the erosion of traditional knowledge from the Arnadans and they are keeping a low profile in their knowledge. Cholanaikkans, who ranked third position in their ethnobotanical knowledge regarding the selected diseases in the present study, are living in the deep forest areas and are out of contact with public due to their shy nature. Kattunaikkans who share their knowledge with people very close to them, ranked second in their knowledge profile in the present study. Muthuvans treat their guests more friendly, mingle very close with public and they cultivate plants and vegetables nearby their houses. In the present paper, fewer Muthuvans were sampled compared with the five other groups. Kurumans are more educated but their population is less in the present study area. Older people (age >50 years) generally possessed a greater knowledge of plant species than younger generation. Although there were both female and male informants, the mean number of plants cited

for each disease category did not significantly differ between genders.

Similarities and differences in plant use between ethnic groups were observed. Usage of similar species for more than one condition by same tribes was recorded, like the use of *Achyranthes aspera* for leprosy and anemia by Muthuvans. Similarly different tribes use same plant species for different ailments, such as Kattunaikkans use *Curculigo orchoides* for treating jaundice whereas Arnadans use it against asthma. Use of same species for similar ailments by different tribes was noticed, like the use of *Coix lacryma-jobi* for post-partum health by both Arnadans and Paniyans. Similarly, Kattunaikka and Paniya commonly use *Curcuma longa* for post-partum health and snake bite and also *Ocimum sanctum* for tuberculosis (Table 1). Documentation of the mode of preparation and application of herbal remedies indicated that they are prepared out of various plant parts of single plant, or multiple plants. The majority of the preparations were made in aqueous medium and the mode of application was either topical or administered orally.

3.1 Tables and Figures

Table 1: Plant species used by six tribal communities for various ailments / conditions

Sl. No	Diseases	Plant species	Family	Tribal group*
1	Anemia	<i>Piper longum</i> L.	Piperaceae	Ka
		<i>Achyranthes aspera</i> L.	Amaranthaceae	Mu
		<i>Gardenia jasminoides</i> Ellis.	Rubiaceae	Pa
2	Asthma	<i>Justicia adhatoda</i> L.	Acanthaceae	Ar
		<i>Curculigo orchoides</i> Gaertn.	Hypoxidaceae	Ar
		<i>Pogostemon cablin</i> (Blanco) Benth.	Lamiaceae	Ch
		<i>Calotropis gigantea</i> (L.) R.Br.	Apocynaceae	Ka
		<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Ka
		<i>Desmodium motorium</i> (Houtt.) Merr.	Leguminosae	Ku
		<i>Solanum violaceum</i> Ortega	Solanaceae	Mu
		<i>Ricinus communis</i> L.	Euphorbiaceae	Pa
		<i>Alpinia calcarata</i> Rosc.	Zingiberaceae	Pa
		<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees	Acanthaceae	Ka
3	Cancer	<i>Asclepias curassavica</i> L.	Apocynaceae	Ku
		<i>Morus alba</i> L.	Moraceae	Mu
		<i>Gloriosa superba</i> L.	Colchicaceae	Pa
4	Cardiac disorders	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Ch
		<i>Curcuma pseudomontana</i> J.Graham.	Zingiberaceae	Ka
		<i>Desmodium gangeticum</i> (L.) DC.	Leguminosae	Ka
		<i>Gmelina arborea</i> Roxb.	Lamiaceae	Ku
		<i>Premna serratifolia</i> L.	Lamiaceae	Mu
		<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Pa
		<i>Solanum violaceum</i> Ortega	Solanaceae	Pa
		<i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Pa
5	Cholera	<i>Tectona grandis</i> L. f.	Lamiaceae	Ch
		<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W. Watson	Poaceae	Ku
		<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees	Acanthaceae	Pa
		<i>Ixora coccinea</i> L.	Rubiaceae	Pa
6	Diabetes	<i>Momordica charantia</i> L.	Cucurbitaceae	Ar
		<i>Syzygium cumini</i> (L.) Skeels.	Myrtaceae	Ch
		<i>Aegle marmelos</i> (L.) Correa.	Rutaceae	Ka
		<i>Gymnema sylvestre</i> (Retz)R.Br.ex Schult	Apocynaceae	Ka
		<i>Costus pictus</i> D. Don ex Lindl.	Costaceae	Pa
7	Epilepsy	<i>Nervilia infundibulifolia</i> Blatt. & McCann.	Orchidaceae	Ch
		<i>Bacopa monnieri</i> (L.) Wettst.	Plantaginaceae	Ka
		<i>Nothapodytes nimmoniana</i> (J.Graham) Mabb.	Icacinaceae	Ka
		<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz.	Apocynaceae	Ku
		<i>Evolvulus alsinoides</i> L.	Convolvulaceae	Pa
8	Eye diseases	<i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem. & Schult.	Apocynaceae	Ar
		<i>Abrus precatorius</i> L.	Leguminosae	Ch
		<i>Holostemma ada-kodien</i> Schult.	Apocynaceae	Ka, Pa

