Journal of Ayurveda and Integrative Medicine 10 (2019) 32–37

Contents lists available at ScienceDirect

Journal of Ayurveda and Integrative Medicine

journal homepage: http://elsevier.com/locate/jaim

Original Research Article (Clinical)

Integration of traditional herbal medicines among the indigenous communities in Thiruvarur District of Tamil Nadu, India

Jayaraj Krupa, Jeyalatchagan Sureshkumar, Rajendran Silambarasan, Kanagaraj Priyadarshini, Muniappan Ayyanar*

Department of Botany and Microbiology, A.V.V.M. Sri Pushpam College (Autonomous), Poondi 613 503, Thanjavur, India

ARTICLE INFO

Article history:
Received 11 May 2017
Received in revised form
22 June 2017
Accepted 3 July 2017
Available online 14 August 2018

Keywords:
Ethnobotany
Folk medicine
Medicinal plants
Thiruvarur district
Traditional healers

ABSTRACT

Background: Ethnobotanical studies are recognized as effective methods of finding locally important plants for discovery of crude drugs. Siddha medicinal system is prevailed in south Indian states principally in Tamil Nadu and gaining recognition as alternative medicine among the indigenous communities for their primary healthcare needs.

Objectives: The study was aimed to explore and document folk medicinal plant knowledge among the local people in Puliyankudi village of Thiruvarur District, Tamil Nadu, India.

Materials and methods: An ethnobotanical study was carried out during February 2016 to January 2017 among the local people in study area. Traditional healers, traders, local vendors and local people who are practicing herbal medicines were approached for documentation of folk medicinal uses. Acquired results were further analyzed with descriptive statistical methods such as use value (UV) and informant consensus factor (ICF).

Results: During the survey, a total 116 plant species from 49 families and 103 genera were recorded to treat 73 types of ailments. Among the plant parts used for preparation of medicine, leaves (73 reports) are often used and predominant method of preparation of medicine is paste (56 reports). *Limonia acidissima* was reported by all the interviewed informants with an UV of 0.98 and kidney problems have highest ICF value of 0.91.

Conclusion: Plants with highest use values in the study indicates possible occurrence of valuable metabolites and should be investigated for associated pharmacological activities which leads to development of potential new drugs to treat various ailments.

1. Introduction

Medicinal plants are only source and an important contribution for primary healthcare during ancient times. Knowledge about use of medicinal plants for treating various diseases was highly valued among ancient civilizations. Until the mid-nineteenth century, plants were the main therapeutic agents used by humans and still have an important role in medicinal preparations [1]. About 80% of people in developing countries depend on traditional medicine for their primary health care needs, because of their low costs, effectiveness, frequently inadequate provision of modern medicine, cultural and religious preferences [2,3].

Studies on traditional medicinal plants have become increasingly valuable in the development of healthcare and conservation programs in different parts of the world [4]. Traditional medicine systems being used as a source of bioactive molecules with pharmaceutical interest [5]. In India, history of healthcare systems goes back to 5000 years B.C. i.e, noted in ancient literatures like 'Rig-Veda' and 'Atharva-Veda'. Later, the literatures like 'Charak Samhita' and 'Sushruta Samhita' (about 10th century BC) where use of plants was highlighted for healthcare systems [2]. Several ethnic people with diverse cultural backgrounds reside in India and practice their own system of traditional medicine. 80% of people in India use non-allopathic (Ayurveda, Siddha, Unani and Homeopathy) herbal based medicines for their healthcare which are collected from wild and cultivated sources [6].

Siddha medicinal system is one of the traditional medical systems practiced by Tamil People from prehistoric period and

* Corresponding author.
E-mail: asmayyanar@yahoo.com.
Peer review under responsibility of Transdisciplinary University, Bangalore.

https://doi.org/10.1016/j.jaim.2017.07.013

nowadays its gaining recognition as complementary or an alternative medicine. Plant based (moola vargam), mineral based (thaathu vargam) and animal product based (jeeva vargam) medical systems were followed in Siddha medicine [7]. During the last few centuries, dramatic increase in documentation of medicinal plants used by various indigenous people throughout India [4,8–12]. Recently Vijayakumar et al. [13] have undertaken a survey among siddha medical practitioners in Thiruvarur district, in which they collected ethnomedicinal information for only a few species and Parthiban et al. [14] reported 54 species of plants from Kudavasal taluk of Thiruvarur district to cure livestock diseases. However, much information has not yet been documented from local people in various villages, though they are practicing folk medicines among themselves as well as for their neighbors. Hence, the present study was aimed to explore and document of folk knowledge of local people in Puliyankudi village, Thiruvarur District of Tamil Nadu, India.

