QUANTITATIVE ANALYSES OF MEDICINAL PLANTS CONSUMPTION AMONG THE INHABITANTS OF SHANGLA-KOHISTAN AREAS IN NORTHERN-PAKISTAN

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Abstract

The main purpose of present study is to provide important information on the use of traditional herbal medicines for the therapy of various human aliments in selected areas of northern Pakistan. The survey was conducted using a semi-structured questionnaire for 157 informants. In addition, the recorded data was analyzed by various quantitative indices like relative frequency citation (RFC), frequency of citation (FC), Fidelity level (FL), Used value (UV) and Used reports (UR). Local residents of the study area provided data on 61 medicinal plants belonging to the 34 families and 49 genera. Lamiaceae was the predominant used family consisting of 6 genera (7 species). The highest FL was reported for *Coriandrum sativum* for the treatment of Respiratory disorders (*100%*) and the lowest for *Cedrus deodara* (*78.57%*). The Relative frequency of *Berberis lyceum* (0.39) comes the highest and the lowest for the species of *Oxalis acetosella* (0.15). Leaves were recorded as most used plant part. For the treatment of various diseases, herbs in the area were highly utilized. For the healing of minor and major illness in northern Pakistan, indigenous medicinal plants are more intended as a form of primary health care. Plants that are used for the first time in the treatment of various diseases in the study area can be considered to be pharmacologically effective. Recognizing their frequent use, there is drive need to promote the use of these plants in phytochemical and pharmacological studies to prove their traditional medicinal knowledge.

Key words: Medicinal plants; Traditional knowledge; Fidelity level; Shangla; Kohistan; Northern Pakistan.

Introduction

The use of plants as a source of medicine dates back to the start of human well-being. The specific medicinal uses of plants and the methods of application for a particular disease are passed on from generation to generation through oral transmission (Shinwari & Qaisar, 2011; Balunas & Kinghorn, 2005). Since prehistoric times man used a variety of natural resources as a basis of medicines. Plants have constantly had a vital role to play in medicine and civic well-being. The acquaintance with use of therapeutic plants and their properties and their transmission to the future generations was acquired by means of trial and error (Shaheen & Shinwari, 2012).There is a need to preserve this crucial information about the therapeutic plant uses as the data transmission between old and younger generation is not always self-assured (Anyinam, 1995; Shinwari *et al.*, 2012). The updating and refinement practice led to build up herbal pharmacopoeias (Balunas & Kinghorn, 2005). The use of traditional medicines for different ailments is significantly increasing (Khan & Shinwari 2016). Since from early ages particularly the remote areas population directly dependent on herbal medicines for all types of medicinal needs. Herbal medications are employed for self-administered pharmaceutical remedies and the parts of the plant are also used as supplementary products by population for all medicinal purposes (Sarwat *et al.*, 2012; Chizzola *et al.*, 2003). The rural community of the country relies more on herbal medications than on modern drug system, about 80% of the populations in developing countries still use plant based medications for their health care (Tareen *et al.*, 2016) The use of herbal prescriptions exists not only in the developing countries but the use of

medicinal plants for the treatment of various diseases is also employed in the developed countries. The knowledge about medicinal plants and their therapeutic uses has been accumulated in the course of lots of centuries based on diverse medicinal systems such as Ayurveda, Unani and Siddha. The preservation and documentation of traditional knowledge, especially the use of medicinal plants, provides important information for modern medicines (Gul *et al.*, 2012; Balick & Cox, 1996).

Plants emphasizes the human life greatly by having multipurpose uses, millions of traditional population use plants for food purposes, for clothing, shelter, fuel and for most admiring medicinal purposes. The investigations data proved that about 80% world population relies on herbal medications (Shinwari & Gilani, 2003). According to reports, a total of 422,000 flowering plants were report from around the world, over 50,000 are used for therapeutic purposes (Grayer *et al.*, 1996; Schippmann *et al.*, 2002). Humans from the beginning of life always use their resident plants as sources of nutrition, fuel, medicine, clothing, housing and chemical production (Kargıoğlu *et al.*, 2008). From the advent of life on the earth human beings use the medicinal plants for the well-being and for different purposes (Lulekal *et al.*, 2013; Venkataswamy *et al.*, 2010). Plants are an important component of the lives of several indigenous communities (Sadeghi *et al.*, 2014). The flora comprises of all cultivated and wild plants, almost 75% of the medicinally imperative plant species grow up in wild condition (Kannan & Jeeva, 2008; Laloo *et al.*, 2006). Over the past decades many studies about medicinal plants were reported in different countries e.g. Turkey (Kültür, 2007), Italy (Pieroni, 2000) and neighboring countries of Pakistan like Bangladesh (Yusuf *et al.*, 1994) and India

(Jain & De Filipps, 1991). In Pakistan, there are 6000 documented wild plant species in which 600-2000 have been used in traditional medicines in different areas of the country and most of them are under investigation to be explored (Ishtiaq *et al*., 2007; Shinwari, 1996).

Pakistan is one of the richest country in terms of biodiversity. Due to variable soil conditions, climatic factors and rich biodiversity of flora, Pakistan has a very unique position in the developing countries (Tareen *et al*., 2016). A large number of literature survey shows that plant based drugs practices is prominent in Pakistani culture. Many studies have been conducted to document traditional knowledge of medicinal plants used for treatment of various ailments and for food in many parts of the country like snake and scorpion bites, skin disease, respiratory disorders, wild edible fruits, diabetics management(Abbasi *et al*., 2010; Butt *et al*., 2015; Kayani *et al*., 2014; Khan *et al*., 2015; Khan & Shinwari, 2016; Shah *et al*., 2015; Tareen *et al*., 2016; Yaseen *et al*., 2015). As for now no quantitative study about medicinal plants has been carried out in Shangla, Kohistan areas of northern Pakistan. This is first comprehensive ethnomedicinal study to present folklore knowledge of plants of the area which is used by the local inhabitant with their quantitative importance.

