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Original Research Article (Experimental)

Documentation of 'Plant Drugs' dispensed via local weekly shanties of Madurai City, India

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ABSTRACT

Background: The *Valaiyār* (*Moopanar*) communities of Tamil Nadu are traditionally known for catching rats and snakes from the agricultural fields. Prior to independence, some of these families have faced socio-economic changes and chosen to become herbalists in Madurai city. They are mainly engaged in collecting and dispensing fresh and dried plant drugs in its 'natural form' at *Tiḷagar tīḍal* market of Madurai city. Their business is unique, because customers receive 'prescriptions' and 'plant drugs', unlike the conventional dispensaries. Their world view is: '*to cure the ailing in natural way*'.

Objectives: To document plant drugs collected and dispensed by some of the families belonging to *Valaiyār* (Moopanar) community in the *Tiḷagar tīḍal* market.

Materials and methods: Ethnobotanical tools were employed to document various aspects of the practices including resource and knowledge base, medicinal uses, dosage, collection of herbarium and raw drug specimens. Integrative approach was adapted to document the trade dynamics.

Results: During the study, 133 medicinal plant species belonging to 50 families were documented. 71% of species were sourced from wild and non-forest areas. 272 simple and compound remedies were recorded.

Conclusion: Local markets/shanties like these are 'Traditional Medicine (TM) health care services at door step'. They cater to local health care needs along with conventional system in a synergistic manner and provide adaptable, local solutions using local resources.

1. Introduction

Globally the demand for Traditional Medicine (TM) and its services is constantly increasing. It has been contributing to the goal of continuance and access to healthcare needs [1].

Traditionally shanties (weekly local markets) have been a time tested system of economic transaction of several goods and agricultural produce in local and regional context. These markets are occasionally known to play a vital role in providing TM healthcare services too, which however goes unnoticed by the mainstream medicine.

An attempt has been made to document such unorganized system of healthcare service offered in shanties, by keeping the focus on *Tiḷagar tīḍal* market, in Madurai city of Tamil Nadu, India,

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which is popular for dispensing 'Plant Drugs' and 'remedies'. During 2011–2013, recurrent visits were made to this market and all the five shop owners belonging to *Valaiyār (Moopanar)* community were interviewed to document the diverse herbal produce that is dispensed along with the prescriptions.

Most of the ethnobotanical research is on the enumeration of medicinal plants and traditional knowledge used by specific communities such as *Irular, Valaiyār, Paḷaiyār, Muthuvar, Kani, Kanikkars* of Madurai and surroundings for their self-use or for the communities. However, so far, no specific study related to *Tiḷagar tīḍal* market, popular for 'Plant Drugs', dispensed by *Valaiyār* (*Moopanar*) community for diverse healthcare needs has been conducted.

2. Materials and methods

2.1. Study area and key respondents

The city of Madurai (9° 56′ 0″ N/78° 7′ 0″ E) lies on the flat and fertile plain of the river Vaigai, which flows in the northwest-southeast direction through the city, dividing it into two almost equal halves. The Sirumalai and Nagamalai hills lie to the north and west of Madurai. The land in and around Madurai is utilized largely for agricultural activity, which is nurtured by the Periyar Dam [2]. *Tiḷagar tīḍal* market or Sunday market is located in the central part of the Madurai city where 'fresh green herbs', dispensed by *Valaiyār* (*Moopanar*) community (Fig. 3).

The key respondents of the study are the experienced elders (senior and knowledgeable as recognized by the community members), who manage their shops in *Tiḷagar tīḍal* market. They belong to *Valaiyār* (*Moopanar*) community of Nagamalai hills, who are known traditionally as "snake catchers", catering to local needs of farmers and farming activities. In Tamil, *Valai* has two meanings: one is *"rat burrow"* and the other is *"net"* [3,4]. These respondents are also "herbalists", who have extensive knowledge about the medicinal plant sources, identification, knowledge related to diagnosis and management of disease, use of herbs and related aspects.

2.2. Literature studies

Review of literature reveals that most of the ethnobotanical studies pertain to Madurai and surrounding districts. Published information can be broadly categorized as enumerations of medicinal plants and traditional knowledge used by specific communities or regional practices/local trade such as follows: An ethnobotanical study on traditional medicinal plants used in Uthapuram, Madurai district, documented 52 valuable medicinal plant species belonging to 36 families with folk uses [5]. An ethno-veterinary survey of the villagers of Usilampatti taluka of Madurai district, recorded 73 medicinal plant species with uses in cattle health management [6]. Ethno-botanical survey in Theni district (Western Ghats) documented 86 plant species with medicinal uses as practiced by *Paliyars* and *Muthuvars* [7]. An ethnobotanical survey of *Kani* tribal communities in Tirunelveli hills of Western Ghats, India resulted in documentation of 90 medicinal plant species used commonly for treating 65 different types of ailments [8]. Another ethnobotanical study of traditional healers from *Mayiladumparai* block of Theni district, Tamil Nadu documented the ethno-medicinal usage of 142 medicinal plant species belonging to 62 families, with 504 formulations [9]. Madurai is one of the well-known 'raw drug trading centre' in the country as recorded in the 'Demand and Supply of Medicinal Plants of India' study [10]. An ethno-medico-botanical documentation of *Valiyan* community from Alagarkoil hills, Madurai district resulted in listing of 111 medicinal plants and their uses [11]. An ethnobotanical investigation among *Paliyar* tribes in Madurai district of Tamil Nadu resulted in systematic documentation of 60 medicinal plant species along with traditional formulations for managing various disorders [12]. A quantitative assessment of medicinal plants traded from selected markets in the state of Tamil Nadu (Chennai (a major market) and Virudhunagar (an intermediate market)) and flow of raw materials to central (Madurai) and regional markets (Chennai) was observed [13]. A study on *Valaiyans*, an ethnic group in Piranmalai hills, Tamil Nadu, recorded 63 medicinal plant species [14]. A comprehensive profile of *Valaiyars* (*Mooppanars/Mooppar*), an agriculture based community is documented in 'People of India Project' [4]. Review shows no focused study on *Tiḷagar tīḍal* market or Sunday market of Madurai, which is solely managed by *Valaiyār* (*Moopanar*) for eight generations (from 1940s).

