QUANTITATIVE ANALYSIS OF MEDICINAL FLORA USEED AS HERBAL REMEDIES IN HINDU KUSH MOUNTAIN RANGE, NORTHERN PAKISTAN

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Abstract

This research aims to collect significant data on traditional uses of medicinal plant species used by the inhabitants as remedies in Northern Pakistan. In this regard ethnobotanical data were compiled from 128 informants through group discussion and well-organized questionnaire. Demographic features, part used, preparation methods, mode of application, life form, and ethno medicinal uses were noted. For data analysis quantitative indices i.e. (ICF) Informant consensus factor, (FL) Fidelity level, (UV) Use value, (RFC) Relative frequency citation and (DMR) data matrix ranking were used. A comparison with 6 published ethnobotanical studies at national and international level was carried out for authentication of ethnomedicinal relevance of data documented. A total of 94 medicinal plant species from 34 families were documented. Family Lamiaceae and Asteraceae (13%) were the most leading families. Ailments were classified into 13 different categories. Leaves (34%) were commonly used for the preparation of ethno medicines. Major contribution (65%) was obtained from herbaceous flora. The most frequently used method for the preparation of ethno medicine was decoction (41%). Highest number of use reports (107) and ICF (0.84) were observed for antispasmodic. High fidelity level 95.45% was observed for *Berberis lyceum*. Use value (UV) was high (0.67) for *Urtica dioica* while RFC (0.45) was observed high for *Ajuga bracteosa*. Plants with high FIC value should be screened for comprehensive pharmacological and phytochemical studies. Medicinal flora was found at risk due to unwise harvesting and over grazing. Further plant exploration, awareness, conservation, Joint collaboration and wise use of plant resources are recommended.

Key words: Herbal remedies; Medicinal plants; Informant consensus factor; Usho; Northern Pakistan.

Introduction

Ethnomedicinal studies are important to discover existing drugs form indigenous medicinal plant resources (Hassan *et al*., 2020). Due to the documentation of traditional knowledge of native plant species numerous drugs have already been discovered (Gilani & Atta-ur-Rahman, 2005). Even 25% of herbal drugs are plant based mentioned in modern pharmacopeia while many synthetic drugs are manufactured from plants isolates (WHO, 2002). Domestication and management of medicinal plant species are in practice in different parts of the world (Mahmood *et al.*, 2013). Besides, medicinal plant species have been under practice since prehistoric time to cure different health disorders throughout the globe (Elisabetsky, 1990). Even today aged and experienced peoples using ethno medicines until return to health at regular basis as peoples have noticed that modern health care system depend on ingredients obtained from plants (Hassan *et al*., 2017c; Zeb *et al.,* 2016; Srithi *et al.*, 2009).

Ethnobotanical research survey is not only carried out for documenting, analyzing, circulating ethno-pharmacological and ethno botanical information but can also be used to provide the interaction between human society and plant diversity and to know that at which degree biodiversity in natural surroundings is in practice and influenced (Canales *et al*., 2005; Frei *et al*., 1998). About 50,000 flowering plants have already been reported in which 85% are taken as ethno medicines while 5000

are subjected to phytochemistry (Stepp & Moerman, 2001). On the other hand about 80% population of the world especially in developing countries use ethno medicines for the treatment of different health disorders due to low cast with less side effects (Savikin *et al*., 2013). To initiate ethno-pharmacological, photochemical toxicological studies right selection of plant resource is the basic requirement to know that at what degree the plant is used for the treatment and preparation of ethno medicines (Canales *et al.*, 2005; Frei *et al*., 1998). Mostly the peoples in hilly areas depends on herbs compared to shrubs and trees for the preparation of ethno medicines due to easy collection and fruitful results (Hassan *et al.*, 2020). Because of high price of English drugs poor peoples in different part of the world taking ethno medicines for the treatment of different diseases, besides this research on medicinal plants is getting power day by day (Shrivastava & Kanungo, 2013).