Materials and Methods

Study area: Northern Pakistan covers upper areas of Khyber Pakhtonkhawa including Chitral, Shangla, Kohistan and some parts of central and northern regions of Pakistan (Fig. 1). The altitude of this area ranges from ± 1400 m to 8611 m and host to three of the world biggest mountain ranges i.e. The Himalaya, the Karakoram and the Hindukush. This area is bestowed with great biodiversity due to altitude variations, snowfall and climate. Near about 80% of endemic flowering plants are located in northern and western hilly ranges of Pakistan. The indigenous people depend upon wild resources directly or indirectly in the form of food, medicines, fruits, vegetables, wood, timber and NTFPs.

Plant collection and Identification from Shangla and Kohistan: The present research work was carried out during 2015-2016 from different areas of northern Pakistan i.e. Shangla top and Kohistan. The survey was conducted using a semi-structured questionnaire for 157 informants (117 females and 40 males) between the ages of 26-68 years, mostly from native indigenous peoples. Plant samples were collected during different season of the year. Each trip was arranged in such a way that maximum information regarding the use of plants for medicinal purposes were collected carefully and effectively. A questioner were made for field study survey which includes interview about personal information, local name, part used, mode of administration and uses. The medicinal plants data were incorporated to get detail information about the specific species by the local inhabitants. Walks were arranged with the local informant for the collection of correct species from their original habitat. During the interviewed the local names of the plant were also asked from the inhabitant. The plants were identified with help of available literature (Ali, 1980; Nasir, 1981). The identification of plants was also done by comparing of plants samples with the authentic specimens available in the Herbarium of Pakistan, Quaid-i-Azam University Islamabad (ISL). Plant samples were collected, dried, pressed, poisoned and mounted standard herbarium sheets. All collected plants were deposited to the herbarium of Pakistan Quaid-i-Azam University Islamabad (ISL) for future references.
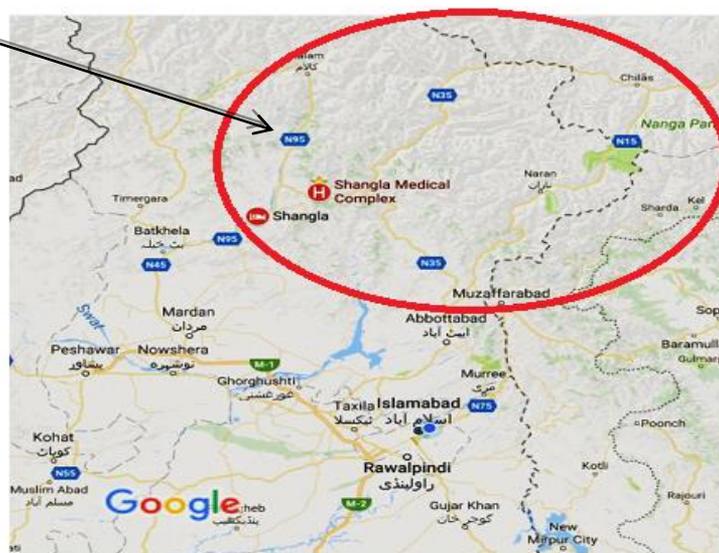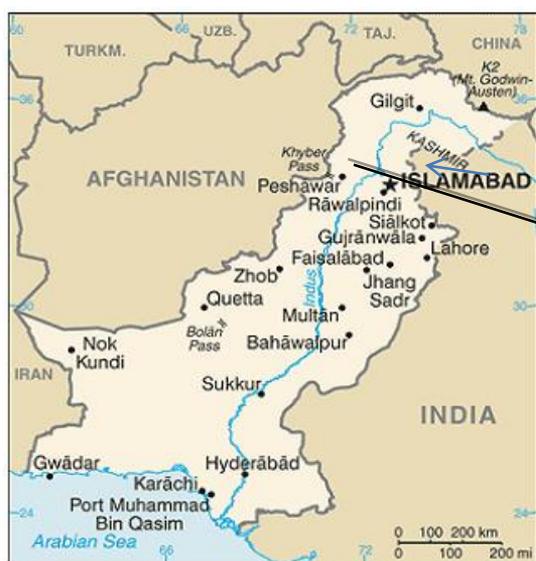

Fig. 1. Map showing study areas.

Quantitative data analysis: Indigenous knowledge is quantitatively assessed using various measurement such as, Use value (UV), relative frequency citation (RFC) and fidelity level (FL).

Use value (UV): The use value is an important to measure all the possible uses of a plant species locally without taking its relative frequency citation. Use value (UV) of a species was carried out by using the formal (Kayani *et al.*, 2014).

$$UV= u/n$$

In this formula u is the value of a plant to cure a disease and n is the number of inhabitant's reporting over all uses of a species.

Relative frequency citation (RFC): Relative frequency citations were calculated to carried out the consensus between the informants on the uses of native medicinal herbs of in area. RFC was calculated by using the formula (Butt *et al.*, 2015).

$$RFC=FC/N(0<RFC<1)$$

where FC is the number of inhabitant who mentioned the species while, N is the total number of informants participated in the study.

Fidelity level (FL): Fidelity level (FL) is the percentage of informants, who claim the use of a specific species for the same major use, which can be carried out through fidelity level formulated by (Alexiades, 1996).

$$FL\%= IP/Iux100$$

where 'Ip' denote the number of use report cited for a given plant species for a specific disease category and 'Iu' is the number of use report cited for a given plant. High FL values are near 100% is obtained for plants for which, all use reports refer to the same disease category, while, low FL value is obtained for species that are used for different disease (Musa *et al.*, 2011).

Results and Discussion

The documented data deals with the consumption patterns of traditional medicinal plants usage among the tribal communities of northern Pakistan. All plant species along with their botanical names, plant part used, common name, mode of Preparation, administration and quantitative data analysis are presented in table 1 (Plates 1 & 2).