2.3. Survey

During February 2011 to December 2013, the key respondents at five retail shops in the market were interviewed by employing

Fig. 1. (a): Flyers or pamphlets in Tamil language. It gives list of plant drugs (Tamil trade name/s) sold and health conditions (Tamil names indicated) that can be managed. (b): Visiting card sample.

ethnobotanical documentation methods (such as personal interviews, observational studies, focused group discussions) to elicit primary information related to the diversity of 'plant drugs' sold as bunches (known as *'kaṭṭu'* in Tamil) or as powder or simple/compound formulations, their sources and traditional uses for specific health conditions [15].

Frequent visits to the market enabled the preparation of a comprehensive resource inventory including availability of season specific plant resources. Open-ended questions were posed to gather retrospective information. To ensure the data consistency and reliability, recall techniques, personal observations and repeated questioning were employed [16].

Samples of plant drugs sold in the market were procured and processed into herbarium and raw drugs voucher specimens as per the international protocols [17].These specimens were identified and validation of scientific names was carried out by referring to international, regional and national floras [18,19], and further authenticated by taxonomists. The identified voucher specimens were deposited at FRLH-Herbarium, at FRLHT, Bangalore with specific accession numbers.

The data gathered was systematically compiled, summarized to a table comprising of Tamil names and its binominal nomenclature, sources, traditional knowledge such as medicinal uses and methods of compounding, selling prices of the materials in the market. Tamil names were further authenticated by consulting taxonomists with Tamil knowledge and regional floristic publications. Further, botanical correlation of Tamil names, was carried out using multi-dimensional databases on Indian medicinal plants. Additionally, the usage of these plants in other medical systems *viz*. Ayurveda(A), Siddha(S), Unani(U), Folk(F), Tibetan (T), Modern(M) and Traditional Chinese Medicine(C) was also tagged [20,31], (Table 1, column 9) (Supplementary file).

The documented medicinal uses were closely examined by the physicians of Indian Systems of Medicine (ISM), who are familiar with Local Health Traditions (LHT) adapting documentation and rapid assessment methodology [21,22]. They consulted various classical medical publications related to medicinal uses of the studied species for direct or indirect references [23–29]. Besides these, physicians also contributed their experience of using these species for a health condition as an input which is shown in Table 1, column 7 (Supplementary file). As a result of this exercise, recorded medicinal uses were further classified as three main categories viz., promotive, preventive and curative health care practices (Table 1).

3. Results

3.1. Enumeration of medicinal plant resources

Through this study, 133 medicinal plant species belonging to 50 families, which are used as fresh and dried plant drugs in Madurai city and surroundings were, recorded (Supplementary file-Table 1). The life form (habit) analysis of the plants species recorded were 75 herbs, 24 climbers, 17 trees and 17 shrubs (Fig. 2a).

3.2. Sources of plant drugs

Mostly commonly growing herbaceous, easily accessible plants were seen in the dispensaries. Nearly 71% of the plant resources were from different habitats in the wild such as the farm lands, fallow lands, foot hills, hedges, road sides, home gardens etc (Fig. 2b, Table 1). However, certain rare resources were collected from foot hills/hilly terrains/neighbouring places. For example, *māhāḻi veru* (*Decalepis hamiltonii* Wight & Arn.) was collected from Annamālai/nāgamalai hills; *tarapasali* (*Portulaca quadrifida* L.) is taken from water-logged areas, which is seasonal too. *Muyal ceviyan* [*Kleinia grandiflora* (Wall. ex D.C.) Rani] was obtained from the nearby hill ranges which required extra effort, and therefore are expensive than others (Rs. 50 to 75 per leafy branches).

