Ethnomedicinal survey of the plants used for gynecological disorders by the indigenous community of district Buner, Pakistan

Hammad Ahmad Jan, Samin Jan, Rainer W. Bussmann, Latif Ahmad, Sher Wali, Nadeem Ahmad

Databases and Inventories

Abstract

Background: This study is the first of its own kind conducted in the study area with the aim to document and conserve the indigenous traditional knowledge of medicinal plants used for curing gynecological diseases.

Materials and Methods: During the course of work, the use of medicinal plants and their ethnomedicinal uses for gynecological problems were documented by interviewing 532 people of different ages (20-110 years) through semi-structured interviews

Results: The result of the present work is showing the dependency of the indigenous population on medicinal plants. In the present work 60 plants, species belonging to 40 families were collected and their medicinal uses were documented by interviewing both genders of the local population through semi-structured interviews and open-ended questionnaires. The results of the study were compared to 14 previously published articles. The result of this study indicates that Asteraceae was the dominant family with 4 species. Similarly, the dominant life form was herb (39 species) and the most used plant part was leaf (19 species). The highest RCF (Relative Citation Frequency) value was obtained for *Acacia modesta* Wall. 0.71. The highest UV (Use Value) was 0.91 for *Trachyspermum ammi* (L.) sprague and lowest UV was 0.50 for *Ficus benghalensis* L. The highest ICF (Informants Consensus Factor) value 1.0 was obtained for emmenagogue and vomiting and the lowest for leucorrhoea (0.67).

Conclusions: The present study shows that the study area is rich in ethnomedicinal knowledge. The result also indicates that the local population is more sensitive and careful about gynecological diseases. This study is providing a baseline for future pharmacological studies to discover new herbal drugs.

Keywords: Traditional knowledge conservation; Ethno-medicine; Gynecological disorders; Buner; Pakistan

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Ethnobotany Research & Applications 19:26 (2020)

خلاصول

دا څېړنه په خپل ډول کې لومړی ډول دی چې د مطالعې په ساحه کې ترسره شوی چې هدف يې د درملو نباتاتو داخلي دوديز پوهه اسناد او ساتنه ده چې د ښځينه ناروغيو ناروغيو درملنې لپاره کارول کيږي. د

Manuscript received: 31/01/2020 – Revised manuscript received: 11/03/2020 - Published: 14/03/2020

http://dx.doi.org/10.32859/era.19.26.1-18

اوسني کار پايله د درملو بوټو باندې د ځايی خلکو انحصار بنيي. په اوسني کار کې د 40 کښتونو پورې اړوند 60 نباتات ډول ډول راټول شوي او د دوی درملو کارول د نيم جوړ شوي مرکو او د خلاصي پوښتنليکونو له لارې د ځايی خلکو دواړه جنسونو سره مرکه کولو سره مستند شوي. د مطالعې پايلې د 14 خپاره شوي مقالو سره پرتله شوي. د دې څېړنې پايله په ګوته کوي چې Asteraceae د 4 ډولونو سره غالب کورنۍ وه. په ورته ډول د حاکم ژوند بوټي (39 ډولونه) او د نباتاتو ترټولو کارول شوي برخه پا leafاه وه (19 ډولونه). ترټولو لوړ د(Relative RCF (Citation Frequency ارزښت د اکاسيه مودېستا وال لپاره ترلاسه شوی و. 0.71. ترټولو لوړ (Use Value) UV د *Trachyspermum ammi* (L.) sprague لپاره 0.91 محاسبه شوی او ټيټ 0.50 UV د L *Ficus benghalensis* لپاره و. د ترټولو لوړ ارزښت ICF (Informants Consensus Factor) 1.0 د Emmanagogue او التون لپاره ترلاسه شوی او ټيټ يې د leucorrhoea) 0.67) لپاره ترلاسه شوی. اوسنی مطالعه بنيي چې د مطالعې ساحه د توکميزې پوهې څخه بډايه ده. پايله دا هم په ګوته کوي چې ځايی وګړي د نسايي ناروغيو په اړه ډير حساس او محتاط دي. دا مطالعه د راتلونکو فارماولوژيک مطالعاتو لپاره اساس ليک چمتو کوي ترڅو نوي بوټي درمل ومومي.

Introduction

The use of herbal medicines in daily life has a long history and still has great importance in indigenous cultures (Gurib-Fakim, 2006). In rural areas, medicinal plants still play a significant role (Qureshi and Ghufran, 2005) and are still used as the primary healthcare system and about eighty percent of people of remote regions of Pakistan are still reliant on medicinal plants (Jan *et al.* 2017). About twenty-five percent of medicines of the current global pharmacopeia were derived from plants and many synthetic drugs are analogs synthesized on prototype compounds isolated from plants (Sadeghi and Mahmood, 2014).

In Pakistan, rural women are often experiencing gynecological complications because of malnutrition, poverty, unhygienic conditions of living, and hard physical work. Women locally called 'Daiya', are found in every village, and specialize in phytotherapy to alleviate gynecological problems with indigenous medicinal plants (Bhat *et al.* 2013). Due to modernization and little interest of younger generations in traditional knowledge, the number of these female healers is diminishing rapidly. Thus, the conservation of ethnogynecological knowledge is the need (Khan *et al.* 2015).

To treat gynecological problems, nowadays allopathic medicines, anti-inflammatory medicines, non-steroidal analgesics, and surgery are used more often. These treatments are effective, but often have side effects such as vomiting and nausea related to surgery/anesthetics; sexual problems after hysterectomy; digestive problems or skin rashes, and more seriously, kidney, liver, and heart impairment related to drugs, especially when drugs are used for a long time. Furthermore, some drugs when used in pregnancy can harm the embryo (Sadeghi and Mahmood, 2014).

Ethnogynecology is a newly emerging branch of ethnobotany, dealing with the use of medicinal plants for healing gynecological problems (e.g. example abortion, menstrual problems, leucorrhoea, anti-fertility, and delivery problems) (Rahman, 2014). Very little work has been done in this area until now all over the world, and less in Pakistan (Siddiqui *et al.* 1988; Dash and Satapathy, 2016). In the study area no research has been done on ethnogynecology.

In this study, we tried to find answers for the following questions about the medicinal plants used to cure gynecological disorders: (i) Which species are used locally for the cure of gynecological disorders? (ii) Which type of gynecological disease is treated by a particular plant? (iii) Are certain plant families more or less used than expected? (iv) Which part is used for the medicinal plant? (v) What is the mode of administration of the drug? Furthermore, we conducted this study to find valuable medicinal plants, to preserve the indigenous wealth of knowledge, and to make the indigenous population aware of the importance of sustainable use of medicinal plants.

Materials and methods

The geographical position of the area

The study area lies between $34^0$9'-$34^0$43'N and $72^0$10'-72^0-47'E. The area is bordered by district Swat in the North, the Malakand Agency to the West, Mardan district to the South bordered, the Hazara Division and Indus River to the East and Swabi district to the North-East (Fig. 1). The study area was a sub-division part of district Swat until 1990. In 1991 it received the status of the district (www.kpktribune.com). The region encompasses 1865 km^2 with a total population of 897319 as per the 2017 census (www.pbs.gov.pk). The entire population of the district is homogenous both culturally and religiously.

In Buner, most of the local population has a low economic level. About 95% mainly depend on agriculture and livestock, and 5% have earned work income (www.kpktribune.com). Buner is surrounded by mountains on all sides. The elevation ranges from 366 mm in Totalai to 2911 m on Dosara Peak. The district climate varies with altitude and can be categorized as dry subtropical (www.paiman.jsi.com/Resources/Docs/district-health-profile-buner). Phytogeographically the district is the part of the Sino-Japanese region with unique vegetation (Ali *et al.* 2015). The area has two distinctive rainy seasons the Rabi season from

November to May and the Kharif monsoon from July to October. About 1650 mm rainfall occurs annually. The district climate is moderate. In summer, it is pleasant in the upper parts (Gadezai and Gokand), while hot in the lower parts (Khadukhel), where the temperature reaches up to 40°C. In winter snowfall occur in the upper parts. About 32102 hectares of the area is covered by subtropical forest (www.pdf.usaid.gov). In the time of Wali-i-Swat (from 1926 to 1969), this region was famous for its large forests, dominated by *Pinus roxburgii*, *Olea ferruginea*, *Acacia modesta,* and *Quercus incana*. The mountains of Buner have a rich variety of medicinal flora. Ananguaray/Anar (Wild pomegranate, *Punica granatum*), Bakyana (*Melia azedarach* L.), Inzer (Wild fig, *Ficus carica*), and Toot (Mulberry, *Morus alba*), *Celtis australis*, *Monotheca buxifolia*, *Berberis lyceum*, *Olea ferruginea, Acacia modesta, Dodonaea viscosa, Pinus roxburgii,* and *Quercus incana,* are the most famous medicinal plants (Jan *et al.* 2017). Due to the remoteness of the area, the people mainly prefer medicinal plants to cure minor diseases.

