Ethnobotanical study of medicinal plant uses in polycystic ovary syndrome in western of Algeria

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Research

Abstract

Background: Polycystic ovary syndrome (PCOS) is a common endocrine-metabolic disorder in women of reproductive age. In many communities, medicinal plants are used to manage menstrual irregularities, hyperandrogenic symptoms and metabolic complications, yet this knowledge remains poorly documented in western Algeria. This study aimed to document and quantitatively assess medicinal plants used for PCOS management in western Algeria.

Methods: From March to July 2024, we conducted a cross-sectional ethnobotanical survey in five provinces of western Algeria using semi-structured interviews with 150 informants (women with PCOS, traditional healers, herbalists and herb sellers). Plant specimens were collected during field visits and/or purchased from local markets as reported by informants, identified using standard taxonomic procedures, and voucher specimens were deposited in the herbarium of Djillali Liabes University of Sidi Bel Abbes. Use reports were analysed using relative frequency of citation (RFC), use value (UV), informant consensus factor (ICF) and fidelity level (FL).
Results: We recorded 27 medicinal plant species belonging to 17 families. Lamiaceae (five species) and Apiaceae (four species) were the most represented families. *Atriplex halimus L.* showed the highest cultural prominence (RFC=0.5266; UV=0.0266), followed by *Salvia officinalis L.* (RFC=0.3400; UV=0.0333). Most remedies were prepared as infusions or decoctions and administered orally. High agreement among informants was observed for menstrual and hormonal disorders (ICF=0.94).

Conclusion: This first quantitative ethnobotanical report on PCOS remedies in western Algeria highlights a small set of culturally salient species that warrant pharmacological and safety evaluation. The documented knowledge may support future development of affordable complementary approaches and conservation of local ethnomedicinal heritage.

Keywords: Ethnobotanical Survey; Medicinal Plants; Polycystic Ovary Syndrome; Traditional Medicine; Western Algeria

Background

Polycystic Ovary Syndrome (PCOS) is a multifaceted yet prevalent endocrine disorder predominantly affecting women of reproductive age (Azziz *et al.* 2016). It is one of the leading causes of subfertility, with approximately 70% of affected individuals experiencing ovulatory dysfunction (Teede *et al.* 2018). PCOS disrupts normal ovarian function due to the

development of multiple cystic follicles within the ovaries (Rotterdam ESHRE/ASRM 2004). Clinical manifestations of PCOS encompass amenorrhea or oligomenorrhea, irregular menstrual bleeding, anovulation or infrequent ovulation, the presence of numerous immature follicles, and hyperandrogenism characterized by elevated levels of male hormones (Lizneva *et al.* 2016). Additional symptoms include male-pattern alopecia or hair thinning, hirsutism, acne, seborrhea, and acanthosis nigricans, particularly affecting regions such as the neck, groin, and axillae (Goodman *et al.* 2015). Patients may also report chronic pelvic pain and commonly exhibit metabolic disturbances including obesity, insulin resistance or diabetes mellitus, dyslipidemia, and hypertension (Azziz *et al.* 2016, Moran *et al.* 2010). Overall, PCOS is characterized by significant reproductive and metabolic abnormalities arising from impaired follicular maturation and hormonal imbalances (Dayani Siriwardene *et al*, 2010). If left unmanaged, PCOS may result in significant health complications, including impaired fertility (Latha *et al.* 2015).

According to the National Institute of Health Office of Disease Prevention, Polycystic Ovary Syndrome (PCOS) is a heterogeneous disorder that predominantly affects women of reproductive age. It is estimated to affect approximately 5 million women in the United States, representing nearly 7% of the adult female population (American Congress of Obstetricians and Gynecologists 2009, Aubuchon & Legro 2015). PCOS is recognized as the most prevalent endocrine disorder among females aged 18 to 44 years, with epidemiological studies indicating a prevalence rate ranging from 5% to 10% within this population (Ndefo *et al.* 2013).

Currently, there is no definitive cure for PCOS; management primarily focuses on lifestyle modifications including regular physical activity, dietary adjustments, and weight reduction. Pharmacological treatments aim to regulate menstrual cycles, reduces hyperandrogenic symptoms, and improve insulin sensitivity through the use of oral contraceptives, anti-androgens, and insulin sensitizers. However, these medications can be costly and may lead to adverse effects including weight gain, menstrual irregularities, gastrointestinal disturbances, and exacerbation of insulin resistance. Thus, an integrated approach combines lifestyle interventions with cautious pharmacotherapy is recommended for effective management of PCOS (Choudhary *et al*. 2019).

Medicinal plants are regarded as valuable sources for developing effective therapies for Polycystic Ovary Syndrome (PCOS). Contemporary research demonstrates that bioactive compounds derived from herbal sources exert beneficial effects on PCOS symptoms and are typically associated with minimal adverse effects (Ong *et al.* 2017, Kwon *et al.* 2020).

The administration of herbal treatments, typically prepared as powders, teas, tonics, or tinctures, has been shown to effectively facilitate the regulation of the menstrual cycle (Nduche *et al.* 2015, Fasola 2015). Consequently, there has been increasing scientific interest in validating the therapeutic properties attributed to these botanicals. Qualitative phytochemical analyses of commonly used medicinal plants have indicated bioactive compound with pharmacological, including cytotoxicity, antioxidant activity, and hormonal balance restoration, thereby supporting their traditional applications. Notably, numerous beneficial effects of isoflavones in humans have been documented. Empirical evidence suggests that soy consumption, which provides an isoflavone-rich diet, may contribute to the prevention of cardiovascular diseases and postmenopausal conditions such as osteoporosis (Rice Evans & Packer 2003, Malińska & Kiersztan 2004). In light of this, the present study aims to identify, document, and qualitatively assess the isoflavone constituents in a selection of botanicals traditionally employed for the treatment of PCOS in Western Algeria.

Therefore, this study aimed to document and analyse the medicinal plants used in the management of PCOS in western Algeria. The specific objectives were to identify the plant species employed for treating PCOS-related symptoms; to determine the most commonly used plant parts, methods of preparation, and routes of administration; to assess the cultural importance of these species using quantitative ethnobotanical indices (RFC, UV, and FL); and to evaluate the level of agreement among informants across different symptom categories using the Informant Consensus Factor (ICF).