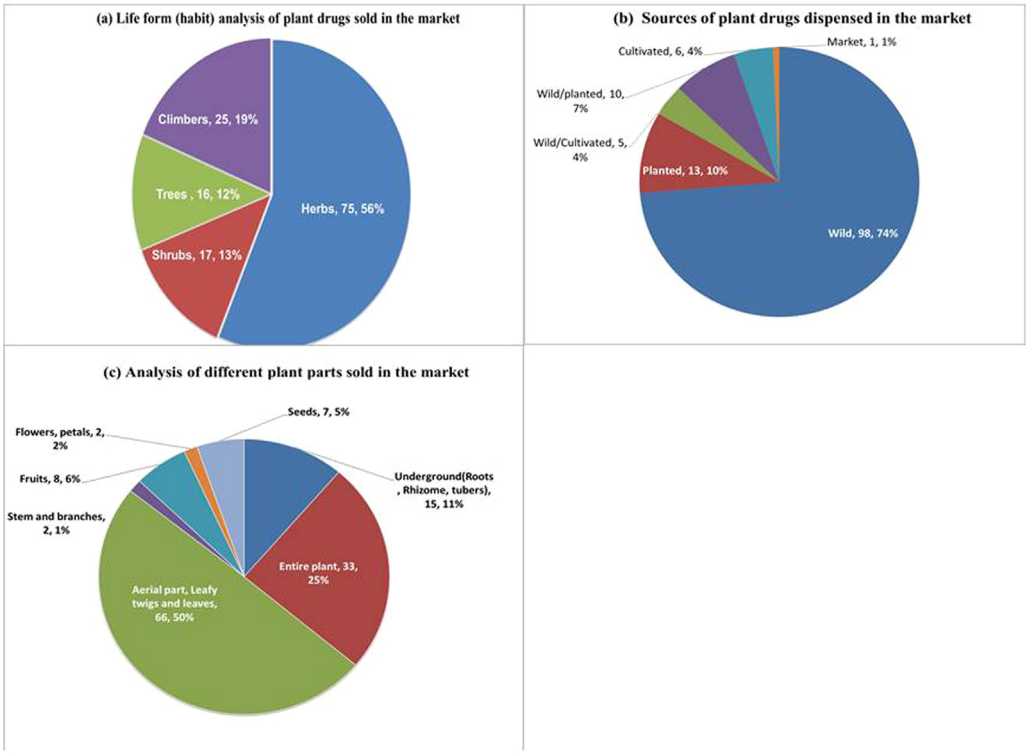

Fig. 2. (a) Habit wise analysis of 'plant drugs'; (b) Sources of medicinal plants traded; (c): Plant parts traded.

Fig. 3. A glimpses of the *Tiḷagar tiṭal* market, Madurai, India.

3.3. Plant parts traded

Among the 133 species recorded in the market, 67 are used as leafy materials/twigs/tender branches/stem; 33 species are whole plants; 16 species are fruits (both pre-mature and ripened), 11 species are underground parts including rhizome, roots, tubers, bulbs etc; 7 species are seeds and 2 species are floral parts (Fig. 2c, Table 1).

3.4. Range of health care solutions

272 herbal remedies for managing various health conditions were recorded in this study. These were broadly classified into curative (43%), preventive (17%), and promotive (19%) health care solutions (additionally 21% can be included across the categories). Range of health conditions addressed are from cuts, wounds, fever, cold, cough, reproductive health, antidotes, skin care, hair care, rejuvenants, cardiac care, diabetes management, etc. Analysis of data shows, more than one species being prescribed to manage a health condition (Table 1).

3.5. Prudent use of resources

A wide range of knowledge resides in the community related to specific habitats preferences, seasonal availability of resources, morphological variants and alternatives.

a) Morphological similarities: Similarities in the appearance of plant drugs guides their choice for treatment. Instead of *śiru parpaṭakam (Oldenlandia corymbosa* L.), which is a linear leaved erect herb, *peruṃ parpaṭakam (Mollugo oppositifolia* L.) an ovate leaved decumbent herb is preferred; similarly for *Nalla tuḷasi (Ocimum tenuiflorum* L.), which is a mildly scented greenish herb, *nāyi tuḷasi/ kāṭṭu tulsi (Ocimum americanum* L.), a strong scented one is preferred.
b) Seasonal variants and health solutions: They also believe that seasonal health problems can be addressed using herbs available in specific seasons e.g., for skin care in rainy and winter seasons, avuri/nīli (*Indigofera tinctoria* L.), kuppaimeni (*Acalypha indica* L.), *śīma agatti* (*Senna alata* (L.) Roxb. are used.
c) Specific habitat preference: In traditional practices there is always preference for plant drugs procured from specific location. E.g., *amukkarān veru* (*Withania somnifera* (L.) Dunal) roots collected from *Pollachi* and *Masaniamma Koil*, Tamil Nadu are much preferred than the Rajasthan variety. Similarly, *Tulasi* (*O. tenuiflorum*) from Rajapalyam areas and *soṭru kaṭraḷai* (*Aloe vera* (L.) Burm.f.) from Kolli hills, Serumalai and Alagarkoil are popular in trade.
d) Substitutes and adulterants: Respondents are also familiar with genuine, adulterants/substitutes available in the local markets. E.g., one of the informants Shri P. Mokan says: " … *I stopped sending people to main market due to one incidence: One day, a stock of bhūmicakkarai kiḻaṅgu (based on description of the climber, flowers & tubers, species identified as Ipomoea mauritiana Jacq.) was exhausted in our shop. I told my patient to buy from regular retailer in the city. The patient got back to me with pieces of roots of Maravidi kiḻaṅgu (as described, these are roots of Agave mexicana* Lam.), *which were sold in the name of bhūmicakkarai kiḻaṅgu. From thereafter, I decided not to send any of our customers to retail shops, but collect the material ourselves and provide them to the customers. In another instance, one has to know how to differentiate genuine, alternatives and adulterants. I identify resources through close observation of external morphological and organoleptic characters and thus confirm its genuinity due to familiarity. I can differentiate between similar looking plants like Nalla vallarai elai (Centella asiatica* (L.) Urb.) *and koḍi vaḷḷarai (Merremia emarginata* (Burm. f.) Hallier f), *which seasonal plants used as memory enhancers and hair conditioners. Both have kidney shaped, semi-cordate leaves. Nalla vallarai elai has roots and leaves at every node and spreads on the ground. koḍi vaḷḷarai has no roots at each node. It has a strong tap root and branches arising from centre and spreads all over like a climber. Nalla vallarai elai is slightly bitter to taste and is much preferred than the latter*".

