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RESEARCH ARTICLE

CONVENTIONAL PRACTICES FOR GYNECOLOGICAL WELFARE AMONG INDIGENOUS IRULAR CLANS OF TAMIL NADU, INDIA

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Abstract

Ethnobotanical knowledge serves as a vital reservoir of culturally rooted health practices, especially among indigenous communities. This investigation explores the medicinal plant usage for gynecological disorders among the Irular tribal population of Anaikatty, Maruthamalai and Theethipalayam areas of Tamil Nadu. A total of 50 informants, primarily above the age of 50, were interviewed using semi-structured methods. The study recorded 31 medicinal plant species belonging to 24 families, predominantly sourced from forest ecosystems, indicating strong ecological dependence. The families Lamiaceae and Fabaceae were most frequently represented. Herbs were the dominant life form (15 species), and leaves were the most commonly used plant part. Decoction emerged as the principal preparation method. Quantitative ethnobotanical indices were calculated to assess the cultural importance of each plant. The informant consensus factor values ranged from 0.55 to 0.85, with *Achyranthes aspera* L. scoring the highest, indicating substantial agreement on its use for menstrual disorders. Relative frequency of citation values varied from 0.12 to 0.50, while use value ranged between 0.10 and 0.82. The findings reflect a well-preserved traditional pharmacopoeia, despite generational gaps in knowledge transmission. Rapid expansion of the economy, meanwhile, poses an urgent risk to traditional medicinal knowledge and medicinal plant species for numerous reasons. Therefore, it is essential to establish regulations and protocols to safeguard plant wealth and ancient traditions linked to them.

Keywords: Ethnobotany, Irular, Knowledge, Medicinal Plants, Quantitative Analysis

1. Introduction

Ethnobotany holds an infinite magnitude in safeguarding scientific research and cultures, as it draws a parallel paradigm with traditional knowledge systems and modern scientific routines, expediting the discovery of therapeutic compounds and pioneering treatments[1,2,3]. It portrays a fundamental responsibility in the recovery of biodiversity by authenticating the antiquated uses of plant species emphasizing their impact in local ecosystems[4,5,6,7]. Ethnobotanical explorations contribute to the indulgence of human-plant interactions, as it emboldens indigenous communities by acknowledging and substantiating their conventional wisdom and methods [8,9]. Tribal communities in India have a copious cultural heritage deeply interconnected with indigenous medicine. These communities have fostered excellent medicinal practices over generations, employing immediately available plants for alleviating various ailments[10,11].

The Irular, Paniyan, and Kurumba tribes are just a few of the prominent ethnic communities who have made Tamil Nadu as their home. Each of these groups have unique ancestral traditions and healthcare systems that are widely acknowledged for their capacity for healing a variety of illnesses [12]. The Irular tribal community of Tamil Nadu, known for their intricate perception of medicinal plant species and conventional healing practices, plays a crucial part in the region's ethnobotanical inheritance, contributing extensively to biodiversity conservation and posing valuable prospective for pharmaceutical progressions [13].

Gynecological syndromes comprehend a great extent of ailments affecting the female reproductive system, like menstrual disorders, polycystic ovarian syndrome (PCOS), and cervical cancer. These

disorders are a chief public health conflict, contributing to obscure sickness and disadvantaged lifestyle, especially for females of all ages [14]. Irrespective of evolvement in the parental health care and cervical cancer deterrence, there is a severe disregard of Benign Gynecological Conditions (BGCs) that have pervasive consequences on overall physical and mental health [15]. In the current set-up, there is an exemplar shift of interest towards traditional medicine as there is a rising appeal in natural and holistic attitude to healthcare coupled with concerns regarding ramifications of modern pharmaceuticals. Therefore, the present investigation highlights the key medicinal plant species incorporated in Irular indigenous medicinal system for curing gynecological disorders.