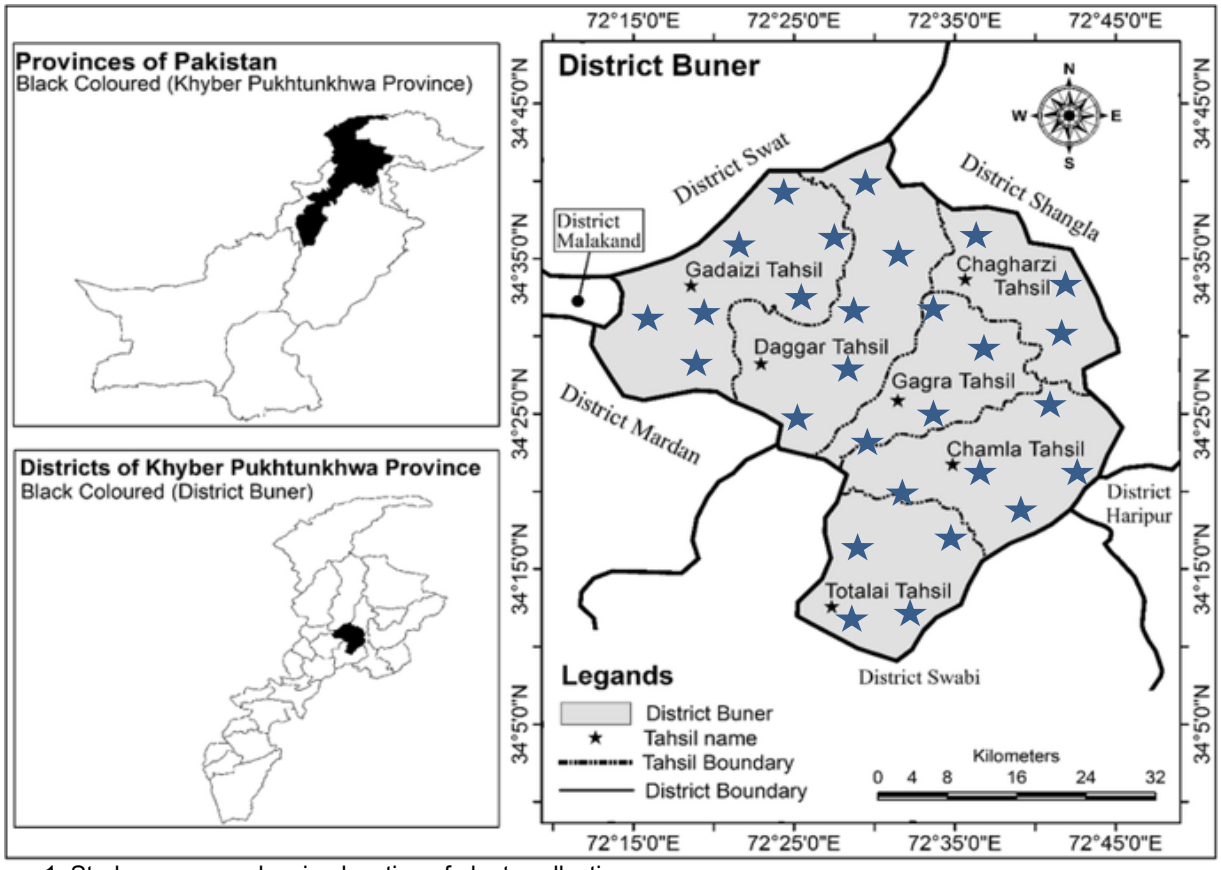

Figure 1. Study area map showing location of plants collection

Interviews with the local community

To collect data on medicinal plants, the study area was visited several times in the period of 2018-19 in different seasons. During the course of work, the use of medicinal plants and their ethnomedicinal uses for gynecological problems were documented by interviewing 532 people of different ages (20-110 years) through semi-structured interviews (Martin, 1995; Cotton and Wilkie, 1996; Jan *et al.* 2017). Both men and women (283 men including 43 male herbalists, 249 women including 70 female herbalists/Dayiahs) (Table 1) were selected by snowball sampling (Cotton and Wilkie, 1996; Höft *et al.* 1999; Martin, 2004; Awas and Demissew, 2009; Motti and Motti, 2017). The questionnaire which was used as tool for data collection consisted of the following questions; (ì) informant name, residence place, gender, education level, age and job, (ìì) plant local name, collection place, medicinal importance, medicinal important part, route of use, indigenous medicinal recipe, dose of drug and side effect/s. The informants were asked to free list all plants they knew.

Medicinal plant collection, preservation, and identification

During collection, walks in the woods and mountains were conducted (de Albuquerque *et al.* 2009) and plant specimens were collected and preserved according to Santos *et al.* (2014). Collected specimens and photos were taken in the field were used for identification (de Albuquerque *et al.* 2009;

Jan *et al.* 2017) with the help of herbarium specimens and also with Dr. Samin Jan and Dr. Sher Wali (Department of Botany, Islamia College Peshawar), and Dr. Zahid Ullah Department of Botany, University of Swat. For authentication and correction, the names were compared with the online "Flora of Pakistan" (http://www.tropicos.org/project/pakistan) and "The Plant List" (http://www.theplantlist.org). All collected specimens were stored at the Herbarium of the Botany Department, Islamia College Peshawar. All the practical work conducted during the study is summarized in Fig. 2.

Table 1. Informants demographic data

Age	No. of Informants	Percentage
20-29	43	9.42
30-39	69	15.13
40-49	143	31.35
50-60	174	38.15
Above 60	103	22.58
Total No. of Informants		**532**
Illiterate	234	51.31
Primary School	151	33.11
High School	82	17.98
Graduate	53	11.62
Post Graduate	12	2.63

Study of literature

Previously published data were searched using Google Scholar, HINARI, Medline/PubMed and ScienceDirect databases. To find topic related papers, 10 different keywords were used: ethnogynecology, ethno-pharmacological study/survey, ethno-medicine, ethno-botany, herbal medicines, traditional medicines, medicinal plants, medicinal plants Pakistan and medicinal plants of Northern Areas of Pakistan.

Data calculation, statistical analysis, and table and figure formation

MS-Excel 2010 was used to sort the collected data, form tables, and figures and data calculation.

Relative citation frequency (RCF)

Local significance of every plant species was figured in view of the relative frequency of citation, which does not consider the variable *i.e.* use-category (Tardio and Pardo-de-Santayana, 2008). The RCF was calculated as follows:

$$RCF = FC/N$$

Where, FC is number of informants who mentioned the use of the species and N is the total number of informants participating in the study.

Consensus index (CI)

To calculate the percentage of local informants about the traditional knowledge of medicinal plants used to cure gynecological disorders consensus index was used (Rahman *et al.* 2016; Wali *et al.* 2019). The following formula was used.

$$CI = \frac{n}{N} \times 100$$

In the formula "n" is the number of informants citing the species as a medicinal plant and "N" is the total number of informants.

Use value (UV)

This index is used to determine the relative importance of each medicinal plant in the study area (Ahmad *et al.* 2015). The use-value for each species was calculated with the help of the formula given below.

$$UV = \sum Ui/Ni$$

Where Ui is the number of use reports cited by each informant for the particular medicinal plant and Ni is the total number of informants interviewed for that particular medicinal plant.

Informants consensus factor (ICF)

In order to calculate the homogeneity of the information obtained through interviews Informant consensus factor (ICF) has been applied to the data. The ICF has been calculated with the help of the following formula.

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Whereas, N_{ur} is Citations' number of each category and N_t is Species' number of each category (Heinrich *et al.* 2009).

Results and Discussion

Informants' demographic characteristics

During the fieldwork, a total of 283 men including 43 herbalists (*Hakims*), and 249 women including 70 female herbalists (*Dayiahs*) of different ages (20-110 years) were asked about ethnomedicinal knowledge. Most of the ethnobotanical knowledge was received from informants more than 50 years old. Informants with age above 60 were mostly illiterate. It was observed that the informants of age 50 were more knowledgeable. Similar results were reported by other authors from surrounding areas and from other countries (Ayantunde *et al.* 2008; Alam *et al.* 2011; Abbasi *et al.* 2013; Ahmad and Pieroni, 2016; Jan *et al.* 2017). The data showed that women were more knowledgeable as compared to males, similar to other studies (Cornara *et al.* 2009; Alam *et al.* 2011; Ahmad *et al.* 2014). As women play a fundamental role in providing everyday meals, herbal homemade medicines, and in caring for the health of all family members (Howard, 2003; Voeks, 2007).