3.6. Medicinal plants across Indian systems of medicine

Out of 133 species recorded, 16 of them are being used across Ayurveda, Siddha, Unani, Folk, Homeopathy and modern medicine. For example, *amukkarān kizhangu* (*W. somnifera* (L.) Dunal) is used as a rejuvenant; *śirukuruñjan/śakkaraikoḻḻi* (*Gymnema sylvestre* (Retz.) R.Br. ex Sm.) is used in diabetes management. The overlapping usage pattern indicates common origin of practices or knowledge sharing across various systems of medicine (Table 3).

3.7. Potential nutraceuticals

During the study, more than 20 species were recorded and are used in various food preparations such as tea, beverages and cuisine for specifically managing health issues. Mostly, whole herbaceous plants or fresh twigs/tender stems/wild edible fruits are used (Table 2). Such preparations warrant nutraceuticals and dietetics research.

3.8. Collection practices

A strict regime is followed by collector-cum-herbalist while harvesting. They pay due respect to plants by offering a coconut, betel leaves and incense stick prior to harvest. For example: collecting roots of *veḷḷai erukku* (*Calotropis gigantea* (L.) Dryand.), certain ritual is followed. A nude male member goes in the night and collects the roots after performing certain rituals and harvest eastward growing roots. Harvested roots are soaked in milk, dried and sold. A strong belief is that any changes in this ritualistic practice may cause harm to collector and is ineffective. Sustainable harvest protocols are followed in most of the cases for example: While collecting tuberous roots of *tanīrviṭam*

Table 1
Broad categories of health conditions (preventive, promotive, curative) addressed with simple remedies using 'Plant Drugs'.

