Pak. J. Bot., 49(5): 1787-1799, 2017.

MEDICINAL PLANT DIVERSITY USE FOR GYNECOLOGICAL DISORDERS AMONG THE RURAL COMMUNITIES OF NORTHERN PAKISTAN

SHEHLA SHINWARI[1], MUSHTAQ AHMAD[1,2*], GUOLIN ZHANG[2], SARWAT JAHAN[3] AND SHAZIA SULTANA[1]

[1]*Department of Plant Sciences, Quaid-i-Azam University-45320, Islamabad, Pakistan*
[2]*Center of Natural Product Lab, Chengdu Institute of Biology, Chinese Academy of Sciences, Chengdu-610041, Sichuan, China*
[3]*Department of Animal Sciences,Quaid-i-Azam University-45320, Islamabad, Pakistan*
[*]*Corresponding author email: mushtaqfora@hotmail.com(Phone: 0300-5599117)*

Abstract

The present study aimed to documentation of medicinal plants specifically used for gynecological disorders by the rural communities of, Northern Pakistan. Ethnomedicinal data was collected from 156 informants, including local people and traditional healers, through a well- structured questionnaire which falls under the category of participatory rural appraisal (PRA). The informants reported 67 plant species belonging 62 genera of 43 families used to treat gynecological disorders. Among the plant parts used, leaves were found to be highly utilized (28 %) followed by roots (25%), whole plant (21%), seeds (9%), bark (7%), flowers (4%), fruits (4%) and bulb (2%). Methods of preparation fall into various categories like decoction (37%), fresh parts (14%), infusion (9%), powder (9%), paste (9%), boiled (3%), extract (9%), juice, latex and poultice (1.5%). Folk treatment of gynecological disorders is prevalent among the indigenous communities of the area due to its remoteness and limited modern medical facilities. The survey reports sixty seven plants used to treat thirty one gynecological disorders which provide a baseline data for further pharmacological and phytochemical studies.

Key words: Gynecological diseases; Northern Pakistan; Medicinal plants.

Introduction

The Northern Pakistan covers Gilgit-Baltistan, the upper region of Khyber Pakhtunkhwa (former North West Frontier Province) including Chitral and some parts of the central and northern regions of Pakistan. Northern Pakistan is host to three of the world's biggest and most spectacular mountain ranges, the Himalaya, the Karakoram and the Hindu Kush. The ranges extends over an area of 132700 km^2. Owing to its peculiar geographical position, Northern Pakistan harbors a great diversity of flora. More than 6000 vascular plant species occur in this region, out of which 5,600 species have been described to date in the Flora of Pakistan, representing 222 families and about 150 genera (Shinwari *et al*., 2006). Out of these 6000 plants, about 400-600 species have been reported to exhibit therapeutic properties (Pei & Manadhar, 1987; Pei, 1992; Sheikh, 2001; Hashmi & Shaifullah, 2003; Shinwari *et al*., 2003). It is among the regions where the earth's logical wealth is most distinctive and rich. The local community has centuries old knowledge about traditional uses of the plants occurring in the areas. Almost entire population of Northern Pakistan depends upon directly or indirectly on natural resources to meet their daily needs (Shinwari & Gilani, 2003; Sarwat *et al*., 2012). The medicinal preparations are practiced in daily life of people living in remote villages. Economic development of the area depends on management of high diversity of crops, maintaining high pastures, raising fodder trees in varied mountain environment and development of livestock diversity and medicinal plants (Gilani *et al*., 2007; Gul *et al*., 2012).

In Pakistan reliance on herbal medicine partly is owing to the high cost of conventional allopathic medicine and inaccessibility of modern healthcare facilities especially in remote areas. Moreover, traditional medicine is often deemed as a more appropriate method of treatment especially in rural areas (Shinwari *et al*., 2009; Shinwari & Qaiser, 2011). There are 50,000 Herbalists (Hakims) and 10,000 Homeopathic doctors, spread all over the country that runs their clinics in rural and urban areas and using medicinal plants in crude form. Ten percent of Pakistani flora is used as medicines. Besides this, the rural area dwellers use the plants on their own experience and ancestral prescription (Gilani *et al*., 2010; Walter *et al*., 2011). About 80% population of Pakistan lives in rural areas where these plants are easily available. Herbal recipes in the form of local traditions and beliefs are still the mainstay of health care among the rural communities in this region (Begam *et al*., 2017). Herbal traditional system use special combination of plants to treat diseases passed on from generation to generation in rural societies (Stewart, 1972; Nasir & Ali 1972; Anon., 1998; Perkin, 2003).

Among various disciplines of ethnobotany, ethno-gynecology is an emerging and new branch which offers promising role for the treatment of various gynecological ailments including abortion, menstrual trouble, leucorrhoea, delivery problems etc. There are frequent surveys on the documentation and validation of plants used for gynecological disorders in different parts of the world (Tarafder, 1983a; Tarafder, 1983b; Tarafder, 1984; Siddique *et al*., 1988; Joshi, 1989; Sheldon, 1998), while to best of our knowledge based on literature surveys, the Northern Pakistan is neglected in this regard. The use of herbal medicines is wide spread in this region as the rural population relying on it. This is because of lack of awareness, modern medical health facilities and the high cost of medical system which is unaffordable for the local people. Tribals of the area have their own traditions based on their indigenous knowledge for curing number of gynecological diseases. Although a substantial number of women seek treatment from traditional healers for a variety of gynecological complications and disorders, yet

no such documentation has been done earlier. The aim of this study is to document the ethnomedicinal information of traditional herbal remedies for the treatment of gynecological disorders and to preserve this valuable but fast disappearing traditional knowledge of the tribal communities of the area.

Material and Methods

Study area and its physiography: Pakistan is a subtropical country, situated between 24^0-37 North latitudes and 61^0-5/ East longitudes. Its maximum distance from north to south is over 1,660 Km and from east to west it is about 913 Km. Total area of the country is 8, 03,950 Sq km. Our focus of this survey was on documentation of medicinal plants used for gynecological disorders particularly in the Northern Pakistan due to rich cultural and floral diversity. The Kunhar river catchments area is 161 Km long scenic wonderlands, with its towering Himalayan peaks, peaceful lakes, majestic glaciers and splashing waterfalls. Even, today, when few places have escaped man's meddlesome fingers, is still in an unbelievably pristine state, an un-spoilt paradise. It is situated between 34^0-17/ to 35^0-10/ North latitudes and 73^0-28/ to 74^0-7/ East longitudes. Total area of the valley is about 1627 Sq. Km. Some areas of Northern Pakistan is a water shed area of the river Jhelum and the large water reservoir, "Mangla Dam" built on this river (Vitalini *et al.*, 2013). Northern Pakistan is bounded on the east as well as on the southern side by Azad Jammu Kashmir, on the north by Chilas and Gilgit agencies and on the west by Allai Kohistan and Mansehra. The altitude in the area ranges from 915 m at Balakotto 5280 m at Malika Parbat (Queen of the Mountains), the highest peak in the valley bordering the beautiful lake, "Saif-ul-Malook" (Hussain, 1984; Hussain & Ilahi, 1991) (Fig. 1).

Fig. 1. Map of northern Pakistan.