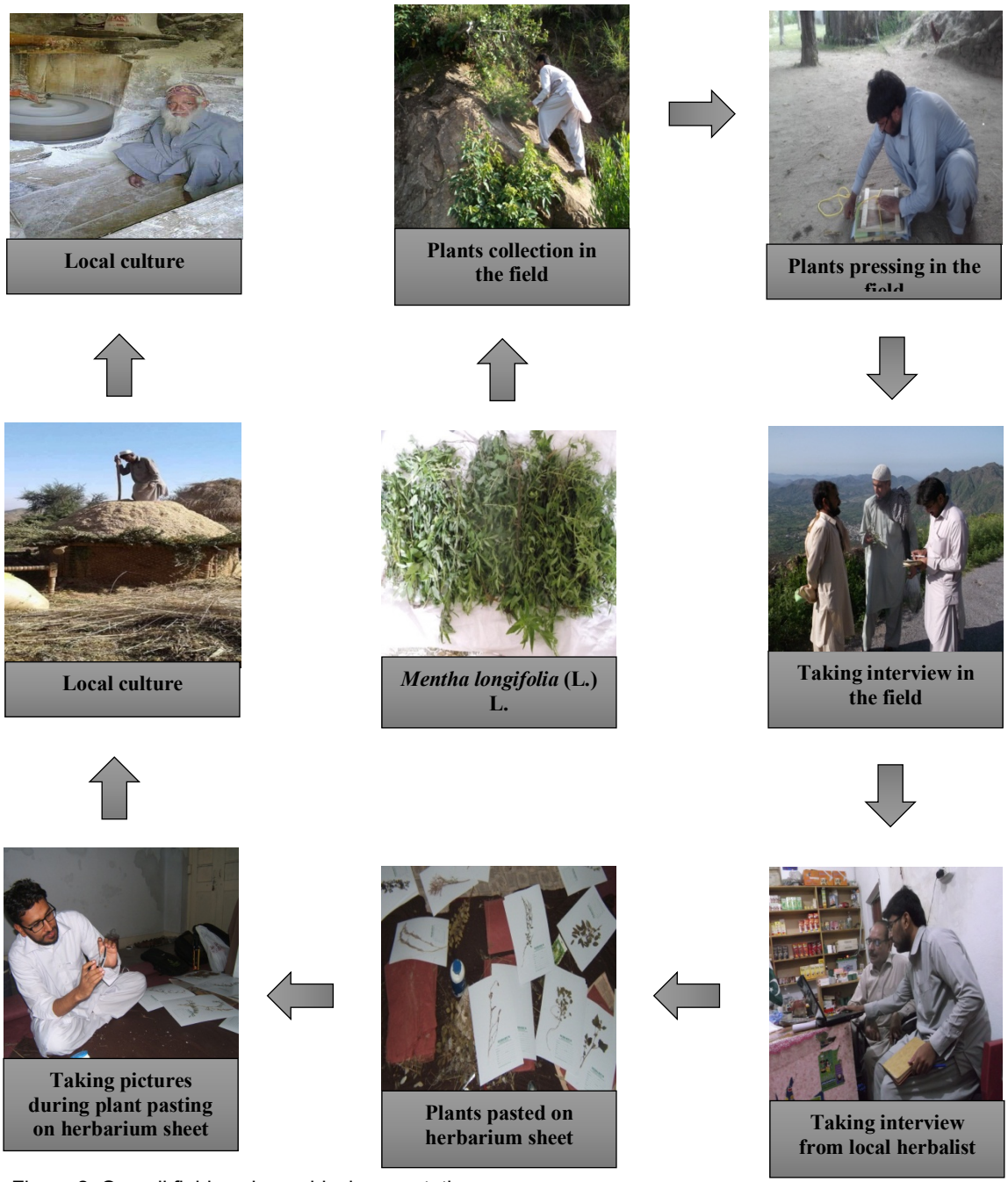

Figure 2. Overall field work graphical presentation

It was also observed that older people had more medicinal knowledge about plants, which may be due to their long experience. Most of the people reported also share experiences of other people about the use of medicinal plants. However, the dissemination of traditional knowledge was found to be threatened because the younger generation had little interest in learning, and thus was generally less knowledgeable about medicinal plants. Similar results were recorded by other researchers (Mehdioui and Kahouadji, 2007; Benkhnigue *et al.* 2007; Ayantunde *et al.* 2008; Benkhnigue *et al.* 2010; Alam *et al.* 2011; Abbasi *et al.* 2013; Thomas *et al.* 2013; Ahmad and Pieroni, 2016; Ahmad *et al.* 2017; Jan *et al.* 2017; Umair *et al.* 2017). According to Sargin and his collaborators, modernization of lifestyle leads young generations to use plants less as remedies (Sargin, 2015). The data showed a clear correlation between the education level of informants and their knowledge about the uses of medicinal plants (Table 1). The highly educated people of the area preferred the modern healthcare system based on modern scientific knowledge. The same results were documented by other researchers (Wester and Yongvanit, 1995; Gedif and Hahn, 2003; Giday *et al.* 2009; Kayani *et al.* 2014; Sargin, 2015).

During this survey, we interviewed 249 women informants, (47% of all informants). The informants interviewed in this study were mostly from rural areas (80%) because they use more herbal medicine in comparison to urban areas (Balick *et al.* 2000; Pieroni and Quave, 2005; Anderson, 2011). For local people, the transferring of traditional knowledge heritage is an important tool (Bishaw, 1990; Fajardo *et al.* 2000).

On the other hand, it was also noted that local herbalists mainly learned traditional herbal knowledge comes mainly from literature (39%), as compared to experiences of local people (27%), inherited from family (24%), and from personal experiences (8%). While for the female herbalists (Dayiahs) the source of traditional knowledge is mainly inherited (80%) and some they learned from personal experiences (20%).

Indigenous medicinal floral diversity

In Table 2 we give details about all medicinal plants, including botanical names, family name, indigenous name/s, part/s used, method of preparation, side effect/s, medicinal use/s, and complete local recipe/s. The 60 plant species found belonged to 40 families. The medicinal plant families that were dominant in this study with regard to species numbers were Asteraceae (4 species), similar to previous studies (Shedayi and Bibi, 2012; Shah *et al.* 2014; Barkatullah *et al.* 2015; Ijaz *et al.* 2016) (Fig. 3). The reason behind the dominance of the family Asteraceae is that members of this family are well known for aromatic quality (Shedayi and Bibi, 2012).

Furthermore, the members of this family widely occur in the region, and many have well-known ethnomedicinal uses (Bano *et al.* 2014). The most dominant life form used in gynaecological medicine was herbs (40 species = 66.67%), followed by trees (12 species = 19.67%) and shrubs (9 species = 14.75%) (Fig. 4). Herbs often have a high content of bio-active compounds (Giday *et al.* 2009; Mesfin *et al.* 2009; Teklehaymanot *et al.* 2007; Lulekal *et al.* 2013) and so their medicinal action is more effective than shrubs and trees (Adnan *et al.* 2012; Adnan *et al.* 2014). Herbs also grow more commonly along roadsides and in homegardens, and therefore available in nature (Shrestha and Dhillion, 2003; Ayyanar and Ignacimuthu, 2005; Uniyal *et al.* 2006; Giday *et al.* 2009; Islam *et al.* 2014; Kayani *et al.* 2014) and easily accessible.

Leaves (19 sp.) were the most commonly used plant part, as also previously reported in other studies (Giday *et al.* 2003; Akhtar *et al.* 2013; Adnan *et al.* 2014; Bano *et al.* 2014; Bhatia *et al.* 2014; Butt *et al.* 2015; Shah *et al.* 2016) followed by seeds (8 sp.), and whole plant and roots (7 sp. each) (Fig. 5). The reason for more frequent use of leaves rather than other parts, may be due because in the leaf, as center of photosynthesis and other metabolic processes, many secondary metabolites are formed (Verpoorte *et al.* 2002; Ghorbani, 2005; Mukherjee and Wahile, 2006; Cakilcioglu and Turkoglu, 2010; Ahmad *et al*. 2014). The medicine preparation from leaves is also easier and their collection too. For these reasons, leaves are frequently used in folk medicines (Telefo *et al.* 2011; Ahmad *et al.* 2015). From a conservation point of view, the consumption of leaves as compared to other parts for therapeutic purposes is more sustainable (Giday *et al.* 2003).

In the present study powder (15 recipes) is the main methodology for the preparation of herbal drugs (Fig. 6). The preferences in preparation modes were said to be dependent on potency and shelf life of remedy (Sonibare and Abegunde, 2012). In the present study, the oral (taken by mouth) route of administration was used for all the remedies. However, there was generally a lack of accuracy in the determination of the precise dosage given to patients.

Relative citation frequency (RCF) and Consensus index (CI)

The relative citation frequency (RCF) for each medicinal plant species is given in Table 3**.** These quantitative techniques are generally used to find out the relative importance of single plant species. Based on the values of RCF, the number of informants who cited the species for ethno-gynecological disorders at various localities, the most consumed medicinal plant species includes *Acacia modesta* Wall. with value 0.71 followed by *Triticum aestivum* L. and *Ricinus communis* L. with RCF value 0.68 and 0.65 respectively (Fig. 7).

The high values of RCF narrate the fact that these medicinal plants species are well known to the maximum number of study informants. The plants having high RCF should be further assessed phytochemically and pharmaceutically to identify their active constituents for drug discovery (Vitalini *et al.* 2013). The highest CI value was obtained for *Acacia modesta* Wall. and *Foeniculum vulgare* Mill. (69.73%) and lowest for *Equisetum arvense* L. (1.50). CI indicates a consensus on the importance of *Acacia modesta* Wall. and *Foeniculum vulgare* Mill. as an important, well known medicinal plants used in folk medicines and treat gynecological disorders in the valley.

Table 2. Medicinal plants used for gynecological diseases by the local community of the study area