Botanical diversity: A total of 61 medicinal plants belonging to 49 genera and 34 families were reported from the study area which have medicinal values. Qualitative (Plant common name, Plant Part used, Mode of Preparation and administration) and quantitative analysis (FC, RFC, UV, UR, FL) of each plant species were recorded. Family Lamiaceae has the highest contribution with 7 plants, followed by family Rosaceae with 6 plants and Family Polygonaceae with 4 plants. Family Amaranthaceae was represented by 3 species while families like Adiantacae, Amarylidaceae, Aspleniaceae, Berberidiacae, Ebenaceae, Fabaceae, Moraceae, Oxalidaceae, Pinaceae, Plantaginaceae, Rutaceae were represented by two species each, and family Adoxaceae, Apicaeae, Araliceae, Astereaceae Brassicaceae and remaining families show one specie. The Lamiaceae family is predominance in this area show similar findings with Ahmad *et al.* (2014); Hamayun (2007) this might be due to same climatic condition and altitudes. In terms of life forms (65%) were herbaceous followed by trees (18%) and shrubs (15%). The dominance of herbaceous life form might be due to easy availability and abundant growth in wild form. Due to easy access indigenous people prefer herbs as source of medicine (Fig. 2).

Plant Part used and mode of preparation: In present study about all parts of plants were used for treatment of various ailments. The most commonly plant part were leaves (40%), followed by fruits (26%), whole plant (18%) and fronds (4%) in the study area (Table 1; Fig. 3). The uses of leaves are safe for the sustainability of plant communities. Collection and preparation of the drug from the leaves are much easier than the rest of the plant and make them the first choice for use(Telefo *et al.*, 2011).It is also noted that from previous studies, roots and fruits in the studies of Rashid *et al.* (2010) and Ragunathan & Soloman (2009).From scientific point of view, leaves are the main organ responsible for photosynthesis and phytochemicals synthesis (Ahmad *et al.*, 2014; Butte *et al.*, 2015).

Medicinal plants were used by local inhabitants in different ways and diverse recipes. It noticeable that decoction (51%) were dominant in mode of Preparation, followed by powder and juice (12% each), as raw (7%), infusion and extract (4%) (Fig. 4). Decoction is mostly used method for preparation of indigenous herbal practices due to its easy preparation by mixing with water or tea (Khan *et al.*, 2011). In some cases, the processing includes drying the plant material, followed by grinding into fine powder. Addition of adjuvants is sometimes added to improve the drug properties or increase the aesthetic value of the formulation. Indigenous people use herbal drugs in the area due to lack of basic health facilities, far away from cities and rich diversity of medicinal plants.

Quantitative data analysis: The recorded data was analyzed through different statistical indices like FC, RFC, UV, UR and Fidelity level.

Relative frequency of citation (RFC): Relative frequency citation (RFC) shows the traditional importance of each species with reference to informants who cited these medicinal species. The plant species in the study area with high degree of RFC were *Berberis lycium* Royle. (0.39), followed by *Mentha spicata* L. (0.38). Other important medicinal plants in documented data were *Mentha longifolia* (L.) Huds. And *Morus alba* L. (0.36) each, *Dysporus kaki* (0.35). The lowest RFC was recorded for *Oxalis acetosella* L. (0.15), *Adiantum venustum.* D.Don (0.16) and *Adiantum capilus-veneris* L. (0.17). The results show that more professional villagers and therapists have a better understanding of medicinal plants than most of the common knowledge of medicinal plants in Northern Pakistan.

Table 1. Medicinal plants with quantitative analyses used among the inhabitants of Northern Pakistan.