Climate of the tract as a whole is temperate with distinct seasonal variations. Winters are severe with heavy snowfall, which may be expected any time from middle of November to middle of April. According to standard classification of "Forest types of Pakistan" the Northern Pakistan forests fall under the major type "Montane Temperate Forests" and "Himalayan Dry Temperate Forests". Altitude in this area ranges from 915 meters at Balakot to 5280 meters at Malika Parbat, highest peak in the valley. The forests occupy the lower parts of the valley and are situated at varying altitudes between 1370 meters to 3660 m, above the forests, stretch the alpine pastures, which are visited annually by nomadic cattle and domestic livestock from different parts of the valley (Champion *et al*., 1965; Swati, 1985). The population of Northern Pakistan is entirely rural and mostly poverty stricken and under nourished. Their economy is mostly agro-pastoral. With intense increase of population i.e. 163030 persons.

Principal tribes (ethnic groups) in the Northern Pakistan are Syed, Swati, Gujar and Awan. Syed and Swati are economically dominant. Gujars are in numerical majority. Most of the people speak Hindko and Gujri languages. Literacy rate according to 1998 census report was 30.9%. Increase in literacy rate during seventeen years is not encouraging. High illiteracy in the area is because of the poverty and less educational facilities. Agriculture is the principal occupation, although sheep and cattle rising are practiced over the adjacent mountainous area. Few people are engaged in trade, local labor and employment in bigger cities of the country (Abbasi, 1993; Jamal, 2009; Smeda, 2009; Jamal *et al.*, 2012).

Demographic information: During field survey, the local informants includes male, female (*Daei*), herbalist medicinal plant collectors and herb sellers were interviewed. In these interviews lively discussions were generated in which other villagers also provided valuable information, particularly with regard to the plant resources. In order to get qualitative and participatory data about the plant resources and their utilization by the local people during the survey, well planned questionnaires were adopted. The questionnaires were designed in light of the reconnaissance survey and discussions made with a number of persons, well conversed with indigenous knowledge. Information sought for the questionnaires were about the method of medicinal plants collection, part used, their storage, drying, harvesting time, processing, utility of plants, quantity of plants used, ratio of consumptions, rate of availability, demand and priority species. Prior informant consent (PIC) was strictly followed in the field work.

Demographic information was based on gender, experience, age and education status of the informants. A total of 156 informants were interviewed and categorized into two major groups on the basis of experience, represented by local healers male 60% and 41.5% Female healers (*Daei*) as the experienced while 58.4 % local inexperienced women and 40% inexperienced men. On the basis of education level the indigenous knowledge and use of medicinal plants for treatment of gynecological disorders was more prevalent in the illiterate people i.e. 45% and the same knowledge was decreasing in the highly educated class of the area. The information on age confirms that the practice of plants based remedies in gynecological disorders was more prevalent in the elderly people 44% and was declining in the younger generation 24%. Women being the most affected have a greater pool of knowledge 65% in relation tothe use of medicinal plants for treatment of gynecological ailments (Table 1).

Field data collection: The field work was carried out from spring 2013 to fall 2014 for collection of plant specimens and data regarding the existing ethnobotanical knowledge and plant diversity. The same included observations, guided field walks/transect walks and interviews. To authenticate the practices of local community regarding use of plants, a number of reconnaissance surveys were made to different villages of the area including transect walks, discussions and informal talks with hakims, *pansaris* and local people. During such field observations local methods of medicinal plants collection, storage, drying, harvesting time, processing and utilization were observed and noted accordingly. This exercise helped in developing a broader picture of the dependence of local people on wild plant resources. This also provided a framework for developing a formal questionnaire for more systematic and formal field surveys. Further before large scale application of the questionnaire in the field the same could be pre-tested in the field and could even be modified in the light of results of the pre-test. Meanwhile all the plants during flowering and (or) fruiting stage were collected, pressed and preserved.

Women indigenous knowledge of medicinal plants: Women of the area provide the most valuable source of indigenous knowledge of medicinal plants. According to data collected from local healers women (*Daei*) and old ladies got maximum knowledge of folk medicinal herbs and their usage techniques. Women work in the fields along with their men. They also collect fuel wood from the forest. During their visits to the forest for fuel wood, they also collect medicinal plants. Some of these plants collected are kept at home and used as household remedies, while rest of medicinal plants are sold at a very low price to the local herb sellers for earning their livelihood.

Table 1. Demographic information on gender, experience, age and education of informants.

Variable	Categories		No. of person	Percent
Gender	Male		55	35.2
	Female		101	64.7
Informants' experience	Local healer	Female (Daei)	42	41.58
		Male	33	60
	Folk people	Female	59	58.4
		Male	22	40
Age	30-45 years		38	24.35
	46-60 years		49	31.4
	61-75 years		69	44.2
Educational background	Illiterate		45	28.8
	Primary qualification		30	19.2
	Middle qualification		23	14.7
	Secondary qualification		22	14.1
	Undergraduate		20	12.82
	Graduate		16	10.25

Documentation of research data and preservation of plant specimens: The data obtained along with the flora collected during field work was documented properly. Plant specimens were dried and preserved on herbarium sheets with field notes and voucher specimen number. The herbarium sheets along with plant specimens were deposited in the Herbarium (ISL), Department of Plant Sciences, Quaid-i-Azam University, Islamabad. The ethnobotanical data obtained during field work was checked and compared with the available literature and analyzed. Hence the indigenous knowledge about plant resources was documented. The ethnobotanical inventory include botanical names, families, local names, common names, plant habit, part used, flowering season and local uses. Thus the local people perception regarding plants resources, their use, religious and cultural aspects and conservation status of the flora was documented.

Medicinal plants collectors and their ethnicity: Medicinal plant collectors are usually poor villagers. Plant collection is there part time activity besides farming and livestock rearing. They collect medicinal plants during spring and summer season which starts from April to September and sell it in the local market to earn some money. The plants collected are washed with water to remove mud attached to these plants. Bulk of medicinal plants collected in the area is rhizomatous. The collectors carry with them digging tools and dig medicinal plant wherever found. The plants are sold in local markets while some of them are kept in homes for curing different ailments. Major proportions of plants collected are sold in fresh while some plants are stored in bags and sacks from one week to one year. Before storing, these plants are washed and kept under shade for drying. During storage considerable amounts of medicinal plants are wasted due to humidity, insect attacks, inappropriate storage facilities and lack of awareness on the part of collectors.

Medicinal plants are collected extensively during the summer season starting from March when the snow has almost melted to September. The collectors include men, women and children. The women and children collect plants while on their way to work in the fields and surrounding areas of their work place. The women and children of Gujar families collect medicinal plants while grazing their livestock. This type of collection of medicinal plants is carried out on daily basis.

The men collectors belong to poor families of both Kohistani and Gujar tribes of the area. They are selective in their collection and collect only those plants which are profitable and can be sold easily in the local markets. These people are very expert as they know the exact locations from where they can get their required plants. Their collection trips are long as it comprise about 2 to 7 days in the forest. In majority of circumstances the collection is sold in the local market in fresh form. However, some plants are stored for several months in order to get maximum money for them.