Materials and Methods

Study area

Western Algeria is located in the northwestern sector of the country and represents a geographically diverse territory extending from the Mediterranean coastal zone toward the Saharan margins. The study area lies approximately between latitudes 29°00′ and 36°55′ N and longitudes 0°30′ W and 2°30′ E, covering a broad environmental gradient from coastal plains to inland steppe and desert ecosystems (Figure 1). The present ethnobotanical investigation was conducted across six administrative provinces, namely Oran, Tlemcen, Sidi Bel Abbes, Mascara, Naama, and Bechar.

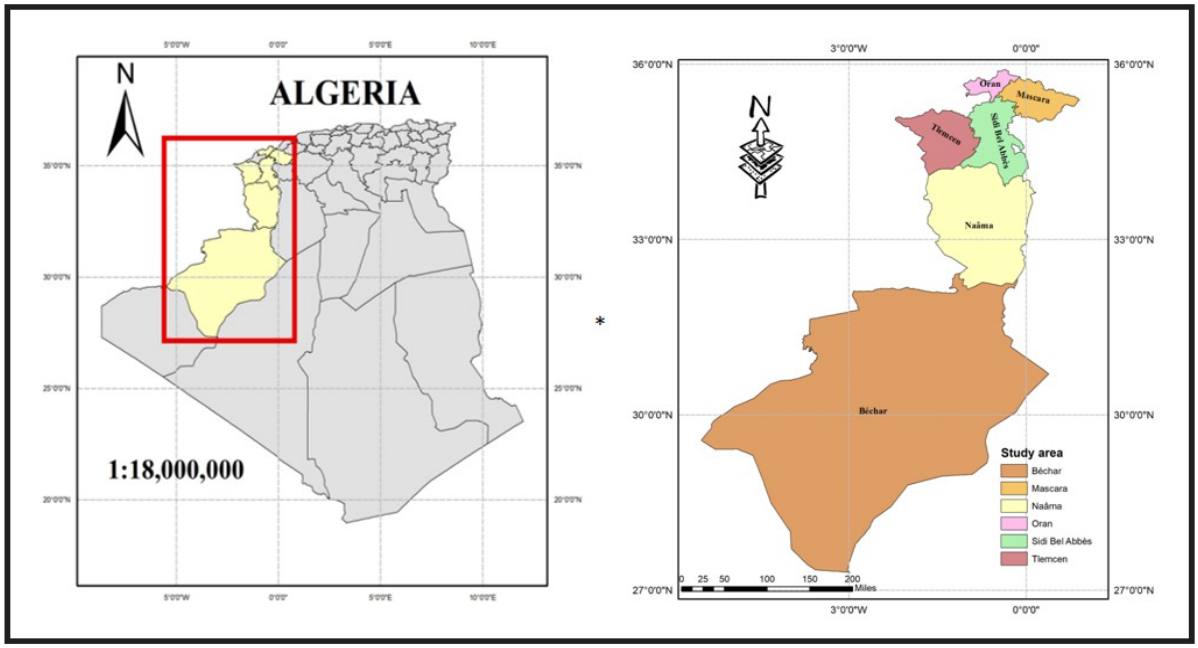

Figure 1. Map situation of the study area (ArcGis 10.7)

The surveyed zone encompasses an estimated surface area of approximately 216,617.43 km², reflecting one of the largest sampling territories documented in Algerian ethnobotanical research addressing women's reproductive and endocrine health. The region displays pronounced climatic and ecological heterogeneity due to its large latitudinal extension and variable topography. Northern localities, particularly coastal and mountainous areas (Oran and parts of Tlemcen), are influenced by a Mediterranean climate, whereas the southern provinces such as Naama and Bechar are characterized by semi-arid to arid conditions with a gradual transition into steppe and Saharan environments. This north-south gradient is accompanied by substantial variation in precipitation patterns, with annual rainfall being notably higher in the northern part compared to the southern part of the study zone.

Altitude ranges from coastal plains to mountainous areas of the Tell Atlas and steppe plateaus, which contributes to habitat diversity and supports a rich floristic composition, including both Mediterranean aromatic taxa and drought-adapted xerophytic species. Consequently, western Algeria constitutes a highly relevant region for ethnobotanical investigations, as it combines ecological diversity with the persistence of traditional medicinal knowledge and the continued reliance on medicinal plants for local healthcare practices

Ethnobotanical survey and data collection

A total of 150 participants**,** including women diagnosed with polycystic ovary syndrome (PCOS)**,** herbalists, herb sellers, and traditional medicine practitioners, aged between 30 and 73 years**,** were recruited from several provinces in Western Algeria (Oran, Tlemcen, Sidi Bel Abbes, Mascara, Naama, and Bechar). The ethnobotanical survey was conducted between March 1 and July 15, 2025**.** Data collection was conducted through semi-structured interviews using randomized visits to households, markets, mosques, hospitals, parks, and other public areas across the study zone. Before starting each interview, the study objectives were explained to the participants, and verbal informed consent was obtained voluntarily from all respondents, in accordance with the Code of Ethics of the International Society of Ethnobiology (ISE 2008). When appropriate, anonymity of informants was preserved and sensitive details were handled following ethical best practice. We followed the conventional ethnobotanical data collection procedure outlined by Albuquerque *et al.* (2014) and Meddour *et al.* (2022)**.**

In addition, sociodemographic characteristics of participants were collected, including age, gender, educational level, place of residence, and practice specification (e.g., herb sellers, herbalists, PCOS patients, and traditional practitioners).

Botanical identification

Plant specimens were identified primarily by Soltani et al. 2025 and all of whom possess expertise in botany and plant taxonomy. The identification process was supported by specialized botanical literature and subsequently confirmed through consultation with university botanists and traditional herbalists. Scientific nomenclature was validated using authoritative

taxonomic databases, including Plants of the World Online (POWO) (Royal Botanic Gardens, Kew, 2024), The Plant List, and the African Plant Database. Voucher specimens of freshly collected species were deposited in the herbarium of the Eco-Development of Spaces Research Laboratory, Faculty of Natural and Life Sciences, Djilali Liabes University, Sidi Bel Abbes. Vernacular names were cross-checked using classical references such as Directory of plant names in the Maghreb (Louis Trabut, reissued by Rebahi, 2015) and Contribution on the study of traditional pharmacopoeia in Morocco (Bellakhdar, 1997).

