RESEARCH PAPER

Management of Polycystic Ovarian Syndrome: A Comprehensive Analysis of Ethnomedicinal Plants and Cultural Ritual Practices of Assam

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ABSTRACT

The incidence of Polycystic Ovarian Syndrome (PCOS) is rising due to genetic, environmental, and intrinsic individual factors, presenting major challenges in managing reproductive health and quality of life for women of reproductive age. Northeast India possesses a rich source of ethnobotanical knowledge, which is deeply embedded within folklore, rituals, and traditional healing practices. Assam, with its rich biodiversity and deep-rooted ethnomedicinal traditions, holds significant potential in underexplored medicinal plants that remain underutilized, which are highly effective for managing PCOS. Several medicinal plants (some widely studied, others known only through folklore) show promising qualities for hormonal regulation, insulin-sensitization, anti-inflammatory and antioxidant effects, all of which can support the improvement of women's reproductive health. The present study explores, documents and lists down the common ethnomedicinal plants of Assam, along with their therapeutic applications for management of PCOS, while generating a comprehensive database.

Keywords: Polycystic Ovarian Syndrome (PCOS), Ethnobotanical knowledge, Ethnomedicinal plants, Northeast India, Assam

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1. Introduction

Polycystic Ovarian Syndrome (PCOS) is a complex endocrine and metabolic disorder that is estimated to affect 6% to 15% of women of reproductive age worldwide, with prevalence in India ranging from 8% to 22%, particularly higher in urban areas due to lifestyle factors like diet, inactivity, stress, and obesity. First described in 1935 as Stein-Leventhal syndrome, it

is characterized by a combination of clinical features including irregular or absent menstrual cycles, hyperandrogenism (e.g., hirsutism, acne), polycystic ovaries, insulin resistance, obesity, and infertility. Long-term health risks include type 2 diabetes, cardiovascular disease, and psychological issues like anxiety and depression. The etiology of PCOS is multifactorial, involving genetic predisposition, hormonal imbalance, metabolic dysfunction, and environmental influences. The current incidence of PCOS is rapidly increasing due to changes in lifestyle and is becoming common amongst adolescents, developing soon after puberty.

Assam, a state of Northeast India, is nestled in the South of the Eastern Himalayas, and defined by two vast and distinct river valleys- the Brahmaputra and the Barak, creating exceptional biodiversity. Over 70% people depend on agriculture across 115 ethnic communities with rich cultural traditions. The region harbours a variety of medicinal plants and herbal medicine has been an integral part of traditional healthcare systems such as Ayurveda, Siddha, Unani, and various indigenous medical practices for centuries.

Medicinal plants possess diverse pharmacological properties, including anti-inflammatory, antioxidant, insulin-sensitizing, and hormone-modulating effects, which are significantly relevant in the management of PCOS. Traditional herbal medicine, rooted in cultural heritage and ethnobotanical knowledge (Dhal et al., 2014), provides accessible and affordable primary healthcare with fewer side effects than synthetics.

Indigenous Technical Knowledge (ITK) refers to locally developed wisdom that communities use to interact with their natural environment, passed down through generations orally and by practice. In Assam, ITK encompasses traditional uses of local plants, rituals, chants and song therapy for treating various health conditions, including reproductive health issues. Although their mechanism of action is unknown and unclear, traditional systems are creating their own position in the treatment of various diseases and are drawing global interest in the use of medicinal plants and herbal formulations as alternative or complementary therapies for PCOS.

Conventional management of PCOS relies on symptomatic therapies like hormonal contraceptives, insulin-sensitizers, and ovulation inducers, but these carry side effects, high costs, and fail to address root causes. As a result, there is growing interest in herbal approaches, which administers plant-based therapies, and stress management, aligning well with the multifaceted nature of PCOS. Increasing scientific interest in validating traditional herbal remedies has further highlighted their role as safe and effective complementary therapies. Exploring the potential of herbal medicine and related practices in PCOS management is important for developing integrative treatment strategies that addresses both the symptoms and underlying causes of the disorder.