S. No	Plant name	Voucher number	Family	Local name	Habit	Part used	Preparation mode	Diseases treated	FC*	RFC*[1]	UV*[2]	UR*[3]	FL%*[4]
1.	Adiantum capillus-veneris L.	KO-07 ISL	Adiantaceae	Velo	Herb	Fronds, Whole plant	Decoction, Powder	Anti-asthmatic, Respiratory disease	27	0.17	0.07	2	92.59
2.	Adiantum venustum D. Don	KO-04 ISL	Adiantaceae	Sumbal	Herb	Fronds	Infusion	Infusion of this plant is used as contraceptives, Blood purifier and cooling of the body	25	0.16	0.12	3	80
3.	Ajuga integrifolia Buch.-Ham.	KO-55 ISL	Lamiaceae	Buti	Herb	Fronds	Decoction, powder, Juice	Decoction/Juice of whole plant is used to treat respiratory disorders, skin diseases, Chest problems and Goitre	53	0.34	0.08	4	94.33
4.	Allium cepa L.	KO-29 ISL	Amaryllidaceae	Peyaz	Herb	Whole plant	Decoction	Decoction is used to treat eye diseases, blood pressure, diabetics, heart diseases, hypertensive and hypertensive agent, antiseptic,	38	0.24	0.18	7	89.47
5.	Allium sativum L.	KO-33 ISL	Amaryllidaceae	Ooga	Herb	Whole plant	Decoction	Blood pressure, ear pain, hypertensive, boils maturation, digestive disorders, lungs diseases, antiseptic, Tuberculosis	41	0.26	0.20	8	90.24
6.	Amaranthus viridis L.	KO-22 ISL	Amaranthaceae	Gamhar	Herb	Leaves	Decoction	Dysentery, constipation, snake and scorpion biting, diuretic, Pot herb,Cough	34	0.22	0.21	7	94.11
7.	Artemisia dubia L.	KO-05 ISL	Astereaceae	Kakry	Herb	Whole plant	Decoction	Typhoid, fever, anticancer, body tonic, skin diseases	26	0.17	0.19	5	92.30
8.	Asplenium ceterach L.	KO-47 ISL	Aspleniaceae	Aspabuty	Herb	Whole plant	Infusion	Antifertility, fever	47	0.30	0.04	2	93.61
9.	Asplenium dalhousiae	KO-13 ISL	Aspleniaceae	Haspybuty	Herb	Whole plant	Decoction	Antifertility, diabetics	29	0.18	0.07	2	86.20
10.	Berberis lycium Royle	KO-61 ISL	Berberidiacae	Kawary	Shrub	Leaves, Roots, Fruits	Decoction	Diabetic, typhoid, fever, anticancer, body tonic, liver diseases, skin diseases	62	0.39	0.11	7	88.70
11.	Bergenia ciliata (Haw.) Stemb.	KO-43 ISL	Saxifragaceae	Gat panrha	Herb	Whole plant	Decoction	skin infections, kidney problems, wound healer	45	0.29	0.07	3	91.11
12.	Cannabis sativa L.	KO-38 ISL	Cannabaceae	Bhang	Herb	Leaves, Seeds	Powder	Anti-cancer, Headache, dry cough, muscle pain, diarrhoea, sedative	43	0.27	0.14	6	93.02
13.	Cedrus deodara (Roxb.ex. D.Don)	KO-09 ISL	Pinaceae	Acahr	Tree	Gum	Decoction	Removal of unwanted hairs, furniture, anti diabetics, anti-cancer	28	0.18	0.14	4	78.57
14.	Chenopodium album L.	KO-25 ISL	Amaranthaceae	Sarmay	Herb	Leaves	Extraction, decoction	Hepatitis, aphrodisiac, liver disorders	35	0.22	0.09	3	85.71
15.	Citrus aurantium L.	KO-14 ISL	Rutaceae	Narang	Tree	Fruits	Juice	Antifertility and skin problems	29	0.18	0.07	2	82.75
16.	Citrus limon (L.)	KO-45 ISL	Rutaceae	Lemo	Tree	Fruits	Juice	Skin infection, small patches that are formed due the anaemia, Cough, vomiting, Skin diseases,	46	0.29	0.11	5	91.30
17.	Clinopodium umbrosum (M.Bieb.) K.Koch	KO-26 ISL	Lamiaceae	Sakinabuty	Herb	Whole plant	Decoction	Vegetables, constipation, antifertility, skin, eye diseases	35	0.22	0.14	5	91.42
18.	Coriandrum sativum L.	KO-46 ISL	Apicaeae	Daniyal	Herb	Whole plant	Powder	Respiratory disorders, sedative, stomach diseases	46	0.29	0.07	3	100
19.	Crataegus songarica K.Koch	KO-15 ISL	Rosaceae	Makhranai	Shrub	Fruits, Leaves	Juice	Leaves are used as antifertility, fruit is edible and used for digestive problems	29	0.18	0.10	3	86.20
20.	Cynodon dactylon (L.) Pers	KO-49 ISL	Poaceae	Kabal	Herb	Whole plant	Decoction	Diarrhoea, skin infection	49	0.31	0.04	2	81.63
21.	Viola odorata L.	KO-50 ISL	Violaceae	Lailo	Herb	Leaves	Decoction	Constipation, cough, chest infection	32	0.20	0.09	3	93.75
22.	Dysphania ambrosioides (L.) Mosyakin & Clemants	KO-56 ISL	Amaranthaceae	Saqabuty	Herb	Leaves	Decoction, Juice	Eyes sight, antifertility, digestive disorders, skin problems, headache, cough	49	0.31	0.12	6	91.83
23.	Diospyros kaki L.	KO-54 ISL	Ebenaceae	Sooramlok	Tree	Fruits	Extraction	Blood purifier, laxative, edible, blood pressure, Skin diseases	55	0.35	0.09	5	92.72
24.	Diospyros lotus L.	KO-34 ISL	Ebenaceae	Tooramlok	Tree	Fruits	Decoction	Constipation, carminative, vomiting, constipation	52	0.33	0.08	4	96.15
25.	Elaeagnus umbellata Thunb	KO-19 ISL	Elaeagnaceae	Gulamranga	Shrub	Fruits	Decoction	Cardiac problems, cough	41	0.26	0.05	2	85.36
26.	Ficus carica L.	KO-39 ISL	Moraceae	Inzar	Tree	Fruits	As raw	Blood purifier, skin problems, edible, miswak	32	0.20	0.13	4	87.87
27.	Fumaria indica (Hausskn.) Pugsley	KO-52 ISL	Fumaraceae	Paprha	Herb	Leaves	Decoction	Fever, chest infection, blood purifier	43	0.27	0.07	3	90.69
28.	Hedera nepalensis K.Koch	KO-16 ISL	Araliceae	Palol	Herb	Leaves	Decoction	Hypertension, anti-diabetic	51	0.32	0.04	2	98.03
29.	Isodon rugosus (Wall. ex Benth.)	KO-44 ISL	Lamiaceae	Banrya	Shrub	Leaves	Decoction	Anti-emetic, anti-cancer	29	0.18	0.07	2	93.10
30.	Juglans regia L.	KO-18 ISL	Juglandacaeae	Ghoz	Tree	Fruits, Leaves	Powder	Stomach diseases, eye diseases, walnut oil s used to cure eczema, intestinal worms, edible fruit, brain tonic and aphrodisiac	45	0.29	0.16	7	93.33
31.	Mentha longifolia (L.) Huds.	KO-58 ISL	Lamiacae	Velany	Herb	Whole plant	Decoction	Gas problems, arthritis, digestive disorders, gastro intestinal disorders, cosmeceuticals, blood Pressure, antifertility, fever	56	0.36	0.14	8	96.42

Table 1. (Cont'd).