Quantitative analysis

RFC and FIV: Quantitative methods like Relative Frequency Citation (RFC) and Family Importance Value (FIV) were calculated as to assess consensus between Informants on cited species and families, cite frequency was estimated for species and family, taking the percentage of informants citing each species (or family) with respect to the total number of informants; RFC = FC/N ($0 < RFC < 1$).

It shows the local importance of each species and it is given by the frequency of citation (FC, the number of informants mentioning the use of the species) divided by the total number of informants participating in the survey (N).

Results and Discussion

The use of plants and plant based remedies for different ailments is an old practice, inherited through generations and is the base of modern pharmaceutical industry. Gynecological disorders are common in the area due to its remoteness, cold and harsh climatic conditions and limited health care facilities. The people of the Northern Pakistan depend on the available plant resources to treat various diseases including gonorrhea, leucorrhoea, menorrhagia, amenorrhea, syphilis, vomiting due to pregnancy, menstruation disorders, genital irritation, scarcity of milk and sexual impotency.

Medicinal plants diversity and life form categories: The study has a rich floral diversity, represented by a large number of plant species due to its conducive climatic conditions. The present study compiled data on 67 medicinal plant species belonging to 62 genera and 43 families, extensively used to cure gynecological disorders in the local communities of Northern Pakistan. The most dominating family was Asteraceae with 7 species, followed by Solanaceae with 4 species, Amaranthaceae, Sapindaceae, Euphorbiaceae, Moraceae and Lamiaceae with 3 species each and Liliaceae, Meliaceae, Brassicaceae, Cucurbitaceae, Apiaceae and Verbenaceae with 2 species each. The most effective plant species used to cure gynecological disorders (such as menstrual trouble, abortion, leucorrhoea, delivery problems) were found to be *Acyranthes aspera*, *Adiantum capillus-veneris*, *Allium cepa*, *Aerva lanata*, *Azadirachta indica*, *Mentha spicata*, *Origanum vulgare*, *Phyla nodiflora*, *Plantago ovata*, *Ricinus communis*, *Sapindus mukorossi* and *Withania somnifera* (Fig. 2). Table 2 presents an overview of the most commonly reported medicinal plants according to specific diseases and ailments during pregnancy.

Medicinal plants part used and modes of preparation: The utilization of medicinal plants in the local communities is based on the indigenous knowledge and common usage. Different plant parts are regarded as useful in different treatments. Local communities of Northern Pakistan utilize almost all parts of the medicinal plants as remedies for gynecological disorders. The highly utilized part for treatments observed were leaves 28%, followed by root 25%, whole plant 21%, seed 9%, bark 7%, Flower and fruit 4% and bulb 2% (Fig. 4).

The modes of application varies with respect to the plant part used and disease treated with. A total of 11 modes of application were identified in the local communities. Most of the people use medicinal plants in the form of decoction (37%), Raw form (14%), Extract, infusion, paste, powder (9%), oil roasted (5%), boiled (3%) and Juice, latex, poultice (2%) each (Fig. 5).

Table 2. Medicinal Plant diversity used for Gynecological disorders in Northern Pakistan.

S. No.	Botanical name/ Family / Voucher specimen no	Local name	Parts used	Gynecological use	Application	FC	RFC
1.	*Acacia modesta* Wall. (Mimosaceae) SS ISL 571	Phulai	Whole plant	Tonic after delivery	Powdered gum is roasted with oil, eggs, almonds, poppy seeds and dates and used as tonic after delivery	27	0.17
2.	*Achyranthes aspera* L. (Amaranthaceae) SS ISL 572	Putkanda	Whole plant	Painful delivery	Decoction of leaves (6-8ml) is used in painful delivery. Root paste is also considered as antifertility drug	24	0.15
3.	*Adiantumcapillus–veneris* L. (Adiantaceae) SS ISL 573	Paroshan	Leaves	Abnormal stoppage of menses	Decoction of leaves (1 cup daily for 3-4 days) is used to for menstrual flow	15	0.1
4.	*Aerva lanata* (L.) Juss. (Amaranthaceae) SS ISL 574	Shutpask	Roots	Abnormal stoppage of menses	Root paste (2-4g) is used to prevent excessive bleeding in menstruation	13	0.08
5.	*Ailanthus excela* Roxb. (Simarubaceae) SS ISL575	Darawa	Bark, Leaves	As a tonic after delivery	Infusion of bark and leaves is used as tonic in debility after child birth	11	0.07
6.	*Allium cepa* L. (Liliaceae) SS ISL576	Piaz	Bulb	Menstrual pain	Decoction of bulb (2 spoons twice a day) is used to cure menstrual pain	25	0.16
7.	*Amaranthus caudatus* L. (Amaranthaceae) SS ISL577	Ganiar	Leaves	Leucorrhoea	Leaves are cooked in oil and sugar and this paste is taken for three days to cure leucorrhoea	23	0.15
8.	*Androsace rotundifolia* Hardw. (Primulaceae) SS ISL578	Ratti Booti	Leaves	Abnormal stoppage of menses	Leaves are cooked in oil and sugar and taken for correcting menstrual flow	09	0.06
9.	*Asparagus racemosus* Willd. (Liliaceae) SS ISL579	Satavari	Roots	Milk increase	Root powder (5g) is given with milk to nursing mothers to increase breast milk	24	0.15
10.	*Azadirachta indica* A. Juss. (Meliaceae) SS ISL580	Nim	Leaves	Emmenagogue	Leaf extract is used twice a day to prevent excessive bleeding during menstrual period	23	0.15
11.	*Boerhavia diffusa* L. (Nyctaginaceae) SS ISL 581	Biskhapra	Roots	Bleeding after delivery	Powder of roots (5g) is taken once a day for seven days to check bleeding after delivery	23	0.15
12.	*Caesalpiniabonduc* (L.) Roxb. (Caesalpinaceae) SS ISL 582	Nata	Seeds	Puerperal fever after delivery	Powder of seeds (8g) is given for puerperal fever after delivery	12	0.08
13.	*Calotropisprocera* (Ait.) R. Br. (Asclepiadaceae) SS ISL 583	Ak	Leaves	Leucorrhoea	Decoction of fresh leaves (3ml) is administered continuously for seven days to cure leucorrhoea	24	0.15
14.	*Capsella bursa- pastoris* (L.) Medik. (Brassicaceae) SS ISL 584	Janglisaro	Whole plant	Abnormal stoppage of menses	Plant infusion (2 spoons daily for two days) is reported to increase menstrual flow	21	0.13

Table 2. (Cont'd.)