2. Study sites

Assam is situated in the North-East of India and is the largest northeastern state in terms of population while second in terms of area with a span of 78,438 km^2 (30,285 sq miles). Geographically the state extends from 22°19’ to 28°16’ North Latitude and 89°42’ to 96°30’ East Longitude between the foot hills of the Eastern Himalayas and the Patkai and Naga Hill Ranges. The state is bordered in the North by Bhutan and in the East by Arunachal Pradesh. Along the south lie Nagaland, Manipur and Mizoram. Meghalaya lies to the South-West, West Bengal and Bangladesh to the West. The State is divided into 35 districts. This present ethnobotanical study was conducted in Assam and the districts were selected based on the availability of registered traditional healers.

3. Methods

3.1.1. Data collection

Data were collected to identify commonly used medicinal plants and document those employed by traditional healers in treating female reproductive ailments and problems associated with Polycystic Ovarian Syndrome. Data were collected using a custom-designed questionnaire and semi-structured interview schedule from the registered traditional healers to identify the most suitable medicinal plants and compositions for the treatment of PCOS. The gathered information included medicinal uses, local name of the plants, plant parts used, formulation procedure and preparation of recipes, dose regimen, treatment period and mode of administering from 50 practicing local traditional healers. Information on different cultural practices and rituals were also collected during the study period. Each traditional healer (respondent) was visited two to three times in order to confirm the trustworthiness

of the ethnobotanical information and their uses. From the survey area, we collected the parts of cited medicinal plants, noted their local names with assistance from the traditional healers and took photographs.

3.1.2. Data analysis

The plants were then identified with the help of a plant taxonomist after collection of sample. Finally the collected data were systematically arranged and analyzed. Data were entered into Microsoft Excel for storage, cleaning and summarization. Biographical information was clearly noted because they are registered traditional healer. List of all the species with local name, scientific name, name of the disease, doses are clearly documented. Data will be interpreted in the following section from the tables prepared for individual medicinal plant and compositions used for PCOS.

4. Results

4.1. Profile of the respondents

The majority of the respondents were male (92.0 %), while only 8.0 % were females (Table 1). The main age range was between 55- 72 years (50 %). Almost 44 % of the respondents had completed secondary school (HSLC), 20 % had graduation, while for primary education and diploma the percentage is 18. Majority of the traditional healers are self-employed 60 %, they are practicing their own skill as traditional healers. Fourteen percent respondents were unemployed; they are doing their farming and other household activities but not commercially practicing their profession. 18% were employed in Governmental and private sector. Retired persons (8 %) are there among the practicing healers.

Table 1
Socioeconomic profile of respondents

Attribute	Category	Percentage
Gender	Male	92.0
	Female	8.0
Age (years)	18- 36	10.0
	37- 54	24.0
	55- 72	50.0
	73- 90	16.0
Education	Primary level & none	18.0
	HSLC	44.0
	Degree	20.0
	Diploma	18.0
Employment status	Unemployed	14.0
	Employed	18.0
	Practicing (Self employed)	60.0
	Retired	8.0
Income (R/month)	1000 - 10000	22.0
	10001- 20000	44.0
	20001- 30000	16.0
	30001- 50000	18.0
	Above 50000	22.0
Household size (members)	1-4	76.0
	5 - 8	20.0
	9 - 12	4.0

4.2. Numbers of species

The present study documented 89 distinct plant species with a total of 70 recipes traditionally used by the local healers of Assam to treat PCOS and related reproductive health conditions, including menstrual irregularities, ovarian cysts, menorrhagia, dysmenorrhea, delayed menstruation and infertility. Medicinal plants are commonly administered in forms like pastes, juices and decoctions made from various plant parts such as, bark, roots, leaves, fruits and flowers. The healer of the study area uses various traditional units of measurement such as, finger length for root, bark and stem, pinch for powdered form and numbers for leaves and seeds to prescribe the dosage of medicine. Judgment of the healer to stop the treatment was based on the severity of the disease symptoms and, at times, their complete disappearance. The traditional healers have their own logic and explanations that no serious adverse effects were reported from the identified plants from our survey. In this study, we found that herbal medicines were made out of a single plant, plant part or combination of several plant parts.