S. No	Plant name	Voucher number	Family	Local name	Habit	Part used	Preparation mode	Diseases treated	FC*	RFC*1	UV*2	UR*3	FL%*4
32.	Mentha spicata L.	KO-60 ISL	Lamiaceae	Pudina	Herb	Whole plant	Decoction / Eaten as raw	Gastric problems, nausea, stomach disorders, vomiting, carminative, muscular disorders	59	0.38	0.10	6	88.13
33.	Morchella esculanta (Buch-Ham. ex D.Don)	KO-10 ISL	Morchellaceae	Gojai	Fungus	Whole	Powder	Mouth diseases and tonsils, digestive, hair loss, anti-cancer, anti diabetes	28	0.18	0.21	6	82.14
34.	Morus alba L.	KO-59 ISL	Moraceae	Amlok	Tree	Fruits, Leaves	Decoction / Extract	Antifertility, gastric problems, rheumatism, cough, stomach disorders	57	0.36	0.09	5	92.98
35.	Nasturtium officinale W.T. Aiton	KO-51 ISL	Brassicaceae	Tambera	Herb	Leaves	Decoction	Asthma, anti-helminthic, joint pain, vegetables	49	0.31	0.08	4	89.79
36.	Oxalis acetosella L.	KO-01 ISL	Oxalidaceae	Speentaroky	Herb	Leaves	Decoction	Respiratory and skin problems	23	0.15	0.09	2	86.95
37.	Oxalis corniculata L.	KO-40 ISL	Oxalidaceae	Taroky	Herb	Leaves, Fruits	Decoction / Juice	Vermifuge, digestive diseases	43	0.27	0.05	2	86.04
38.	Paeonia emodi Royle	KO-42 ISL	Paeoniaceae	Mamekh	Herb	Fruits, Leaves	Powder	Hypertension, gynaecological problems	44	0.28	0.05	2	90.90
39.	Papaver somniferum L.	KO-23 ISL	Papavaraceae	Qashqash	Herb	Seeds	Latex	Narcotics, cough, pain killer, chest infection in children,	34	0.22	0.12	4	88.23
40.	Persicaria amplexicaulis (D.Don) Ronse Decr.	KO-27 ISL	Polygonaceae	Tarwaparnha	Herb	Leaves	Decoction	Antifertility, weight loss	35	0.22	0.06	2	91.42
41.	Persicaria barbata (L.) H. Hara	KO-11 ISL	Polygonaceae	Palpolak	Herb	Leaves	Decoction	Hunting of fishes, scabies	28	0.18	0.07	2	92.85
42.	Pinus wallichiana L.	KO-20 ISL	Pinaceae	Peecoch	Tree	Gum, leaves, Bark	Gum	Allergy, furniture, for removing of public hairs, diabetics	33	0.21	0.12	4	93.93
43.	Plantago lanceolta L.	KO-48 ISL	Plantaginaceae	Jabai	Herb	Leaves	Extract	Diarrheal, constipation, cardiac diseases, abdominal pain, inflammation, wound healing	47	0.30	0.11	5	89.36
44.	Plantago major L.	KO-41 ISL	Plantaginaceae	Ghatajaba	Herb	Whole plant	Decoction	Candidiasis, headache, constipation, Goitre	43	0.27	0.09	4	93.02
45.	Podophyllum hexandrum Royle.	KO-30 ISL	Berberidiaceae	Kakora	Herb	Fruits	Raw	Vomiting, nausea	38	0.24	0.05	2	84.21
46.	Portulaca oleracea L.	KO-35 ISL	Portulaceae	Zanglali	Herb	Leaves	Decoction	Hepatitis, kidney disorders, joint pain	41	0.26	0.07	3	90.24
47.	Prunella vulgaris L.	KO-36 ISL	Lamiaceae	Parharbuty	Herb	Leaves, Whole plant	Decoction	For healing of wounds, obesity	42	0.27	0.05	2	88.09
48.	Prunus armeniaca L.	KO-28 ISL	Rosaceae	Alocha	Tree	Fruits	Raw fruits	Anti-cancer, edible, cause antifertility when eaten unripe, gastro intestinal disease.	36	0.23	0.11	4	83.33
49.	Prunus persica (L.) Batsch	KO-37 ISL	Rosaceae	Zardao	Herb	Fruits, Leaves	Raw	Anti-constipation, skin and blood purifier	42	0.27	0.07	3	92.85
50.	Punica granatum L.	KO-53 ISL	Lythraceae	Angory	Tree	Fruits	Juice, Powders	Blood purifier, vomiting, tuberculosis, cough, intestinal disorders	51	0.32	0.10	5	88.23
51.	Rosa indica L.	KO-21 ISL	Rosaceae	Gulab	Shrub	Leaves, flowers	Spray	Skin problems, digestive disorders, increase eye sight, ornamental, perfumes, kidney tonic	33	0.21	0.18	6	90.90
52.	Rosa moschata Herrm.	KO-08 ISL	Rosaceae	Qurch	Shrub	Fruits, Flowers	Decoction	Stomach problems, skin diseases, ornamental purposes	27	0.17	0.11	3	88.88
53.	Rubus niveus Thonb.	KO-02 ISL	Rosaceae	Bugarnha	Shrub	Fruits	Juice	Juice of this plant is used for treatment of digestive, Urinary and respiratory disorders	24	0.15	0.13	3	87.5
54.	Rumex dentatus L.	KO-24 ISL	Polygonaceae	Shalkhy	Herb	Leaves	Decoction	Chronic disorders, gastro intestinal tract diseases, nervous disorder, general body weakness, joint pain	34	0.22	0.15	5	91.17
55.	Rumex hastatus D.Don	KO-31 ISL	Polygonaceae	Katkaltaroky	Herb	Leaves	Decoction	Urinary diseases, constipation, stomach worms,	39	0.25	0.13	5	89.74
56.	Solanum villosum Mill.	KO-06 ISL	Solanaceae	Kachmacho	Herb	Fruits	As raw	Digestive problems, skin	26	0.17	0.08	2	92.30
57.	Trifolium repens L.	KO-17 ISL	Fabaceae	Shawtal	Herb	Leaves	Infusion	Skin diseases, fever, wound healing	29	0.18	0.10	3	82.75
58.	Urtica dioica L.	KO-57 ISL	Urticaceaes	Jalbang	Herb	Leaves	Decoction	Skin irritation, anti-helminthic	55	0.35	0.04	2	90.90
59.	Viburnum grandiflorum Wall. ex DC.	KO-03 ISL	Adoxaceae	Gedarkawar	Shrub	Fruits, Leaves	Juice	Stomach disorders, antifertility, urinary problems, cardiac disorders	24	0.15	0.17	4	83.33
60.	Vicia faba L.	KO-32 ISL	Fabaceae	Pali	Herb	Seeds	As raw	Digestive problems, eyes sight	39	0.25	0.05	2	89.74
61.	Vitex negundo L.	KO-12 ISL	Lamiaceae	Marvandy	Shrub	Leaves	Decoction	Urinary disorders, constipation, joint pain	28	0.18	0.11	3	89.28