Broad categories of health conditions addressed	Number of remedies	Categories	Tamil name (Botanical names) of plant drugs used
Gastrointestinal problems (ulcers, gripe, indigestion, constipation, flatulence, appetite, heat boils due to *pittam/ushnam,* worms infestation, improves digestion, Piles and fistula)	47	Curative and promotive	Śirukīrai (*Amaranthus graecizans* L.), Eḍaṃburi (*Helicteres isora* L.), Peruṃ tuṃbai (*Anisomeles indica* (L) Kuntze*),* Kaḍukāyi *(Terminalia chebula* Retz.*),* Kātukarani kiḷaṅgu (*Cyphostemma setosum* (Roxb.) Alston), Kavil tuṃbai (*Trichodesma indicum* R.Br.), Kovai elai (*Coccinia grandis* (L.) Voigt.), Muḍakatān (*Cardiospermum halicacabum* L.), musmuskāyi (*Mukia maderaspatana* (L.) M.Roem*),* Naiyuravi/nāyuravi (*Achyranthes aspera* L.*),* Nelavāgai (*Senna alexandrina* Mill.*),* Omavalli (*Plectranthus amboinicus* (Lour.) Spreng.*),* Tarapaśāli/darbhaśāli/darbaśāli (*Portulaca quadrifida* L.*),* Bhūmicakkarai kiḷaṅgu (*Ipomoea mauritiana* Jacq.*),* Payipoḍal/payipodal (*uffa amara* Roxb.), Pīrkaṅkāyi/pīrtaṅkāyi *(Luffa acutangula* (L) Roxb), Vīpam/vīmbu/vepilai (*Azadirachta indica* A. Juss.*),* Virali meḷagu/viraḷi meḷagu (*Evolvulus alsinoides* L.)
Skin and hair care (itching, scabies, local allergic reactions, lichensia, cuts and wounds, hair care, lice, bad body odour and excessive sweating)	36	Curative and promotive	Avuri/nīli (*Indigofera tinctoria* L.), Kuppaimeni (*Acalypha indica* L.), Sīma agati (*Senna alata* (L.) Roxb.), Śiriyanaṅgai (*Andrographis paniculata* (Burm f.) Nees.*),* Śirpacālai (*Acalypha fruticosa* Forssk.), Eḍaṃburi (*Helicteres isora* L), Karbogarasi (*Psoralea corylifolia* L.), Musmuskāyi (*Mukia maderaspatana* (L.) M.Roem)
Respiratory problems(cough, cold, fever, dengue, breathing problem, chest pain, asthma, sinusitis)	30	Curative and preventive	Āḍātoḍā elai (*Adhatoda vasica* Nees), Atimarduram (*Glycyrrhiza glabra* L.*),* Kandaṅgatiri elai/kaṇḍaṅgatiri elai (*Solanum virginianum* L*),* Karpūravalli (*Hyptis suaveolens* (L.) Poit.), Mūṅgil (*Bambusa arundinacea* Willd.), Muḷḷu muruṅgai (*Erythrina suberosa* Roxb.), Tuḷasi (*Ocimum tenuiflorum* L.), Omavalli (*Plectranthus amboinicus* (Lour.) Spreng*),* Saṃgu elai (*Azima tetracantha* Lam.), Śiriyanaṅgai (*Andrographis paniculata* (Burm f.) Nees.*),* Śiru tumbai elai (*Leucas aspera* (Willd.) Link.), Vātanārāyaṇan elai *(Delonix elata* (L.) Gamble*), Parpaṭakam* (*Mollugo cerviana Ser.*), Viṣṇukrānti (*Evolvulus alsinoides* L), Vilva (*Aegle marmelos* (L.) Corrêa.), Kumatikāyi (*Citrullus colocynthis* (L.) Schrad*)*
Orthopedic problems (strengthening of bones, joint pains)	24	Curative and preventive	Vilva *Aegle marmelos (*(L.) Corrêa), Gila (*Crotalaria verrucosa* L.*),* Kānaveḍi/ veṇṇai pūṃḍu (*Dipteracanthus patula (*Jacq.) Nees*),* Kavil tuṃbai (*Trichodesma indicum* R.Br.), Kovai elai (*Coccinia grandis* (L.) Voigt.), Mañjanati (*Morinda coreia* Buch.-Ham.), Muḍakatān (*Cardiospermum halicacabum* L.), Nāyi tuḷasi (*Ocimum americanum* L.), nindalvaḍi (*Biophytum sensitivum* (L.) DC.), ūmatai kāyi (*Datura metel* L.*),* piraṇḍai (*Cissus quadrangularis* L.*),* taḷutāḷai (*Clerodendrum phlomidis* L.f.), tāyi velai *(Gynandropsis gynandra),* toṭṭalavaḍi/toṭṭalavāḍi/toṭṭalśinugi (*Mimosa pudica* L) tūti elai (*Abutilon indicum* (L.) Sweet.*),* taḷutāḷai/Vatamadaki (*Clerodendrum phlomidis* L.f.*),* Vātanārāyaṇan elai (*Delonix elata* (L.) Gamble*),* veḷiparuti (*Pergularia daemia* (Forssk.) Chiov.)
Poisonous bite (snake, insects and scorpions bites)	19	Curative	āḍutinnā pālai (*Aristolochia indica* L.), āvārai (*Senna auriculata* (L.) Roxb), ākāśagaruḍan kiḷaṅgu/koḷḷaṃgovai kiḷaṅgu (*Corallocarpus epigaeus* (Rottler) C.B.Clarke*),* Avuri/nīli (*Indigofera tinctoria* L.), kañjīram (*Strychnos nux-vomica* L.), nīrmel neruppu (*Ammannia baccifera* L.), pāl kuruñjan (*Ichnocarpus frutescens* (L.) WT.Aiton), perun kuruñjan (*Dregea volubilis*), Sīma agati (*Senna alata* (L.) Roxb.), Śiriyanaṅgai (*Andrographis paniculata* (Burm f.) Nees., śivakaraṇḍai/śivakarandai *(Sphaeranthus amaranthoides* Burmf), vīpam/vīmbu/vepilai (*Azadirachta indica* A. Juss.*)*
Rejuvenants	16	Preventive and promotive	amukulan kiḷaṅgu (*Withania somnifera),* arakīrai (*Amaranthus tristis* Willd.), arugam pul (*Cynodon dactylon*), Bhūmicakkarai kiḷaṅgu (*Ipomoea mauritiana*), nīli kāyi ((*Phyllanthus emblica*), nīrmel neruppu (*Ammannia baccifera* L.), nīrumuḷḷi viḍai (*Hygrophila schulli* M.R.Almeida & S.M.Almeida), nilapani kiḷaṅgu (*Curculigo orchioides* Gaertn.), oridhal tāmarai elai (*Hybanthus enneaspermus* (L.) F.Muell), piraṇḍai (*Cissus quadrangularis* L.*),* pūṇḍu (veḷḷai) (*Allium sativum* L.) tetān koṭṭai/teṭrān koṭṭai (*Strychnos potatorum* L.f.*),* tanīrviṭam kiḷaṅgu/taṇṇīrviḍam kiḷaṅgu (*Asparagus racemosus* Willd.)
Life style related (Diabetes management)	15	Promotive	arakīrai (*Amaranthus tristis* Willd..), arugam pul (*Cynodon dactylon* (L.) Pers., āvārai (*Senna auriculata)*, āvārai (*Senna auriculata*), kāśini kīrai (*Cichorium intybus*), kovai elai (*Coccinia grandis*), nāvalpaḷam koṭṭai (*Syzygium cumini),* pāl kuruñjan (*Ichnocarpus frutescens (L.)* WT.Aiton), sīntil koḍi/śīntil koḍi (*Tinospora cordifolia* (Willd) Miers.), śiriyanaṅgai (*Andrographis paniculata* (Burm f.) Nees.), śirukuruñjan/śakkaraikoḷḷi (*Gymnema sylvestre* (Retz.) R.Br. ex Sm.*),* tūduva elai/tūtuva elai (*Solanum trilobatum* L.), vīpam/vīmbu/ vepilai (*Azadirachta indica* A. Juss.), veṇḍaya kīrai (*Trigonella foenum-graecum* L.), Vilva (*Aegle marmelos* (L.) Corrêa.*)*
Liver problems (jaundice and liver tonic)	14	Curative and promotive	āvārai (*Senna auriculata),* arugam pul (*Cynodon dactylon* (L.) Pers.), kāṭṭu koḍi (*Cocculus hirsutus* (L.) W.Theob.*),* kīlānelli (*Phyllanthus amarus* Schumach & Thonn.*),* mañjaḷ karalaṅkaṇṇi (*Sphagneticola calendulacea* (L.) Pruski, *Wedelia triloba* (L.) Hitchc.)
Urinary disorder (coolant, burning micturition, infection, stones, diuretic, odema	11	Curative	kūraipū/kaṇṇuppūlai (*Aerva lanata* (L.) Juss), nīrmel neruppu (*Ammannia baccifera* L), neriñjimuḷ/neriñjimul (*Tribulus lanuginosus* L.) pudīnā elai (*Mentha arvensis* L.*),* muyal kāḍu (*Kleinia grandiflora* (Wall. ex DC.) Rani)