4.3. Uses of Plant family for treatment of different symptoms of PCOS

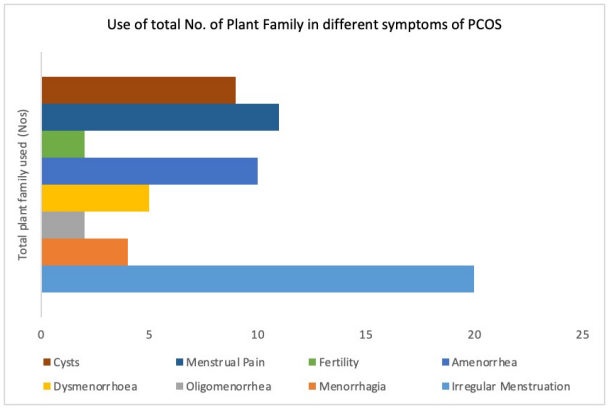


Fig.1. Distribution of plant family used for different symptoms of PCOS

Results showed that the medicinal plants are associated with different ailments, with irregular menstruation emerging as the most frequently treated condition. The majority of traditional healers address the problem of irregular menstruation using plants from 20 families, followed by treatment of menstrual pain, utilizing plants from 11 families. Ten numbers of plant families are used for the treatment of amenorrhea. Cysts are the major symptoms of PCOS and 9 plant families are used in case of Cysts. Traditional healers reported 5 numbers of plant families used in treating Dysmenorrhea, followed by 4 numbers in case of Menorrhagia, 2 numbers of plant family for Oligomenorrhea and another 2 numbers in case of fertility. We have found that there is a similarity among the plant family they are using for the treatment of PCOS by the respondents (traditional healer).

4.4. Recurrent use of plants

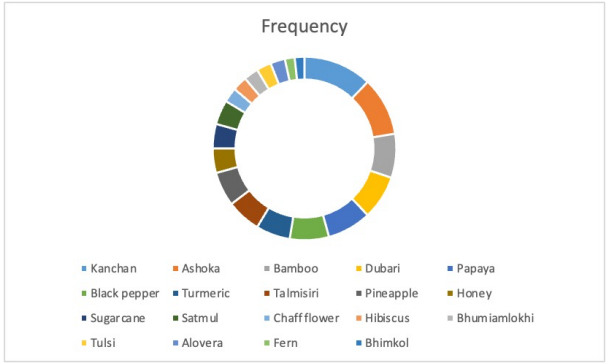


Fig. 2. Distribution of frequency of plants used by Healers

Majority of the healers (14 numbers) use the bark of Kanchan (*Bauhinia variegata*) tree in various formulations for the treatment of PCOS symptoms. Ashoka (*Saraka asoca*) tree is used by 12 healers in their herbal medicine recipes. Nine (9) numbers of healers use bamboo thuri (*Bambusa tulda*), bermuda grass (*Cynodon dactylon*) and papaya (*Carica papaya*) in preparations targeting different PCOS symptoms. Black pepper (*Piper nigrum*) is one of the ingredients used by eight numbers of healers for their herbal compositions. Seven (7) numbers of healers use Turmeric, Talmisiri (*Borassus flabellifer*), Pineapple (*Ananas comosus*) in a small amount in their formulation. Honey (*Apis mellifera*), Sugarcane (*Saccharum officinarum*) and Satmul (*Asparagus racemosus*) were repeated by 5 numbers of traditional healers. Three (3) numbers of respondents among 50 numbers of traditional healers repeated the medicinal plants for their formulation; these are Chaff flower (*Achyranthes aspera*), Hibiscus (*Hibiscus rosa-sinensis*), Bhumi amlokhi (*Phyllanthus fraternus*), Black Tulsi (*Ocimum tenuiflorum*) and Aloe Vera (*Aloe barbadensis*). Fern (*Diplazium esculentum*) and Bhim-kol (*Musa balbisiana*) were repeated twice by different healers. The data revealed that certain medicinal plant species are widely used across multiple conditions, reflecting their perceived efficacy among the locals and cultural importance.

4.5. The healing ritual of the study area

During the survey period we have found some interesting information that they perform auspicious rituals like *Sitala Puja, Aai Naam, Aai letha, Bhitor seva and Bhokot seva* along with using herbal drugs. Some of them usually apply herbal medicines and magical water for curing the problems.