Sl. No	Diseases	Plant species	Family	Tribal group*
		<i>Vernonia cinerea</i> (L.) Less.	Compositae	Pa
9	Jaundice	<i>Phyllanthus amarus</i> Schum. & Thonn.	Phyllanthaceae	Ch
		<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Ch
		<i>Curculigo orchitoides</i> Gaertn.	Hypoxidaceae	Ka
		<i>Indigofera tinctoria</i> L.	Leguminosae	Pa
10	Kidney stone	<i>Pouzolzia zeylanica</i> (L.) Benn.	Urticaceae	Ch
		<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Lamiaceae	Ka
		<i>Scoparia dulcis</i> L.	Plantaginaceae	Mu
		<i>Rotula aquatica</i> Lour.	Boraginaceae	Pa
11	Leprosy	<i>Calotropis gigantea</i> (L.) R.Br.	Apocynaceae	Ar
		<i>Cyclea peltata</i> (Lam.) Hook.f. & Thoms.	Menispermaceae	Ch
		<i>Plumbago indica</i> L.	Plumbaginaceae	Ka
		<i>Elephantopus scaber</i> L.	Compositae	Pa
		<i>Tectona grandis</i> L. f.	Lamiaceae	Ku
		<i>Acacia catechu</i> (L.f.) Willd.	Leguminosae	Mu
		<i>Achyranthes aspera</i> L.	Amaranthaceae	Mu
		<i>Datura stramonium</i> L.	Solanaceae	Pa
12	Menstrual problems	<i>Naravelia zeylanica</i> (L.) DC.	Ranunculaceae	Pa
		<i>Azadirachta indica</i> A.Juss.	Meliaceae	Ch
		<i>Curcuma longa</i> L.	Zingiberaceae	Ch
		<i>Pterocarpus marsupium</i> Roxb.	Leguminosae	Ka
		<i>Murraya koenigii</i> (L.) Spreng	Rutaceae	Ku
13	Postpartum health	<i>Asparagus racemosus</i> Willd.	Asparagaceae	Pa
		<i>Coix lacryma-jobi</i> L.	Poaceae	Ar, Pa
		<i>Kaempferia galanga</i> L.	Zingiberaceae	Ar
		<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Ch
		<i>Cycas circinalis</i> L.	Cycadaceae	Ka
		<i>Mesua ferrea</i> L.	Calophyllaceae	Ka
		<i>Pseudarthria viscida</i> (L.) Wight & Arn.	Leguminosae	Ka
		<i>Asparagus racemosus</i> Willd.	Asparagaceae	Ka
		<i>Dioscorea alata</i> L.	Dioscoreaceae	Ka
		<i>Curcuma longa</i> L.	Zingiberaceae	Ka, Pa
		<i>Thottea siliquosa</i> (Lam.) Ding Hou.	Aristolochiaceae	Ku
		<i>Cyclea peltata</i> (Lam.) Hook.f. & Thoms.	Menispermaceae	Pa
		<i>Holostemma ada-kodien</i> Schult.	Apocynaceae	Pa
		<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Pa
14	Rheumatism	<i>Cycas circinalis</i> L.	Cycadaceae	Ar
		<i>Plumbago indica</i> L.	Plumbaginaceae	Ar
		<i>Ocimum gratissimum</i> L.	Lamiaceae	Ch
		<i>Clerodendrum paniculatum</i> L.	Lamiaceae	Ch
		<i>Azadirachta indica</i> A. Juss.	Meliaceae	Ka
		<i>Desmodium gangeticum</i> (L.) DC.	Leguminosae	Ka
		<i>Tinospora cordifolia</i> (Willd.) Miers	Menispermaceae	Ku
		<i>Strychnos nux-vomica</i> L.	Loganiaceae	Mu
		<i>Sida cordifolia</i> L.	Malvaceae	Mu
		<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Mu
		<i>Alpinia galanga</i> (L.) Willd.	Zingiberaceae	Mu
		<i>Cassia fistula</i> L.	Leguminosae	Pa
		<i>Justicia gendarussa</i> Burm.f.	Acanthaceae	Pa
		<i>Butea monosperma</i> (Lam.) Taub.	Leguminosae	Pa
<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Pa		
15	Skin diseases	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Menispermaceae	Ka
		<i>Ixora coccinea</i> L.	Rubiaceae	Ka
		<i>Hydnocarpus pentandrus</i> (Buch.-Ham.) Oken.	Achariaceae	Pa
		<i>Indigofera tinctoria</i> L.	Leguminosae	Pa
		<i>Senna tora</i> (L.) Roxb.	Leguminosae	Pa
		<i>Calycopteris floribunda</i> (Roxb.) Lam. ex Poir.	Combretaceae	Pa
16	Snake bite	<i>Datura stramonium</i> L.	Solanaceae	Pa
		<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz.	Apocynaceae	Ar, Ka
		<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	Bignoniaceae	Ch
		<i>Aristolochia indica</i> L.	Aristolochiaceae	Ka
		<i>Aristolochia tagala</i> Cham.	Aristolochiaceae	Ka
		<i>Curcuma longa</i> L.	Zingiberaceae	Ka, Pa
		<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	Ku
		<i>Bryophyllum pinnatum</i> (Lam.) Kurz.	Crassulaceae	Ku
		<i>Gloriosa superba</i> L.	Colchicaceae	Mu
<i>Cassia fistula</i> L.	Leguminosae	Mu		
<i>Schleichera oleosa</i> (Lour.) Oken.	Sapindaceae	Pa		