2. Material and methods

2.1. Study area

Ethnobotanical findings for this research were methodically congregated from the tribal communities dwelling in three distinct localities within Coimbatore district, Tamil Nadu, India (Fig.1). Theethipalayam, situated at coordinates 10.9146° N latitude and 76.8844° E longitude, includes a scope of 1,339 hectares exemplified by a montage of dry deciduous and semi-evergreen woods. Maruthamalai Hills, located at 11.0333° N latitude and 76.8667° E longitude, ascend to an elevation of 4,406 feet Above Mean Sea Level (AMSL), signifying a prominent part of the Western Ghats with its notable dry deciduous forest cover. Anaikatty, situated at 11.1443° N latitude and 76.7569° E longitude, extend over a sector of 752.3 hectares and contrasts in elevation from 560 to 1,600 meters AMSL. These diverse environmental settings not only shelter rich biodiversity but also serve as receptacles of long-established ecological knowledge among the tribal inhabitants, providing instrumental cognizance for ethnobotanical investigations.

Fig. 1 Study area for data collection;
a. Maruthamalai hills; **b.** Anaikatty; **c.** Theethipalayam

2.2. Data collection

Partly structured interviews and group discussions were conducted to obtain data relevant to the present investigation from informants including senior tribal individuals and healthcare practitioners during the months of October and November, 2024 *via* recurrent visits (Fig. 2). A total of 50 individuals were approached for collection of primary data with the help of questionnaires and Participatory Rural Appraisal (PRA). Secondary data were collected from existing literatures. Plants were collected and photographed with the help of informants from these settlements. The vernacular names of the medicinally valuable species were confirmed and their method of utilization were catalogued with the help of experienced elders.

According to existing systems, the life forms of the documented plant species were separated [16]. The taxonomical description and scientific names of the recorded medicinal plant species were authenticated with the help of Flora of Madras Presidency [17].

Fig. 2 Interaction with tribals during data collection

2.3. Ethical issues

The motive of the research was delineated to the participants, and their prior informed authorization (oral) was obtained before participation. All participants voluntarily agreed to take part in the study and informed that they could withdraw from the interviews at any time.

2.4. Quantitative analysis

To evaluate the customary usage and magnitude of each therapeutic plant species within assorted disease classifications, three ethnobotanical indices were worked out; factor of informer consensus (F_{ic}), relative Frequency Of Citation (RFC) and Use Value (UV). The degree of consensus among the interviewees on the proper use of plants for particular illness classes was appraised using F_{ic} [18]. The frequency at which sources stated a specific species permitted RFC to calculate every single plant species' local prominence [19]. UV was applied to establish the relative worth of each species *via* taking into account the quantity and frequency of citations supplied by the informants [20].

3Results

3.1. Demographic scrutiny of the respondents

Throughout the course of investigation, interviews were carried out with 50 respondents (20 women and 30 men), about their apprehension on ethnomedicine. Informants over the age of fifty provided the majority of ethnobotanical data. Although most of the older participants were illiterate, age bias may have contributed an integral part in their better degree of medicinal knowledge. In contrast, the younger generation was found to be less motivated and novice regarding conventional healing practices, highlighting a challenge to the preservation of traditional wisdom.

3.2. Documented plant species and their associated data

A cumulative number of 31 curative plant varieties contained within 24 specific families were exercised for remedying gynecological illnesses among Irular tribal population, were documented in the current study. The entirety of the information on medicinal plants are depicted in Table 1, comprising their scientific and vernacular names, families, parts used, preparation methods, curative applications, F_{ic}, RFC and UV. Out of 31 plant species, 25 species were obtained from forested areas and 8 species were cultivated. Hence, this investigation underscores the fact that how Irulars rely on their natural habitat for ethnomedicine preparations.

The family Lamiaceae and Fabaceae accounted for the most used plant family with three species thereafter, the Acanthaceae, Amaranthaceae, and Euphorbiaceae families with about two species each (Fig. 3). Herbs, with 15 species, were the most common living form utilized to cure gynecological illnesses, followed by shrubs with 10 species and trees with 5 species (Fig. 4). The most commonly

used plant part is leaf, represented by 9 species, which is subsequent to the use of entire plant with 8 species and root with 5 species (Fig. 5). Decoction was the mostly frequently implemented approach for medicine preparation (12 species). The other modes of formulations recurrently exercised are juice, powder (7 species each), and paste (5 species) (Fig. 6).