S. No.	Botanical name/ Family / Voucher specimen no	Local name	Parts used	Gynecological use	Application	FC	RFC
15.	*Cardiospermu mhalicacabum* L. (Sapindaceae) SS ISL 585	Kanphuti	Roots	Amenorrhoea	Decoction of root (15ml) is used for three days to cure amenorrhoea	19	0.12
16.	*Carthamus tinctorius* L. (Asteraceae) SS ISL 586	Kasum	Whole plant	Abnormal stoppage of menses	Decoction of aerial parts (one cup) is taken daily for three days to increase menstrual flow	21	0.13
17.	*Chenopodium ambrosioides* L. (Chenopodiaceae) SS ISL 587	Arunpale	Leaves	Delivery pain	Decoction of leaves is used to relieve post-delivery pains and to hasten milk flow in nursing mothers	23	0.15
18.	*Chrysanthemum parthenium* (L.) Schultz-Bip. (Chenopodiaceae) SS ISL 588	Gul-e-daudy	Flowers	Abnormal stoppage of menses	Dried flowers are taken with milk for two days to induce abortion and to regulate the menstrual flow	21	0.13
19.	*Cinnamomum camphora* (L.) Presl (Lauraceae) SS ISL 589	Caphur	Leaves	Abnormal stoppage of menses	Paste of leaves (2-3g) is applied to stimulate uterus and menstruation	22	0.14
20.	*Citrullus colocynthis* (L.) Schrad. (Cucurbitaceae) SS ISL 590	Tuma	Fruits	Easy delivery	Cotton dipped in fresh fruit juice is placed over the mouth of uterus for timely and easy delivery	23	0.15
21.	*Conyza canadensis* L. (Asteraceae) SS ISL 591	Paleet	Whole plant	Painful menstruation	Decoction of aerial (one cup) is recommended for painful menstruation	23	0.15
22.	*Corydalis govaniana* Wall. (Fumariaceae) SS ISL 592	Mamera	Roots	Syphilis	Root paste is used to cure syphilis	14	0.09
23.	*Cuscuta reflexa* Roxb. (Cuscutaceae) SS ISL 593	Jamaldarai	Whole plant	Sterility	Decoction of leaves (3-4ml) if used after menses for three days makes women sterile	25	0.16
24.	*Cytisus scoparius* Link (Fabaceae) SS ISL 594	Genestra	Whole plant	Easy delivery	Dried plant tops are used for easy delivery	21	0.13
25.	*Daucus carota* L. (Apiaceae) SS ISL 595	Gajar	Seeds	Abnormal stoppage of menses	4-5 seeds are taken orally for four days to regulate menstrual flow	24	0.15
26.	*Datura stramonium* L. (Solanaceae) SS ISL 596	Daturoo	Leaves	Inflammation of breasts	Poultice of leaves is applied to cure the inflammation of breasts	27	0.17
27.	*Dodonaea viscosa* (L.) Jacq. (Sapindaceae) SS ISL 597	Bansathra	Leaves	Excess menstrual flow	Decoction of leaves (10-20ml) is taken once in a day for two days to control excessive menstrual flow	15	0.1
28.	*Echinops echinatus* Roxb. (Asteraceae) SS ISL 598	Kanderi Bhattar	Roots	Sexual weakness	Decoction of root is useful for sexual weakness	23	0.15

Table 2. (Cont'd.)

S. No.	Botanical name/ Family / Voucher specimen no	Local name	Parts used	Gynecological use	Application	FC	RFC
29.	*Eclipta alba* (L.) Hassk. (Asteraceae) SS ISL 599	Sofed Banghra	Whole plant	Miscarriage	Infusion of aerial parts (3-4ml) is employed for one weekto prevent miscarriage		0
30.	*Euphorbia parviflora* L. (Euphorbiaceae) SS ISL 600	Not known	Leaves	Leucorrhoea	Infusion of leaves (4-5ml) is used for one week to treat leucorrhoea	20	0.13
31.	*Equisetum debile* Roxb. (Equisetaceae) SS ISL 601	Satgandibooti	Whole plant	Gonorrhoea	Plant extract (3-6ml) is used to cure gonorrhoea	22	0.14
32.	*Ficus religiosa* L. (Moraceae) SS ISL 602	Peepal	Bark	Leucorrhoea	Decoction of bark is employed as vaginal douche in leucorrhoea	25	0.16
33.	*Ficus benghalensis* L. (Moraceae) SS ISL 603	Bargad	Latex	Sexual weakness	Fresh milky latex is poured into sugar and eaten to improve sexual strength	26	0.17
34.	*Ficus glomerata* Roxb. (Moraceae) SS ISL 604	Gular	Fruits	Menorrhagia	Unripe fruit is employed in menorrhagia	22	0.14
35.	*Geranium wallichianum* D. Don ex Sweet (Geraniaceae) SS ISL 605	Ratanjot	Roots	Tonic after delivery	Roots (5-6g) are grinded and cooked in oil with sugar and used as tonic after delivery	25	0.16
36.	*Grewia optiva* Drummond ex Burret (Tiliaceae) SS ISL 606	Dhaman	Bark	Easy delivery:	Extract of bark is used for smooth and easy delivery	22	0.14
37.	*Lactuca scariola* L. (Asteraceae) SS ISL 607	Kahu	Leaves	Increase milk flow	Decoction of leaves is given to new mothers to hasten the milk flow	22	0.14
38.	*Melia azedarach* L. (Meliaceae) SS ISL 608	Dharaik	Roots	Leucorrhoea	Decoction of root bark (10-15ml) is taken for seven days to treat leucorrhoea	23	0.15
39.	*Mentha spicata* L. (Lamiaceae) SS ISL 609	Pahari Podina	Leaves	Easy delivery	Decoction of leaves (4-6) with cinnamon is prescribed to expectant mother to hasten child birth	23	0.15
40.	*Momordica charantia* L. (Cucurbitaceae) SS ISL 610	Karella	Roots	Abortion	Roots (4-5g) are grinded and taken with water for four days to induce abortion	22	0.14
41.	*Nasturtium officinale* R. Br. (Brassicaceae) SS ISL 611	Tara mera	Leaves	Sterility	Fresh leaves are cooked and taken for 2-3 days to induce temporary sterility	22	0.14

Table 2. (Cont'd.)

S. No.	Botanical name/ Family / Voucher specimen no	Local name	Parts used	Gynecological use	Application	FC	RFC
42.	*Nepeta cataria* L. (Lamiaceae) SS ISL 612	Mutrich	Whole plant	Delayed menstruation	Plant infusion (one cup) is taken daily for three days to delay menstruation	22	0.14
43.	*Nerium oleander* L. (Apocynaceae) SS ISL 613	Kaner	Roots	Abortion	Roots extract (1-2ml) is taken to induce abortion at initial stage	27	0.17
44.	*Origanum vulgare* L. (Lamiaceae) SS ISL 614	Ban Ajwain	Leaves	Menstrual pain	Decoction of leaves is used to treat menstrual pain	18	0.12
45.	*Oxalis corniculata* L. (Oxalidaceae) SS ISL 615	KhatiMithiBoti	Leaves	Vomiting	Fresh leaves are chewed to avoid vomiting during early pregnancy	24	0.15
46.	*Phyla nodiflora* (L.) Greene. (Verbenaceae) SS ISL 616	Makna	Whole plant	Puerperal fever after delivery	Decoction of leaves is used to prevent puerperal fever after delivery	23	0.15
47.	*Psidiumguajava* L. (Myrtaceae) SS ISL 617	Amrud	Leaves, Bark	Expelsion of placenta	Decoction of leaves and bark (10-12ml) is used to expel the placenta after childbirth	7	0.04
48.	*Plantagoovata* Forssk. (Plantaginaceae) SS ISL 618	Aspaghol	Seeds, Husk	Gonorrhoea	Seeds and husk are soaked in water with sugar and one cup is taken orally for four days to cure gonorrhoea	24	0.15
49.	*Rhododendron arboretum* Sm. (Ericaceae) SS ISL 619	Rantol	Flowers	Leucorrhoea	Dried flowers are taken orally with butter for one week to treat leucorrhoea	22	0.14
50.	*Ricinus communis* L. (Euphorbiaceae) SS ISL 620	Harnoli	Roots	Abortion	Root paste (10 gms) is taken in morning for three days for abortion	25	0.16
51.	*Rubia cordifolia* L. (Rubiaceae) SS ISL 621	Chero	Roots	Flow of lochia	Infusion of root (5-6ml) is prescribed as drink after delivery to procure copious flow of lochia	12	0.08
52.	*Sapindus mukorossi* Gaertn. (Sapindaceae) SS ISL 622	Raitha	Seeds	Easy delivery	Seeds are sedative to uterus and used to ease childbirth	6	0.04
53.	*Saponaria officinalis* L. (Caryopyllaceae) SS ISL 623	Not known	Roots	Increase milk flow	Root paste is used to increase milk flow of new mothers	5	0.03
54.	*Sarcococca saligna* (D. Don) Muell. Arg. (Buxaceae) SS ISL 624	Shangal	Roots	Gonorrhoea	Decoction of root (10ml) is used daily for a week to treat gonorrhoea	3	0.02