Quantitative ethnobotanical indices and data analysis

The quantitative importance of each medicinal species and the level of agreement among informants were assessed using standard ethnobotanical indices. including the Use Value (UV) (Phillips & Gentry, 1993), Use Mention Index (UMI) (Andrade Cetto, 2009), Relative Frequency of Citation (RFC) (Molares & Ladio, 2009), Family Importance Value (FIV) (Tardío & Pardo de Santayana, 2008), Informant Consensus Factor (ICF) (Molares & Ladio, 2009), and Fidelity Level (FL) (Khan et al., 2014). For all indices, N denotes the total number of informants (N=150). Medicinal uses were grouped into symptom categories related to PCOS (e.g., menstrual/hormonal disorders, infertility, metabolic issues).

Use mention index (UMI)

$$(1) \quad UMI = \Sigma U_{is} / N$$

Where U_{is} is the number of uses mentioned by a respondent for a particular specie and N is number of entire population interviewed.

Use value (UV)

UV reflects the relative importance of each species based on use reports:

$$(2) \quad UV = \Sigma Uis / nis$$

Where Uis is the number of uses mentioned by a respondent for a particular specie and nis is the number of interviews by the informant.

Relative frequency of citation (RFC)

RFC estimates how frequently a species is mentioned:

$$(3) \quad RFC = nis / N$$

Family importance value (FIV)

FIV was calculated as the sum of RFC values of species within a family:

$$(4) \quad FIV = \Sigma \, RFCi \text{ (for all species i in the family)}$$

Informant consensus factor (ICF):

ICF measures agreement among informants for each symptom category:

$$(5) \quad ICF = (Nur - Nt) / (Nur - 1)$$

where Nur is the number of use reports in the category and Nt is the number of species used in that category.

Fidelity level (FL)

FL indicates the proportion of informants who cited a plant for a particular category relative to all citations for that plant:

$$(6) \quad FL (\%) = (I_p / I_u) \times 100$$

Where (I_p) is the number of respondents that mentioned a plant species for a particular ailment and the (I_u) is the total number of respondents who knows the same plant for management of any ailment.

Results

Demography data of informants

A total of 150 individuals were interviewed regarding their traditional knowledge and use of herbal medicines for polycystic ovary syndrome (Table 1). The analysis of the questionnaires showed a clear female predominance (70.0%). The respondents were aged between 30 and 73 years. Almost (41.4%) were between 30 and 50 years old and (57.1%) were between 50 and 70 years old. Regarding educational level, 13.3% had university education, 28.0%secondary education, 38.0% primary education and 20.6% had no formal. The largest percentage of respondents were herb sellers (42.8%), followed by Herbalist (27.9%), women suffering from PCOS (15.7%), and traditional medicine practitioner (13.5%).

Diversity of medicinal plants

Twenty-seven medicinal plant species belonging to 16 families were documented. Table 2 lists these plants in alphabetical order. For each species identified, the scientific and local names, the plant part used, the local medicinal use, the growth

form, and the values of n_{is}, UMI, U_{is}, UV_{is}, RFC, FIV, and ICF were determined. Based on UMI, the 27 species were grouped into five categories. Two species were found in the first category (UMI = 0.0333), whereas three, six, nine, and seven species were found in the second (UMI = 0.0266), third (UMI = 0.0200), fourth (UMI = 0.0133), and fifth (UMI = 0.0066) categories, respectively. The most frequently used plant families were Lamiaceae (29.41%), Apiaceae (23.52%), and Asteraceae (23.52%), as shown in Figure 2. Based on FIV values, the most important botanical families were Lamiaceae (FIV = 0.9065), Chenopodiaceae (FIV = 0.5266), and Asteraceae (FIV = 0.3465) (Table 2).

Table 1. Demographic Characteristics of the Respondents

Characteristics	Specification	Total	Percentage (%)
1. Sex	Female	104	70.0
	Male	46	29.9
2. Age	30-40	30	15.5
	40-50	45	25.8
	50-60	58	48.4
	60-70	14	8.6
	>70	3	1.4
3. Residence	Urban	59	39.3
	Rural	91	60.6
4. Practice specification	Suffering from PCOS	34	15.7
	Herb sellers	52	42.8
	Herbalist	39	27.9
	Traditional medicine practitioner	25	13.5
5. Marital status	Married	124	82.6
	Single	18	12.0
	Divorced	8	5.30
6. Educational status	University	20	13.3
	Secondary School	42	28.0
	Primary School	57	38.0
	No formal education	31	20.6

The results of this study revealed that 16 plants were used to regulate menstrual and hormonal disorders, with *Atriplex halimus L.* (nis=79) and *Salvia officinalis L.* (nis=51) being the most commonly cited species. Ten plants were reported for managing metabolic syndrome and four plants for the hyperandrogenism. Respondents also mentioned three plants for hirsutism and morphological markers of PCOS, two species for insulin resistance and diabetes, and one species for ovarian cyst and acne. (Table 2). To facilitate drug preparation, five techniques were noted: decoction, infusion, maceration, powder and juice. Among these, decoction was the most used method (42.50) (Figure 3) and oral administration was the only mentioned way (Table 3).

One of the methods used to determine the most important medicinal plant species was the calculation of fidelity level. High fidelity value indicates an approval for the use of each plant species in the study area. This value justifies the selection of a particular species by respondent for the treatment of a specified disease. Among all the plant mentioned, *Daucus carota L., Tabernaemontana crassa, Caralluma europaea, Glycyrrhiza glabra L., Aesculus hippocastanum, Origanum compactum Benth and Prunus persica L.,* showed a Fidelity Level of 100% (Table 3).

For the plant species mentioned for management of PCOS, the leaves (38.28%) were the most–used plant in herbal preparations, followed by seeds (17.64%) and roots (14.70%). Other parts used included stem (8.82%), aerial parts (8.82%), flowers (5.88%), fruit (3.22%) and bark (2.94%). (Figure 4).

Regarding the degree of homogeneity in the use of medicinal plant in the treatment of PCOS, a high level of agreement (ICF= 1.0000) was observed among local populations for reducing ovarian cyst and for regulate menstrual disorders (ICF= 0.9263). Similarly, local populations showed a fairly high affinity on the use of medicinal plants to modulate hormonal disorders (ICF= 0.9090), treat morphological markers of PCOS (ICF= 0.9047), minimize hyperandrogenism (ICF= 0.9000), and improve metabolism (ICF= 0.8181) (Table 4).

Table 2. Plant species reported as remedies for PCOS in western Algeria.