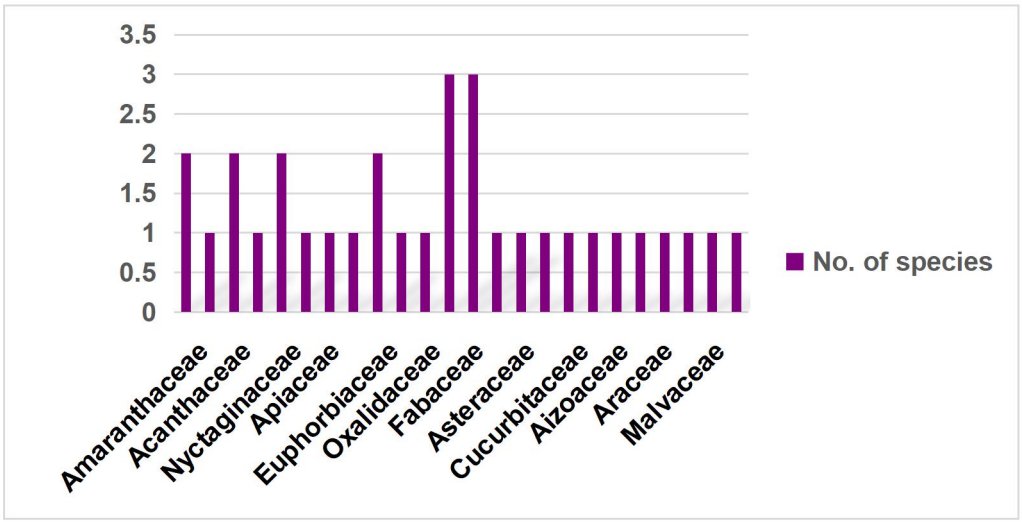

Fig. 3 Distribution of medicinal plant species by family

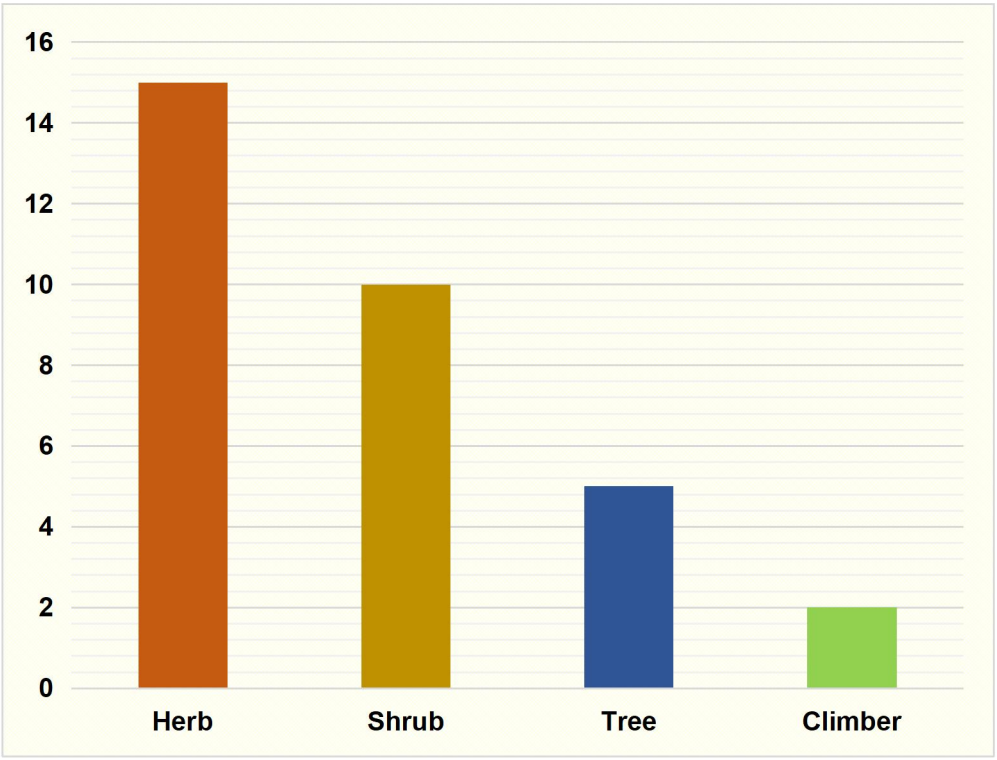

Fig. 4 Diversity of plant types in Irular ethnomedicine

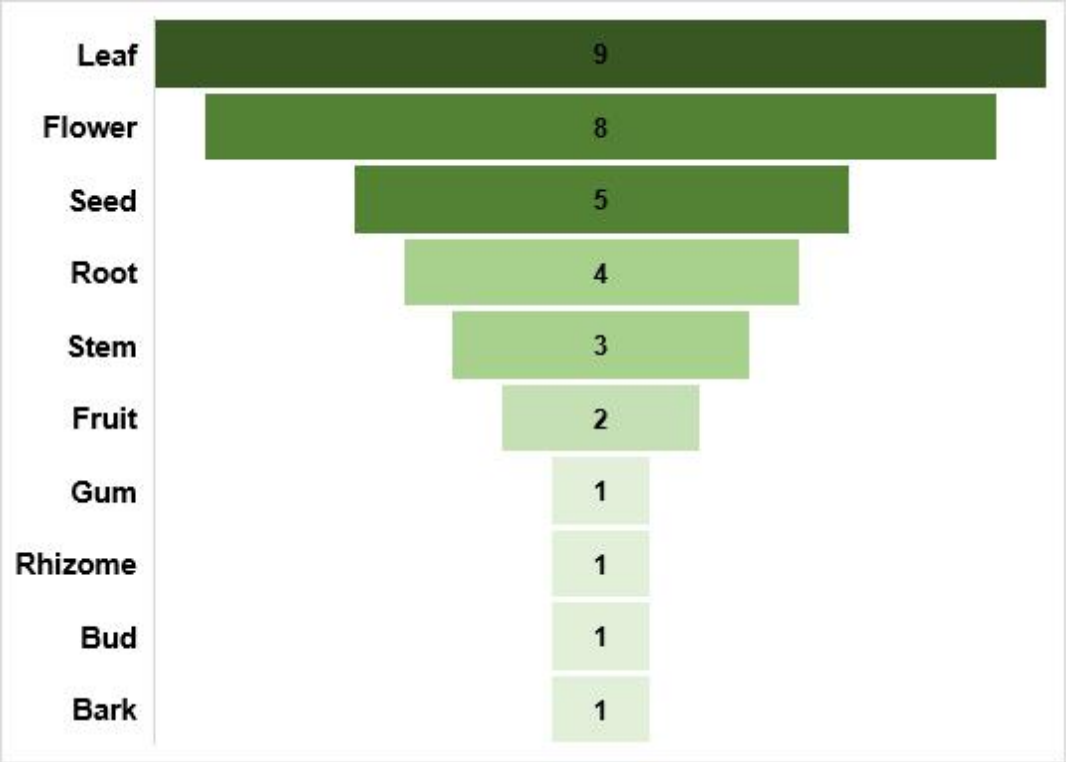

Fig. 5 Various plant parts used for preparation of medicine

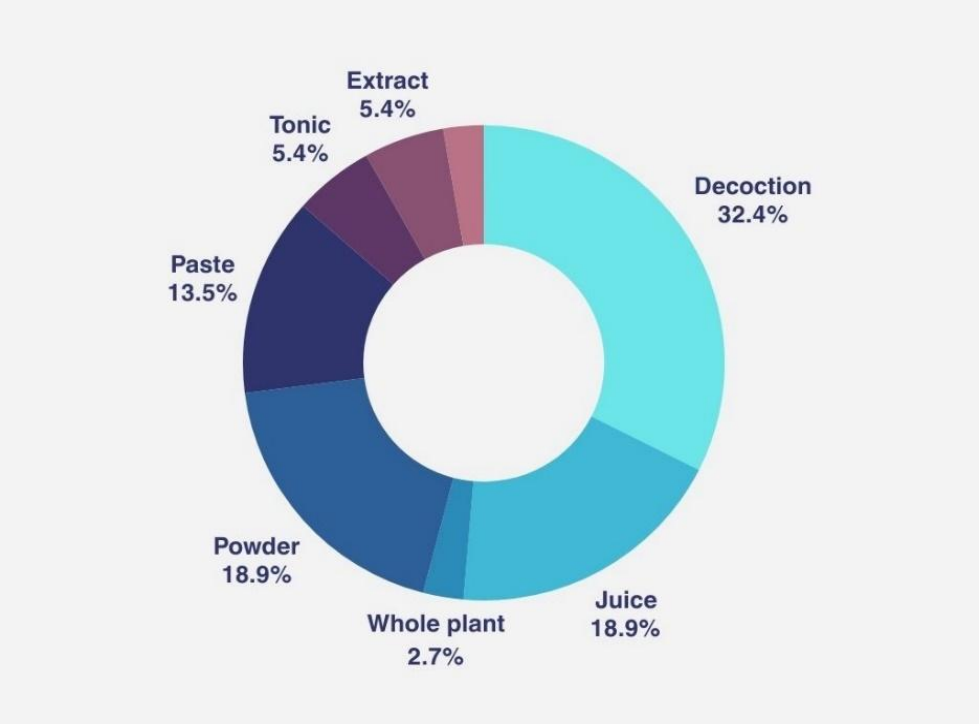

Fig. 6 Preparation methods of medicinal formulations by Irulars

Table 1 Medicinal plant species utilized by Irulars for the treatment of gynecological disorders

Scientific name	Vernacular name	Family	Wild/ Cultivated	Habit	Plant part used	Mode of preparation	Disease category	F_{ic}	RCF	UV
Amaranthus viridis L.	Mulai keerai	Amaranthaceae	Wild	H	L, F	Juice	Menstrual disorders	0.76	0.34	0.30
Achyranthes aspera L.	Naauruvi	Amaranthaceae	Wild	H	WP	Juice	Menstrual disorders	0.85	0.45	0.82