2. Materials and methods

2.1. Study area

The study was carried out in Puliyankkudi village, Valangaiman taluk, Thiruvarur district of Tamil Nadu, India (Fig. 1). The main occupation in the study area is agriculture paddy cultivation prevail other crops like groundnut, cotton, sugarcane, green gram, black gram, etc. There is a three phase cultivation of paddy is endured in three seasons as *kuruvai* (June–August), *samba* (August–January)

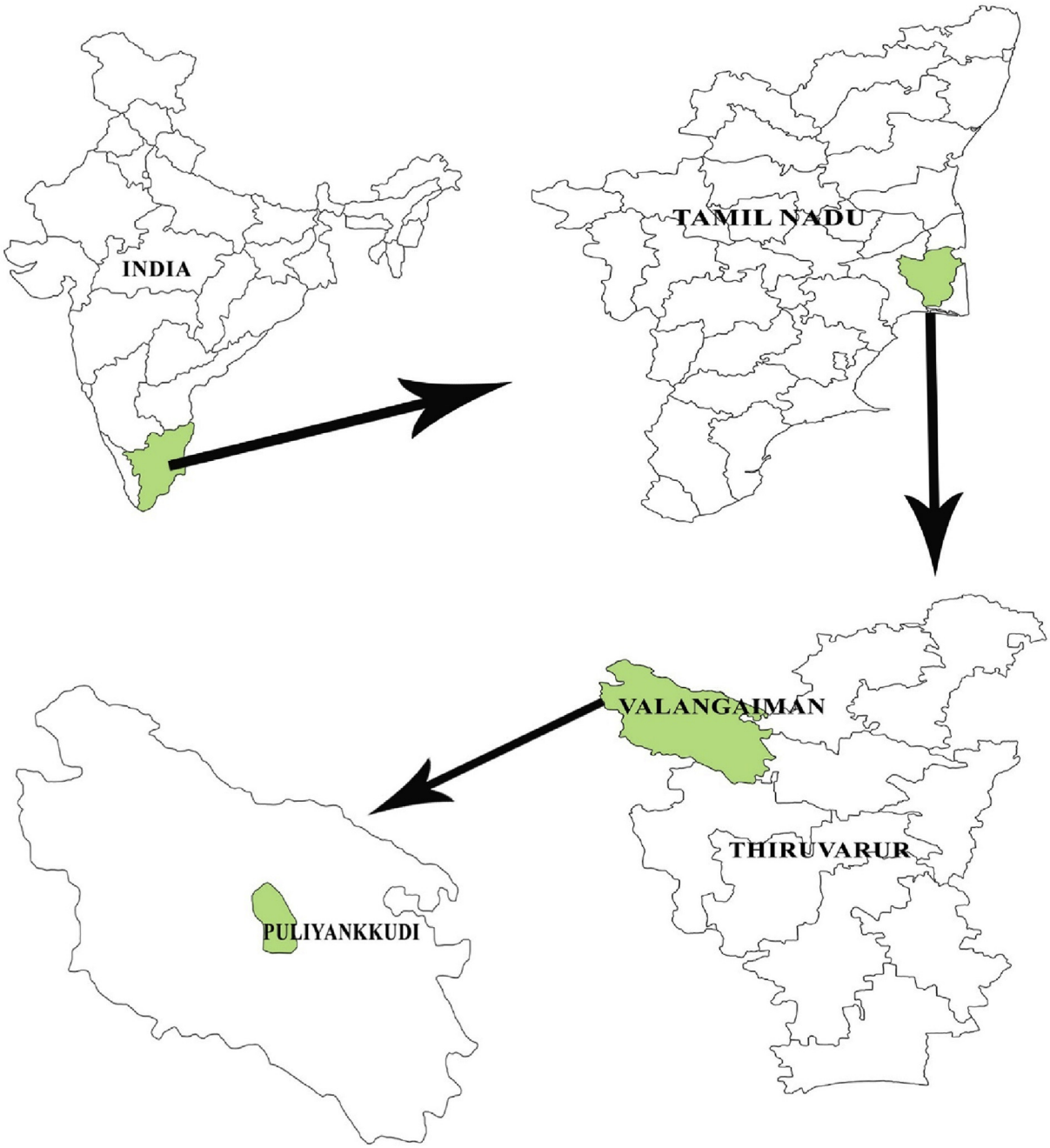

Fig. 1. Location map of study area in Thiruvarur district of Tamil Nadu, India.

and *thaladi* (January–March). The soil is plain terrain of alluvial soil consisting sand, silt and clay. Average annual rainfall is 630 mm. Maximum and minimum annual temperature is 35 °C and 26 °C respectively. Annual relative humidity ranges between 23.6% (average minimum) and 97.3% (average maximum).

2.2. Studied local people

An extensive ethnobotanical survey was conducted in the study area from February 2016 to January 2017 following the standard protocols for collection of ethnobotanical data. Information was collected from traditional healers, traders, local vendors and local peoples with sound knowledge on the use of medicinal plants. As per the 2011 census, local population of Puliyankkudi village is 806 persons (male 415 and female 391).

2.3. Collection of ethnobotanical information

The purpose of fieldwork was explained to local administrators and community elders of the area who led them to the respected healers. The survey was conducted through semi-structured, open-ended interviews. Interview was made in their local language (Tamil). A questionnaire was designed to address following ethnomedicinal information from the informants: local name of plant, plant parts used, preparation methods mode of application and medicinal uses. Social bio-data of the participants such as gender, age, class and educational background were also recorded.

2.4. Plant identification and herborization

