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

Correspondence

Hammad Ahmad Jan1, Samin Jan1, Rainer W. Bussmann2, Latif Ahmad3, Sher Wali1, Nadeem Ahmad2

1Department of Botany, Islamia College Peshawar, Pakistan
2Department of Ethnobotany, Institute of Botany, Ilia State University, Tbilisi, Georgia
3Department of Botany, Shaheed Benazir Bhutto University, Sheringal, Dir Upper, Pakistan
4Department of Botany, University of Peshawar, Pakistan

*Corresponding Author: hajmughul@yahoo.com

Ethnobotany Research & Applications

19:26 (2020)
Ethnobotany Research and Applications

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 Ghufrran, 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 lifestyle, and living, and many synthetic drugs are analogs synthesized on prototype compounds isolated from plants (Sadeghi and Mahmood, 2014).

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 m in Totalai to 2911 m on Dosara Peak. The district climate varies with altitude and can be categorized as dry subtropical areas (Ali et al. 2015). The area no re search 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°9′-34°43′N and 72°10′-72°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 km² 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 this study, we tried to find answers for the following questions about the medicinal plants used to cure 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.
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 (Gadzai 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*), 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.

![Study area map showing location of plants collection](image)

**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; (i) informant name, residence place, gender, education level, age and job. (ii) 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;
Informants participating in the study. The use of the species and \( N \) is the total number of informants. The following formula was used:

\[
ICF = \frac{N_{ir} - N_t}{N_{ir} - 1}
\]

Where \( N_{ir} \) is Citations’ number of each category and \( N_t \) is Species’ number of each category (Heinrich et al. 2009).

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          |            |

Informants' demographic characteristics

During the fieldwork, a total of 283 men including 43 herbalists (Hakims), and 249 women including 70 female herbalists (Dayihas) 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).

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.

\[
UV = \sum \frac{U_i}{N_i}
\]

Where \( U_i \) is the number of use reports cited by each informant for the particular medicinal plant and \( N_i \) is the total number of informants interviewed for that particular medicinal plant.

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:

\[
RCF = \frac{FC}{N}
\]