FC*: Frequency of citation, RFC*1: Relative frequency of citation, UV*2: Used Value, UR*3: Used Reports, FL*4: Fidelity level

Plates: Important Medicinal plants of the area

Plate 1. 1) *Ajuga intigrifolia* 2) *Dysphania ambrosioides* 3) *Aspilinium dilhousia* 4) *Berberis lyceum*.
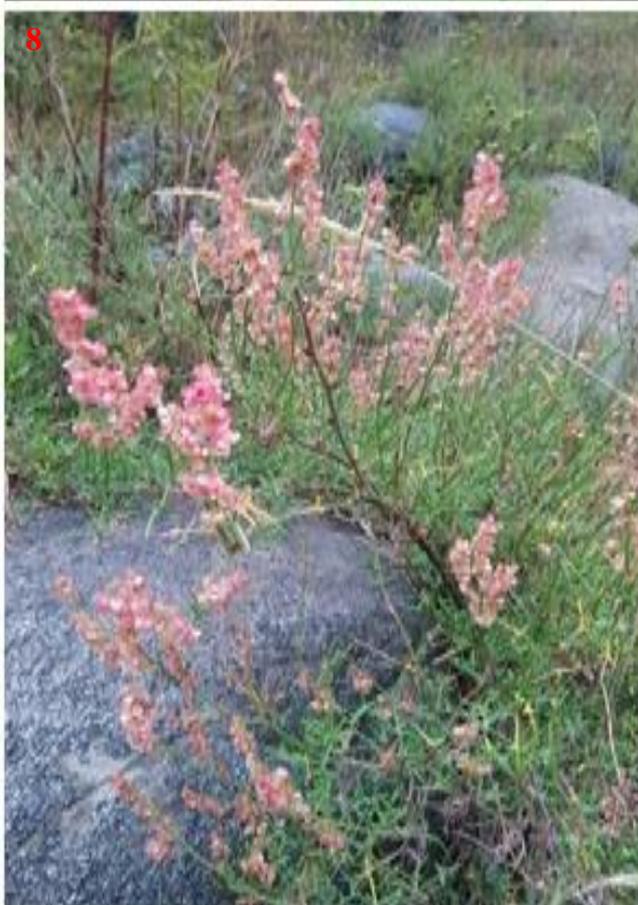
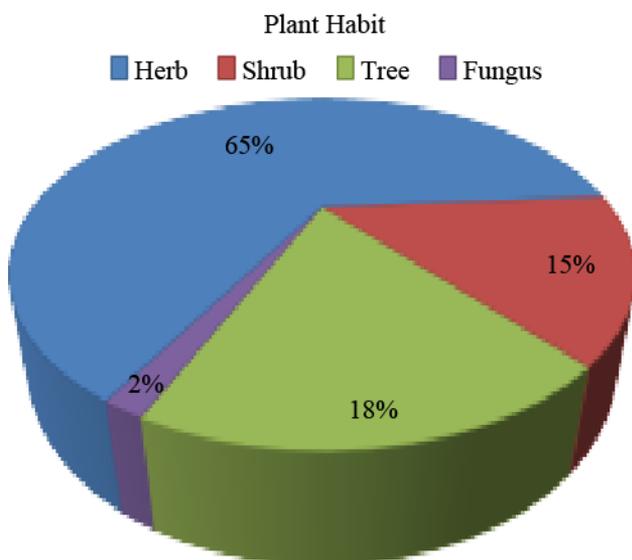Plate 2. 5) *Adaintum venstum* 6) *Oxlis corniculata* 7) *Ricinus communis* 8) *Rumex hastatus*.

Plant Habit
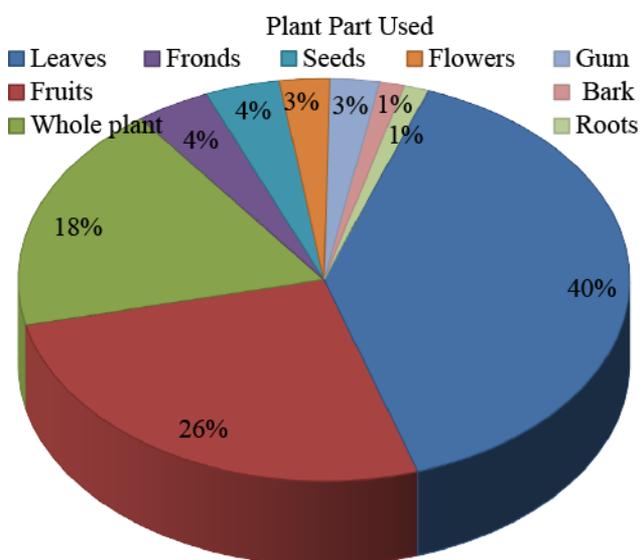

Fig. 2. Habit of the plant species.
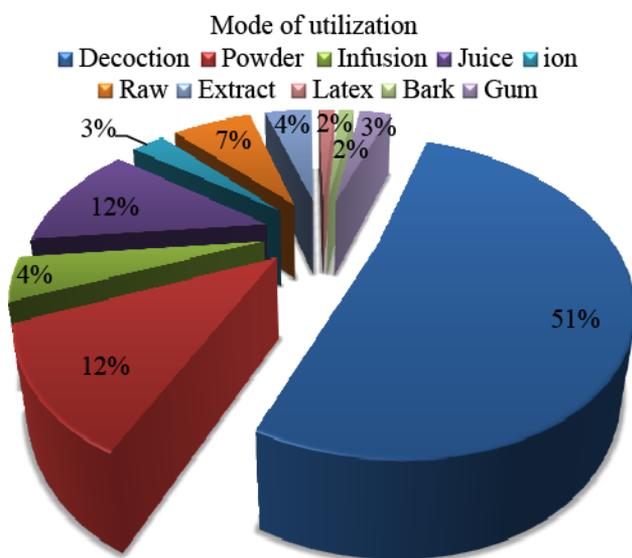
Plant Part Used

Fig. 3. Plant part used.