Botanical Name, Family Name & Voucher Number	Local Name	Habit	Part Used	Uses	Preparation Method	Citations	IN	UR	RCF	UV	CI%
Acacia modesta Wall. (Fabaceae) BUR-01	Palosa	Tree	Gum	Tonic after delivery	Direct	2☺,3☹,4☺,10☺,14☹	371	319	0.71	0.85	69.73
Achyranthes aspera L. (Amaranthaceae) BUR-03	Geshkay	Herb	Leaves	Reduce painful during delivery	Decoction	1☺,2☹,3☹,4☹,5☹,6☺,8☺	63	49	0.12	0.78	11.84
Acorus calamus L. (Araceae) BUR-11	Skhwaja	Herb	Rhizome	Irregular menstruation	Powder	2☹,4☹,8☺	235	198	0.44	0.84	44.17
Adiantum capillus–veneris L. (Adiantaceae) BUR-13	Kohay botay	Herb	Leaves	Abnormal Stoppage of menstrual flow	Decoction	1☹,2☺	48	33	0.09	0.68	9.02
Ajuga bracteosa Wall. (Lamiaceae) BUR-05	Bhutti	Herb	Whole Plant	Amenorrhoea	Extract	2☹	158	113	0.30	0.71	29.69
Allium cepa (L.) R. Br. (Amaryllidaceae) BUR-06	Piaz	Herb	Bulb	Menstrual pain	Decoction	2☹,3☹,4☹,9☺	196	137	0.37	0.69	36.84
Amaranthus viridis L. (Amaranthaceae) BUR-35	Chalverai	Herb	Leaves	Leucorrhoea	Paste	10☺	78	42	0.14	0.53	14.66
Asparagus racemosus Willd. (Asparagaceae) BUR-58	Tendonay	Herb	Roots	To increase lactation	Powder	4☹,5☺,6☹,8☺	12	9	0.02	0.75	2.25
Bauhinia variegata L. (Fabaceae) BUR-66	Kachnar	Tree	Flowers Buds	Enhance Lactation	Powder	2☺	61	47	0.12	0.77	11.46
Boerhavia diffusa L. (Nyctaginaceae) BUR-72	Ensut	Herb	Roots	Check bleeding after delivery	Powder	1☺,4☹,5☺,6☺,7☺,8☺	28	19	0.05	0.67	5.26
Butea monosperma (Lam.) Taub. (Fabaceae) BUR-17	Palay	Tree	Seed, Root and Bark	Leucorrhoea	Extract	1☺,5☹,6☺,8☹,10☺,12☹	189	121	0.36	0.64	35.52
Calotropis procera (Aiton) Dryand. (Apocynaceae) BUR-22	Spalmay	Herb	Leaves	Leucorrhoea	Decoction	9☺,14☺	167	92	0.32	0.55	31.39
Capsella bursa-pastoris (L.) Medik. (Brassicaceae) BUR-88	Bambesa	Herb	Whole Plant	Abnormal stoppage of menses	Infusion	4☹	45	30	0.08	0.67	8.45
Citrullus colocynthis (L.) Schrad. (Cucurbitaceae) BUR-114	Kakora	Herb	Fruits	Easy delivery	Juice		235	181	0.45	0.77	44.17
Cuscuta reflexa Roxb. (Cuscutaceae) BUR-137	Maraz Botay	Herb	Whole Plant	Sterility	Decoction	1☹,2☺	36	27	0.07	0.75	6.76
Daucus carota L. (Apiaceae) BUR-148	Gazara	Herb	Seeds	Abnormal stoppage of menses	Powder	4☹,11☺	153	103	0.29	0.67	28.75
Datura stramonium L. (Solanaceae) BUR-147	Daltora	Herb	Leaves	Inflammation of breasts	Poultice	2☺,4☹	21	17	0.04	0.81	3.947

Dodonaea viscosa (L.) Jacq. (Sapindaceae) BUR-39	Ghoraskay	Shrub	Leaves	Excess menstrual flow	Decoction	4☹	23	12	0.04	0.52	4.32
Dysphania ambrosioides (L.) Mosyakin & Clemants (Amaranhaceae) BUR-105	Benakkai	Herb	Leaves	Relieve post-delivery pains and to hasten milk flow in nursing mothers	Decoction	2☹,4☺	19	14	0.03	0.73	3.57
Eclipta prostrate (L.) L./*Eclipta alba* (L.) Hassk. (Asteraceae) BUR-163	Skha Botay	Herb	Whole Plant	Prevent miscarriage	Infusion	4☹	106	67	0.20	0.63	19.92
Equisetum arvense L. (Equisetaceae) BUR-168	Bandakay	Herb	Whole Plant	Gonorrhoea	Extract		8	6	0.01	0.75	1.50
Erigeron canadensis L./Conyza *canadensis* L. (Asteraceae) BUR-126	Dhanya Botay	Herb	Whole Plant	Painful menstruation	Decoction	1☺,4☹	9	7	0.01	0.78	1.69
Euphorbia parviflora L. (Euphorbiaceae) BUR-175	Ganda Botay	Herb	Leaves	Leucorrhoea	Infusion	4☹	31	16	0.06	0.51	5.82
Ficus benghalensis L. (Moraceae) BUR-42	Burr	Tree	Latex	Sexual weakness	Direct	4☹,5☺,6☹	157	79	0.30	0.50	29.51
Ficus racemosa L./*Ficus glomerata* Roxb. (Moraceae) BUR-181	Inzar	Tree	Fruits	Menorrhagia	Direct	2☹,4☹	291	256	0.55	0.87	54.69
Ficus religiosa L. (Moraceae) BUR-44	Pepal	Tree	Bark	Leucorrhoea	Decoction	2☹,4☹,5☺,13☹	225	173	0.43	0.76	42.29
Foeniculum vulgare Mill. (Apiaceae) BUR-45	Kagu	Herb	Seeds	Menses pain/Easy food digestion	Powder	1☹,10☹,14☺	371	293	0.71	0.78	69.73
Geranium wallichianum D. Don ex Sweet (Geraniaceae) BUR-192	Sra Zelay	Herb	Roots	Tonic after delivery	Cooked	1☺,2☹,4☹,10☺	28	22	0.05	0.78	5.26
Grewia optiva Drum. Ex. Burret. (Malvaceae) BUR-198	Pastonay	Tree	Bark	Easy delivery	Extract	2☹,4☹	108	85	0.20	0.78	20.30
Justicia adhatoda L. (Acanthaceae) BUR-60	Bekar	Herb	Roots	Leucorrhoea	Paste	1☺,3☺,8☹	163	91	0.31	0.55	30.63
Lactuca serriola L. (Asteraceae) BUR-224	Kahu	Herb	Leaves	Increase milk flow	Decoction	2☹,4☹	75	52	0.14	0.69	14.09
Mallotus actinoneurus Airy Shaw/*Mallotus phillippensis* (Lam.) Muell. Arg. (Euphorbiaceae) BUR-242	Kambela	Shrub	Bark	Gonorrhoea	Paste	2☺,4☹	69	50	0.13	0.72	12.96
Melia azedarach L. (Meliaceae) BUR-62	Bakyana	Tree	Leaves	Emmenagogue	Extract	1☺,3☺,4☺,14☺	115	94	0.22	0.81	21.61
Mentha longifolia (L.) L. (Lamiaceae) BUR-258	Velanay	Herb	Leaves	Easy food digestion	Powder		307	261	0.58	0.85	57.70

Mentha spicata L. (Lamiaceae) BUR-260	Podina	Herb	Leaves	Easy delivery	Decoction	4☹	283	206	0.54	0.72	53.19
Momordica charantia L. (Cucurbitaceae) BUR-257	Karella	Herb	Roots	Induce abortion	Powder	2☹,4☹,9☺	147	98	0.28	0.67	27.63
Nasturtium officinale R.Br. (Brassicaceae) BUR-272	Talmera	Herb	Leaves	Induce temporary sterility	Cooked	2☹,4☹,10☺	83	59	0.15	0.71	15.60
Nerium oleander L (Apocynaceae) BUR-273	Ganderay	Shrub	Roots	Induce abortion at initial stage	Extract	1☹,4☹	46	25	0.08	0.54	8.64
Oxalis corniculata L. (Oxalidaceae) BUR-284	Trokay	Herb	Leaves	Avoid vomiting during early pregnancy	Direct	2☺,4☹	93	76	0.17	0.81	17.48
Papaver somniferum L. (Papaveracaea) BUR-289	Kashkash	Herb	Seeds	Tonic after delivery	Direct		327	263	0.62	0.80	61.46
Phyllanthus emblica L./*Emblica officinalis* L. (Phyllanthaceae) BUR-294	Lashora	Tree	Fruits	Leucorrhoea	Powder	5☺	304	221	0.58	0.72	57.14
Plantago ovata Forssk. (Plantaginaceae) BUR-295	Isabgul	Herb	Seeds, Husk	Gonorrhoea	Direct	2☹	291	224	0.55	0.76	54.69
Portulaca oleracea L. (Portulacaceae) BUR-317	Orkharay	Shrub	Leaves	Gonorrhoea	Cooked	2☹	178	113	0.34	0.63	33.45
Psidium guajava L. (Myrtaceae) BUR-324	Amrood	Tree	Leaves, Bark	Expulsion of placenta	Decoction	2☺,4☹,14☺	244	187	0.46	0.76	45.86
Punica granatum L. (Punicaceae) BUR-326	Anar	Tree	Flowers	Leucorrhoea	Paste	2☺,5☹,8☹,11☺,14☺	281	218	0.53	0.77	52.81
Rhododendron arboreum Sm. (Rhododendraceae) BUR-334	Gul-e-nameer	Tree	Flowers	Leucorrhoea	Powder	4☹	40	28	0.07	0.70	7.51
Ricinus communis L. (Euphorbiaceae) BUR-336	Arhand	Shrub	Seed oil	Easy Delivery	Direct	1☺,4☺,5☺,9☹,10☺,14☺	343	283	0.65	0.82	64.47
Sida cordifolia L. (Malvaceae) BUR-366	Drojakay	Herb	Seeds	Sexual weakness	Direct	4☹,5☺	17	11	0.03	0.64	3.19
Solanum americanum Mill./*Solanum nigrum* L. (Solanaceae) BUR-372	Kachmachu	Herb	Leaves	Menorrhagia	Cooked	4☹,14☺	256	183	0.49	0.71	48.12
Tagetes erecta L. (Asteraceae) BUR-384	Nacha Gulay	Herb	Roots	Irregular menstruation	Extract	2☹,4☹	30	18	0.05	0.60	5.63
Tinospora sinensis (Lour.) Merr./*Tinospora cordifolia* (Willd.) Miers (Menispermaceae) BUR-388	Gilu	Herb	Roots	Irregular menstruation	Paste	1☺,6☺,12☺	108	75	0.20	0.69	20.30