Pakistan has 6000 plant species, 12 % out of them are taken for the treatment of different health disorders (Shinwari & Qaiser, 2011), while in hilly areas 84% peoples depends on medicinal plants species for primary health care (Qureshi, 2012). Documentation of traditional knowledge in the study area may be an important step toward conservation approach as the flora is under pressure due to anthropogenic activities. Northern Pakistan is considered as a hub of medicinally important flora which needs proper exploration. Keeping in view the importance of medicinal plants it is

calamitous to document quantitative ethno medicinal and traditional knowledge in Northern Pakistan to identify high valued medicinal plant species. Therefore present study was conducted (i) to identify and document traditional knowledge on indigenous plants used as remedy in Usho District Swat at Northern Pakistan, (ii) To compile information that how and how many different health disorders are treated with wild medicinal plant species, (iii) to evaluate data using FIC, FL, DMR, UV and RFC, indices to explore high valued medicinal plant species in the locality.

Material and Methods

Description of study area: Usho is a spacious sub-valley of Swat count in Hindu Kush mountain range, coldest part located in the North of District Swat, Khyber Pakhtunkhwa, Pakistan. It is located eight kilometres from Kalam and one hundred twenty-three kilometres from Mingora, at the elevation of 2,300 meter from sea level. The landscape of the area is rocky and sloped with stream beds. It is well known for its gorgeous cloudy and rainy forest. The soil is porous, light sandy, shallow and light to average in texture. The growth period is from April to the end of September. Mostly cultivated crops are wheat, maize, cabbage, turnip and potato. Annual high temperature recorded as 20°C in the month of June and lowest as -6°C in January. Heavy rain and snowfall occur in winter resulting in land slide whereas highest rain fall has observed in the month of July and August.

Ethnobotanical data collection, identification and preservation: The data were compiled through various protocols like, field trips, well organized questionnaire, group discussions and semi-structured open-ended interviews from April, 2011 to August, 2013 following (Hassan *et al.,* 2020; Yaseen *et al.,* 2020; Martin, 1995). A total of 128 local informants including male (109) and female (19) of the locality in age from 30 to 80 were interviewed in their local language Pushto, in order to get comprehensive information. Beside, information regarding local name, parts used, methods of preparation, mode of utilization, doze taken, folk recipes, and diseases treated with medicinal plant were also collected. The collected medicinal plant species taken by the local inhabitants of the study area were confirmed through international plant name index (http://www.ipni.org), and the plant list (www.theplantlist.org) but for families followed A.P.G. system (Stevens, 2012). Life form wise the plant specimen were grouped into herbs, shrubs and trees, followed (Brown, 1977). The plant specimens were identified through flora of Pakistan and Herbarium Department of Botany at University of Malakand Pakistan. The specimens were deposited to Herbarium Department of Botany at University of Malakand Chakdara Dir (L.) KP, Pakistan for future reference.

Quantitative analysis of ethnobotanical information: The documented ethnobotanical data was analyzed through various quantitative indices like Informant consensus factor, Relative frequency citation (RFC), Use value (UV), Fidelity level (FL), Consensus Factor (ICF) and Data matrix ranking (DMR). Data was organized into Excel spreadsheet 2007 and concised by graphical statistics like proportions and percentages.

Informant consensus factor (ICF): Informant consensus factor is used to document consensus of knowledge on the practical usage of medicinal plant species for a specific ailment (Canales *et al.*, 2005). The Informant consensus factor value ranges from 0 to 1. The ICF value will be high if a plant species taken for the treatment of number of different ailments reported by large number of informants, while low informant consensus factor value means that the inhabitants had a poor knowledge about that plant species or the selection was random (Heinrich *et al*., 1998; Kloutsos *et al.*, 2001; Teklehaymanot, 2009). The ICF value calculated by the formula followed (Tabuti *et al*., 2003; Trotter & Logan, 1986).

$$ICF = \frac{nur - nt}{nur - 1}$$

where "nur" indicates the total number of use reports for each disease category and "nt" indicates the number of species used in that category.

Use value (UV): Use value (UV) shows the relative importance on usages of medicinal plant species.