Andrographis paniculata (Burm. f.) Wall. ex Nees	Nilavembu	Acanthaceae	Wild	H	WP	Decoction	Menstrual disorders, labor compliations	0.78	0.48	0.76
Aloe vera L.	Kaatralai	Liliaceae	Wild	H	R	Decoction	Labor complications	0.65	0.36	0.40
Boerhavia diffusa L.	Punarvana	Nyctaginaceae	Wild	H	Se	Decoction	Menstrual disorders	0.82	0.46	0.79
Catharanthus roseus (L.) G. Don	Nithyakalyani	Apocynaceae	Cultivated	H	Fr, Fl	Juice	Miscarriage	0.70	0.24	0.18
Cuminum cyminum L.	Seeragam	Apiaceae	Cultivated	H	Fr	Juice	Labor complications	0.81	0.50	0.80
Carica papaya L.	Papaya	Caricaceae	Cultivated	Sh	Fr	Juice	Menstrual disorders	0.76	0.30	0.32
Euphorbia hirta L.	Amman pacharisi	Euphorbiaceae	Wild	H	L	Fresh	Menstrual disorders	0.77	0.42	0.74
Ficus carica L.	Athippazham	Moraceae	Wild	T	WP	Decoction	Labor complications	0.65	0.38	0.34
Oxalis corniculata L.	Puliyarai	Oxalidaceae	Wild	H	Se	Powder	Miscarriage	0.76	0.20	0.22