Table 1 (*continued*)

Broad categories of health conditions addressed	Number of remedies	Categories	Tamil name (Botanical names) of plant drugs used
Circulatory problems (Blood purification, body salts	11	Preventive and promotive	Kandaṅgatiri elai/kaṇḍaṅgatiri elai (*Solanum virginianum* L.), mūkarattai (*Boerhavia diffusa* L.)
Gynecological problems (white discharge, regularize menstrual cycle, excessive bleed, painful menstruation, strengthening of uterus, galactogogue)	10	Curative and promotive	ammān paccarasi elai (*Euphorbia hirta* L.), Atimarduram (*Glycyrrhiza glabra* L.), Chemparuthi (*Hibiscus rosa-sinensis* L.),Kaḍukāyi (*Terminalia chebula* Retz.), kāṭṭu koḍi (*Cocculus hirsutus* (L.) W.Theob.), koraikiḻaṅgu (*Cyperus rotundus* L.), malai veṃbu elai (*Melia dubia* Cav.), Manamuragi (*Euphorbia heterophylla* L.), nīrmel neruppu (*Ammannia baccifera* L.), tāli velai/tāḷi veḷai (*Ipomoea sepiaria* J.Koenig ex Roxb.), tanīrviṭam kiḻaṅgu/taṇṇīrviḍam kiḻaṅgu (*Asparagus racemosus* Willd.), veḷḷarugu elai (*Enicostema axillare* subsp. *littorale* (Blume) A.Raynal)
Kidney care (Kidney stones)	9	Preventive and Curative	ānai neruñjil (*Pedalium murex* L.), chattisāranati (*Trianthema decandra* L. Mant.), kāsini kīrai (*Cichorium intybus*), kūrai pū/kaṇṇuppūlai (*Aerva lanata* (L.) Juss), mūkarattai (*Boerhavia diffusa* L.)
Reproductive health promotion (vitality, virility, strengthening, conception, abortification)	8	Promotive	āḍātoḍā elai (*Adhatoda vasica* Nees), amukulan kiḻaṅgu (*Withania somnifera* (L.) Dunal), araśa elai (*Ficus religiosa* L.)
Cardiac problems (Blood pressure control, cardiac tonic)	5	Preventive and promotive	śembarutti/śembaruti/sembaruti/sembarutti (*Hibiscus rosa-sinensis* L.), śivakaraṇḍai/śivakarandai (*Sphaeranthus amaranthoides* Burmf), Muḷḷu muruṅgai (*Erythrina suberosa* Roxb.)), pudīnā elai (*Mentha arvensis* L.), tāmarai iḍal/tāmarai idal (*Nelumbo nucifera* Gaertn), vaṭṭa śaranti (*Boerhavia diffusa* L.)
Pediatric care (Digestive, skin, memory enhancement, disability)	4	Preventive and promotive	Eḍaṃburi (*Helicteres isora* L), Kaanavedi/Vennai poondu ((*Dipteracanthus patula* (Jacq.) Nees), Karpūravalli (*Hyptis suaveolens* (L.) Poit.), manamuragi (*Euphorbia heterophylla* L.), mavaliṃga elai/mahāliṃga elai (*Crateva religiosa* G Forst), nīrumuḷḷi viḍai (*Hygrophila schulli* M.R.Almeida & S.M.Almeida), Saṃgu elai (*Azima tetracantha* Lam.), Tarapaśāli/darbhaśāli/darbaśāli (*Portulaca quadrifida* L.)
Neurological problems (Paralysis, *Vata* problems)	4	Curative and preventive	toṭṭalavāḍi/toṭṭalśinugi (*Mimosa pudica* L)
Belief: Ward off evil eye	4	Preventive	ākāśagaruḍan kiḻaṅgu/koḷḷaṃgovai kiḻaṅgu (*Corallocarpus epigaeus* (Rottler) C.B.Clarke), kañjīram (*Strychnos nux-vomica* L.), kaṭraḷai/soṭru kaṭraḷai (*Aloe vera* (L.) Burm.f.),
Ear care	3	Curative	maral kāyi (*Sansevieria roxburghiana* Schult. & Schult.f.)
Eye care	2	Preventive and Promotive	ponaṅgaṇṇi/ponāṅgaṇṇi (*Alternanthera sessilis* (L.) R.Br. ex D.), śītakatti (*Sesbania sesban* (L.) Merr.)
Remedies recorded	272		

kiḻaṅgu/taṇṇīrviḍam kiḻaṅgu (*Asparagus racemosus* Willd.), certain portion of mother plant with tubers are left behind for regeneration.