UV will be consider high if the value is near to 1 which shows many use reports for a given plant species and importance of plant species among informants while low UV will be near to 0 which shows few use reports for a given specie (Phillips *et al.*, 1994; Savikin *et al.*, 2013). Use value (UV) cab be calculated by the formula:

$$UV = \frac{U}{n}$$

where "UV" is the relative importance on uses of medicinal plant species and "U" is the number of uses recoded for that specific plant species and "n" is the number of informants reported plant species.

Relative frequency of citation (RFC): Relative frequency of citation (RFC) suggests the local importance of each plant species in the locality (Vitalini *et al*., 2013). High RFC value shows the rank of specie among all informants. The RFC value may be 1 if informants report the particular plant species as important and will be 0 if nobody specify the use of plant species (Medeiros *et al.*, 2012). RFC was calculated using the formula followed (Tardio & Pardo-de-Santayana, 2008).

$$RFC = \frac{FC}{N} (0 \le RFC \le 1)$$

where FC is informants' number who reported the use of medicinal plant species and N is the total number of informants who took part in the survey conduction.

Table 1. Demographic data of informants in Usho (District Swat) Northern Pakistan.

Gender	Density	% Contribution
Male	109	85.16
Female	19	14.84
Age classes		
30-35	11	8.59
35-40	6	4.69
40-45	10	7.81
45-50	13	10.16
50-55	18	14.06
55-60	17	13.28
60-65	20	15.63
65-80	33	25.78
Literacy level		
Illiterate	51	39.84
Primary	20	15.63
Middle	22	17.19
Secondary	17	13.28
Higher Secondary	13	10.16
Graduate	5	3.91
Professional level		
House wives	19	14.84
Teacher	17	13.28
Shopkeepers	27	21.09
Farmers	43	33.59
Labors	14	10.94
Hakeem and nomads	8	6.25

Fidelity level (FL): The Fidelity level (FL) is used to choose best fit medicinal plant species for the treatment of a particular disease (Musa *et al.*, 2011). The high value of FL indicates the importance of a particular plant species as compared to other plant species to cure specific disease because high value declares the high frequency of plant uses against a specific disease. On the other hand, low value shows the use of plant species for different medicinal purposes with low frequency usage against a particular disease. Fidelity level may be calculated by the formula (Friedman *et al.*, 1986).

$$FL = \frac{Ip}{Iu} x100$$

where Ip is the number of informants mentioned the use of plant species for a specific disease category and Iu is the number of informants cited the use of that particular plant species for any other disease category.

Direct matrix ranking (DMR): Direct Matrix Ranking (DMR) in order to rank medicinal plant species DMR was carried out. DMR can be used to compare the used plant diversity of given plant based on data collected from respondents (Cotton, 1996; Martin, 1995). A total of 12 knowledgeable and experienced informants were chosen for DMR data collection. Informants were allowed to give rank to medicinal plant species like (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, and 0 = not used) to each plant species. The average scores given to each plant species was summed up and ranked.

Results and Discussions

Demographic data: A total of 128 informants were interviewed for data collection, out of which eight were traditional healers and the rest were the local inhabitants of the area including only Kohistani Pashtoon. Mostly the informants were male 109 (85.16%) while female were 19 (14.84%). The number of male was high as compared to female which was due to male are considered more responsible as compared to female in Pashtoon society. Age wise, informants were classified into eight major categories. Mostly the informants were between the majority of informants were between 65-80 years (25.78%) and 60-65 years (13.28%). Majority of informants (39.84%) were illiterates. The illiterate informants (39.84%) were observed the most knowledgeable informants while educated peoples also played a vital role in data collection. Among eight traditional healers, five had a good experience from 8–13 years (6.25%) (Table 1).