Ocimum tenuiflorum L.	Thulasi	Lamiaceae	Wild	H	WP	Powder	Labor complications	0.80	0.45	0.76
Ricinus communis L.	Amanakku	Euphorbiaceae	Wild	Sh	L, Fl	Powder, decoction	Menstrual disorders	0.65	0.14	0.12
Mirabilis jalapa L.	Antimanatharai	Nyctaginaceae	Wild	H	L	Paste	Menstrual disorders	0.70	0.12	0.10
Senna occidentalis (L.) Link	Thangarai	Fabaceae	Wild	Sh	WP	Juice, decoction	Menstrual disorders	0.83	0.49	0.81
Leucas aspera (Willd.) Link	Thumbai	Lamiaceae	Wild	H	L	Paste	Menstrual disorders	0.79	0.43	0.75
Phyllanthus emblica L.	Malanelli	Phyllanthaceae	Wild	T	St	Powder, tonic	Vaginitis	0.76	0.26	0.20
Sphagneticola trilobata (L.) Pruski	Mangal kodi Kari salai	Asteraceae	Wild	H	R	Decoction	Labor complications	0.82	0.48	0.79
Withania somnifera (L.) Dunal	Manjalvettuvathalai	Solanaceae	Wild	Sh	R	Decoction, paste	Vaginitis	0.55	0.34	0.24