Sl. No	Diseases	Plant species	Family	Tribal group*
17	Sprains	<i>Strychnos nux-vomica</i> L.	Loganiaceae	Pa
		<i>Momordica charantia</i> L.	Cucurbitaceae	Pa
		<i>Cissus quadrangularis</i> L.	Vitaceae	Ar
		<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	Ku
		<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don	Apocynaceae	Pa
18	Toothache	<i>Garuga pinnata</i> Roxb.	Burseraceae	Ch
		<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Ch
		<i>Barleria cristata</i> L.	Acanthaceae	Mu
		<i>Strobilanthes ciliata</i> Nees	Acanthaceae	Pa
19	Tuberculosis	<i>Desmostachya bipinnata</i> (L.) Stapf	Poaceae	Ch
		<i>Holostemma ada-kodien</i> Schult.	Apocynaceae	Ka
		<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Ka
		<i>Ocimum sanctum</i> L.	Lamiaceae	Ka, Pa
20	Urinary Disorders	<i>Ensete superbum</i> (Roxb.) Cheesman	Musaceae	Ch
		<i>Nyctanthes arbor-trists</i> L.	Oleaceae	Ka
		<i>Saraca asoca</i> (Roxb.) Willd.	Leguminosae	Ka
		<i>Clitoria ternatea</i> L.	Leguminosae	Ku
		<i>Cocos nucifera</i> L.	Arecaceae	Ku
		<i>Canna indica</i> L.	Cannaceae	Mu
		<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Mu
		<i>Coix lacryma-jobi</i> L.	Poaceae	Pa

* Ar-Armanan, Ch-Cholanaikkan, Ka-Kattunaikkan, Ku-Kuruman, Mu-Muthuvan, Pa-Paniyan