Taxonomic classification: A total of 94 medicinal plant species from 34 families were studied and documented (Table 2). Interviewed plant species were angiosperms, gymnosperms (5%), pteridophytes (1%), monocotyledonous (7%) and dicotyledonous (87%). Family Lamiacea (13%) and Asteraceae (13%) with 13 plant species each were the most leading families, followed by Rosaceae with 10 plant species (11%), Polygonaceae with 5 species (6%), Brassicaceae, Pinaceae, Solanaceae with 4 species each (5%), Amaranthaceae, Berberidaceae, Caryophyllaceae, Ranunculaceae with 3 species each (3%), Convolvulaceae, Euphorbiaceae, Urticaceae with 2 species (2%) while other families contribute only one species. The large number of medicinal plant species were reported from family Asteraceae is in agreement with study from other localities at national level (Bibi *et al*., 2014), Lamiaceae (Hassan *et al.*, 2017a) and at international level with (Dei Cas *et al.*, 2015). It might be due to plant species wide distribution and their traditional uses which are under practice in many parts of the word from family Asteraceae (Umair *et al.*, 2017) and Lamiaceae (Dei Cas *et al.*, 2015) to cure different health disorders with fruitful outcomes. Out of total reported medicinal plant species habit wise major contribution (65%) obtained from herbaceous flora, which is in agreement with (Ahmad *et al.*, 2014) who report (58%) herbaceous plant species used by the inhabitants of Chail walley district Swat, Pakistan for the preparation of ethno medicine. Further shrubs contribute (27%) and herbs (8%) (Fig. 3). Our findings are in agreement with previous studies (Akhtar *et al.*, 2013; Rehman *et al.*, 2017). The logic behind high usage percentage of herbs was due to their easy availability (Sanz-Biset *et al.*, 2009; Uniyal *et al.*, 2006) efficacy, collection, easily digestible and the presence of pharmacologically active constituents (Hassan *et al.*, 2017c; Khan *et al.*, 2014), easiness in herbal medicines preparation (Lulekal *et al.*, 2013).

Table 2. Ethnomedicinal plant species of Usho Valley, District Swat, Northern, Pakistan.