Cucurbita pepo L.	Mangal pusani	Cucurbita-ceae	Cultivated	Cr	L	Extract, paste	Vaginitis	0.80	0.47	0.77
Curcuma longa L.	Mangal	Zingibera-ceae	Cultivated	H	WP	Juice	Urinary incontinence	0.78	0.44	0.75
Trianthema portulacastrum L.	Saranathi	Aizoaceae	Wild	H	R	Decoction	Infertility	0.68	0.18	0.22
Barleria casatiana Buscal. & Muschl.	Oothapo	Acantha-ceae	Wild	Sh	G	Tonic	Labor complications	0.81	0.50	0.79
Phyla nodiflora (L.) Greene	Kodu thalai	Verbena-ceae	Wild	H	Rh	Powder	Urinary incontinence	0.62	0.32	0.28
Acacia modesta Wall.	Thaerchavukku	Fabaceae	Wild	T	Fl	Powder	Infertility	0.68	0.30	0.26
Acorus calamus L.	Vasambu	Acoraceae	Wild	H	WP	Infusion	Menstrual disorders	0.76	0.12	0.14
Bauhinia variegata L.	Mandarai	Fabaceae	Wild	ST	B	Extract	Labor complica-tions	0.68	0.36	0.30
Capsella bursa-pastoris (L.) Medik.	Varudanthi mooligai	Brassicacea e	Wild	H	L	Powder	Menstrual disorders	0.78	0.42	0.75
Grewia optiva J.R. Drumm. ex Burret	Biul	Malvaceae	Wild	T	R	Paste	Menstrual disorders	0.77	0.40	0.74
*Mentha longifolia (*L.) L.	Puthina	Lamiaceae	Cultivated	H	L, Fl	Juice	Menstrual disorders	0.83	0.49	0.81
Tinospora sinensis (Lour.) Merr.	Amudam	Menisperm aceae	Wild	Cl	WP	Juice	Menstrual disorders	0.80	0.46	0.78

3.3. Quantitative analysis

To calculate F_{ic} values, the gynecological diseases noted down in the existing study were classified into six categories: menstrual disorders, labor complications, vaginitis, infertility, miscarriage, and urinary incontinence (Fig. 7). F_{ic} values fluctuated from 0.55 to 0.85. The peak F_{ic} value of 0.85 was perceived for *Achyranthes aspera* L., representing its sound accord among informers for its application in curing menstrual disorders. Contrarywise, *Withania somnifera* (L.) Dunal displayed the lowest F_{ic} value of 0.55, proposing lower consensus for its utilization in treatment for vaginitis. RCF values in these findings vary between 0.12 to 0.50. *Cuminum cyminum* L. and *Barleria casatiana* Buscal. & Muschal. have the maximum RCF values of 0.50 specifying that half of the informants quoted these plants for improving labor difficulties. Nevertheless, *Acorus calamus* L. had one of the lowest RCF values (0.12) implying it was less frequently mentioned by the informants. UV values in this examination ranged from 0.10 to 0.82. The peak UV was detected for *A. aspera* (0.82). In contrast, the lowest UV observed was for *Mirabilis jalapa* L. (0.10), alluding it as a less commonly used plant species. On the whole, the high Fic, RCF, and UV values specify that certain plants are greatly appreciated and extensively acclaimed for their medicinal properties, exposing a rich habitual understanding that is critical for the social health traditions of the Irular community.