Family/ Species	Local name(s)	Voucher No.	Part used	Medicinal uses	Growth form	Times stated (nis)	Use mention index (UMi)	Number of uses (by respondent, Uis)	Use value (UVis)	RFC	FIV
Apiaceae *1. Bunium pachypodum Coss. & Durieu*	Talghouda	H-ECODEV-045	Fruits	Treatment of inflammation and oxidative stress.	Herb	5	0.0133	2	0.4000	0.0333	0.2265
2. Daucus carota L.	Zrodiya	H-ECODEV-056	Seeds	Treatment of hormonal disorders.	Herb	1	0.0066	1	1.0000	0.0066	
3. Foeniculum vulgare	Besbas	H-ECODEV-005	Seeds	Treatment of hormonal disorders, Hirsutism and hyperandrogenism.	Herb	8	0.0200	3	0.3750	0.0533	
4. Pimpinella anisum L.	Habet hlawa	K000975625	Seeds	Treatment of menstrual disorders, hormonal disorders and metabolic syndrome.	Herb	5	0.0200	3	0.6000	0.3333	
Apocynaceae *5. Tabernaemontana crassa*	Tofahat adam	K000339984	Leaves	Treatment of menstrual disorders.	Tree	2	0.0066	1	0.5000	0.0133	0.0133
Asclepiadaceae *6. Caralluma europaea*	Daghmous	K000305756	Aerial parts	Treatment of metabolic syndrome.	Shrub	1	0.0066	1	1.0000	0.0066	0.0066
Asteraceae *7. Anastatica hierochuntica* L.	Chadjrat Meriem	H-ECODEV-074	Aerial parts	Treatment of inflammation and oxidative stress.	Shrub	21	0.0133	2	0.0952	0.1400	0.3465
8. Echinops spinosus L.	Tasekra	K002001047	Stem	Treatment of hormonal disorders, inflammation,.	Herb	16	0.0133	2	0.1250	0.1066	
9. Chamomilla matricaria	Baboundje	H-ECODEV-030	Flowers	Treatment of menstrual disorders, hirsutism, metabolic syndrome and oxidative stress.	Herb	10	0.0266	4	0.4000	0.0666	
10. Saussurea costus (Falc.) Lipsch.	Al kist-EL hindi	K000372737	Roots	Treatment of hormonal disorders.	Tree	5	0.0066	1	0.2000	0.0333	

Berberidaceae *11. Berberis vulgaris* L.	Ghris	H-ECODEV-59	Stem, roots, and leaves	Treatment of menstrual disorders, hyperandrogenism and metabolic syndrome.	Shrub	28	0.0133	3	0.1071	0.1866	0.1866
Boraginaceae *12. Borago officinalis* L.	Lsan-El ferde	H-ECODEV-025	Leaves	Treatment of hormonal disorders and inflammation.	Herb	14	0.0133	2	0.1428	0.0933	0.0933
Chenopodiaceae *13. Atriplex halimus* L.	El gtaf	H-ECODEV-040	Leaves and seeds	Treatment of menstrual disorders, insulin resistance, hyperandrogenism and Ovarian cysts,	Shrub	79	0.0266	4	0.0506	0.5266	0.5266
Ephedraceae *14. Ephedra sinica*	Alenda	H-ECODEV-054	Aerial parts	Treatment of metabolic syndrome and improvement of morphological markers of PCOS.	Shrub	3	0.0133	2	0.6666	0.0200	0.0200
Fabaceae *15. Glycyrrhiza glabra* L.	Arque-Essouse	K000764165	Roots	Treatment of PCOS-induced diabetes.	Climber	10	0.0066	1	0.1000	0.0666	0.0666
Juglandaceae *16. Juglans regia* L.	Gorgae	K009001656	Leaves	Treatment of metabolic syndrome, and inflammation.	Tree	2	0.0133	2	1.0000	0.0133	0.0133
Lamiaceae *17. Salvia officinalis* L.	Miramia	H-ECODEV-047	Leaves	Treatment of menstrual disorders, hirsutism, acne, metabolic syndrome and oxidative stress.	Shrub	51	0.0333	5	0.0980	0.3400	0.9065

18. Origanum majorana L.	Bardakouche	H-ECODEV-020	Leaves and seeds	Treatment of Hormonal disorders, metabolic syndrome, inflammation, oxidative stress and improvement of morphological markers of PCOS.	Shrub	43	0.0333	5	0.1162	0.2866	
19. Lavandula stoechas L.	Khozama	H-ECODEV-034	Leaves and flowers	Treatment of hormonal disorders, inflammation and oxidative stress.	Shrub	39	0.0200	3	0.0769	0.2600	
20. Salvia rosmarinus Spenn.	Iklil-El djabal El-yazir Halhal	H-ECODEV-035	Leaves and stem	Treatment of inflammation and oxidative stress.	Shrub	2	0.0200	3	1.5000	0.0133	
21. Origanum vulgare L.	Zaatar	H-ECODEV-011	Leaves	Treatment of menstrual disorders.	Shrub	1	0.0066	1	1.0000	0.0066	
Asphodelaceae *22. Aloe vera* Burm.f.	Aloe vera	H-ECODEV-044	Leaves	improvement of morphological markers of PCOS, inflammation and insulin resistance.	Herb	15	0.0200	3	0.2000	0.1000	0.1000
Myrtaceae *23. Myrtus communis* L.	Rihene	K000764211	Leaves	Treatment of inflammation and oxidative stress.	Shrub	7	0.0133	2	0.2857	0.0466	0.0466
Ranunculaceae *24. Nigella sativa* L.	Sanouj	K000694416	Seeds	Treatment of hormonal disorder, metabolic syndrome, inflammation and oxidative stress.	Shrub	17	0.0266	4	0.2352	0.1133	0.1133
Rosaceae *25. Prunus persica* L.	Khoukh	H-ECODEV-67	Bark Leaves	Treatment of oxydative stress.	Tree	10	0.0066	1	0.1000	0.0666	0.0666

Zingiberaceae *26. Curcuma longa* Roxb	Korkom	K000332052	Roots	Treatment of hormonal disorder, metabolic syndrome, and inflammation.	Herb	23	0.0200	3	0.1304	0.1533	0.2199
27. Zingiber officinale Roxb.	Zandjabil	K:SPC-66325	Roots	Treatment of PCOS-induced diabetes and inflammation.	Herb	10	0.0133	2	0.2000	0.0666	