Botanical name/Family/V. No.	L. name	Habit	Part use	Therapeutic uses	Herbal formulation	Route	FC	RFC	UV	UR	Previous studies
Abies Pindrow R. Pinaceae HUOM.BG.503	achar	tree	root	cough, bronchitis, fever, tooth ache	root is boiled in water with sugar and decoction is made	oral	13	0.10	0.31	4	1●,2■,3■,4■,5▲,6■
Achillea millefolium L. Asteraceae HUOM.BG.504	jarai	herb	leaves	stomach ache	leaves are boiled in water and filter through cloth	oral	19	0.15	0.05	1	1■,2■,3■,4■,5■,6■
Achyranthes aspera L. Amaranthaceae HUOM.BG.505	buchkanda	herb	whole plant	toothache and digestive problems, diarrhea, insect bite, asthma, cough	bloody leaves and roots are crushed and boil in water	oral	41	0.32	0.15	6	1●,2▲,3■,4▲,5■,6●
Ajuga bracteosa W. Lamiaceae HUOM.BG.506	buti	herb	aerial parts	chicken pox, jaundice, Headache, pimples, measles, stomach acidity, internal colic	diuretic, Juice of fresh aerial parts is taken orally before breakfast	oral	57	0.45	0.14	8	1■,2▲,3■,4■,5■,6■
Ajuga parviflora B. Lamiaceae HUOM.BG.507	sra boti	herb	leaves	constipation, hepatitis, fever, treating tonsillitis	leaf paste is used orally	oral	37	0.29	0.11	4	1■,2■,3■,4■,5■,6■
Allium cepa L. Amaryllidaceae HUOM.BG.508	ogakai	herb	bulb	cholera, indigestion, diarrehea, eruption, boils	bulb extract is mixxed with honey	oral	20	0.16	0.25	5	1■,2■,3▲,4■,5■,6■
Allium griffithianum B. Amaryllidaceae HUOM.BG.509	gandechar	herb	bulb	wounds pain	bulbs are washed and applied directly on wounds	dermal	13	0.10	0.08	1	1■,2■,3■,4■,5■,6■
Allium humile K. Amaryllidaceae HUOM.BG.510	Pyaz	herb	Leaves	indigestion	dried leaves mixed with the roots of Saussurea and purified	oral	10	0.08	0.10	1	1■,2■,3■,4■,5■,6■
Allium sativum L. Amaryllidaceae HUOM.BG.511	oga	herb	bulb	ear pain	fried bulbs put in mustard oil, drops are applied on infected ear	Ear drop	21	0.16	0.05	1	1■,2■,3▲,4■,5■,6■
Alnus nitida S. Betulaceae HUOM.BG.512	Gheray	tree	leaves	sores, infection	dried leaves mildly fried in the edible oil to make a poultice	dermal	17	0.13	0.12	2	1■,2■,3■,4■,5■,6■
Artemisia persica B. Asteraceae HUOM.BG.513	jawkay	herb	leaves a	blood diseases	leaves and flowers are boiles in water and decotion is made	oral	27	0.21	0.04	1	1■,2●,3▲,4■,5■,6■
Artemisia vulgaris L. Asteraceae HUOM.BG.514	tharkha	shrub	leaves	malaria, fever, skin diseases	juice of fresh leaves mixed with brown suger and given orally	oral	21	0.16	0.14	3	1■,2■,3■,4■,5■,6■
Berberis lycium R. Berberidaceae HUOM.BG.515	kwaray	shrub	bark	pimples, scabies, diabetes, woundes, purifier	blood crushed bark is soaked in water and extract is taken early morning	oral	54	0.42	0.09	5	1■,2▲,3■,4■,5●,6■
Berberis pseudumbellata P. Berberidaceae HUOM.BG.516	thor kwaray	shrub	root	backache, jaundice, fever	Powder of roots bark is used, fruit as a tonic	oral	51	0.40	0.06	3	1■,2■,3■,4■,5■,6■
Berberis vulgaris L. Berberidaceae HUOM.BG.517	kwaray	shrub	whole plant	Stomachic, intestinal colic, diarrhea, jaundice, internal wounds	piles, the root bark is dried and grinded , the powder is mixed in water	oral	51	0.40	0.12	6	1■,2■,3■,4■,5■,6■
Bergenia stracheyi H.T Saxifragaceae HUOM.BG.518	katpana	herb	rhizome	Muscular pain, pus discharge, ulcer, healing, dysentry and piles	wound dried rhizome powder is taken orally with milk	oral	26	0.20	0.23	6	1■,2▲,3■,4■,5■,6■
Bistorta affinis D. Polygonaceae HUOM.BG.519	anjabar	herb	rhizome	fever, body pains, muscle contraction	Powders prepared from rhizome taken with milk	oral	47	0.37	0.06	3	1■,2●,3■,4■,5■,6■
Buddleja crispa B. Scrophullariaceae HUOM.BG.520	spair boti	shrub	leaves	excessive tearing, pain killer, inflammatory, hepatitis, fever	decoction of the leaves and flower is used	oral	12	0.09	0.42	5	1■,2■,3■,4■,5■,6■
Buxus sempervirens L. Buxaceae HUOM.BG.521	Shamshad	shrub	leaves	toothache	leaves are boiled with pepper corns in water	oral	9	0.07	0.11	1	1■,2■,3■,4■,5■,6■
Calendula arvensis M. Asteraceae HUOM.BG.522	zyar gulay	herb	leaves	wounds	crushed leaves are topically applied on wounds	dermal	8	0.06	0.13	1	1■,2■,3■,4■,5■,6■
Calendula officinalis L. Asteraceae HUOM.BG.523	ashrafi	herb	roots	wound healing, fever, stomach ache	root is crushed to make paste	dermal	11	0.09	0.27	3	1■,2■,3■,4■,5■,6■
Caltha alba C. Asteraceae HUOM.BG.524	makanpath	herb	roots	digestive problems and mouth smell	roots infusion are used	oral	15	0.12	0.13	2	1■,2■,3■,4■,5■,6■
Cannabis sativa L. Cannabaceae HUOM.BG.525	bhang	herb	leaves	sedative, lever and stomach inflammations, pain killer	fresh leaves extract is taken with sugar	oral	43	0.34	0.09	4	1●,2■,3■,4■,5●,6■
Capsella bursa pastoris L. Brassicaceae HUOM.BG.526	bambesa	herb	leaves	menstrual disorder	fresh leaves are boiled in water with salt	oral	10	0.08	0.10	1	1■,2■,3■,4■,5▲,6■

Table 2. (Cont'd).