3.9. Promoting traditions

At any given time or season, on an average, they sell 40 to 70 different plant species as 'plant drugs' in the form of bunches (*Kaṭṭu*), single branch or stick (Tamil: *kuchi*). They also sell underground parts like rhizomes, cluster of roots, tubers, stem pieces, fruits, and flowers and occasionally stem and root barks. The cost of these bunches, vary somewhere between Rs. 10 to 150, and the families earn between Rs. 1000 to 3000 per day depending upon the desired botanicals, availability, accessibility and medicinal significance. In the study, it was observed that the market is often visited by Siddha, Ayurveda and Unani practitioners, who are trained formally in Medical Colleges for procurement of herbs for treatments. Some of the enthusiastic customers, who are keen to learn about Siddha visit and learn about identification and sources of collection.

3.10. World views and reach

During the study, it was observed that the herbalists carefully diagnose and dispense mainly 'plant drugs' bunch (*kaṭṭu*) at nominal fee for the services rendered. They also sell dried form of the plant drugs. They sometimes do free services. They also request for follow-ups' to ensure efficacy and safety.

4. Discussion

This study is a qualitative retrospective research and is the first time documentation of the market was done. There were only 5 shops in the market; the key respondents interviewed were identified by these shop owners. The most challenging part of the study was rapport building with key respondents; understand their world view and their approach to health seekers [16].

These hunter-gatherer members have exhibited a symbiotic and adaptive lifestyle, because of the changes in the landscape, demography and inevitable social conditions and started concentrating on gathering minor forest products or non-forest wild plant resources and providing TM services to other communities. This has earned them social respect and shown an alternative means for their livelihood. This is one of the local ecosystem services offered through shanties. The scope of the study remained only to the documentation of medicinal plant resources. However, it encourages researchers to take up studies related to medical anthropology, health seeking behaviors, world views, socio-economic dimension of the health care services and Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) [30] on the sustenance of traditional practices and livelihood opportunities, sustenance of tradition-cum-profession, under the rapid urbanization flux including continuity, attitudinal changes in younger generations towards their traditional practices.

The community members can be called as 'para-taxonomists', as they easily identify plant resources through close observation of external and organoleptic characters as confirmatory tests, without any higher education and formal training. This aspect of traditional know-how needs to be documented in future, as it would lead to

Table 2
Some examples of 'Plant Drugs' used as greens with potential nutraceuticals properties.

Scientific name (Tamil trade name as per the community)	Parts used	Health conditions
Delonix elata (L.) Gamble *(Vatanarayana)*	Leaves	*Vata* disorders (leading to nerves weakness, muscular problems etc.)
Trianthema decandra L. Mant. (*Chattisaranathi)*	Leaves	Paralysis
Boerhavia diffusa L. *(Mookarattai)*	Leaves	Blood purification
Cissus quadrangularis L. *(Pirandai)*	Stem pieces	Bone strengthening
Erythrina suberosa Roxb. *(Mullu murungai)*	Leaves	Cold
Cardiospermum halicacabum L. (*Mudakataan)*	Leaves	Constipation, flatulence
Erythrina suberosa Roxb. *(Mullu murungai)*	Leaves	Control of blood pressure
Alternanthera sessilis (L.) R.Br. ex D. *(Ponanganni)*	Leaves	Reduces excessive body heat
Trigonella foenum –graecum L. (*Vendaya keerai)*	Whole plant	
Dregea volubilis (L.f.) Benth. ex Hook.f. (*Perun kurunjan)*	Leaves	Diabetes management
Cichorium intybus L. (*Kaasini keerai)*	Leaves	
Trigonella foenum – graecum L.(*Vendaya keerai)*	Leaves	
Alternanthera sessilis (L.) R.Br. ex D. *(Ponanganni)*	Leaves	For improving vision
Eclipta prostrata (L.) L. *(Karappan)*	Whole plant	
Erythrina suberosa Roxb. *(Mullu murungai)*	Leaves	Cough Fever
Centella asiatica (L.) Urb.(*Vallarai elai)*	Whole plant	General weakness Hair growth promoter
Abutilon indicum (L.) Sweet. *(Thuthi elai)*	Leaves	Jaundice treatment
Sphagneticola calendulacea (L.) Pruski (*Manjal karalankanni)*	Whole plant	
Eclipta prostrata (L.) L. *(Karappan)*	Whole plant	
Abutilon indicum (L.) Sweet. *(Thuthi elai)*	Leaves	Joint pain
Cardiospermum halicacabum L (*Mudakatan)*		
Cichorium intybus L. (*Kaasini keerai)*		Kidney stones
Centella asiatica (L.) Urb.(*Vallari elai)*	Whole plant	Memory power (*Buddi Shakti)*
Abutilon indicum (L.) Sweet. (*Thuthi elai)*	Leaves	Piles and fistula
Achyranthes aspera L. *(Naiyuravi)*		
Stachytarpheta jamaicensis (L.) Vahli. *(Eluthani keerai)*		
Trichodesma indicum R.Br. (*Kavil tumbai)*		
Dregea volubilis (L.f.) Benth. ex Hook.f. (*Perun kurunjan)*	Leaves	Worm infestation

Table 3
Medicinal plants species across various medical systems.