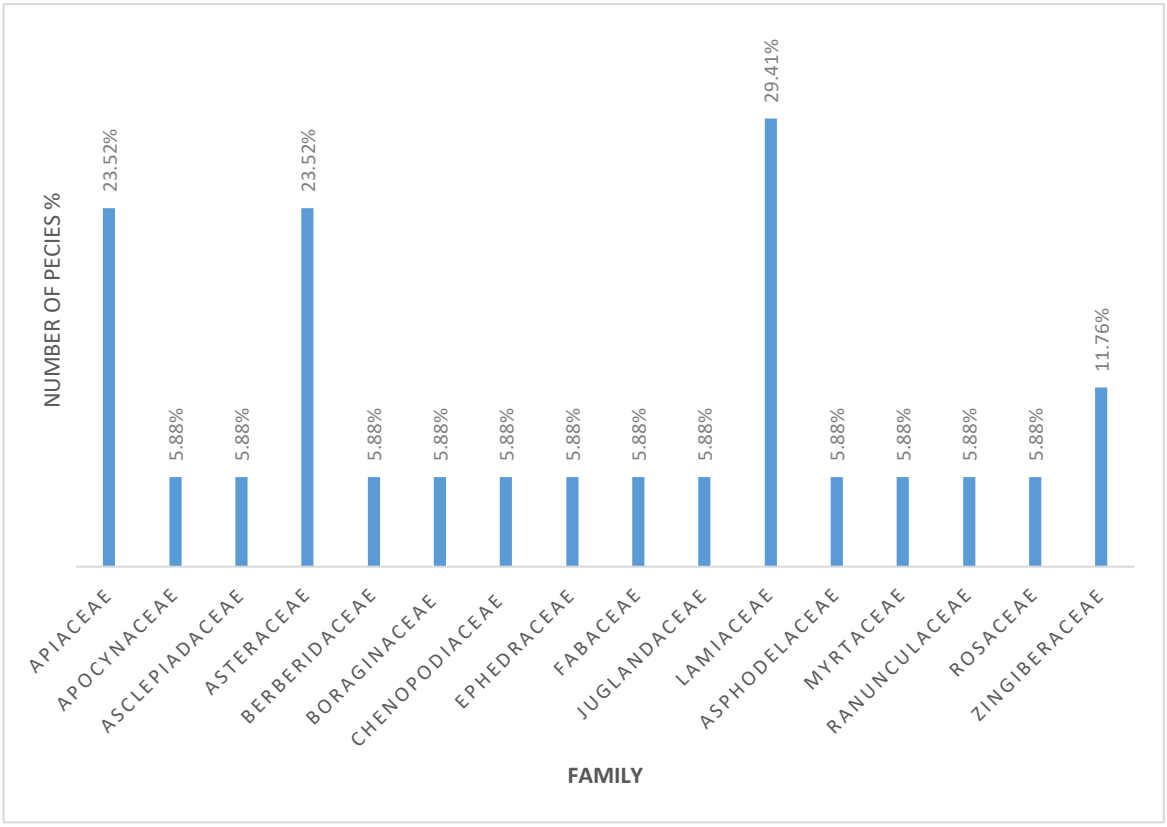

Figure 2. Family and number of species of medicinal plants mentioned for the treatment of PCO

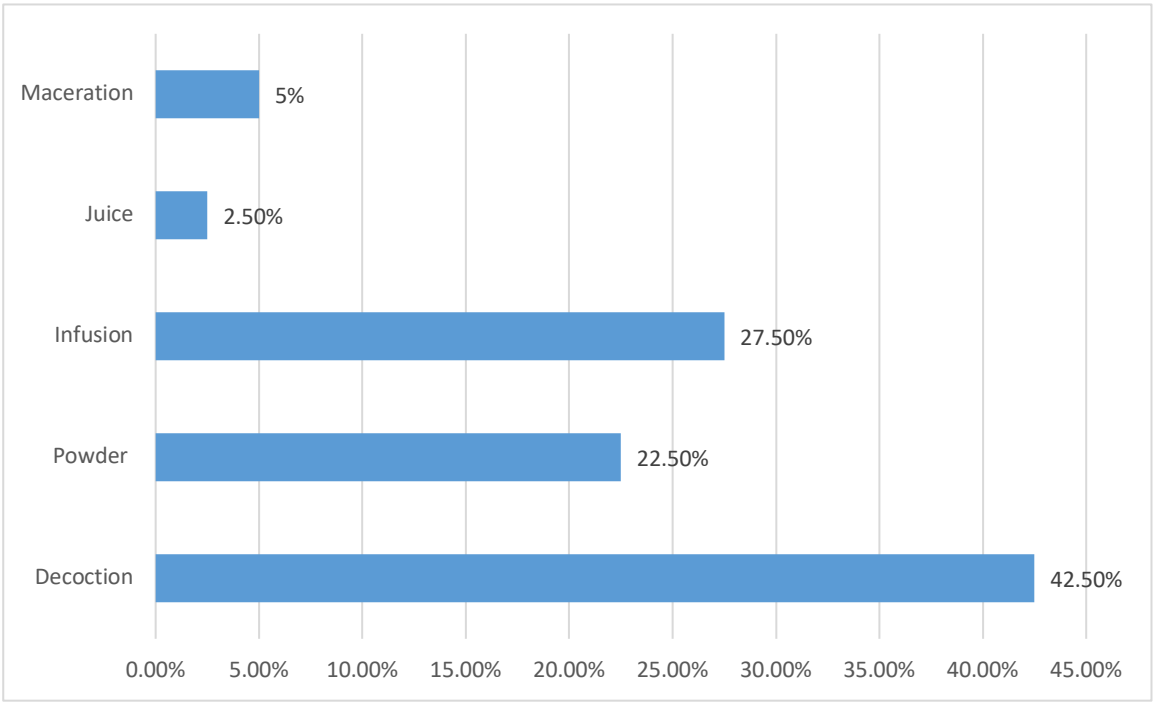

Figure 3. Methods of preparation

Table 3. Mode of preparation, administration and fidelity level (FL) for each medicinal plant mentioned per use