The reported plants were collected at flowering/fruiting stage for identification and preparation of herbarium. Plant specimens were preserved using standard methodologies and identified using 'The Flora of Tamil Nadu Carnatic' [15]. The voucher specimens of documented plants were prepared, labeled and deposited in the herbarium of Department of Botany and Microbiology, A.V.V.M Sri Pushpam College, Poondi (SPCH), Thanjavur, India for future reference.

2.5. Data analysis

2.5.1. Use value (UV)

Use value (UV) was calculated for individual plants to give a quantitative measure of its relative importance to the informant's objectively [16]. Use value was calculated by the following equation,

$$UVs = \sum U/n$$

where 'UVs' refers to the use value of a species, 'U' refers to the number of use reports cited by the informants for that plant species and 'n' refers to the total number of informants interviewed. Generally, UV is calculated to determine the extent of medicinal use for a given plant species. Plant with broad therapeutic uses or those that are widely accepted for the cure of a particular ailment will score a high UV.

2.5.2. Informant consensus factor (ICF)

Informant consensus factor (ICF) was calculated to determine the homogeneity of information for a particular plant to treat a particular ailment [17]. ICF values ranges from 0.00 to 1.00. High ICF value (approaching 1.0) of an ailment category is obtained when one or a few plant species are documented to be used for the treatment of that ailment by a large proportion of informants, whereas a low ICF value indicates that informants disagree over which plant to use. ICF is calculated using the following formula,

$$ICF = (N_{ur} - N_t)/(N_{ur} - 1)$$

where 'N_{ur}' refers to the total number of use reports for a particular illness category, and 'N_t' refers to total number of species used for this illness category. In order to apply above parameter, several diseases are pooled into broad ailment category on the basis of ailments.

Table 1
Demographic description of informants in the study area.