Three numbers of traditional healers were found to practice oil massage for pain relief. After taking interviews from different traditional healers of the survey area, it was observed that the traditional healers have some principles in their system of healing practices. According to them, the natural harmony of the body can only be maintained by an integrated and holistic approach. They pass this knowledge down through generations and sometimes learn it directly from elder traditional healers or experienced practitioners.

5. Discussion

5.1. Uses of Species

Different studies showed that medicinal plant *Achyranthes aspera* appeared as the most versatile potential species used for oligomenorrhea, cysts, and general menstrual problems. *Achyranthes aspera* contains alkaloids, flavonoids, and saponins, contributing to its therapeutic effects, and also exhibits anti-inflammatory, analgesic, and hepato-protective properties (Talreja and Tiwari, 2023; Verma and Morya, 2023; Gosavi et al., 2024). The study findings align with Akbar (2020), who revealed that *Achyranthes aspera* is employed for amenorrhea, dysmenorrhea, and irregular menstruation. Verma et al. (2021) highlighted that *Achyranthes aspera* is traditionally used in gynaecological disorders, indicating its potential as an uterotonic agent. *Saraca asoca* is used for both irregular menstruation and dysmenorrhoea, underscoring its enduring reputation as a uterine tonic. Akhtar et al. (2007) also found that Ashokarista, a formulation containing *Saraca asoca,* has shown efficacy in treating menorrhagia and improving hemoglobin levels. The widespread focus on menstrual irregularities and amenorrhea reflects the focus on menstrual cycle regulation in Indigenous Traditional Knowledge, which aligns with the clinical presentation of PCOS. This shows that the traditional healers interpret and manage PCOS primarily through its symptomatic manifestations. Many of the mentioned plant species are widely used for different ailments, which indicates a polyherbal approach in which multiple plants are used either for synergistic effects or for targeting different dimensions of reproductive health. Kotmire et al. (2024) reveal that the polyherbal approach reduces the risk of toxicity by balancing the effects of potent herbs, as highlighted in Ayurvedic practices. From a biomedical perspective, many of the documented plants possess phytochemical properties that align remarkably with contemporary understanding of PCOS pathophysiology. Majumder et al. (2019) revealed that many plant parts contain alkaloids, which are being used as herbal medicine by the Koch community of Assam. Species containing phytoestrogens and flavonoids, particularly *Asparagus racemosus*, *Saraca asoca*, and *Cynodon dactylon*, helps in regulating ovarian function and balance hormones. *Asparagus racemosus* is recognized for its role in enhancing fertility in women (Chaudhury et al., 2017). Results from the survey found 101 plant species used by tribal and rural communities across Assam to treat female health issues such as irregular menstruation, heavy bleeding, menstrual pain, and pregnancy-related conditions. The plant parts commonly used include leaves, roots, flowers, fruits, bark, and sometimes the whole plant; preparations are made as decoctions, infusions, pastes, or juices (Bora Devanjal et al., 2016).

5.2. Influencing factors of species for the treatment of PCOS

Locally known as shatavari, *Asparagus racemosus* contains steroidal glycosides, saponins, and flavonoids that contribute to its adaptogenic and hormone-balancing properties, which can ameliorate conditions like polycystic ovarian syndrome (PCOS) by restoring hormonal balance and improving ovarian function (Sinha and Tare, 2024; Ghosh et al., 2024). Species such as *Achyranthes aspera* and *Eclipta alba* provide alkaloids and saponins with anti-inflammatory and uterotonic effects, while *Curcuma longa* and *Zingiber officinale* are well known for their roles in reducing inflammation and providing insulin sensitivity. *Musa* species are known to contain flavonoids, tannins, and sterols, which potentially contribute to hormonal regulation and improved glucose metabolism. This ethnomedicinal evidence provides a strong basis for prioritizing *Musa balbisiana* in future pharmacological and clinical research. *Musa balbisiana* contains a variety of active bioactive compounds which contribute to its medicinal properties (Swargiary et al., 2021). Sadab et al. (2024) revealed that *Musa balbisiana* has been traditionally used, as the plant's root has demonstrated anti-diabetic activity, which is relevant given the insulin resistance often associated with PCOS. Overall, the findings highlight that Assamese traditional medicine consists of a multi-targeted strategy to manage PCOS, addressing all menstrual irregularities, menstrual pain, cysts, uterine swelling, fertility and overall women reproductive health. While this validates the depth of indigenous knowledge, it also underscores the need for scientific validation. Standardization of dosage, phytochemical profiling and controlled clinical trials are essential to transform these formulations into safe, effective and widely acceptable alternatives for PCOS management.