Trachyspermum ammi (L.) Sprague (Apiaceae) BUR-390	Sperkay	Herb	Seeds	Irregular menstruation	Direct	4☹,13☹	314	288	0.60	0.91	59.02
Tribulus terrestris L. (Zygophyllaceae) BUR-392	Markundai	Herb	Leaves	Gonorrhoea	Decoction	4☹,9☺,14☺	50	38	0.09	0.76	9.39
Triticum aestivum L. (Poaceae) BUR-394	Ghanam	Herb	Seeds	Tonic after delivery	Powder		360	301	0.68	0.83	67.66
Verbena officinalis L. (Verbenaceae) BUR-402	Shomakay	Shrub	Whole Plant	Prevent miscarriage	Decoction	3☺,4☹	57	41	0.11	0.71	10.71
Vitex negundo L. (Verbenaceae) BUR-81		Shrub	Roots	Regulate Menstrual cycle	Cooked	2☺	73	49	0.13	0.67	13.72
Withania somnifera (L.) Dunal. (Solanaceae) BUR-82	Kotilal	Herb	Roots	Sexual weakness	Powder	1☺,3☺,4☹,5☹,9☺, 10☺,13☺,14☺	200	146	0.38	0.73	37.59
Woodfordia fruticosa (L.) Kurz (Lythraceae) BUR-83		Shrub	Dried flowers	Leucorrhea	Powder	1☹,2☺,7☹	43	27	0.08	0.62	8.08
Zingiber officinale Roscoe (Zingiberaceae) BUR-85	Adrak	Herb	Rhizome	Wound Healer and Pain Killer after Pregnancy	Powder	2☺,8☹,9☺,10☺	184	149	0.35	0.80	34.58
Ziziphus nummularia (Burm. f.) Wight & Arn. (Rhamnaceae) BUR-427	Karkana	Shrub	Roots	Induce abortion	Powder		210	163	0.40	0.77	39.47

IN= Informants number, RCF=Relative citation frequency, UV=Use value, and CI=Consensus index
☺= Different Use and ☹= Similar Use **Citations** [1=Khan et al. (2015); 2=Shah et al. (2013); 3=Adnan et al. (2015); 4=Shinwari et al. (2017); 5=Tripathi et al. (2010); 6=Maru and Patel, (2014); 7=Behera, (2006); 8=Panda et al. (2018); 9=Sharaibi et al. (2017); 10=Aziz et al. (2018); 11=Akhter et al. (2016); 12=Vidyasagar and Prashantkumar, (2007); 13=Sarwat and Ahmad, (2012); 14=Sultana, (2006)]

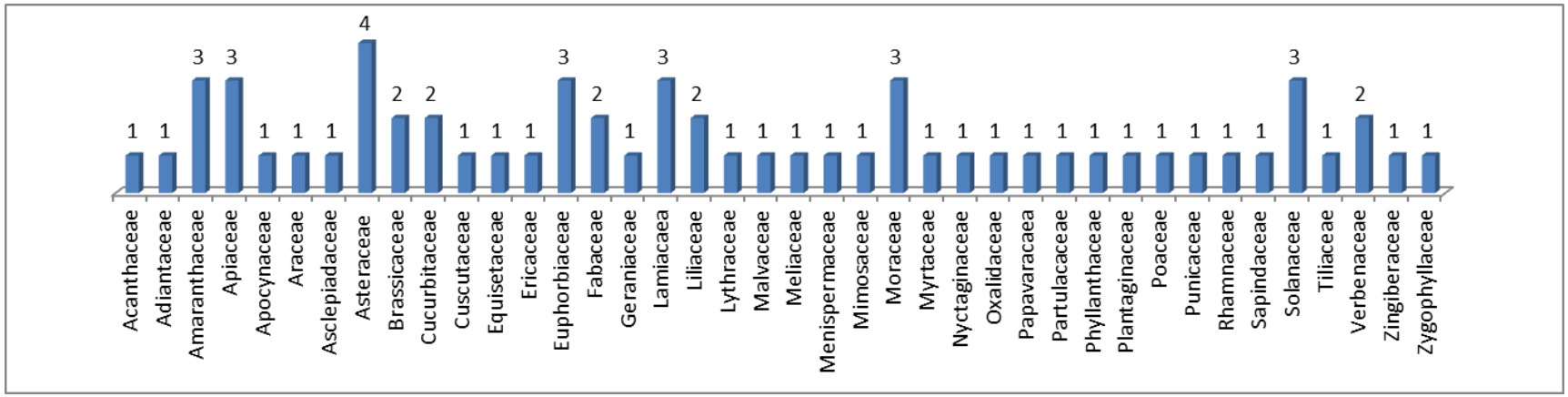

Figure 3. Number of species belonging to families reported in this study

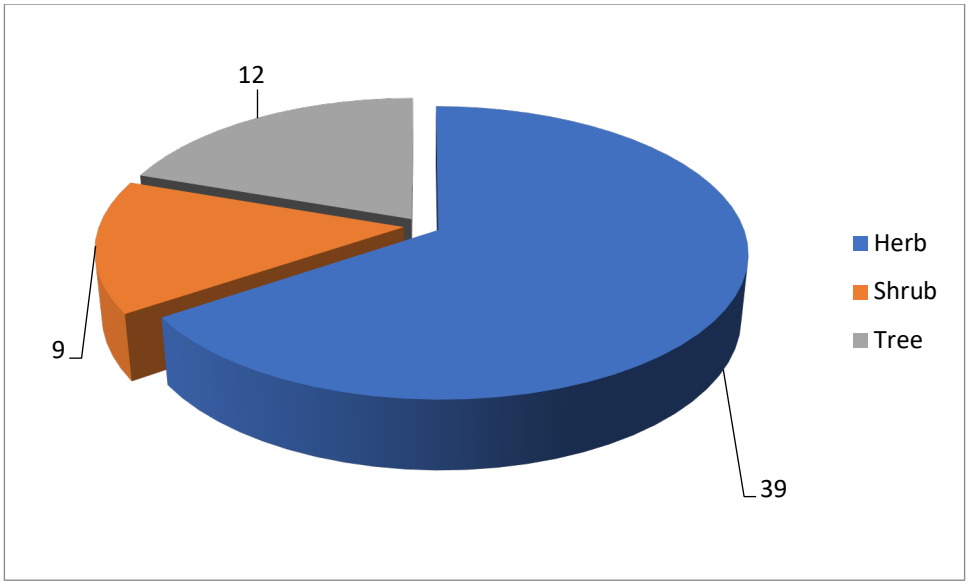

Figure 4. Number of species belonging to each life form

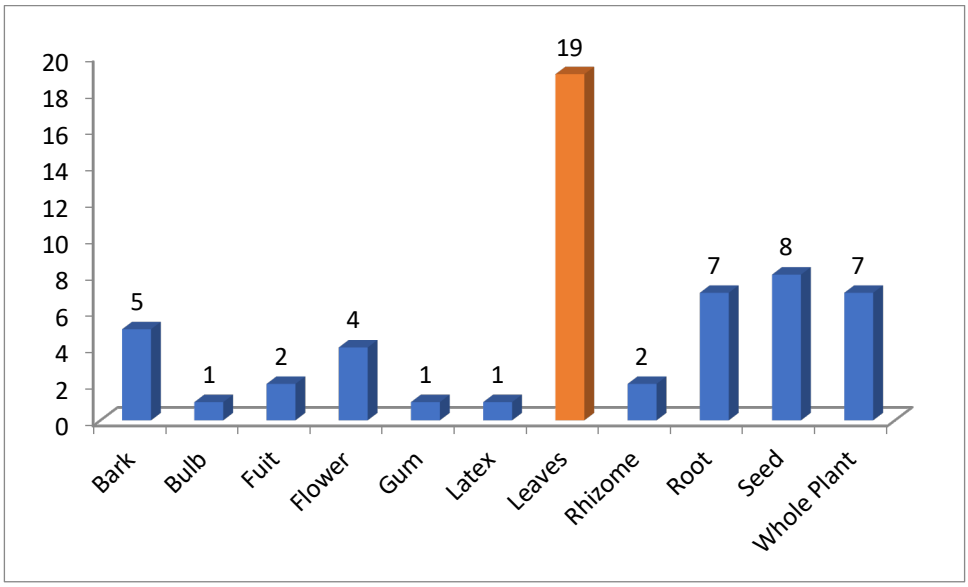

Figure 5. Parts used as medicine of medicinal plants

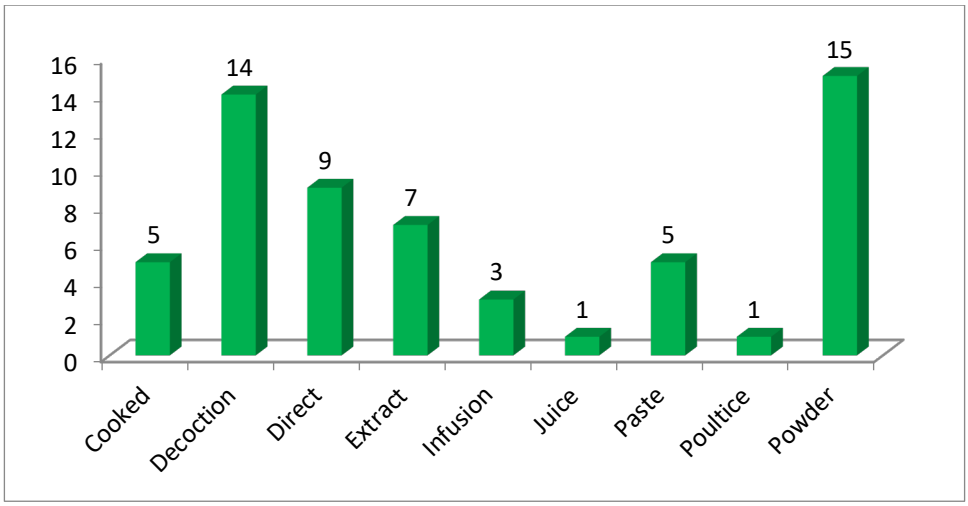

Figure 6. Mode of drug preparation

Table 3. ICF value for different diseases categories

Use Category	Nur	Nt	Nur-Nt	Nur-1	ICF
Bleeding stoppage and wound healing	192	2	190	191	0.994
Breast and Lactation	79	4	75	78	0.961
Delivery problems	383	7	376	382	0.984
Easy food digestion	386	2	384	385	0.997
Emmenagogue	115	1	114	114	1
Gonorrhoea	301	5	296	300	0.986
Induce abortion	215	3	213	214	0.995
Leucorrhoea	335	10	225	334	0.673
Menorrhagia	316	2	314	315	0.996
Menstural Problems	398	12	386	397	0.972
Prevent miscarriage	182	2	180	181	0.994
Sexual problems	219	5	214	218	0.981
Tonic	379	4	375	378	0.992
Vomiting stoppage	93	1	92	92	1