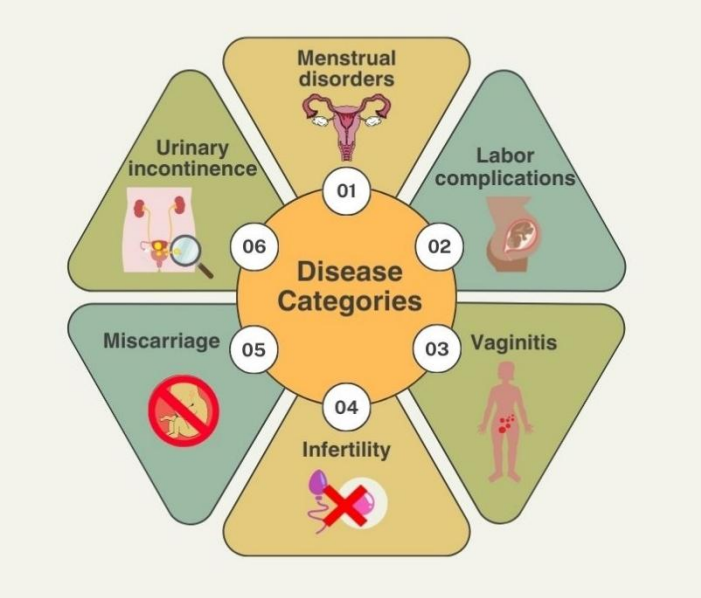

Fig. 7 Categories of gynecological disorders treated by Irulars

4. Discussion

With the goal to preserve indigenous knowledge, discover rich plant-based resources for food, medicine and cultural activities, and advance scientific understanding for sustained human well-being, ethnobotanical expeditions are indispensable[21,22]. Ethnobotany represents a dynamic scientific discipline that connects indigenous ecological know-how with methodical explorations thereby expediating evidence-based justification of traditional practices and their amalgamation into pharmacology, nutrition, and ecosystem management[23]. The systematic documentation of ethnobotanical knowledge strengthens biodiversity safeguarding, apprises sustainable resource consumption, and postulates a robust framework for bioprospecting and the discovery of novel bioactive compounds [21,22].

An individual's age has implications on the dissemination and perpetuation of traditional knowledge given that the older members of the community are inclined to have richer ethnobotanical knowledge that has been acquired over time[24]. Therefore, preserving and transmitting ancient customs to younger members of community necessitates acknowledging the wisdom that older generations acquire [25]. Similar patterns declared among the native inhabitants of Wolaita and Gondar (Ethiopia), and the Naama of Algeria further support the observation that older people endure significantly more ethnobotanical knowledge [26,27,28]. This finding also appears consistent with the findings among the Irular community. Around locations where access to standard medical care may be restricted, such as women's reproductive health, ethnobotanical knowledge provides crucial insights into plant-based treatments. Such knowledge systems symbolize generations of empirical inspections and cultural transmissions, replicating how communities acclimate local floristic reserves to tackle reproductive health challenges [23]. A number of investigations has been carried out globally to gauge the knowledge of medicinal plants that tribal groups possess in the treatment of gynecological disorders. These studies highlight not only the diversity of species employes but also the cultural specificity of plant selection, preparation, and administration, underscoring the role of ethnobotany in preserving reproductive health traditions across distinct ecological and social contexts [29,30,31].

Within ethnobotanical enquiries, Lamiaceae and Fabaceae are two angiosperm families that are viewed as cornerstones, owing to their extreme species diversity, phytochemical abundance, and broad spectrum of traditional usages spanning medicine, nutrition, and cultural practices [32,33,24,25]. The consistent mention of Lamiaceae and Fabaceae species in the traditional practices of the Maroon and Malayali tribes and ethnic groups of Ethiopia reinforces the fact that the prominence of these families in disease treatment is likely linked to their aromatic properties [32,33,24,25]. Herbs have been used as a medicine since ancient times across all cultures as they are abundant in the surroundings of tribal settlements [34]. The results reported for the Irular community in the present study were confirmed by investigations among indigenous groups of Mizoram, Cooch Behar (West Bengal), and Himachal Pradesh, which likewise found herbs to be the predominant growth type [35,36,37]. Since leaves are readily accessible, comprises of greater bioactive entities

and sustainable when compared to other plant portions, they are often used in the preparation of medicine by the tribes and local healers [38,24,25].