Botanical name/Family/V.No.	L. name	Habit	Part use	Therapeutic uses	Herbal formulation	Route	FC	RFC	UV	UR	Previous studies
Chenopodium album L. Amaranthaceae. H.UOM.BG.527	sarmay	herb	leaves	constipation, intestinal worms	fresh leaves are cooked as a vegetable and eaten	oral	20	0.16	0.10	2	1●,2■,3■,4■,5●,6■
Chenopodium botrys L. Amaranthaceae H.UOM.BG.528	skha kharawa	herb	aerial parts	diuretic, constipation, carminative antidiarrhoic	and infusions and liquid extracts are prepared	oral	21	0.16	0.19	4	1■,2■,3■,4■,5●,6■
Chrysanthemum griffithii C. Asteraceae H.UOM.BG.529	guli dawodi	herb	flower	Irregular menstrual cycles,	flower are boiled in water and decoction is prepared	oral	18	0.14	0.06	1	1■,2■,3■,4■,5■,6■
Cichorium intybus L. Asteraceae H.UOM.BG.530	Han	herb	leaves	anti-inflammatory, hepatic complaints, jaundice, gas trouble, antiasthmatic	fever, decoction of leaves and sugar is taken	oral	48	0.38	0.13	6	1■,2■,3■,4■,5■,6■
Cirsium falconeri H. Asteraceae H.UOM.BG.531	ghana	herb	roots	arthritis	raw roots crushed to prepare paste	dermal	12	0.09	0.08	1	1▲,2■,3■,4■,5■,6■
Clematis grata W. Ranunculaceae H.UOM.BG.532	Zeelai	shrub	leaves	boils	fresh leaves paste are applied on boils	dermal	10	0.08	0.10	1	1■,2■,3■,4■,5■,6■
Convolvulus arvensis L. Convolvulaceae H.UOM.BG.533	prewatkai	herb	leaves	constipation, intestinal worms, purgative,	fresh plant extract mixed with sugar	oral	9	0.07	0.33	3	1▲,2■,3■,4■,5■,6▲
Cotoneaster microphyllus W. Rosaceae H.UOM.BG.534	Mamanrha	shrub	fruits	cuts, wounds, astringent	Fruits paste with mustard oil is applied on the skin	dermal	36	0.28	0.08	3	1■,2■,3■,4■,5▲,6■
Dactylorhiza hatagirea D. Orchidaceae H.UOM.BG.535	jabagai	herb	tubers	sex stimulant and, nerve tonic.	tubers are grinded well to make powder	oral	33	0.26	0.06	2	1■,2■,3■,4■,5▲,6■
Daphne mucronata R. Thymelaeaceae H.UOM.BG.536	leghonay	shrub	whole plant	abdominal pain, swellings, wounds,	Gastrointestinal, infusion of leaves is prepared	oral	19	0.15	0.21	4	1■,2■,3■,4■,5▲,6■
Debregeasia saeneb F. Urticaceae H.UOM.BG.537	ajlai	shrub	whole plant	diarrhoea	fresh plant paste mixed with curd	oral	23	0.18	0.04	1	1■,2■,3■,4■,5■,6■
Delphinium denudatum W. Ranunculac H.UOM.BG.538	lajward	herb	rhizome	cough and fever	rhizome is dried and grinded into powder then taken with water	oral	14	0.11	0.14	2	1■,2■,3■,4■,5■,6■
Duchesnea indica J. Rosaceae H.UOM.BG.539	zmaki tooth	herb	fruit	bloody diarrhea.	fruit paste is used with milk	oral	7	0.05	0.14	1	1■,2▲,3■,4■,5■,6■
Ephedra gerardiana W. Ephedraceae H.UOM.BG.540	Somani	herb	whole plant	asthma, astringent, relaxation of muscles.	bronchial powder of crushed plant and sometime its tea is used	oral	55	0.43	0.05	3	1■,2■,3■,4■,5■,6■
Epilobium hirstum L. Onagraceae H.UOM.BG.541	sordengai	herb	aerial parts	inflammations, joint pains and skin allergies	aerial parts are dried and grinded into powder	dermal	18	0.14	0.17	3	1■,2■,3■,4■,5■,6■
Equisetum debile R. Equisetaceae H.UOM.BG.542	Bandakay	herb	Aerial parts	bone strengthening, hairs and nail development and weakness caused by TB	powder prepare from aerial parts are used	dermal	19	0.15	0.16	3	1■,2■,3■,4■,5▲,6■
Erigeron canadensis L. Asteraceae H.UOM.BG.543		herb	whole plant	diarrhea, dysentery	plant extract is taken	oral	15	0.12	0.13	2	1■,2■,3■,4■,5■,6■
Eruca sativa M. Brassicaceae H.UOM.BG.544	salad	herb	seeds	Bleeding piles. ear pain,	seeds is taken orally with water, warm oil are used to relieve ear pain	dermal	27	0.21	0.07	2	1■,2■,3■,4■,5■,6■
Euphorbia helioscopia L. Euphorbiaceae H.UOM.BG.545	mandano	herb	seeds	skin eruption, Anthelminthic, Constipation,	roasted with additives and applied on skin	dermal	12	0.09	0.25	3	1▲,2■,3■,4■,5▲,6■
Euphorbia wallichii H. Euphorbiaceae H.UOM.BG.546	arghamala	herb	Latex	wounds, skin diseases	stem latex is applied over skin	dermal	10	0.08	0.20	2	1■,2■,3■,4■,5■,6■
Ficus carica L. Moraceae H.UOM.BG.547	ainzar	tree	whole plant	boils, laxative	paste of the plant mixed with milk is eaten and applied on skin	dermal	39	0.30	0.05	2	1■,2■,3■,4■,5●,6■
Fragaria indica A. Rosaceae H.UOM.BG.548	tuth	herb	whole plant	stomach ulcers, menstruation problems, tonic	fruit mixed with Berberis, leaves are used to make tea	oral	9	0.07	0.33	3	1■,2▲,3■,4■,5▲,6■
Fragaria vesca L. Rosaceae H.UOM.BG.549	tut	herb	fruits	diabetes and sexual diseases	fruit juice with milk are used	oral	11	0.09	0.18	2	1■,2■,3■,4■,5■,6■
Gymnosporia royleana W. Celastraceae H.UOM.BG.550	Sur Azghay	shrub	seed	colic, dysentery, diarrhea in children	seeds are boiled with water, sugar or salt	oral	30	0.23	0.10	3	1■,2■,3■,4■,5■,6■