Mode of utilization

Fig. 4. Mode of utilization of medicinal plants.

Used value (UV) and fidelity level (FL): Used Value (UV) is an important tool for selecting the most valuable medicinal plants in any area having more frequent reports from local informants. Used value in our reported area ranges from 0.04 to 0.21. The highest used value was reported for *Amaranthus viridis* L. and *Morchella esculanta* (Buch-Ham. ex D.Don) (0.21 each), followed by *Allium sativum* L. (0.20). The lowest UV was recorded for *Asplinum ceterach* L., *Cynodon dactylon* (L.)Pers, *Hedra neplaenus* K.Koch and *Urtica dioica* L. (0.04 each). The present study about medicinal plants is first quantitative study in Shangla and Kohistan regions of Northern areas however in other parts of Pakistan work has been done like (Yaseen *et al*., 2015b; Butt *et al*., 2015) but there is clear vartions regarding most cited species and their statistical anayses. For example *Amaranthus viridis* L. and *Morchella esculanta* (Buch-Ham. ex D.Don) has highest value but according to Yaseen *et al*. (2015), *Citrullus vulgaris, Aerva javanica* have highest UV. This variation might be due to climatic and altitude changes. It is suggested that plants species with high UV values should be further studies for Phytochemicals and Biological activities.

Fidelity level (FL) indicates the preference for species to be superior to other species in the management of a particular disease. FL ranges from 100% to 78.57% in the study area for medicinal plants use age. The highest FL were reported for *Corriandum sativum* L (100%), *Hedra neplaenus* K.Koch (98.03) while lowest were for *Cedrus deodara* (Roxb.ex. D.Don), (78.57) *Adiantum venustum.* D.Don, (80%) *Cynodon dactylon* (L.) Pers, (81.63%) *Morchella esculanta* (82.14%). Based on our findings highest FL Values species should be further considered, evaluate more data on the efficacy and authenticity of their reports.

Conclusion

Most of the communities in study area were far away from basic health facility and still using traditional medicinal plants for their treatment of minor and major illness. This survey contributed to create a list of medicinally important plants of the northern Pakistan (Shangla-Kohistan area). In total 61 plant species were reported for treatment of various diseases like respiratory, skin, digestive disorders and Diabetes. Due to increasing number of herbal drugs, protecting this indigenous knowledge is critical to maintaining continuity and the record of traditional culture heritage, which is also lost on the basis of local biodiversity. Keeping in mind and encourage the younger generation to learn traditional medicine knowledge to protect and conserve it. In present study many of recorded medicinal plants still need fidelity screening of phytochemical investigation. It is strongly recommended that a comprehensive research project on the pharmacological investigation of indigenous medicinal plants in the region must be initiated.

Acknowledgement

References

Abbasi, A.M., M.. Khan, M. Ahmad, M. Zafar, S. Jahan and S. Sultana. 2010. Ethnopharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal communities of north-west frontier province, Pakistan. *Journal. Ethnopharmacol.,* 128(2): 322-335.

Ahmad, M., S. Sultana, S. Fazl-i-Hadi, T. Ben Hadda, S. Rashid, M. Zafar, M.A. Khan, M.P.Z. Khan and G. Yaseen. 2014. An ethnobotanical study of medicinal plants in highmountainousregion of Chail valley (District Swat-Pakistan). *J. Ethnobiol. Ethnomed.*, 10: 36.

Alexiades, M.N. 1996. Collecting ethnobotanical data: an introduction to basic concepts and techniques. Advances in *Economic Botany*, 10: 53-96.

Ali, S.I. 1980. Flora of Pakistan. Pakistan Agricultural Research Council.

Anyinam, C. 1995. Ecology and ethnomedicine: exploring links between current environmental crisis and indigenous medical practices. *Social Science & Medicine,* 40: 321-329.

Balick, M.J. and P.A. Cox. 1996. *Plants, people, and culture: the science of ethnobotany*. Scientific American Library.

Balunas, M.J. and A.D. Kinghorn. 2005. Drug discovery from medicinal plants. *Life sciences,* 78: 431-441.

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

Calixto, J.B. 2005. Twenty-five years of research on medicinal plants in Latin America: a personal view. *Journal of Ethnopharmacol,* 100: 131-134.

Chizzola, R., H. Michitsch and C. Franz. 2003. Monitoring of metallic micronutrients and heavy metals in herbs, spices and medicinal plants from Austria. *European Food Research and Technology,* 216: 407-411.

Grayer, R.J., G.C. Kite, F.J. Goldstone, S.E. Bryan, A. Paton and E. Putievsky. 1996. Infraspecific taxonomy and essential oil chemotypes in sweet basil, Ocimum basilicum. *Phytochemistry*, 43(5): 1033-1039.

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.

Hamayun, M. 2007. Traditional uses of some medicinal plants of Swat valley, Pakistan. *IJTK*, 6: 636-641.

Ishtiaq, M., A. Mahmood and M. Maqbool. 2015. Indigenous knowledge of medicinal plants from Sudhanoti district (AJK), Pakistan. *Journal of Ethnopharmacol*, 168: 201-207.

Jain, S.K. and R.A. DeFilipps. 1991. Medicinal plants of India. Algonac: Reference Publications.

Kannan, D. and S. Jeeva. 2008. Use of ethnoveterinary plants by indigenous rangeland community of Kanyakumari District, Tamil Nadu, India. In: *Proceedings of the International Grassland Congress and 8th International Rangeland Congress*, June (p. 22).

Kargıoğlu, M., S. Cenkci, A. Serteser, N. Evliyaoğlu, M. Konuk, M.S. Kök and Y. Bağcı. 2008. An ethnobotanical survey of inner-West Anatolia, Turkey. *Human Ecology*, 36: 763-777.