Factor	Categories	No. of the persons	% of informants
Gender	Male	56	67
	Female	27	33
Age	20–30 year	11	13
	30–40 year	19	24
	50–60 year	30	36
	60–70 year	16	19
	More than 70 year	7	8
Class	Local people	35	42
	Medicinal plant collectors	26	31
	Traditional healers	19	23
	Traders	03	04
Educational level	Illiterate	18	22
	Primary education	31	37
	Secondary education	16	19
	Higher secondary education	11	13
	graduates	7	9

3. Results and discussion

3.1. Demographic profile of informants

Out of 83 informants inquired for documentation of ethnomedicinal information, 42% were local people (those who have little knowledge about herbal medicine), 23% were traditional healers (have folk knowledge on medicinal plants and practice herbal medicines/Vaidhyars), 31% were local plant collectors (collect herbals from their environs and sell to the local traders) and

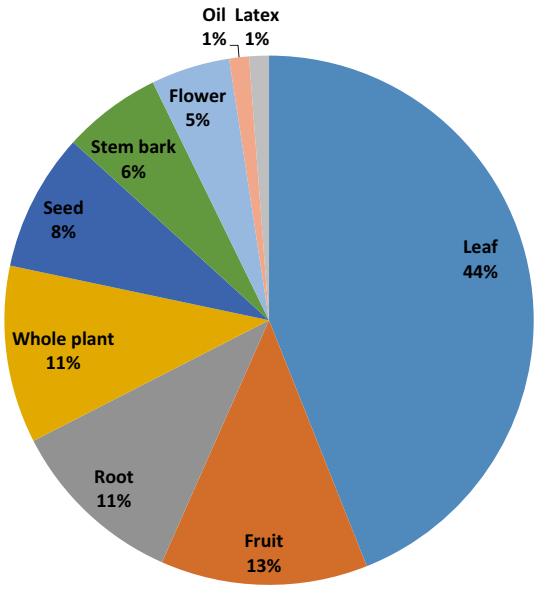

Fig. 2. Percentage of plant parts used for the preparation of folk medicine.

4% were traders (those who collect herbals from local plant collectors) (Table 1). Age of most of the informants was recorded as 21 years–82 years old. Traditional healers are keen for specific time or season for plant collection, preparation methods and route of administration, dosage of treatment, etc. Literate traditional healers often used to keep written document for their preparations of medicine. Some traditional healers refer ancient texts which are based on siddha system of medicine for preparation of folk medicines. *Siddha Maruthuva Noi nadal Noi muthal Nadal Thirattu* [18] and Thotra Kirama Araiachium Siddha Maruthuva Varalarum [19] are chiefly referred by traditional healers in the study area. Most of the traditional healers prefer to convey their folk knowledge about medicinal plants orally either to their family members or to their assistants, which is a common practice in many other societies around the world [20–22].

3.2. Medicinal plant diversity and their uses

Through this extensive field survey, a total 116 plant species from 49 families and 103 genera were recorded from the study area to treat various ailments (Supplementary Table). Of the collected ethnomedicinal plants, 53% (61 species) were herbaceous species followed by 24% of trees (28 sps.), 12% of climbers (14 sps.) and 11% of shrubs (13 sps.). Similar life form analysis have been reported in different region of India [9,10,13,14,23,24]. The highest number of species (9 species) belong to Fabaceae and Lamiaceae followed by Euphorbiaceae and Amaranthaceae (each with 6 sps.), Asteraceae (5 sps.), Malvaceae, Apocynaceae, Solanaceae, Convolvulaceae and Phyllanthaceae (each with 4 sps.). Previously Parthiban et al. [14] also reported Lamiaceae as dominant family in preparation of herbal medicines among the traditional healers in Kudavasal taluk of Thiruvarur district in Tamil Nadu. Our results are in accordance with some of the previous studies [9,22,25] in family wise classification of ethnomedicinal plants.

Among the plant parts used for preparation of medicine, leaf (73 reports) (Fig. 2) was most frequently used part followed by fruit (21 reports), root and whole plant parts (each with 18 reports), seed (14 reports), stem bark (10 reports), flower (8 reports), oil and latex (2 reports each). Most of previous folk knowledge based documentation studies around the word also recorded leaves as commonly used plant parts for preparation of herbal medicines, because leaves possibly have higher concentration of metabolites [9,10,13,14,26–29].