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.
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; Teklehaimanot 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 Dhillon, 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 pharmacologically 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.
| 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| Bambesa    | 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         | Kakora     | Herb  | Rhizome   | Irregular menstruation | Powder 2,4,6,8 | 235      | 198| 0.44| 0.84| 44.17 |
| Adiantum capillus-veneris L. (Adiantaceae) BUR-13 | Spalmay | Herb  | Leaves    | Abnormal Stoppage of menstrual flow | Decoction 1,2 | 48       | 33 | 0.09| 0.68| 9.02  |
| Ajuga bracteosa Wall. (Lamiaceae) BUR-05   | Palay      | Tree  | Seed, Root and Bark | Leucorrhoea | Paste 10 | 78       | 42 | 0.14| 0.53| 14.66 |
| Allium cepa (L.) R. Br. (Amaryllidaceae) BUR-06 | Bambesa    | Herb  | Whole Plant | Amenorrhoea | Extract 2 | 158      | 113| 0.30| 0.71| 29.69 |
| Amaranthus viridis L. (Amaranthaceae) BUR-35 | Kakora     | Herb  | Leaves    | Leucorrhoea | Decoction 2,3,4,5,6,10,12 | 189      | 121| 0.36| 0.64| 35.52 |
| Asparagus racemosus Wild. (Asparagaceae) BUR-58 | Bambesa    | Herb  | Whole Plant | Abnormal stoppage of menses | Infusion 4 | 45       | 30 | 0.08| 0.67| 8.45  |
| Bauhinia variegata L. (Fabaceae) BUR-06    | Kakora     | Herb  | Fruits    | Easy delivery | Juice 235 | 181 | 0.45| 0.77| 44.17 |
| Boerhavia diffusa L. (Nyctaginaceae) BUR-72 | Maraz Botay | Herb  | Whole Plant | Sterility | Decoction 1,2 | 36       | 27 | 0.07| 0.75| 6.76  |
| Butea monosperma (Lam.) Taub. (Fabaceae) BUR-17 | Palay      | Tree  | Flowers   | Enhance Lactation | Powder 2 | 61       | 47 | 0.12| 0.77| 11.46 |
| Calotropis procera (Alton) Dryand. (Amaranthaceae) BUR-22 | Spalmay    | Herb  | Roots     | To increase lactation | Powder 4,5,6,8 | 12       | 9  | 0.02| 0.75| 2.25  |
| Capsella bursa-pastoris (L.) Medik. (Brassicaceae) BUR-88 | Gazara    | Herb  | Whole Plant | Leucorrhoea | Extract 1,5,6,8,10,12 | 189      | 121| 0.36| 0.64| 35.52 |
| Citrullus colocynthis (L.) Schrad. (Cucurbitaceae) BUR-114 | Kakora     | Herb  | Fruits    | Abnormal stoppage of menses | Infusion 4 | 45       | 30 | 0.08| 0.67| 8.45  |
| Cuscuta reflexa Roxb. (Cuscutaceae) BUR-137 | Maraz Botay | Herb  | Whole Plant | Leucorrhoea | Decoction 1,3,4,5,6,7,8 | 189      | 121| 0.36| 0.64| 35.52 |
| Daucus carota L. (Apiaceae ) BUR-148        | Gazara     | Herb  | Seeds     | Abnormal stoppage of menses | Powder 4,5,6,12 | 153      | 103| 0.29| 0.67| 28.75 |
| Datura stramonium L. (Solanaceae) BUR-147   | Daltora    | Herb  | Leaves    | Inflammation of breasts | Poultice 2,3,4 | 21       | 17 | 0.04| 0.81| 3.947 |
| Plant Name                                      | Family          | Use                                                                 | Part                  | Dose     | Efficacy | 1000 | 10000 | 100000 |
|------------------------------------------------|-----------------|---------------------------------------------------------------------|-----------------------|----------|----------|------|-------|--------|
| 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 (Amaranthaceae) | BUR-105     | Benakkai Herb Leaves Relieve post-delivery pains and to hasten milk flow in nursing mothers Decoction | 2 19 | 4 | 0.03 | 0.73 | 3.57 |
| Eclipta prostrata (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                       | 2 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 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 | 4 157 | 79 | 0.30 | 0.50 | 29.51 |
| Ficus racemosa L./Ficus glomerata Roxb. (Moraceae) | BUR-181 | Inzark Tree Fruits Menorrhagia Direct | 2 291 | 256 | 0.55 | 0.87 | 54.69 |
| Ficus religiosa L. (Moraceae)                 | BUR-44         | Pepal Tree Bark Leucorrhoea Decoction | 2 225 | 173 | 0.43 | 0.76 | 42.29 |
| Foeniculum vulgare Mill. (Apiaceae)           | BUR-45         | Kagu Herb Seeds Menses pain/Easy food digestion Powder | 1 371 | 293 | 0.71 | 0.78 | 69.73 |
| Geranium wallichianum D. Don ex Sweet (Geraniaceae) | BUR-192 | Sra Zelaiy Herb Roots Tonic after delivery Cooked | 1 28 | 22 | 0.05 | 0.78 | 5.26 |
| Grewia optiva Drum. Ex. Burret. (Malvaceae)   | BUR-198        | Pastonay Tree Bark Easy delivery Extract | 2 108 | 85 | 0.20 | 0.78 | 20.30 |
| Justicia adhatoda L. (Acanthaceae)            | BUR-60         | Bekar Herb Roots Leucorrhoea Paste | 1 163 | 91 | 0.31 | 0.55 | 30.63 |
| Lactuca serriola L. (Asteraceae)              | BUR-224        | Kahu Herb Leaves Increase milk flow Decoction | 2 75 | 52 | 0.14 | 0.69 | 14.09 |
| Mallotus actinoneurus Airy Shaw/Mallotus philippensis (Lam.) | BUR-242   | Kambela Shrub Bark Gonorrhoea Paste | 2 69 | 50 | 0.13 | 0.72 | 12.96 |
| Melia azedarach L. (Meliaceae)                | BUR-62         | Bakyana Tree Leaves Emmenagogue Extract | 1 115 | 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 |
| Plant Name                                      | Part/Use            | Species      | Active Ingredient                          | Preparation | Strength (%) | Frequency (%) |
|------------------------------------------------|---------------------|--------------|--------------------------------------------|-------------|--------------|---------------|