Species	Preparation	Administration	Medicinal uses	Ip	Iu	FL %
1. ***Bunium pachypodum*** **Coss. & Durieu**	Powder	Oral	Inflammation Oxidative stress	3 2	5	60 40
2. Daucus carota **L.**	Decoction	Oral	Hormonal disorders	1	1	100
3. Foeniculum vulgare	Infusion Decoction	Oral	Hormonal disorders Hirsutism Hyperandrogenism	3 2 3	8	37.5 25 37.5
4. Pimpinella anisum **L.**	Infusion	Oral	Menstrual disorders Hormonal disorders Metabolic syndrome	2 2 1	5	40 40 20
5. Tabernaemontana crassa	Decoction	Oral	Menstrual disorders	2	2	100
6. Caralluma europaea	Powder	Oral	metabolic syndrome.	1	1	100
7. Anastatica hierochuntica L.	Decoction	Oral	Inflammation Oxidative stress	11 10	21	52.3 47.6
8. Echinops spinosus **L.**	Decoction	Oral	Hormonal disorders Inflammation	12 4	16	75 25
9. Chamomilla matricaria	Infusion Decoction	Oral	Menstrual disorders Hirsutism Metabolic syndrome Oxidative stress	6 1 2 1	10	60 10 20 10
10. Saussurea costus **(Falc.) Lipsch.**	Powder	Oral	Hormonal disorders	5	5	100
11. Berberis vulgaris **L.**	Powder	Oral	Menstrual disorders Hyperandrogenism Metabolic syndrome	14 6 8	28	50 21.4 28.5
12. Borago officinalis **L.**	Infusion	Oral	Hormonal disorders Inflammation	9 5	14	64.2 35.7
13. Atriplex halimus **L.**	Decoction Infusion Powder Maceration	Oral	Menstrual disorders Insulin resistance, Hyperandrogenism Ovarian cysts	40 6 12 25	79	50.6 7.5 15.1 31.6
14. Ephedra sinica	Decoction	Oral	Metabolic syndrome Improvement of Morphological markers of PCOS.	2 1	3	66.6 33.3
15. Glycyrrhiza glabra **L.**	Decoction Maceration	Oral	PCOS-induced diabetes.	10	10	100
16. Juglans regia **L.**	Infusion	Oral	Menstrual disorders Diabetes	1 1	2	50 50
17. Salvia officinalis **L.**	Decoction, Infusion	Oral	Menstrual disorders hirsutism Acne Metabolic syndrome Oxidative stress	21 7 7 11 5	51	41.1 13.7 13.7 21.5 9.8
18. Origanum majorana **L.**	Decoction, Infusion	Oral	Hormonal disorders Metabolic syndrome Inflammation Oxidative stress Improvement of	18 9 4 1 11	43	41.8 20.9 9.3 2.3 25.5

			morphological markers of PCOS			
***19 Lavandula stoechas* L.**	Decoction, Infusion	Oral	Hormonal disorders Inflammation Oxidative stress	29 5 5	39	74.3 12.8 12.8
***20. Salvia rosmarinus* Spenn.**	Infusion Decoction	Oral	Inflammation Oxidative stress	1 1	2	50 50
***21. Origanum vulgare* L.**	Powder	Oral	Menstrual disorders	1	1	100
***22. Aloe vera* Burm.f.**	Juice	Oral	Improvement of morphological markers of PCOS Inflammation Insulin resistance	10 3 2	15	66.6 20 13.3
***23. Myrtus communis* L.**	Decoction	Oral	Inflammation Oxidative stress	4 3	7	57.1 42.8
***24. Nigella sativa* L.**	Powder	Oral	Hormonal disorders Metabolic syndrome Inflammation Oxidative stress	8 4 4 1	17	47.0 23.5 23.5 5.8
***25. Prunus persica* L.**	Powder Decoction	Oral	Oxidative stress	10	10	100
***26. Curcuma longa* Roxb**	Powder Decoction	Oral	Hormonl disorders Metabolic syndrome Inflammation	13 7 3	23	56.5 30.4 13.0
***27. Zingiber officinale* Roxb**	Infusion Decoction	Oral	PCOS-induced diabetes Inflammation	7 3	10	70 30

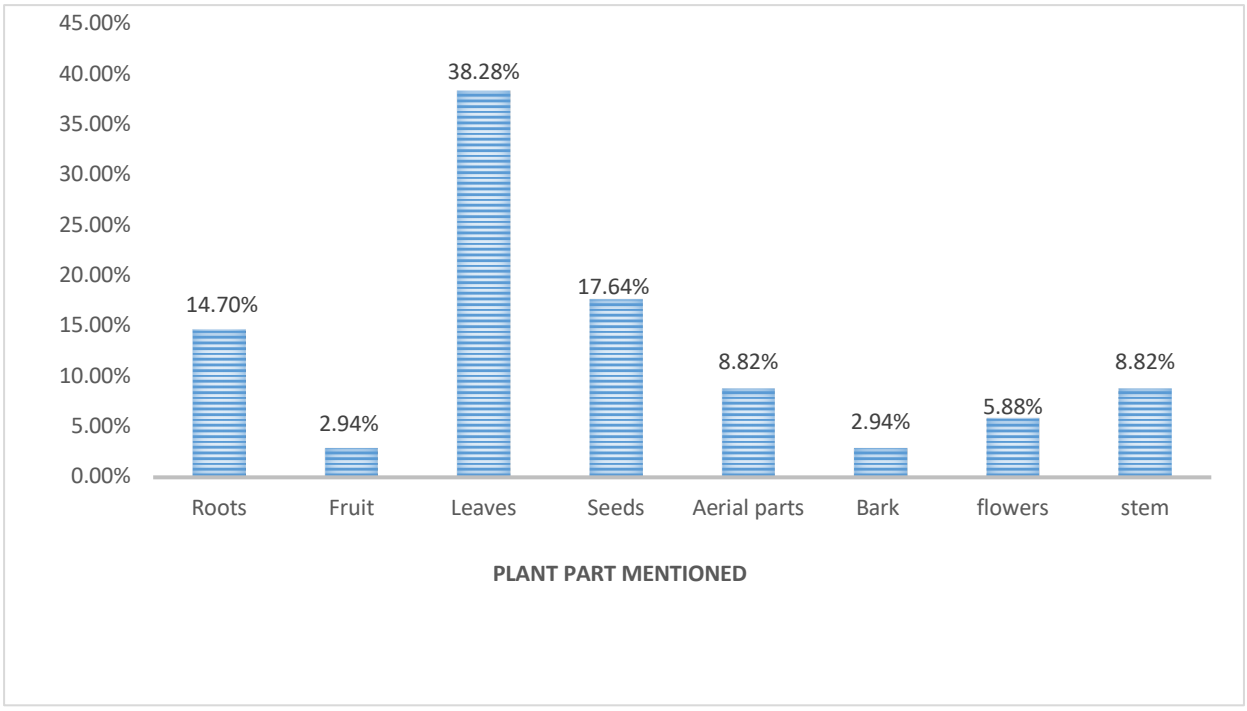

Figure 4. Plant parts mentioned for the treatment of PCOS

Table 4. Informant consensus factor values (ICF) by category for ethnobotanical treating PCOS