The traditional herbal practitioners and local people who are practicing folk medicine are formulating their preparations by different methods. In which, paste (56 reports, 30%) was predominantly used by them followed by raw plant materials (48 reports, 25%), juice (40 reports, 21%), decoction (27 reports, 14%) and powder (18 reports, 10%). Similar kind of herbal preparation method was reported by Vijayakuamr et al. [13] from the nearby study area of same district among the siddha medical practitioners. Paste was prepared by grinding the raw (fresh or dried) material of the plant part with water or oil. Juice was prepared by grinding fresh material and separates the juice after filtration. Decoction was prepared by boiling the plant in water until the volume of water reduced to half of its original volume. Powder was prepared by grinding the shade dried raw materials. In support of our study, most of the researchers revealed paste as one of the commonly used method of herbal preparation among the ethnic communities all over the World [5,9,10,30–34]. In terms of usage of folk medicinal preparations, oral administration (67%) of herbal medicine dominates the topical uses (33%). As stated by previous researchers [9,10,34] traditional healers in the present study also directly applied over the affected places in treating the diseases like cuts, wounds, rheumatism, skin disease, swelling and poison bites.

3.3. Quantitative analysis of data

Limonia acidissima was reported by all the interviewed informants in the study area and gives the highest UV of 0.98 with 81 use reports due to its potential effectiveness in treating various diseases. It was followed by *Achyranthes aspera* (0.73), *Celosia*

Table 2
Ailment categories and their informant consensus factor values of documented ethnomedicinal uses.

Ailment categories	Diseases reported in the present study	Number of use reports (N_{ur})	Number of taxa (N_t)	F_{IC}
Kidney problems (KP)	Stone formation (13), kidney disorders (9)	22	2	0.95
Dental care (DC)	Toothache (27), mouth ulcer (9)	36	5	0.89
Hair care (HC)	Hair loss (16), dandruff (8), hair growth (5)	29	4	0.89
General health (GH)	Reduce burning sensation in body (7), weight loss (8), body strength (34)	49	7	0.88
Respiratory system disorders (RSD)	Asthma (51), respiratory problems (7), cold (70), cough (126)	254	31	0.88
Fevers (Fvr)	Typhoid fever (4), fever (150), dengue fever (2), malaria fever (5)	161	21	0.88
Dermatological infection and disorder (DID)	Leprosy (18), ulcer (93), skin disease (109), wounds (115), ringworm (8), cuts (15), scabies (8), itching (15), wound healing (3), pimples (9), skin itchiness (11), leucorrhea (10), eczema (5)	419	53	0.88
Gastro-intestinal ailments (GIA)	Digestion (55), stomach ache (75), dysentery (149), intestinal disorders (17), intestinal worms (16), acidity (6), gastric complaints (8), indigestion (37), stomach ulcer (9), constipation (5), laxative (10),	387	46	0.88
Endocrinal disorders (ED)	Diabetes (100)	100	14	0.87
Poisonous bite (PB)	Insect bites (21), snake bites (26), scorpion bites (23)	70	10	0.87
Skeleto-muscular system disorders (SMSD)	Rheumatism (47), bone strength (15), swelling (67), headache (29), elephantiasis swelling (1), body pain (5)	164	24	0.86
Liver problem (LP)	Liver disorders (22), jaundice (43)	65	11	0.84
Genito urinary problem (GUP)	Abortion (5), urinary problems (27), pregnancy pain (8), female fertility (7)	47	9	0.83
Ear, nose, throat problems (ENT)	Ear ache (16), night blindness (11), eye problem (21), sore throat (14), nose bleeding (4)	66	12	0.83
Hemorrhoides (HEM)	Piles (49)	49	10	0.81
Others	Epilepsy (3), conjunctivitis (4), chicken pox (3), hypotension (5), hypertension (14), body cooling (15), uterine disorder (4)	48	10	0.80
Circulatory system/cardio-vascular diseases (CSCD)	Heart problems (26), blood purification (3)	29	7	0.79
Oncology (ONC)	Cancer (16), stomach cancer (2)	18	7	0.65