	Ayurveda	Folk	Homeo	Sidda	Tibetian	Unani	Western
Ayurveda	117	96	41	108	47	66	12
Folk	96	107	36	99	44	58	9
Homeo	41	36	41	40	25	32	8
Sidda	108	99	40	118	47	62	12
Tibetian	47	44	25	47	47	39	6
Unani	66	58	32	62	38	66	11
Western	12	9	8	12	6	11	12

Note: Out of 133, One species have not been included in any of the system as it is new record in folk.

practical key for identification of resources. Their ecological knowledge and sustainable collection practices can help in adaptive management of medicinal plants.

Through this study, it was recorded from the respondents that a range of 25–100 visitors come to these shops every day. Their daily income ranges between rupees 1000 to 3000 rupees. The shop owners generally distribute flyers with the information on herbs available for sale (Fig. 1). These 5 shops have gained popularity by merely providing unique TM services, where fresh herbs, prescriptions and caring touch are offered. Health seekers have recognized their value for managing health care at affordable price by utilizing their services. Over-the-Counter products like pain removal oils, hair oils, hair wash, conditioners, skin care products and mixtures of powders are sold. Certain plant parts are sold to ward off evil spirit. Example: stem and root pieces of *C. gigantea* (L.) Dryand. as amulets and dried stem pieces of *yeṭṭipaḷaṃ* (*Strychnos nux-vomica* L.).

Among 1149 plant species recorded in Siddha system of medicine (FRLHT database), around 250 are prominently and widely used. Among them, 119 species are also being sold in *Tiḷagar tīḍal* market whereas, 120 species among 1549 species recorded in Ayurvedic medicine are being dispensed in the same market. 64 species among 493 species recorded in Unani medicine are also being sold here [31] (Table 1). It was observed that the physicians from these three systems of medicines, which are commonly practiced in and around Madurai district, were one of their customer groups. During various discussions with the physicians it was evident that *Tiḷagar* supplies their raw material needs on request.

The *Tilagar* market functions like a Primary Health Care Centre through traditional medicine. Our study revealed that the set up treats 56 numbers of primary health issues and chronic problems. Apart from treating ailments, it also functions like source of wellness medicine and promotive health care (Table 1).

Moreover, it was observed that the market shows dynamism and gives feeling of cordialness. The healers-cum-traders, in the market have established customer base over the years leading to a cordial environment. This environment enables the customers to share their every minute health issues with the healer which in turn helps in achieving positive health. The customer feels and

knows the medicine in their 'natural form', which again helps building faith. Entire system seems to be a faith-based set up rather commercial which is evident from the practice of dispensing medicine at the cost without expecting any consultation fees.

The market seems to be continuously supplying raw materials throughout the year. Seasonal plants like *P. quadrifida* are collected during abundance and stored for continuous supply. In order to meet the rare species demand, they go to an extent to collect them from faraway places. Example, hilly terrain species like *D. hamiltonii*, roots are harvested from Alagarkoil or Nagamalai hills. These are processed and preserved.

The healers-cum-traders are 'eco-conscious' by nature and practice. They harvest plant parts after offering prayers and take just enough for their consumption. From among the 133 species recorded in the market, more than 50% (67 species) are harvested for leafy materials/twigs/tender branches/stem, which get replenished.

Like any other societal changes, this community of healers is also facing similar socio-economic changes. For instance, it was recorded that the younger generation members of this community are largely influenced by modernization, and getting deviated from the traditional occupation.

5. Conclusion

Even today, in many parts of the world, access to modern healthcare is difficult or not affordable. They continue to rely on TM which is based on locally available natural resources and traditional knowledge. Hence, such local markets/shanties can be considered as 'TM health care services at door step', which provides local solutions and resources in cost-effective manner. The good practices existing in *Tiḷagar tiḍal* market have to be recognized and promoted for wider application, thus ensuring symbiotic relationship across health care service providers in the system. There is a need to assess the ecological services valuation to sustain such practices. This study warrants proper documentation of know-how of these healers-cum-traders with regard to their traditional ecological knowledge, affordability of the solutions, bio-prospecting potential of the remedies, empirical evidences, and anthropological studies to know the dynamism in these practices.

The markets like these treasure immense knowledge, experiences coupled with traditional wisdoms, which needs to be unraveled for "Health for All" in the community.

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Conflict of interest

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Appendix A. Supplementary data

Supplementary data related to this article can be found at doi:10.1016/j.jaim.2017.05.008.

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