Category	Plant Species Used and Number of Citations	Species (Nur)	Use citations (Nt)	ICF
Menstrual disorders	*Pimpinella anisum (2), Tabernaemontana crassa (2), Chamomilla matricaria (6), Berberis vulgaris (14), Atriplex halimus (40), Juglans regia (1), Salvia officinalis (21), Origanum vulgare (10)*	8	96	0.9263
Hormonal disorders	*Daucus carota (1), Foeniculum vulgare (3), Pimpinella anisum (2), Echinops spinosus (12), Borago officinalis (9), Saussurea costus (5), Origanum majorana (18), Lavandula stoechas (29), Nigella sativa (8),Curcuma longa (13)*	10	100	0.9090
Metabolic syndrome	*Pimpinella anisum (1), Caralluma europaea (1) Chamomilla matricaria (2), Berberis vulgaris (8), Ephedra sinica (2), Salvia officinalis (11), Origanum majorana (9), Nigella sativa (4), Curcuma longa (7)*	9	45	0.8181
Hyperandrogenism	*Foeniculum vulgare (3), Berberis vulgaris (6), Atriplex halimus (12)*	3	21	0.9000
Hirsutism Acne	*Foeniculum vulgare (2), Chamomilla matricaria (1), Salvia officinali. (7), Salvia officinalis (7)*	3	17	0.8750
Improvement of morphological markers of PCOS	*Ephedra sinica (1), Origanum majorana (11), Aloe vera. (10)*	3	22	0.9047
Diabetes	*Glycyrrhiza glabra L. (10), Juglans regia L. (1), Zingiber officinale Roxb (7)*	3	18	0.8823
Insulin resistance	*Atriplex halimus L. (6), Aloe vera Burm.f. (2)*	2	8	0.8571
Ovarian cyst	*Atriplex halimus (25)*	1	25	1.0000
Inflammation	*Bunium pachypodum (3), Anastatica hierochuntic. (11), Echinops spinosus (4), Borago officinalis (5), Origanum majorana (4), Lavandula stoechas (5), Salvia rosmarinus Spenn. (1), Aloe vera (3) Myrtus communis (4), Nigella sativa (4), Curcuma longa (3), Zingiber officinale (3)*	12	50	0.7555
Oxidative stress	*Bunium pachypodum (2), Anastatica hierochuntica (10), Chamomilla matricaria (1), Salvia officinalis (5), Origanum majorana (1), Lavandula stoechas. (5), Salvia rosmarinus (1), Myrtus communis (3), Nigella sativa (1), Prunus persica (10)*	10	39	0.7631

Discussion

The present study documented and quantitatively analysed traditional knowledge regarding medicinal plants used for the management of polycystic ovary syndrome (PCOS) in western Algeria. The survey, based on 150 informants, recorded 27 medicinal plant species belonging to 16 botanical families, reflecting a rich and structured ethnomedical repertoire developed for a disorder with complex endocrine-metabolic manifestations. The reported therapeutic scope extended beyond menstrual and hormonal disturbances to include metabolic syndrome, insulin resistance, diabetes, hyperandrogenism, inflammation, oxidative stress, and improvement of morphological markers of PCOS, indicating that PCOS is addressed locally as a multidimensional syndrome rather than as a single symptom cluster. This syndrome-oriented approach is consistent with the biomedical characterization of PCOS as a chronic condition involving interrelated reproductive, endocrine, and metabolic abnormalities (Teede 2023, Azziz *et al.* 2016).

The sociodemographic profile highlights strong female participation (70.0% of respondents) and a predominance of rural inhabitants (60.6%), which supports the central role of women and rural communities in the preservation and transmission of knowledge related to reproductive health and household therapeutics. In addition, knowledge was distributed across multiple categories of informants, including herb sellers (42.8%), herbalists (27.9%), women suffering from PCOS (15.7%), and traditional medicine practitioners (13.5%). This diversified structure suggests that local pharmacopoeial knowledge is maintained through both experiential use and professional practice, strengthening continuity of use, circulation of remedies,

and collective validation. These findings are consistent with previous North African ethnobotanical research showing that indigenous knowledge and demographic factors strongly influence the persistence and use of herbal medicine in reproductive health contexts (Jouad *et al.* 2001, Mehdioui & Kahouadji 2007, Jamila & Mostafa 2014, Zatout *et al.* 2021, Bah *et al.* 2011). The botanical composition of the PCOS pharmacopoeia was characterized by a strong representation of Mediterranean medicinal families, with Lamiaceae, Apiaceae, and Asteraceae among the most represented groups. Family importance was further supported by the Family Importance Value (FIV), which highlighted Lamiaceae (FIV = 0.9065), Chenopodiaceae (FIV = 0.5266), and Asteraceae (FIV = 0.3465) as the most important families. The dominance of these families is consistent with the literature reporting their therapeutic significance and frequent occurrence in ethnomedicinal inventories, particularly due to their richness in aromatic and phenolic constituents and their broad applications in inflammatory, endocrine, and metabolic complaints (El Alami & Chait, 2017, El Amri *et al.* 2015). In the context of PCOS, such family-level convergence is consistent with the common traditional focus on plants perceived as regulators of menstrual function, hormonal balance, and systemic metabolic disturbances.

Plant part utilization showed a clear predominance of leaves (38.28%), followed by seeds (17.64%) and roots (14.70%), while stems and aerial parts each accounted for 8.82%, flowers for 5.88%, and fruit and bark for 2.94% each. This pattern is consistent with multiple ethnobotanical studies reporting leaves as the most frequently used plant part due to their accessibility, abundance, renewability, and rich content of bioactive metabolites (Abouri *et al.* 2012, Didier *et al.* 2011, González *et al.* 2010, Malik *et al.* 2018).