| **Mentha spicata L. (Lamiaceae)** BUR-260    | Leaves              | Podina       | Easy delivery                              | Decoction   | 283          | 0.54          |
| **Momordica charantia L. (Cucurbitaceae)** BUR-257 | Roots               | Karella      | Induce abortion                            | Powder      | 147          | 0.28          |
| **Nasturtium officinale R.Br.** (Brassicaceae) BUR-272 | Leaves             | Talmera      | Induce temporary sterility                 | Cooked      | 83           | 0.15          |
| **Nerium oleander L. (Apocynaceae)** BUR-273  | Roots               | Ganderay     | Induce abortion at initial stage           | Extract     | 46           | 0.08          |
| **Oxalis corniculata L. (Oxalidaceae)** BUR-284 | Leaves              | Trokay       | Avoid vomiting during early pregnancy      | Direct      | 283          | 0.17          |
| **Papaver somniferum L. (Papaveraceae)** BUR-289 | Seeds               | Kashkash     | Tonic after delivery                       | Direct      | 327          | 0.62          |
| **Phyllanthus emblica L./Emblica officinalis L.** (Phyllanthaceae) BUR-294 | Fruits             | Lashora      | Leucorrhoea                                | Powder      | 304          | 0.58          |
| **Plantago ovata Forssk.** (Plantaginaceae) BUR-295 | Seeds, Husk         | Isabgul      | Gonorrhoea                                 | Direct      | 291          | 0.76          |
| **Portulaca oleracea L.** (Portulacaceae) BUR-317 | Leaves              | Orkharay     | Gonorrhoea                                 | Cooked      | 178          | 0.34          |
| **Psidium guajava L.** (Myrtaceae) BUR-324   | Flowers, Bark       | Amrood       | Expulsion of placenta                      | Decoction   | 244          | 0.46          |
| **Punica granatum L.** (Punicaceae) BUR-326   | Flowers             | Anar         | Leucorrhoea                                | Paste       | 281          | 0.53          |
| **Rhododendron arboreum Sm.** (Rhododendraceae) BUR-334 | Flowers            | Gul-e-nameer | Leucorrhoea                                | Powder      | 40           | 0.07          |
| **Ricinus communis L.** (Euphorbiaceae) BUR-336 | Seed oil            | Arhand       | Easy Delivery                              | Direct      | 343          | 0.65          |
| **Sida cordifolia L.** (Malvaceae) BUR-366    | Seeds               | Drojakay     | Sexual weakness                            | Direct      | 17           | 0.03          |
| **Solanum americanum Mill./Solanum nigrum L.** (Solanaceae) BUR-372 | Leaves             | Kachmachu    | Menorrhagia                                | Cooked      | 256          | 0.49          |
| **Tagetes erecta L.** (Asteraceae) BUR-384    | Roots               | Nacha Gulay  | Irregular menstruation                     | Extract     | 30           | 0.05          |
| **Tinospora sinensis (Lour.) Merr./Tinospora cordifolia (Wild.) Miers** (Menispermaceae) BUR-388 | Roots               | Gilu         | Irregular menstruation                     | Paste       | 108          | 0.20          |
| Plant Name                        | Part Used        | Reported Use                  | Informant Number (IN) | Relative Citation Frequency (RCF) | Use Value (UV) | Consensus Index (CI) |
|----------------------------------|------------------|-------------------------------|-----------------------|----------------------------------|---------------|---------------------|
| **Trachyspermum ammi** (L.) Sprague (Apiaceae) BUR-390 | Sperkay Herb Seeds | Irregular menstruation Direct | 314                   | 0.60                             | 0.91          | 59.02               |
| **Tribulus terrestris** L. (Zygophyllaceae) BUR-392 | Markundai Herb Leaves | Gonorrhoea Decoction | 50                    | 0.09                             | 0.76          | 9.39                |
| **Triticum aestivum** L. (Poaceae) BUR-394 | Ghanam Herb Seeds | Tonic after delivery Powder | 360                   | 0.68                             | 0.83          | 67.66               |
| **Verbena officinalis** L. (Verbenaceae) BUR-402 | Shomakay Shrub Whole Plant | Prevent miscarriage Decoction | 57                    | 0.11                             | 0.71          | 10.71               |
| **Vitex negundo** L. (Verbenaceae) BUR-81 | Shrub Roots | Regulate Menstrual cycle Cooked | 73                    | 0.13                             | 0.67          | 13.72               |
| **Withania somnifera** L. Dunal. (Solanaceae) BUR-82 | Kotilal Herb Roots | Sexual weakness Powder | 200                   | 0.38                             | 0.73          | 37.59               |
| **Woodfordia fruticosa** (L.) Kurz (Lythraceae) BUR-83 | Shrub Dried flowers | Leucorrhea Powder | 43                    | 0.08                             | 0.62          | 8.08                |
| **Zingiber officinalis** Roscoe (Zingiberaceae) BUR-85 | Adrak Herb Rhizome | Wound Healer and Pain Killer after Pregnancy Powder | 184                   | 0.35                             | 0.80          | 34.58               |
| **Ziziphus nummularia** (Burm. f.) Wight & Arn. (Rhamnaceae) BUR-427 | Karkana Shrub Roots | Induce abortion Powder | 210                   | 0.40                             | 0.77          | 39.47               |