Theoretical descriptions of ritual generally regard it as action and thus automatically distinguish it

from the conceptual aspects of religion, such as beliefs, symbols, and myths. The rural healers of India and their healing practices included rituals, chants, and song therapy that are considered for curing diseases related to women reproductive health. These rural healers have learned their practices from an older healer and also from elders who practiced their specific healing methods. The gathered information indicates that they practice some traditional healing rituals along with the herbal medicine they prescribe.

Photographs of some important Medicinal Plants

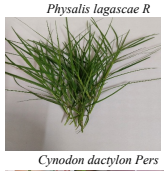

Bauhinia variegata


Saraka asoca


Physalis lagascae R

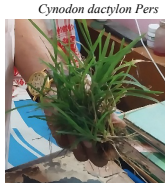

Psidium guajava L


Ocimum tenuiflorum


Cynodon dactylon Pers


Artemisia dracunclus


Asparagus racemosus Willd


Eleusine indica L.


Smilax rotundifolia (Roundleaf Greenbrier)


Hydrocotyle sibthorpioides


Euphorbia heterophylla

6. Conclusion

The traditional system of healing is directly linked to its rich floral diversity in our Country. Even today, many local and indigenous communities in Asian countries meet their needs from the products they prepared based on their traditional knowledge. The traditional healers are the main source of information of ethno medicinal plants. With the passage of time, traditional uses of herbal medicine are gradually decreased due to different factors, like lack of herbs, identification of traditional healers, discrimination of healers , declining interest of young people, and loss of attractiveness of the profession. Herbal drugs obtained from plants are believed to be much safer, this has been proved in the treatment of various ailments (Mitaliya et al., 2003). In view of the importance of traditional medicine which provides health services to 75-80% of the world population and increasing demand of herbal drugs, it is high time to document the medicinal utility of lesser known plants available in remote areas of the country (Zaidi and Crow, 2005). Improper processing and maintenance of herbs and medicinal plants is an increasing challenge. Therefore, there is an urgent need to formulate appropriate strategies for production, conservation of these traditional medicinal plants to revive the sustainable use of these plants. Well planned and carefully designed research, standardization, and a holistic integrative approach are required to unlock their full potentiality and ensure safe, effective and sustainable use.

7. Notes

i. Sitala Puja: Goddess Sitala is predominantly worshipped by women whom she blesses with fertility, healthy sons, and decent husbands. She is invoked because she is gentle, compassionate, and loving. Before going to take the medicinal help, the victim's family likes to please Goddess Sitala to rescue from fearing the rage of Sitala.

ii. Aai Naam: The folk song of the Assamese community is associated with the Sitala ritual or Sitala Puja. These songs are used to please Goddess Sitala. A group of women has performed the songs. The lead woman usually directs the performance. The leader acts as a coordinator, and she often sings a few solo lines that are then repeated by the chorus. The female devotees are known as gopini and they sit in a circle and clap their hands rhythmically.

iii. Aai letha: Aai Letha is the situation when inferility exists, chickenpox appears in someone's body, and it is called 'Aai le thal.' Aai is the word for Goddess Bhagavati and Sitala. Three or four women are invited to perform the rituals and offer Puja and clean food. All of them are the medium to remove the obstacles from their clients or devotee's lives.

iv. Bhitor seva: indicates the ritual which is performed inside; here "bhitor" indicates inside and "seva" the ritual.
v. Bhokot seva: indicates the ritual is performed by the bhakat, the prestigious and religious male folk.
vi. Magical water: Chanting mantras to water and uses for curing the problems.

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Conflict of Interest

The work is a part of the PhD Research of the 1st author. The authors of the present work declare that no conflict of interest is associated with this manuscript. The co-author has gone through the manuscript and they have given their consent to the corresponding author to handle the manuscript and to publish.

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