Use value (UV)

This index is used to find out the relative importance of medicinal plants in the study area. Its value ranges between 0-1. Medicinal plant with high UV has more use reports and the medicinal plant having low UV has fewer use reports. In this survey, the highest UV was calculated 0.91 for *Trachyspermum ammi* (L.) sprague and lowest UV was 0.50 for *Ficus benghalensis* L. (Table 2). Medicinal plants having low UV should not be ignored as failing to teach them to upcoming generations could raise the threat of slow vanishing of the knowledge (Ahmad *et al.* 2015). Furthermore, plants with low UV do not mean that they are not important medicinally, but it indicates that the traditional knowledge of these plants is at risk and/or less availability of the medicinal plant (Chaudhary *et al.* 2006; Mahmood *et al.* 2013). Medicinal plants for which the UV is high due to their common distribution in the study area and the local people are well familiar from their medicinal use/s (Rahman *et al.* 2016).

Informant consensus factor (ICF)

The main purpose of applying ICF was to ascertain the informants' consensus for the cure of a disease category. The value ICF explains the cultural consistency for the use of a group of therapeutic plants to cure a group of specific diseases (Henrich *et al.* 2009). During this work, a total of 14 main groups of diseases have been documented on the basis of ICF data. From the result of ICF, the highest value 1.0 was obtained for emmenagogue and vomiting and the lowest for leucorrhoea (0.67) as shown in Fig. 8.

Herbal remedies comparative analysis and novelty of the study

The ethno-gynecological data of the present study were compared with previously published national and international articles on the same topic. It was observed during comparison that some plant species have similar or different medicinal importance was previously reported while others were reported for the first time. The following species were documented for the first time to treat gynecological disorders: *Citrullus colocynthis* (L.) Schrad., *Equisetum arvense* L., *Mentha longifolia* (L.) L., *Papaver somniferum* L., *Triticum aestivum* L., and *Ziziphus nummularia* (Burm. f.) Wight & Arn. (Table 2).

There are numerous ethnomedicinal works that have shared similarities about the traditional practices of medicinal plants for the cure of different diseases from all over the world (Rehman *et al.* 2017). Our study adds some new medicinal plants and their uses which may serve for pharmacological and phytochemical analysis for the discovery of new drugs.

Relevance for public health or environmental issues

The results of this study clearly show that the local community was still giving serious consideration to the herbal treatment of gynecological disorders. The interaction of rural and remote populations with urban society due to rapid economic and technological development like over the world has however brought socio-cultural and ecological changes. This change also leads to the reduction of local traditional knowledge about the uses of plants for various diseases, which is also shown by the result of this study. The local community has no proper knowledge/skills about the plants' sustainable use, collection, and proper processing, wasting a large number of medicinal plants, which results in the decrease of valuable medicinal flora. Therefore, we suggested training the indigenous population to use indigenous medicinal plants sustainably.

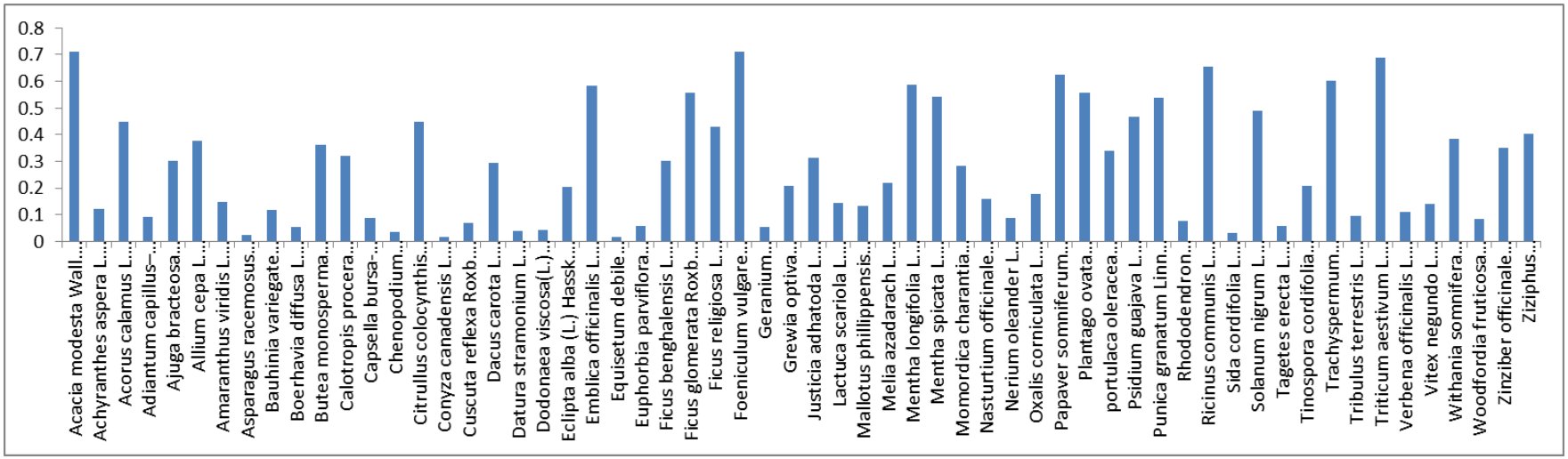

Figure 7. Relative citation frequency of each medicinal plant species

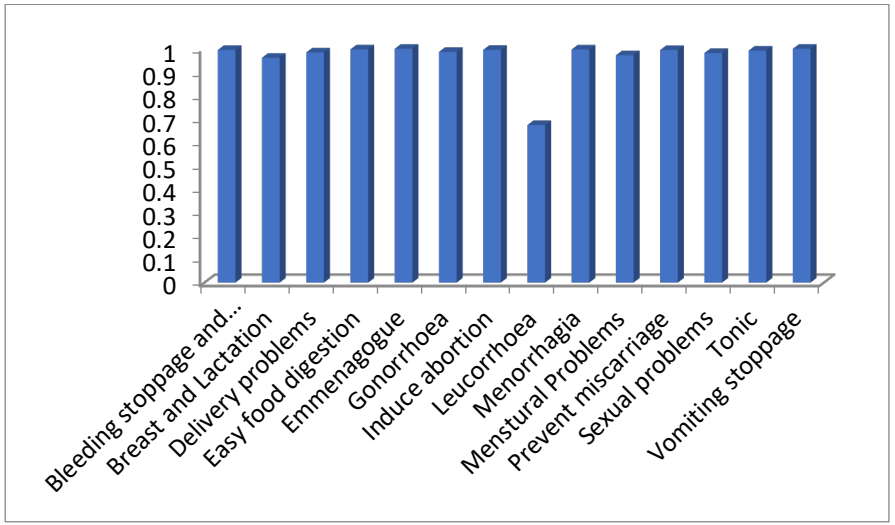

Figure 8. ICF value of different diseases categories

Conclusions

The ethnobotanical results of this study clearly demonstrate that the traditional knowledge of medicinal plants is mainly the asset of elders. Sixty plant species used to cure gynecological diseases were documented. The result clearly indicated that the most prominent family was *Asteraceae*. The plant part which was commonly used to cure gynecological disorders was leaves. The comparative analysis with the previously published works showed similarities with our data. The highest RCF value was obtained for *Acacia modesta* Wall. 0.71.

The highest UV was calculated 0.91 for *Trachyspermum ammi* (L.) sprague and lowest UV was 0.50 for *Ficus benghalensis* L. The highest ICF value 1.0 was obtained for emmenagogue and vomiting and the lowest for leucorrhoea (0.67). The results clearly indicate a real risk of progressive loss of traditional knowledge. In this study some plants are reported for the first time for their ethnomedicinal use; they should be assessed for the phytochemical and pharmacological activities. Further research on conservation strategies needs to be conducted to contribute to the sustainable development of herbal medicines in the study area.

Declarations

Ethics approval: This ethnomedicinal study was approved by the ethical committees of the Department of Botany, of the University and Herbarium, Department of Botany Islamia College Peshawar, Pakistan and Biodiversity Action Plan (BAP-2010-2020) for Pakistan. Before conducting interviews, individual prior informed consent was obtained from all participants. No further ethics approval was required. All work conducted was carried out under the stipulations of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. The right to use and authorship of any traditional knowledge of all participants is maintained, and any use of this information, other than for scientific publication, does require the additional prior consent of the traditional owners, as well as a consensus on access to benefits resulting from subsequent use.

Consent for publication: Not applicable – no personal data are included in this manuscript.

Conflict of interests: The authors declare that they have no competing interests.

Availability of data and materials: The raw data without names of participants are available from the authors.

Funding: This study has not received funding.

Author's contributions: SJ and HAJ designed and supervised the study; HAJ, SW, and LA conducted the fieldwork, HAJ, and NA conducted the main statistical analysis and wrote the manuscript, RB and HAJ revised the data analysis and the manuscript; all authors read, corrected and approved the manuscript.