**Notes:**

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=Saarwat 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
Ethnobotany Research and Applications

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 |
| Menstrual 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 therapeutical 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 (Burn. 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. Ethnogynaeological 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 Ethnobotany 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.
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 area of Chail valley (District Swat-Pakistan). Journal of Ethnobiology and Etnomedicine 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 Etnomedicine 9(1):25.

Ali S, Perveen M, Qaiser M. 2015. Vegetation structure, edaphology and ethnobotany of Mahaban and Malka (district Buner) KPK, Pakistan. Pakistan Journal of Botany 43(2):773-780.

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 Ethnic 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 ethnobotanical 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, Patels 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 Ksirí 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 Garhwali 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 (Elaziğ-Turkey). Journal of Ethnopharmacology 132(1):165-175.

Chaudhary MI, He Q, Cheng YY, Xiao PG. 2006. Ethnomedicinal plants from tian mu Shan biosphere reserve, Zhejiang-province, China. Asian Journal of Plant Sciences 5(4):464-53.

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.

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://kptribune.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 Gujarat India. Life Sciences Leaflets 58:26.
Mehdiou R, Kahouadjia A. 2007. Etude ethnobotanique auprès de la population riveraine de la forêt d’Amstittène: cas de la Commune d’Imi n’Tilt (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, SNRNP, 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 Northern 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 rural areas of Bhadrak district, Odisha, India. Botanica 24(2):132-142.

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-gynaecological 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(3):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 Lalina 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.

Tardio 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 Amatans of Nilambur Forest, Western Ghats region of Kerala, India. Research in Plant Biology 3(2):12-17.

Tripathi R, Dwivedi SN, Dwivedi S. 2010. Ethnomedicinal 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.