Decoction is utilized extensively in medical traditions, as reflected by the fact that it was the most popular form of therapeutic preparation in this investigation [39]. As it can efficiently extract hydrophilic bioactive components, particularly from tough plant parts like roots, bark, and stems, decoction is often preferred [40]. Numerous ethnobotanical investigations have revealed similar results, with decoction continuing to be the most popular preparation technique because of its ease of use, effectiveness, and cultural acceptance amongst rural and indigenous groups [41,42].

A strong and culturally embedded knowledge system regarding the use of medicinal plants for gynecological ailments among the Irular community is indicated by the high F_{ic}, RFC, and UV observed in this study. The F_{ic} value of 0.85 for *Achyranthes aspera* L. in handling menstrual disorders reflects a high degree of agreement among informants, underscoring its perceived ethnomedicinal role. These results coincide with prior studies among tribal populations along the Pakistan-Afghan border, which found equivalent F_{ic} values (0.95 for menstrual problems, 0.94 for sexual and urinary issues) [43]. This points to a strong cultural consensus concerning the use of natural therapies to manage women's health. Conversely, the high UV for *Moringa oleifera* Lam. (2.588) reported by Vedarayanam Taluk residents for breastfeeding and reproductive problems reinforces the notion that versatile species with an assortment of therapeutic uses regularly control regional medical practices [30]. Parallel trends may also be seen in China, as *Scutellaria baicalensis* Georgi, received the highest UV (0.91), implying widespread usage of the species [44]. *A. aspera* also had the highest UV (0.82) in this investigation, verifying its crucial role in the local ethnopharmacopoeia. The particular usage of *Achyranthes aspera* by Irulars has been confirmed by previous accounts that it is used to treat menstruation and gynecological disorders [45,46]. These tendencies are further supported by RFC values, which show the key role of certain species in maternal health traditions. For example, *Cuminum cyminum* L. and *Barleria casatiana* Buscal. & Muschl. were commonly indicated for labor problems (RFC=0.50). Similar plant prominence has been documented in other regions, where *Withania somnifera* (L.) Dunal and *Foeniculum vulgare* Mill. were among the top species cited for gynecological and urinary disorders [43]. Ultimately, the study's robust quantitative indicators align with ethnobotanical trends recognized across geographically and culturally diverse societies.

5. Conclusion

The Irular community in Anaikatty, Maruthamalai Hills, and Theethipalayam, Tamil Nadu, employs 31 medicinal plant species to treat gynecological conditions; the most often used components and preparation techniques are leaves and decoctions. Quantitative indicators like UV (up to 0.82), RCF (up to 0.50), and Fic (up to 0.85) demonstrate the widespread agreement and dependence on certain species of medicinal plants. These results highlight the importance of conserving traditional knowledge in the face of diminishing intergenerational transmission and reflect the community's rich ethnobotanical heritage.

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Statements and declarations

Funding:

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Conflict of interest:

The authors have no conflicts of interest to declare.

Ethics approval:

The ethnobotanical field study was conducted in strict adherence to ethical standards with prior informed consent obtained from tribal elders and the local community before initiating the survey.

Consent to participate:

Not applicable

Consent for publication:

The authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.

Availability of data and material:

Not applicable

Code availability:

Not applicable

Authors' contributions:

Conceptualization: TK, AP, MJ; Data curation: LS, AP, TK; Formal analysis: LS, AP; Funding acquisition: LS; Investigation: LS; Methodology: AP, TK; Project administration: TK, AP; Resources: LS; Software: AP; Supervision: TK, AP; Validation: TK, AP; Visualization: AP; Writing-original draft: AP; Writing-review and editing: AP, MJ, TK

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