Table 2. (Cont'd.)

S. No.	Botanical name/ Family / Voucher specimen no	Local name	Parts used	Gynecological use	Application	FC	RFC
55.	*Mallotus phillippensis* (Lam.) Muell. Arg. (Euphorbiaceae) SS ISL 625	Kamla	Bark	Gonorrhoea	Paste of bark (3gm) is taken daily for 15 days to cure gonorrhoea	22	0.14
56.	*Solanum nigrum* L. (Solanaceae) SS ISL 626	Mako	Leaves	Menorrhagia	Fresh leaves (10gm) are cooked and taken for ten days to cure menorrhagia	23	0.15
57.	*Solanum xanthocarpum* Burm. f. (Solanaceae) SS ISL 627	Mokri	Whole plant	Conception	Decoction of the plant is used to promote conception in female	19	0.12
58.	*Spiraea tomentosa* L. (Rosaceae) SS ISL 628	Not known	Flowers	Easy delivery	Decoction of flowers is used to ease delivery	22	0.14
59.	*Sida cordifolia* L. (Malvaceae) SS ISL 629	Not known	Seeds	Sexual weakness	Seeds (4-6) are taken daily to improve sexual strength	23	0.15
60.	*Tagetes erecta* L. (Asteraceae) SS ISL 630	Gainda	Roots	Irregular menstruation	Root extract (8-10ml daily for 5 days) is used in irregular menstruation	22	0.14
61.	*Trachyspermum ammi* (L.) Sprague (Apiaceae) SS ISL 631	Ajwain	Seeds	Irregular menstruation	Roasted seeds (5-6g) mixed with sugar are given to regularize menstrual cycle after birth	23	0.15
62.	*Tribulus terrestris* L. (Zygophyllaceae) SS ISL 632	Bhukhra	Leaves	Gonorrhoea	Decoction of leaves is taken for 4-6 days to cure gonorrhoea	25	0.16
63.	*Trianthema portulacastrum* L. (Aizoaceae) SS ISL 633	Itsit	Whole plant	Abortion	Decoction of aerial parts is used as vaginal douche for abortion and to increase menses	12	0.08
64.	*Verbena officinalis* L. (Verbenaceae) SS ISL 634	Karenta	Whole plant	Miscarriage	Decoction made from 2-4g of dried powdered plant is taken daily (one cup) to prevent miscarriage	13	0.08
65.	*Viscum album* L. (Loranthaceae) SS ISL 635	Neela	Berry	Sexual weakness	Berries (4-5) taken daily for 10 days to stimulate sexual desire	10	0.06
66.	*Withania somnifera* (L.) Dunal (Solanaceae) SS ISL 636	Asghand	Roots	Sexual weakness	Dried roots (1gm) are grinded and taken daily for a week in sexual weakness.	27	0.17
67.	*Ziziphus nummularia* (Burm. f.) Wight & Arn. (Rhamnaceae) SS ISL 637	Jangli Bair	Roots	Abortion	Powdered root bark (5-8g) of *Zizyphus nummalaria* along with powdered stem bark of *Syzygiuum cumuni* and *Mangifera indica* is taken orally to induce abortion	22	0.14

Quantitative analysis of ethnomedicinal data: Quantitative indices like Family importance value (FIV) and Relative Frequency citation (RFC) were calculated to ascertain the important species and representative families for gynecological disorders in the local communities of Northern Pakistan. Family importance values (FIV) shows that family Asteraceae is the dominant family with FIV (85), Solonaceae (62), Moraceae (47), Euphorbiaceae (43), Lamiaceae (40), Amaranthaceae (38) and the least value of FIV for families Buxaceae (2), Caryophyllaceae (3), Myrtaceae (4) and Primulaceae, Loranthaceae (6 each).

Relative frequency citation values were calculated to assess consensus between Informants on cited species. It shows that *Acacia modesta, Datura stramonium, Nerium oleander, Withania somnifera* has the highest value of RFC (0.17) followed by *Allium cepa, Cuscuta reflexa, Ficus religiosa, Ficus benghalensis, Geranium wallichianum, Ricinus communis, Tribulus terrestris* (0.16) and *Achyranthes aspera, Asparagus racemosus, Calotropis procera, Daucus carota, Oxalis corniculata* has RFC value (0.15). The least value of RFC was represented by *Eclipta alba* (0.01).

Gynecological disorders: During the present ethno-gynecological survey 27 gynecological disorders including leucorrhoea, gonorrhea, and abnormal stoppage of menses, abortion, menstrual pain, sexual weakness, syphilis, sterility, menorrhagia, miscarriage, irregular menstruation, vomiting and delayed menstruation were reported. 15 medications (22.38%) were used for menses, followed by 14 medications (20.89%) for delivery, 6 medications (8.95%) to cure leucorrhoea, 5 medications (7.46%) to induce abortion, to cure gonorrhea and sexual weakness. 3 medications (4.47%) to enhance milk flow.2 medications (2.98%) to cure sterility, menorrhagia, and to induce miscarriage while 1 medication (1.49%) for emmenagogue, syphilis, conception, expulsion of placenta, flow of lochia, inflammation of breasts, amenorrhea and vomiting (Fig. 6).

Almost all life forms were represented in the present study. The most dominant being the herbs 66% followed by tree 18% and shrubs 16% (Fig. 3).

Comparative analysis of ethno-gynecological information: The present study was analyzed on the basis of previous information available from the neighboring areas, within the country, across the region and globally. Thirteen published research studies were taken into consideration for the purpose. This analysis exhibits a novelty of information based on the plant part used, mode of preparation of crude drugs, its administration and type of gynecological disorder treated. Medicinal plants used to treat gynecological disease in the present study are often used for similar purposes globally.