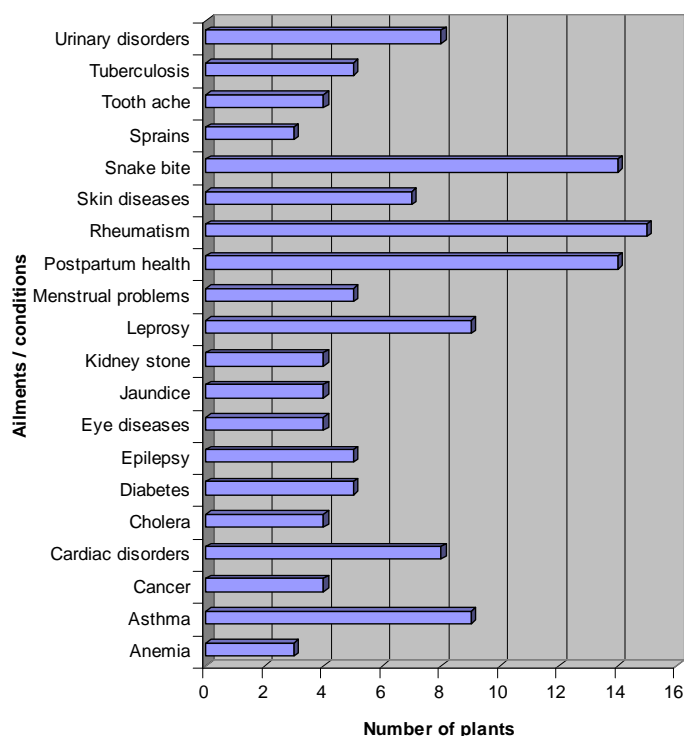


Fig 1: Variation in the number of species used by the tribal communities for various ailments

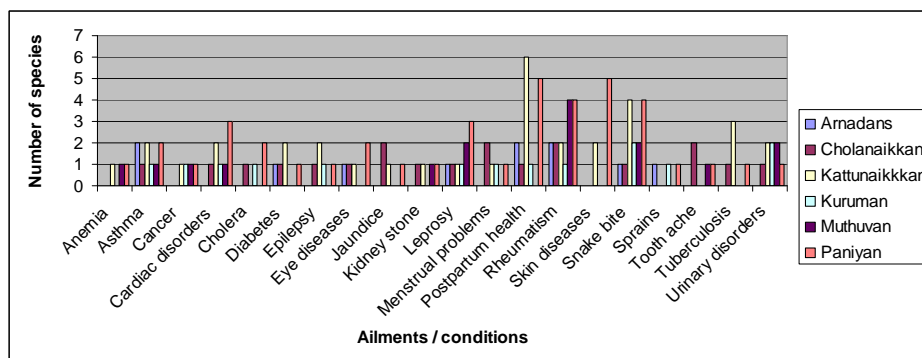


Fig 2: Variation in the knowledge level among the six tribal communities with regard to the treatment described for 20 selected diseases

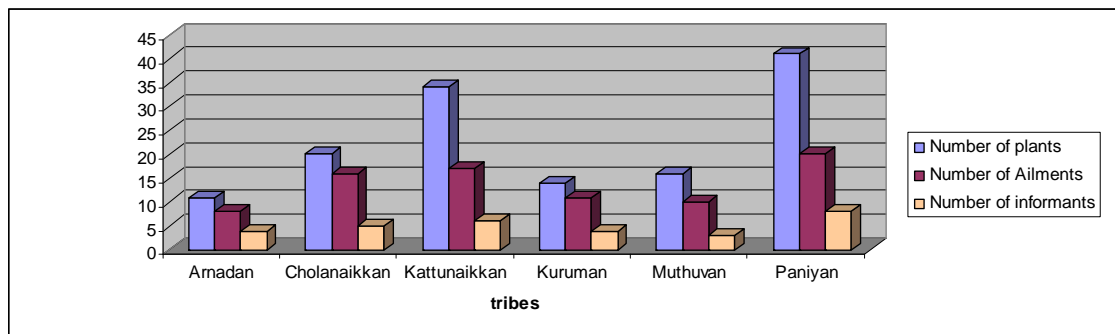


Fig 3: Relationship between the number of key informants from six tribal communities and usage of plants for various ailments

4. Conclusion

The aim of this study was to carry out an ethnobotanical survey of plants species used by six tribal communities for twenty selected diseases / conditions across the tribal settlements of Malappuram district. The study reveals too little commonality in usage of herbal remedies for the selected diseases. The difference in usage of plants by same tribes occupying different localities and different tribes of the same or nearby localities was observed. The indigenous knowledge of these tribal traditional healers has been disappearing due to lack of followers for this valuable knowledge, as well as their migration to places outside of the forest.

5. Acknowledgement

The Arnadan, Cholanaikkan, Kattunaikkan, Kuruman, Muthuvan, Paniya tribes of Malappuram district are the source of information and the authors are grateful to all the respondents who took part in this study and their willingness to share their valuable ethnobotanical knowledge and their whole-hearted co-operation. Ethnobotanical field work requires researchers to collaborate with government officials, scientists, and local people and their support are gratefully acknowledged. Authors are thankful to Management, Arya Vaidya Sala, Kottakkal and TATA Trust, Mumbai for providing the facilities for taking up the programme.

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