Kayani, S., M. Ahmad, M. Zafar, S. Sultana, M.P.Z., Khan, M.A. Ashraf, J. Hussain and G. Yaseen. 2014. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies–Abbottabad, Northern Pakistan. *Journal. Ethnopharmacol,* 156: 47-60.

Khan, B., A. Abdukadir, R. Qureshi and G. Mustafa. 2011. Medicinal uses of plants by the inhabitants of Khunjerab National Park, Gilgit, Pakistan. *Pak. J. Bot.,* 43(5): 2301-2310.

Khan, M.P.Z., M. Ahmad, M. Zafar, S. Sultana, M.I. Ali and H. Sun. 2015. Ethnomedicinal uses of Edible Wild Fruits (EWFs) in Swat Valley, Northern Pakistan. *Journal. Ethnopharmacol,* 173(2015): 191-203.

Kültür, Ş. 2007. Medicinal plants used in Kırklareli province (Turkey). *Journal of Ethnopharmacol*, 111(2): 341-364.

Shah, A.H., S.M. Khan, A.H. Shah, A. Mehmood, I.U. Rahman and H. Ahmad. 2015. Cultural uses of plants among Basikhel tribe of District Tor Ghar, Khyber Pakhtunkhwa, Pakistan. *Pak. J. Bot.*, 47: 23-41.

Khan, M.Q. and Z.K. Shinwari. 2016. The ethnomedicinal profile of family rosaceae; a study on pakistani plants. *Pak. J. Bot.*, 48: 613-620.

Laloo, R.C., L. Kharlukhi, S. Jeeva and B.P. Mishra. 2006. Status of medicinal plants in the disturbed and the undisturbed sacred forests of Meghalaya, northeast India: population structure and regeneration efficacy of some important species. *Current Science*, 90(2): 225-232.

Lulekal, E., Z. Asfaw, E. Kelbessa and P Van Damme. 2013. Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara Region. Ethiopia. *J. Ethnobiol. Ethnomed.*, 63: 1-13.

Musa, M.S., F.E. Abdelrasool, E.A. Elsheikh, L. Ahmed, A.L.E. Mahmoud and S.M. Yagi. 2011. Ethnobotanical study of medicinal plants in the Blue Nile State, South-eastern Sudan. *J. Med. Pl. Res.,* 5(17): 4287-4297.

Nasir, E. 1981. Flora of Pakistan, Agriculture Research Conference, 1981, Islamabad (Pakistan), 24-27 Oct. 1981. PARC.

Pieroni, A. 2000. Medicinal plants and food medicines in the folk traditions of the upper Lucca Province, Italy. *Journal of Ethnopharmacology*, 70: 235-273.

Rashid, A., M.F. Swati, H. Sher and M.N. Al-Yemeni. 2011. Phytoecological valuation with detail floristic appraisal of the vegetation arround Malam Jabba, Swat, Pakistan. *Asian Pacific J. Tropic Biomed.*, 1(16): 461-467.

Ragunathan M. and M. Solomon. 2009. The study of spiritual remedies in orthodox rural churches and traditional medicinal practice in Gondar Zuria district. *Northwestern Ethiopia Pharmacognosy J.*, 1: 178-183.

Sadeghi, Z., K. Kuhestani, V. Abdollahi and A. Mahmood. 2014. Ethnopharmacological studies of indigenous medicinal plants of Saravan region, Baluchistan, Iran. *Journal of Ethnopharmacol*, 153(1): 111-118.

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.

Schippmann, U.W.E., D. Leaman and A.B. Cunningham. 2006. A comparison of cultivation and wild collection of medicinal and aromatic plants under sustainability aspects. *Frontis*, 17: 75-95.

Shaheen, H. and Z.K. Shinwari. 2012. Phyto diversity and Endemic richness of Karambar Lake Vegetation from Chitral, Hindukush-Himalayas. *Pak. J. Bot.*, 44(1): 17-21.

Shinwari, Z.K. 1996. Ethnobotany in Pakistan: Sustainable and participatory approach. In Proceedings Ethnobotany and its application to conservation, p. 14-25, Ethnobotany and its application to conservation. NARC, NARC, Islamabad, Pakistan.

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

Shinwari, Z.K., S.A. Gilani and A.L. Khan. 2012. Biodiversity loss, emerging infectious diseases andimpact on human and crops. *Pak. J. Bot.*, 44(SI): 137-142.

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

Tareen, N.M., M.A. Saeed-ur-Rehman, Z.K. Shinwari and T. Bibi. 2016. Ethnomedicinal utilization of wild edible vegetables in district harnai of balochistan province-pakistan. *Pak. J. Bot.*, 48: 1159-1171.

Telefo, P., L. Lienou, M. Yemele, M. Lemfack, C. Mouokeu, C. Goka, S. Tagne and F. Moundipa. 2011. Ethnopharmacological survey of plants used for the treatment of female infertility in Baham, Cameroon. *Journal. Ethnopharmacol,* 136(1): 178-187.

Venkataswamy, R., H. Mohamad, A. Mubarack, T.K. Doss Ravi and M. Sukumar. 2010. Ethnobotanical study of medicinal plants used by Malasar tribals in Coimbatore district of Tamil Nadu (South India). *Asian J. Exp. Biol. Sci*., 1: 387-392.

Yaseen, G., M. Ahmad, M. Zafar, S. Sultana, S. Kayani, A.A. Cetto and S. Shaheen. 2015. Traditional management of diabetes in Pakistan: Ethnobotanical investigation from Traditional Health Practitioners. *Journal. Ethnopharmacol,* 174(2015): 91-117.

Yaseen, G., M. Ahmad, S. Sultana, A.S. Alharrasi, J. Hussain and M. Zafar. 2015. Ethnobotany of medicinal plants in the Thar desert (Sindh) of Pakistan. *Journal of Ethnopharmacol*, 163: 43-59.

Yusuf, M., J. Chowdhury, M. Wahab and J. Begum. 1994. Medicinal plants of Bangladesh. *Bangladesh Council of Scientific and Industrial Research,* Dhaka, Bangladesh, 192.