The leaves of *Riccinus communis* wrap the feet of delivering women for inducing labor and placenta delivery (Srithi *et al*., 2012). Leaves decoction of *Tribulus terrestris* is used for gonorrhea. The fruit of the same plant is used for threatened abortion and leucorrhoea (Champion *et al*., 1965). Root infusion of *Rubia cordifolia* is prescribed as drink to procure copious flow of lochia. Root of the same plant is used for menorrhagia (Hutching, 1996), amenorrhea (Pooley, 1998) and infertility (Bryant, 1966). Bulb decoction of *Allium cepa* is given in menstrual pain. Onion bulb mixed with olive oil and lemon used to treat infertility (Estevez & Baez, 1998).

Out of 67 species, 18 species reported here were shown to have same medicinal uses for women's healthcare as in previous study (Abbasi, 1993), While the rest of species with medicinal uses reported in this survey are contemporary and do not seem to have been reported earlier. Decoction of the whole plant of *Achyranthes aspera* is given for relief in painful delivery Shukla *et al*. (2008) reported that decoction of root is used for the same purpose. The root powder is also taken with cow milk to relieve menstrual disorder. Root powder of *Asparagus racemosus*is taken to treat lactation problem. Similar uses were reported earlier (Yadav *et al*., 2008), but fresh and dried root soaked in water is taken orally for excess bleeding during menstrual discharge and burning sensation in urine. Leaf extract of *Azadirachta indica* is used to stop excessive bleeding during menstrual period. While in literature (Dhar *et al*., 2011) warm leaves of same plant are applied on hypogastria to relieve painful menstruation. The leaf of *Caesalpinia bonduc* cooked with oil is applied on swollen and painful testicles while in previous study (Rahmatullah *et al*., 2011) seed powder is given to women suffering from puerperal fever. Tea made from the leaves of *Chenopodium ambrosioides* is used to relieve post-delivery pain and to hasten milk flow in nursing mothers. While in earlier (Dhar *et al*., 2011)), it is mentioned that leaf decoction of same plant is given to treat painful menstrual flow.

In other study (Steenkamp, 2003) a total of 6 medicinal plant species i.e. *Capsella bursa-pastoris, Cuscuta reflex, Daucus carota, Solanum nigrum, Trachyspermum ammi* and *Tribulus terrestris* used extensively for gynecological disorders but the part used and mode of preparations varies considerably. They reported the extensive use of fruit and whole plant as a source of drug while powder form is the major mode of preparation treating mostly amenorrhea, Leucorrhoea and gonorrhea but in contrast our study reported the use of fruit and decoction for the treatment of gynecological ailments.

Similarly in another investigation, 11 medicinal plant species used mainly for gynecological pains describing the use of roots and leaves as the main plant part used and powder as the major preparation which is in contrast to our study mentioning the extensive use of fruit and whole plant and decoction as the major preparation of crude drug. As compare to previous studies (Champion *et al*., 1965; Steenkamp, 2003; Rahmatullah, 2011), significant variations regarding the use of similar medicinal plants for various gynecological disorders are noted and the part used, mode of preparation and administration is mostly different.

Novelty and future impact of the study: It is the first independent study of its kind in the area and the region as a whole to the best of our knowledge. The current study provides information on the effective usage of medicinal plants for gynecological disorders. This ethno-gynecological information is in relevance up to some extent with some other ethnobotanical studies with in the region and globally, but instead this study documented a total of 67 medicinal plants which were specifically used for gynecological disorders. The data revealed that part of plant used, mode of preparation of crude drug by the local people and its administration considerably differs within the region and globally, thus providing new ethnomedicinal knowledge. This information could be used as a baseline data for future phytochemical studies and effectively exploited by the pharmaceutical industry (Khalil *et al*., 2017). Besides it may also act as a source of income for the local people and have positive impact on the socioeconomic conditions, with a view of conserving these natural treasures.

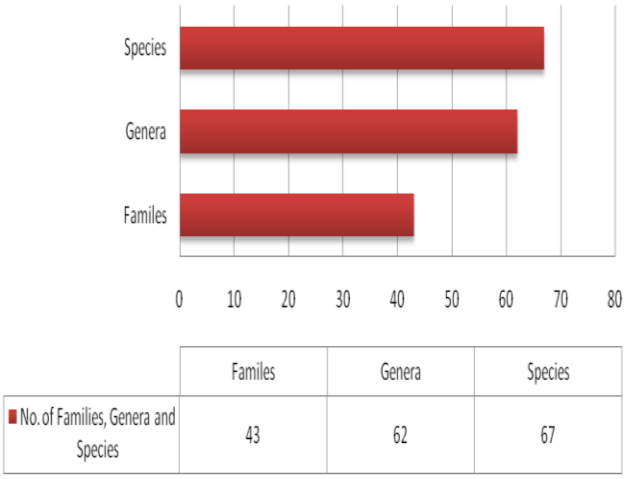

Fig. 2. Number of families, genera and species used for gynecological disorders.

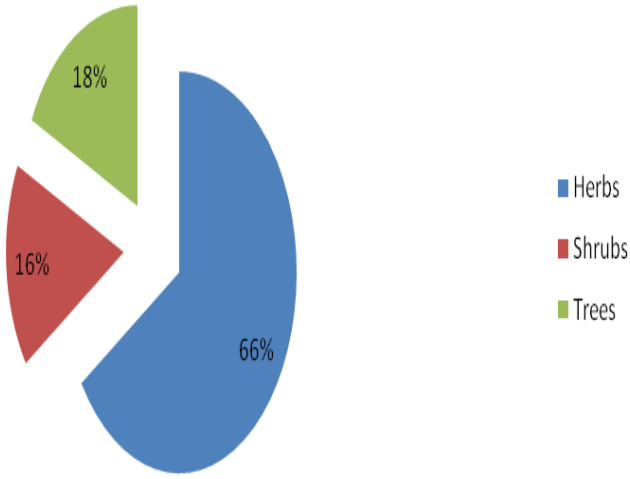

Fig. 3. Life form classes of medicinal plants used in gynecological disorders.

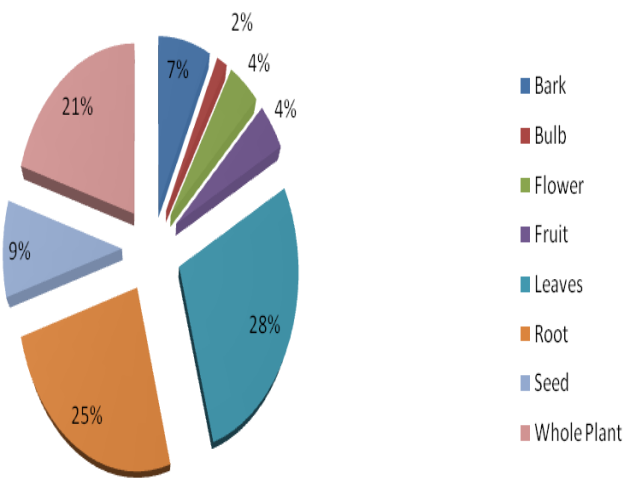

Fig. 4. Percentage of plant parts used for medicinal applications.