Acknowledgments

The authors are thankful to Islamia College Peshawar, Pakistan and the Higher Education Commission (HEC), Pakistan. We are thankful to the local communities of the study area for participating in the field survey and providing valuable information. We are also thankful to all others who helped us in this research.

Literature cited

Abbasi AM, Khan, MA, Khan N, Shah MH. 2013. Ethnobotanical survey of medicinally important wild edible fruits species used by tribal communities of Lesser Himalayas-Pakistan. Journal of Ethnopharmacology 148(2):528-536.

Acharya E, Pokhrel B. 2006. Ethno-medicinal plants used by Bantar of Bhaudaha, Morang, Nepal. Our Nature 4(1):96-103.

Adnan M, Begum S, Khan AL, Tareen AM, Lee IJ. 2012. Medicinal plants and their uses in selected temperate zones of Pakistani Hindukush-Himalaya. Journal of Medicinal Plants Research 6(24):4113-4127.

Adnan M, Tariq A, Mussarat S, Begum S, Abd El salam NM, Ullah R. 2015. Ethnogynaecological assessment of medicinal plants in Pashtun's Tribal Society. BioMed Research International doi.org/10.1155/2015/196475

Adnan M, Ullah I, Tariq A, Murad W, Azizullah A, Khan AL, Ali N. 2014. Ethnomedicine use in the war affected region of northwest Pakistan. Journal of Ethnobiology and Ethnomedicine 10(1):16.

Ahmad K, Pieroni A. 2016. Folk knowledge of wild food plants among the tribal communities of Thakht-e-Sulaiman Hills, North-West Pakistan. Journal of Ethnobiology and Ethnomedicine 12(1):17.

Ahmad KS, Hamid A, Nawaz F, Hameed M, Ahmad F, Deng J, Mahroof S. 2017. Ethnopharmacological studies of indigenous plants in Kel village, Neelum Valley, Azad Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 13(1):68.

Ahmad L, Semotiuk A, Zafar M, Ahmad M, Sultana S, Liu QR, Yaseen G. 2015. Ethnopharmacological documentation of medicinal plants used for hypertension among the local communities of DIR

Lower, Pakistan. Journal of Ethnopharmacology 175:138-146.

Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, Zafar M, Yaseen G. 2014. An Ethnobotanical study of Medicinal Plants in high mountainous region of Chail valley (District Swat-Pakistan). Journal of Ethnobiology and Ethnomedicine 10(1):36.

Akhtar N, Rashid A, Murad W, Bergmeier E. 2013. Diversity and use of ethno-medicinal plants in the region of Swat, North Pakistan. Journal of Ethnobiology and Ethnomedicine 9(1):25.

Akhter N, Akhtar S, Kazim S, Khan T. 2016. Ethnomedicinal study of important medicinal plants used for gynecological issues among rural women folk in district Gilgit. Nature and Science 14:30-34.

Alam N, Shinwari ZK, Ilyas M, Ullah Z. 2011. Indigenous knowledge of medicinal plants of Chagharzai valley, District Buner, Pakistan. Pakistan Journal of Botany 43(2):773-780.

Ali S, Perveen M, Qaiser M. 2015. Vegetation structure, edaphalogy and ethnobotany of Mahaban and Malka (district Buner) KPK, Pakistan. Pakistan Journal of Botany 47:15-22.

Anderson EN. 2011. Ethnobiology: overview of a growing field. Ethnobiology, edited by EN Anderson, DM Pearsall, ES Hunn, and NJ Turner, 1-14.

Awas T, Demissew S. 2009. Ethnobotanical study of medicinal plants in Kafficho people, southwestern Ethiopia. In Proceedings of the 16th International Conference of Ethiopian Studies (Vol. 3, pp. 711-726). Trondheim, Norway: NTNU-Trykk Press.

Ayantunde AA, Briejer M, Hiernaux P, Udo HM, Tabo R. 2008. Botanical knowledge and its differentiation by age, gender and ethnicity in Southwestern Niger. Human Ecology 36(6):881-889.

Ayyanar M, Ignacimuthu S. 2005. Medicinal plants used by the tribals of Tirunelveli hills, Tamil Nadu to treat poisonous bites and skin diseases. Indian Journal of Traditional Knowledge 4(3):229-236.

Aziz MA, Khan AH, Ullah H, Adnan M, Hashem A, Abd Allah EF. 2018. Traditional phytomedicines for gynecological problems used by tribal communities of Mohmand Agency near the Pak-Afghan border area. Revista Brasileira de Farmacognosia 28(4):503-511.

Balick MJ, Kronenberg F, Ososki AL, Reiff M, Fugh-Berman A, Roble M, Atha D. 2000. Medicinal plants used by Latino healers for women's health conditions in New York City. Economic Botany 54(3):344-357.

Bano A, Ahmad M, Hadda TB, Saboor A, Sultana S, Zafar M, Ashraf MA. 2014. Quantitative ethnomedicinal study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan. Journal of Ethnobiology and Ethnomedicine 10(1):43.

Barkatullah IM, Rauf A, Hadda TB, Mubarak MS, Patel S. 2015. Quantitative ethnobotanical survey of medicinal flora thriving in Malkand Pass Hills, Khyber PakhtunKhwa Pakistan. Journal of Ethnopharmacology. 169:335-346.

Behera KK. 2006. Plants used for gynecological disorders by tribals of Mayurbhanj district, Orissa, India. Ethnobotanical Leaflets 1:15.

Benkhnigue O, Zidane L, Fadli M, Elyacoubi H, Rochdi A, Douira A. (2010). Ethnobotanical study of medicinal plants in the Mechraâ Bel Ksiri region of Morocco. Acta Botanica Barcinonensia (53):191-216.

Bhat JA, Kumar M, Bussmann RW. 2013. Ecological status and traditional knowledge of medicinal plants in Kedarnath Wildlife Sanctuary of Garhwal Himalaya, India. Journal of Ethnobiology and Ethnomedicine 9(1):1.

Bhatia H, Sharma YP, Manhas RK, Kumar K. 2014. Ethnomedicinal plants used by the villagers of district Udhampur, J&K, India. Journal of Ethnopharmacology 151(2):1005-1018.

Bishaw M. 1990. Attitudes of modern and traditional medical practitioners toward cooperation. Ethiopian Medical Journal 28(2):63-72.

Butt MA, Ahmad M, Fatima A, Sultana S, Zafar M, Yaseen G, Kayani S. 2015. Ethnomedicinal uses of plants for the treatment of snake and scorpion bite in Northern Pakistan. Journal of Ethnopharmacology 168:164-181.

Cakilcioglu U, Turkoglu I. 2010. An ethnobotanical survey of medicinal plants in Sivrice (Elazığ-Turkey). Journal of Ethnopharmacology 132(1):165-175.

Chaudhary MI, He Q, Cheng YY, Xiao PG. 2006. Ethnobotany of medicinal plants from tian mu Shan biosphere reserve, Zhejiang-province, China. Asian Journal of Plant Sciences 5(4):646-53.

Cornara L, La Rocca A, Marsili S, Mariotti MG. 2009. Traditional uses of plants in the Eastern Riviera (Liguria, Italy). Journal of Ethnopharmacology 125(1):16-30.

Cotton CM, Wilkie P. 1996. Ethnobotany: principles and applications (No. Sirsi) i9780471955375). Chichester: John Wiley & Sons.

Dash K, Satapathy CS. 2016. Ethno medicinal uses of plants related to gynecological problem among the Mundas of Jajpur district of Odisha. Journal of Medicinal Plants 4(6):248-251.

de Albuquerque UP, Hanazaki N. 2009. Five problems in current ethnobotanical research—and some suggestions for strengthening them. Human Ecology 37(5):653-661.

dos Santos LL, Vieira FJ, de Sousa Nascimento LG, da Silva ACO, dos Santos LL, de Sousa GM. 2014. Techniques for collecting and processing plant material and their application in ethnobotany research. In Methods and Techniques in Ethnobiology and Ethnoecology (pp. 161-173). Humana Press, New York, NY.

Fajardo J, Verde A, Rivera D, Obón C. 2000. Las plantas en la cultura popular de la provincia de Albacete. Instituto de Estudios Albacetenses Don Juan Manuel.

Gedif T, Hahn HJ. 2003. The use of medicinal plants in self-care in rural central Ethiopia. Journal of Ethnopharmacology 87(2-3):155-161.

Ghorbani A. 2005. Studies on pharmaceutical ethnobotany in the region of Turkmen Sahra, north of Iran:(Part 1): General results. Journal of Ethnopharmacology 102(1):58-68.

Giday M, Asfaw Z, Elmqvist T, Woldu Z. 2003. An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. Journal of Ethnopharmacology 85(1):43-52.

Giday M, Asfaw Z, Woldu Z. 2009. Medicinal plants of the Meinit ethnic group of Ethiopia: an ethnobotanical study. Journal of Ethnopharmacology 124(3):513-521.

Gurib-Fakim A. 2006. Medicinal plants: traditions of yesterday and drugs of tomorrow. Molecular aspects of Medicine 27(1):1-93.

Heinrich M, Sarah E, Daniel EM, Marco L. 2009. Ethnopharmacological field studies: a critical assessment of their conceptual basis and methods. Journal of Ethnopharmacology 124(1):1-17.

Höft M, Barik SK, Lykke AM. 1999. Quantitative ethnobotany. Applications of multivariate and statistical analyses in ethnobotany, People and Plants working paper 6:1-49.