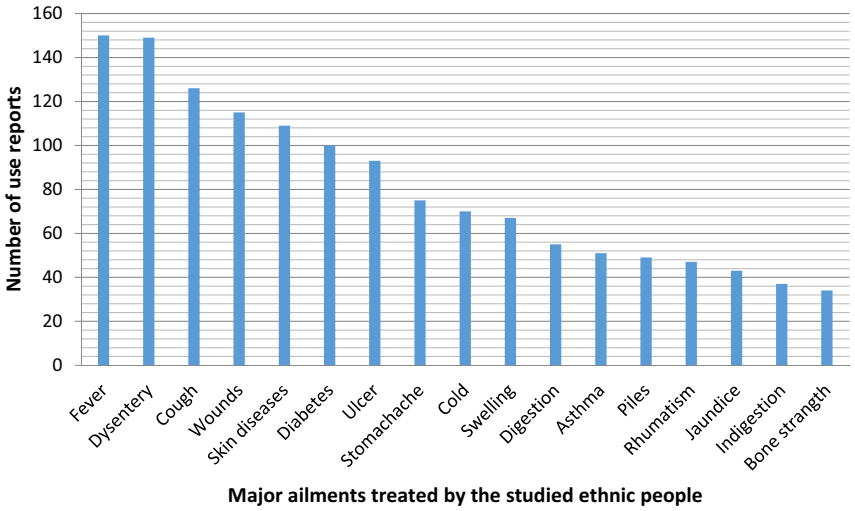

Fig. 3. Most commonly treated ailments by the studied indigenous communities.

argentea (0.57), *Aristolochia bracteolata* (0.55), *Ocimum basilicum* (0.54), *Mangifera indica* (0.53), *Lantana camara* (0.52) and *Physalis minima* (0.47), while *Commelina benghalensis* also revealed the low use value (0.02) (Supplementary Table). *L. acidissima* is also one of the plants having highest UV as stated by a few researchers in previous studies [10,22].

To determine the informant consensus factor values (ICF), all the recorded 76 ailments were grouped into 17 major ailment categories according to their body parts treated (Table 2). For example, the diseases such as leprosy, ulcer, skin disease, wounds, ringworm, cuts, scabies, itching, wound healing, pimples and skin itchiness are related to various skin diseases and infections are pooled together into a major ailment category dermatological infection and disorder (DID). Moreover, diseases like epilepsy, conjunctivitis, chicken pox, hypotension, hypertension, body cooling and uterine disorder are not related to any of the sorted 17 ailment categories and are placed under a general heading as others. ICF values were calculated for the recorded plants and ranged from 0.91 to 0.65. A higher ICF value suggests that the informants are in strong agreement on the use of a certain species in treating a particular ailment. Kidney problem (stone formation and kidney disorders) is recorded with highest ICF scoring of 0.91 *Aerva lanata* and *Sesamum indicum*. Quantitative assessment of folk medicines practiced by ethnic communities in recent assessments [10,34] also corresponding to our results, where kidney problem have highest ICF values (see Fig. 3).

4. Conclusion

The present investigation revealed the ethnobotanical knowledge of local people as well as traditional healers in Puliyankkudi village of southern India. The study exemplifies the vast diversity of medicinal plants which are used for primary health care system and this is the first report from ethnobotanical point of view. Local people (informants) in the study area utilizing a number of plants for preparation of folk medicines with proper training acquired from their forefathers and also from some ancient text book resources. However, some of the plant species such as *Acalypha indica*, *Annona squamosa*, *Aponogeton natans*, *Azima tetracantha*, *Basella rubra*, *Cardiospermum halicacabum*, *Coccinia grandis*, *Digera muricata*, *Ipomoea aquatica*, *Phyllanthus emblica* are used along with their food in day-to-day life. The plants with highest use values in this study indicates possible occurrence of valuable metabolites. There is an urgent need for exploiting frequently used ethnomedicinal plants for the development of potential new drugs to treat various ailments.

Acknowledgments

Authors are wholeheartedly acknowledges all informants in the study area who shared their knowledge on medicinal plants and their co-operation during the field study, without which this study would not have been achievable. We are thankful to anonymous reviewers who contributed greatly to improve the quality of this manuscript.

Conflicts of interest

All the authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jaim.2017.07.013.

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