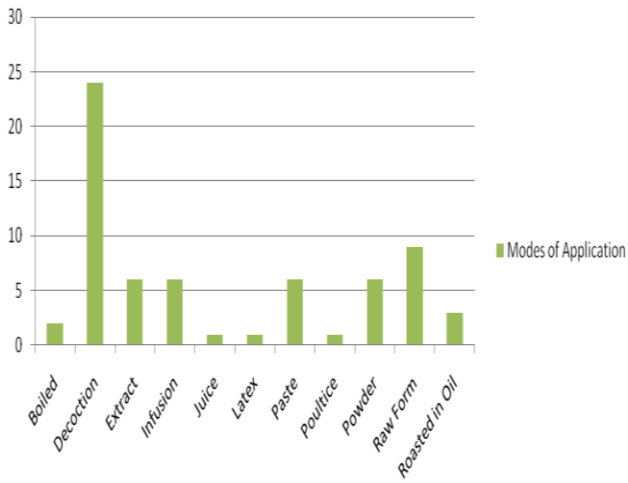

Fig. 5. Mode of applications for herbal remedies.

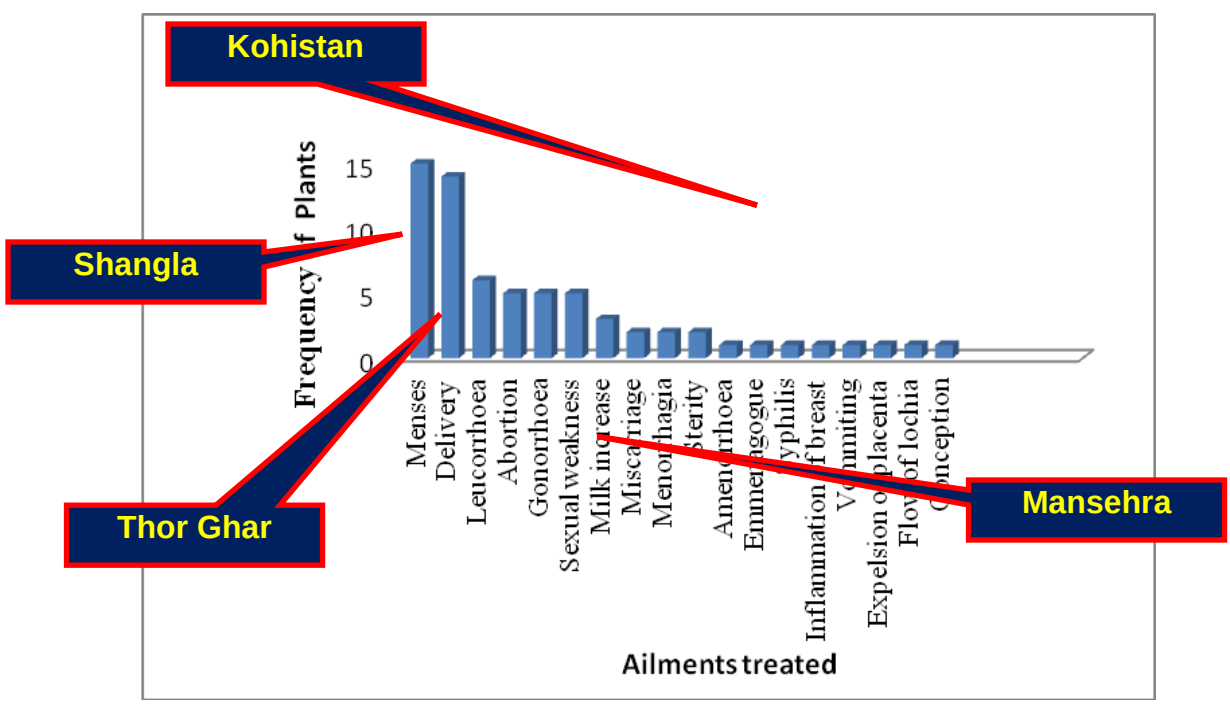

Fig. 6. Number of plants used for most frequently treated ailments.

Conclusion

The rural people of the area are deprived of the modern medical facilities and moreover they cannot afford costly allopathic medicines. The rural people inherit the traditional knowledge about the medicinal plants from elders and apply this knowledge for making phytomedicine to cure gynecological diseases. We often give attention to the conservation of natural resources but never think about the preservation of the valuable knowledge which rural elder people possess. Keeping in view the medicinal uses of the reported plants, detailed pharmacological and clinical trials are needed to explore the active constituents of plants and their role in modern medicine. This could ultimately lead to the discovery of novel drugs for the benefit of mankind. It may also supplement the socioeconomic conditions of the people while taking into account the conservation status of this valuable natural resource.

Competing interests: The authors hereby declare that they have no competing interests.

Acknowledgement

We acknowledge the local women community of Northern Pakistan for sharing useful indigenous knowledge with us and PIFI-CAS fellowships for financial assistance.

References

Abbasi, S.H. 1993. Vegetation Analysis with special reference to deforestation in Kaghan valley. *M.Sc. Thesis, Deptt. of Bot., GPC Abbottabad, UOP*.

Ali, S.I. and E. Nasir. 1972. Flora of Pakistan, National Herbarium, NARC, Islamabad and Department of Botany, University of Karachi. *Karachi. Fasc*, (1-207), pp. 1970-2002.

Anonymous. 1998. Census report of North West Frontier Province. Population Census Organization. *Statistic Division, Govt. of Pakistan, Islamabad*.

Begum, H.A., M. Hamayun, K. Zaman, Z.K. Shinwari and A. Hussain. 2017. Heavy metal analysis in frequently consumable medicinal plants of Khyber Paktunkhwa, Pakistan. *Pak. J. Bot*., 49(3): 1155-1160.

Bryant, A.T. 1966. Zulu Medicine and Medicine Men. Struik, Cape Town, 115 pp.

Bryant, AT: Zulu Medicine and Medicine-men. Cape Town: C. Struik. Chambers, R., 1992. Rural appraisal: rapid, relaxed and participatory. *Institute of Develop Studies, Sussex, UK, discussion paper* 1966, 311.

Champion, S.H., S.K. Seth and G.M. Khattak. 1965. Forest types of Pakistan. *Forest types of Pakistan.*

Chaurasia, O.P. 2011. Herbal formulations from cold desert plants used for gynecological disorders. *Ethnobotany Research and Applications*, 9: pp. 059-066.

Dhar, P., A. Tayade, B. Ballabh, O.P. Chaurasia, R.P. Bhatt and R.B. Srivastava. 2011. *Lycium ruthenicum* Murray: A less-explored but high-value medicinal plant from trans-Himalayan cold deserts of Ladakh, India. *Plant Archives*, 11(2): 583-586.

Estevez, M.A. and F. Baez. 1998. Plantas Curativas: Usos Populares y Cientı´ficos. *Caribe Soy, Santo Domingo, Dominican Republic* 1998, pp. 352.

Gilani, S.A., A. Kikuchi, Z.K. Shinwari, Z.I. Khattak and W.N. Watanabe. 2007. Phytochemical, pharmacological and ethnobotanical studies of *Rhazyastricta* Decne. *Phytother. Res*., 21: 301-307.

Gilani, S.A., Y. Fujii, Z.K. Shinwari, M. Adnan, A. Kikuchi and K.N. Watanabe. 2010. Phytotoxic studies of medicinal plant species of Pakistan. *Pak. J. Bot*., 42(2): 987-996.