Howard PL. 2003. Women and the plant world: an exploration. Women & Plants. Gender Relations in Biodiversity Management & Conservation.-London (Zed Books), 1-48.

http://kpktribune.com

http://paiman.jsi.com/Resources/Docs/district-health-profile-buner

http://www.pbs.gov.pk

http://www.pdf.usaid.gov

http://www.theplantlist.org

http://www.tropicos.org/project/pakistan

Ijaz F, Iqbal Z, Rahman IU, Alam J, Khan SM, Shah GM, Afzal A. 2016. Investigation of traditional medicinal floral knowledge of Sarban Hills, Abbottabad, KP, Pakistan. Journal of Ethnopharmacology 179:208-233.

Islam MK, Saha S, Mahmud I, Mohamad K, Awang K, Uddin SJ, Shilpi JA. 2014. An ethnobotanical study of medicinal plants used by tribal and native people of Madhupur forest area, Bangladesh. Journal of Ethnopharmacology 151(2):921-930.

Jan HA, Wali S, Ahmad L, Jan S, Ahmad, N, Ullah N. 2017. Ethnomedicinal survey of medicinal plants of Chinglai valley, Buner district, Pakistan. European Journal of Integrative Medicine 13:64-74.

Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf MA, Yaseen G. 2014. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies–Abbottabad, Northern Pakistan. Journal of Ethnopharmacology 156:47-60.

Khan RU, Mehmood S, Muhammad A, Mussarat S, Khan SU. 2015. Medicinal plants from Flora of Bannu used traditionally by North West Pakistan's women to cure gynecological disorders. American-Eurasian Journal of Agricultural and Environmental Sciences 15:553-559.

Lulekal E, Asfaw Z, Kelbessa E, Van Damme P. 2013. Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. Journal of Ethnobiology and Ethnomedicine 9(1):63.

Mahmood A, Mahmood A, Malik RN, Shinwari ZK. 2013. Indigenous knowledge of medicinal plants from Gujranwala district, Pakistan. Journal of ethnopharmacology 148(2):714-723.

Martin G. 1995. Ethnobotany: a methods manual, Chapmany Hall. Nowy Jork.

Martin GJ. 2004. Ethnobotany; A methods manual: WWF and IIED. Earth Scans, Camden, London.

Maru R, Patel R. 2014. Certain ethno-medicinal plants used to treat gynecological disorders by tribal people of Jhalodtaluka of Dahod District Gujrat India. Life Sciences Leaflets 58:26.

Mehdioui R, Kahouadji A. 2007. Etude ethnobotanique auprès de la population riveraine de la forêt d'Amsittène: cas de la Commune d'Imi n'Tlit (Province d'Essaouira). Bulletin de l'Institut scientifique, Rabat, section Sciences de la vie 29:11-20.

Mesfin F, Demissew S, Teklehaymanot T. 2009. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. Journal of Ethnobiology and Ethnomedicine 5(1):28.

Motti R, Motti P. 2017. An ethnobotanical survey of useful plants in the agro Nocerino Sarnese (Campania, southern Italy). Human Ecology 45(6):865-878.

Mukherjee PK, Maiti K, Mukherjee K, Houghton PJ. 2006. Leads from Indian medicinal plants with hypoglycemic potentials. Journal of Ethnopharmacology 106(1):1-28.

Panda T, Mishra N, Rahimuddin S, Pradhan BK, Rout SD, Mohanty RB. 2018. Folk medicine used for the treatment of gynaecological disorders in rural areas of Bhadrak district, Odisha, India. Botanica 24(2):132-142.

Pieroni A, Quave CL. 2005. Traditional pharmacopoeias and medicines among Albanians and Italians in southern Italy: a comparison. Journal of Ethnopharmacology 101(1-3):258-270.

Qureshi RA, Ghufran MA. 2005. Medicinal value of some important roses and allied species of Northeren Area of Pakistan. Pakistan Rose Annual 24-29.

Rahman AHMM. 2014. Ethno-gynecological study of traditional medicinal plants used by Santals of Joypurhat district, Bangladesh. Biomedicine and Biotechnology 2(1):10-13.

Rahman IU, Ijaz F, Iqbal Z, Afzal A, Ali N, Afzal M, Asif M. 2016. A novel survey of the ethno medicinal knowledge of dental problems in Manoor Valley (Northern Himalaya), Pakistan. Journal of Ethnopharmacology 194:877-894.

Rehman MN, Ahmad M, Sultana S, Zafar M, Edwards S. 2017. Relative popularity level of medicinal plants in Talagang, Punjab Province, Pakistan. Revista Brasileira de Farmacognosia 27(6):751-775.

Sadeghi Z, Mahmood A. 2014. Ethno-gynecological knowledge of medicinal plants used by Baluch tribes, southeast of Baluchistan, Iran. Revista Brasileira de Farmacognosia 24(6):706-715.

Sargin SA. 2015. Ethnobotanical survey of medicinal plants in Bozyazı district of Mersin, Turkey. Journal of Ethnopharmacology 173:105-126.

Sarwat SZ, Ahmad N. 2012. Screening of potential medicinal plants from district sawat specific for controlling women diseases. Pakistan Journal of Botany 44(4):1193-8.

Shah GM, Abbasi AM, Khan N, Guo X, Khan MA, Hussain M, Tahir AA. 2014. Traditional uses of medicinal plants against malarial disease by the tribal communities of Lesser Himalayas–Pakistan. Journal of Ethnopharmacology 155(1):450-462.

Shah GM, Jamal Z, Hussain M. 2013. Phytotherapy among the rural women of district Abbotabad. Pakistan Journal of Botany 45:253-61.

Shah SA, Shah NA, Ullah S, Alam MM, Badshah H, Ullah S, Mumtaz AS. 2016. Documenting the indigenous knowledge on medicinal flora from communities residing near Swat River (Suvastu) and in high mountainous areas in Swat-Pakistan. Journal of Ethnopharmacology 182:67-79.

Sharaibi OJ, Adeogun DA, Abati OT. 2017. Ethno-gynaeacological knowledge and preliminary phytochemical screenings of medicinal plants used in Lagos State, Nigeria. International Journal of Medicinal Plants and Natural Products. 3:6-18.

Shedayi AA, Gulshan B. 2012. Ethnomedicinal uses of plant resources in Gilgit-Baltistan of Pakistan. Journal of Medicinal Plants Research 6(29):4540-4549.

Shinwari S, Ahmad M, Zhang G, Jahan S, Sultana S. 2017. Medicinal plant diversity for gynecological disorders among the rural communities of northern Pakistan. Pakistan Journal of Botany 49(5):1787-1799.

Shrestha PM, Dhillion SS. 2003. Medicinal plant diversity and use in the highlands of Dolakha district, Nepal. Journal of Ethnopharmacology 86(1):81-96.

Siddiqui MB, Alam MM, Husain W, Sharma GK. 1988. Ethno-medical study of plants used for terminating pregnancy. Fitoterapia.59(3):250-252.

Sonibare M.A, Abegunde RB. 2012. Ethnobotanical study of medicinal plants used by the Laniba village people in South Western Nigeria. African Journal of Pharmacy and Pharmacology 6(24):1726-1732.

Sultana S. 2006. Indigenous knowledge of folk herbal medicines by the women of district Chakwal, Pakistan. Ethnobotanical Leaflets 1:26.

Tardío J, Pardo-de-Santayana M. 2008. Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic Botany 62:24-39.

Teklehaymanot T, Giday M, Medhin G, Mekonnen Y. 2007. Knowledge and use of medicinal plants by

people around Debre Libanos monastery in Ethiopia. Journal of Ethnopharmacology 111(2):271-283.

Telefo PB, Lienou LL, Yemele MD, Lemfack MC, Mouokeu C, Goka CS, Moundipa FP. 2011. Ethnopharmacological survey of plants used for the treatment of female infertility in Baham, Cameroon. Journal of Ethnopharmacology 136(1):178-187.

Thomas B, Mathews RP, Rajendran A, Kumar KP. 2013. Ethnobotanical observations on tribe Arnatans of Nilambur Forest, Western Ghats region of Kerala, India. Research in Plant Biology 3(2):12-17.

Tripathi R, Dwivedi SN, Dwivedi S. 2010. Ethno-medicinal plants used to treat gynecological disorders by tribal people of Madhya Pradesh, India. International Journal of Pharmacy and Life Sciences 1(3):160-169.

Umair M, Altaf M, Abbasi AM. 2017. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. PloS one 12(6):e0177912.

Uniyal SK, Singh KN, Jamwal P, Lal B. 2006. Traditional use of medicinal plants among the tribal communities of Chhota Bhangal, Western Himalaya. Journal of Ethnobiology and Ethnomedicine 2(1):14.

Verpoorte R, Contin A, Memelink J. 2002. Biotechnology for the production of plant secondary metabolites. Phytochemistry Reviews 1(1):13-25.

Vidyasagar GM, Prashantkumar P. 2007. Traditional herbal remedies for gynecological disorders in women of Bidar district, Karnataka, India. Fitoterapia 78(1):48-51.

Vitalini S, Iriti M, Puricelli C, Ciuchi D, Segale A, Fico G. 2013. Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, Italy) – an alpine ethnobotanical study. Journal of Ethnopharmacology 145:517-529.

Voeks RA. 2007. Are women reservoirs of traditional plant knowledge? Gender, ethnobotany and globalization in northeast Brazil. Singapore Journal of Tropical Geography 28(1):7-20.

Wali S, Jan HA, Bussmann WR. 2019. Quantitative ethnomedicinal study of indigenous medicinal plants used for digestive disorders of Laspur Valley, Chitral, Northern Pakistan. Ethnobotany Research and Applications 18(32):1-18.

Wester L, Yongvanit S. 1995. Biological diversity and community lore in northeastern Thailand. Journal of Ethnobiology 15:71-88.