Preparation methods were dominated by water-based techniques, with decoction (42.50%) and infusion (27.50%) as the principal forms, followed by powder (22.50%), maceration (5%), and juice (2.5%). The oral route was the only reported mode of administration. The predominance of infusion and decoction and oral administration aligns with ethnobotanical patterns widely reported across Africa, reflecting practical feasibility and the aim of achieving systemic therapeutic effects (Bah *et al.* 2011, Abouri *et al.* 2012, Didier *et al.* 2011, Mpondo *et al.* 2017, Françoise *et al.* 2018, Sangare *et al.* 2012, Okafor & Ham 1999).

Quantitative ethnobotanical indices provided strong evidence for the internal coherence of the local therapeutic system. The reported uses were organized across symptom categories relevant to PCOS, including menstrual disorders, hormonal disorders, metabolic syndrome, hyperandrogenism, hirsutism/acne, insulin resistance, diabetes, ovarian cysts, inflammation, oxidative stress, and improvement of morphological markers of PCOS. Agreement among informants was particularly high for key PCOS-related categories as reflected by the Informant Consensus Factor (ICF). The highest consensus was recorded for ovarian cyst (ICF = 1.0000), followed by menstrual disorders (ICF = 0.9263) and hormonal disorders (ICF = 0.9090). High consensus was also observed for improvement of morphological markers of PCOS (ICF = 0.9047) and hyperandrogenism (ICF = 0.9000), while metabolic syndrome (ICF = 0.8181) remained substantially elevated. Lower ICF values for broader physiological categories such as inflammation indicate a wider diversity of plant options for non-specific systemic complaints, which is a common pattern in quantitative ethnobotany (Boutaj 2024, Hedidi *et al.* 2024, Belaidi *et al.* 2004, Ndefo *et al.* 2013).

The Relative Frequency of Citation (RFC) identified culturally prominent species central to PCOS management. *Atriplex halimus* (RFC = 0.5266; nis = 79) was the most cited species and was reported across several PCOS dimensions including menstrual disorders, insulin resistance, hyperandrogenism, and ovarian cysts, supporting its central status in the local pharmacopoeia. *Salvia officinalis* (RFC = 0.3400; nis = 51) was also highly cited and used for menstrual disorders, hyperandrogenic symptoms, metabolic syndrome, and oxidative stress. Additional frequently cited species included *Origanum majorana* (RFC = 0.2866; nis = 43) and *Lavandula stoechas* (RFC = 0.2600; nis = 39), both repeatedly associated with endocrine and inflammatory/oxidative domains. These findings are consistent with the growing body of literature suggesting that multiple herbal medicines may influence PCOS-related outcomes, although clinical confirmation and standardization remain required (Kwon *et al.* 2020, Latha *et al*. 2015, Moran *et al.* 2010).

The Fidelity Level (FL) further strengthened the prioritization of species by identifying plants with high indication-specific agreement. Several taxa reached FL = 100%, including *Daucus carota, Tabernaemontana crassa, Caralluma europaea, Glycyrrhiza glabra, Saussurea costus , Origanum vulgare, and Prunus persica*, indicating highly consistent attribution of these plants to specific PCOS related complaints. In ethnopharmacological research, such high fidelity values provide a strong rationale for prioritizing these taxa for targeted phytochemical and pharmacological investigations (Bah *et al.* 2011, Fasola 2015)

Current ethnopharmacological research increasingly emphasizes connecting community knowledge to bioactive discovery through systematic prioritization and chemical profiling. In this perspective, the convergence of high RFC values (cultural prominence), high ICF values (community consensus), and high FL values (indication specificity) provides a robust basis for selecting candidates for follow-up studies, consistent with approaches highlighted in recent ethnopharmacological work (Bhoi & Ahirwar 2025, *Ahirwar et al.* 2025). Future research should prioritize phytochemical profiling and mechanism-oriented bioassays aligned with PCOS pathways (endocrine regulation, insulin sensitivity, anti-inflammatory and antioxidant activity), together with safety evaluation given the predominance of oral administration and potential chronic use. These steps are essential to translate culturally validated practices into evidence-informed recommendations compatible with contemporary PCOS management frameworks (Teede 2023).

Conclusion

The ethnobotanical repertoire documented in western Algeria reflects a resilient and highly structured knowledge system in which cultural continuity, ecological accessibility, and shared empirical validation converge to shape traditional approaches to polycystic ovary syndrome (PCOS). The strong predominance of women among informants and the active involvement of herbalists, herb sellers, traditional practitioners, and affected women highlight a socially distributed network of knowledge production and transmission, particularly relevant to reproductive health concerns. The marked rural representation further underscores the role of local ecological proximity and market-mediated circulation in sustaining phytotherapeutic practices.

High Informant Consensus Factor (ICF) values for key PCOS-related categories especially ovarian cysts, menstrual disorders, and hormonal disorders demonstrate strong communal agreement on plant selection and suggest a culturally stable therapeutic logic targeting the most central manifestations of PCOS. The floristic dominance and family importance of Lamiaceae, Apiaceae, and Asteraceae, together with the leading FIV values of Lamiaceae and Chenopodiaceae, reflect both ecological adaptation and a preference for aromatic and bioactive taxa commonly perceived as effective for endocrine metabolic disturbances. The predominance of leaves as the main plant part used, and the high frequency of decoction and infusion, further illustrate pragmatic choices that balance renewability, accessibility, and preparation feasibility within domestic healthcare settings.

Quantitative indices (RFC, UV, FL, and ICF) consistently identify culturally salient “core species” and highly specific taxa, with *Atriplex halimus* and *Salvia officinalis* emerging as key plants by citation prominence, while several species exhibit perfect fidelity (FL = 100%), indicating strong indication-specific reliability within community practice. Overall, the convergence of high consensus, selective taxonomic representation, and index-based prioritization demonstrates that the traditional PCOS pharmacopoeia in western Algeria remains a living heritage culturally coherent, methodologically robust, and scientifically promising as a foundation for future phytochemical, pharmacological, and safety-focused investigations aimed at bridging traditional knowledge with evidence-based therapeutic discovery.

Declarations

List of abbreviations: PCOS (Polycystic Ovary Syndrome); RFC (Relative Frequency of Citation); UV (Use Value); FL (Fidelity Level); ICF (Informant Consensus Factor); UMI (Use Mention Index); N (Number of informants); Nur (Number of Use Reports); Nt (Number of Taxa).

Ethics approval and consent to participate: Verbal informed consent was obtained from all participants before the interviews. Participation was voluntary and anonymous. Because the study involved non-interventional interviews and did not collect clinical data, a formal institutional ethics approval number was not available.

Consent for publication: Not applicable.

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