Gul, F., Z.K. Shinwari and I. Afzal. 2012. Screening of indigenous knowledge of herbal remedies for skin diseases among local communities of North West Punjab. *Pak. J. Bot*., 44(5): 1609-1616.

Hashmi, A.A. and Shafiullah. 2003. Northern Areas Strategy for Sustainable Development. *IUCN Pakistan, Northern Areas Programme, Gilgit*, pp. 1-11.

Hussain, F. and I. Ilahi. 1991. Ecology and vegetation of lesser Himalayas Pakistan. *Department of Botany, University of Peshawar*, 187.

Hussain, S.S. 1984. *Pakistan Manual of Plant Ecology*. National Book Foundation.

Hutchings, A. 1996. *Zulu medicinal plants: An inventory*. University of Natal Press.

Jamal, Z. 2009. *Biodiversity, ethnobotany and conservation status of the flora of Kaghan Valley Mansehra, NWFP Pakistan* (Doctoral dissertation, Quaid-i-Azam University, Islamabad).

Jamal, Z., M. Ahmad, M. Zafar, S. Sultana, M.A. Khan and G.M. Shah. 2012. Medicinal plants used in traditional folk recipes by the local communities of Kaghan valley, Mansehra, Pakistan. *Ind. J. Tradit. Know.*, 11(4): 634-639.

Joshi, P. 1989. Herbal drugs in tribal Rajasthan-from childbirth to childcare. *Ethnobotany*, 1: 77-87.

Khalil, A.T., M. Ovais, I. Ullah, M. Ali, Z.K. Shinwari, S. Khamlich and M. Maaza. 2017. Sageretiathea (Osbeck.) mediated Synthesis of zinc oxide nanoparticles and its biological applications. Nanomedicine, 1-23.

Nasir, E. and S.I. Ali. Eds. 1972. *An annotated catalogue of the vascular plants of West Pakistan and Kashmir*. printed at Fakhri Print. Press.

Pei, S.J. 1992. Mountain culture and forest resource management of Himalaya. *Himalaya Ecosystem*, pp. 114-120.

Perkin, S. 2003. Government of Pakistan and IUCN Pakistan, Karachi. xx, 55, 77, 132, 176.

Pie, S.J. and N.P. Manadhar. 1987. Source of some local medicines in the Himalayan Regions. *Himalayan Ecosystems*, 97: p.112.

Pooley, B. 1998. A field guide to wild flowers of KwaZulu-Natal and the eastern region. *Durban: Natal Flora Publications Trust 630p.-col. illus. ISBN 062021502X En Icones, Maps. Geog*, 5.

Rahmatullah, M. 2011. A survey of preventive medicinal plants used by the Chakma residents of Hatimara (south) village of Rangamati district, Bangladesh. *Amer-Eur. J. Sustainable Agric.*, 5: 92 96.

Sarwat, Z.K. Shinwari and N. Ahmad. 2012. Screening of potential medicinal plants from district Swat specific for controlling women diseases. *Pak. J. Bot*., 44(4): 1193-1198.

Sheikh, M.K. 2001.*Ecological Studies of Avifauna in the Naltar valley, Northern Pakistan with a conservation perspective* (Doctoral dissertation, Quaid-i-Azam University, Islamabad).

Sheldon, T. 1998. Promoting health care quality: what role performance indicators?. *Quality in Health Care*, 7: 45-50.

Shinwari, Z.K. and M. Qaiser. 2011. Efforts on conservation and sustainable use of medicinal plants of Pakistan. *Pak. J. Bot*., 43(SI): 5-10.

Shinwari, Z.K. and S. Gilani. 2003 Sustainable harvest of medicinal plants at Bulashbar Nullah, Astore (Northern Pakistan). *J. Ethnophormacol.*, 84(2003): 289-298.

Shinwari, Z.K., A.A. Khan and T. Nakaike. 2003. Medicinal and other useful plants of district Swat-Pakistan, pp. 187.

Shinwari, Z.K., I. Khan, S. Naz and A. Hussain. 2009 Assessment of antibacterial activity of three plants used in Pakistan to cure respiratory diseases. *Afr. J. Biotechnol*., 8(24): 7082-7086.

Shinwari, Z.K., M. Rehman, T. Watanabe and Y. Yoshikawa. 2006. Medicinal and Aromatic Plants of Pakistan (A Pictorial Guide). Pp. 492 Kohat University of Science and Technology, Kohat, Pakistan.

Shukla, R., M. Chakravarty and M.P. Gautam. 2008. Indigenous medicine used for treatment of gynecological disorders by tribal of chhattisgarh, India. *J. Med. Plants Res.*, 2(12):.356-360.

Siddiqui, M.B., M.M. Alam, W. Husain and G.K. Sharma. 1988. Ethno-medical study of plants used for terminating pregnancy. *Fitoterapia*, 59(3): 250-252.

Smeda, N. 2009. District profile Mansehra. *Small and Medium Enterprises Development Authority, Ministry of Industries and Production. Government of Pakistan*.

Srithi, K., C. Trisonthi, P. Wangpakapattanawong and H. Balslev. 2012. Medicinal plants used in Hmong women's healthcare in northern Thailand. *J. Ethnopharmacol.*, 139(1): 119-135.

Steenkamp, V. 2003. Traditional herbal remedies used by South African women for gynaecological complaints. *J. Ethnopharmacol*, 86(1): 97-108.

Stewart, R.R. 1972. Flora of West Pakistan: An annotated catalogue of the vascular plants of West Pakistan and Kashmir. *Rawalpindi xx,* 1028p. Map Geog, 6.

Swati, M.I. 1985. Revised Working Plan for the Kaghan Reserved Forests of Mansehra District 1985-86 to 2004-05. *Govt. of Pakistan, Peshawar*.

Tarafder, C.R. 1983. Ethnogynaecology in relation to plants part-2 plants used for abortion. *J. Econ. Taxon. Bot.*, 4: 507-516.

Tarafder, C.R. 1983. Ethnogynaecology in relation to plants. Part 1. Plants used for antifertility and conception. *J. Econ. Taxon. Bot*, 4: 483-489.

Tarafder, C.R. 1984. Ethnogynaecology in relation to plants. Part III. Plants used to accelerate delivery and in pre and post-natal complaints. *J. Econ. Taxon. Bot*., 5: 572-576.

Vitalini, S., M. Iriti, C. Puricelli, D. Ciuchi, A. Segale and G. Fico. 2013. Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, Italy). An alpine ethnobotanical study. *J. Ethnopharmacol.*, 145(2): 517-529.

Walter, C., Z.K. Shinwari, I. Afzal and R.N. Malik. 2011. Antibacterial activity in herbal products used in Pakistan. *Pak. J. Bot*., 43(SI): 155-162.

Yadav, A., L. Kawale and V. Nade. 2008. Effect of *Morus alba* L. (Mulberry) leaves on anxiety in mice. *Indian J. Pharmacology*, 40(1): 32-36.

Yadav, J.P., S. Kumar and P. Siwach. 2006. Folk medicine used in gynecological and other related problems by rural population of Haryana. *Indian J. Tradit. Know.*, 5(3): 323-326.

(Received for publication 18 October 2016)