Table 2. (Cont'd).

Botanical name/Family/V.No.	L. name	Habit	Part use	Therapeutic uses	Herbal formulation	Route	FC	RFC	UV	UR	Previous studies
Impatiens bicolor R. Balsaminaceae H.UOM.BG.551	attrang	herb	whole plant	joint pains. speeding defecation.	paste and extract of leaves is used	oral	20	0.16	0.10	2	1■,2■,3■,4■,5■,6●
Iris germanica L. Iridaceae H.UOM.BG.552	turai	herb	rhizome	expectorant; purgative, diuretic, dermatitis	juice of the fresh roots are taken with sugar syrup	oral	7	0.05	0.57	4	1■,2■,3■,4■,5■,6■
Ipomoea purpurea L. Convolvulaceae H.UOM.BG.553	prewata	herb	leaves	Wound healing, Painkiller, Blood clotting. Lice killer	Leaves are grinded and the extract is used for washing hairs to get rid of lice	dermal	32	0.25	0.13	4	1■,2■,3▲,4■,5■,6●
Isodon rugosus W. Lamiaceae H.UOM.BG.554	sperkay	herb	leaves	antiseptic, dermatitis	Leaves are crushed and applied on skin	dermal	13	0.10	0.15	2	1●,2●,3■,4■,5●,6■
Jasminum humile L. Oleaceae H.UOM.BG.555	Ziar Rambeel	shrub	whole plant	body massage and skin diseases	oil are used as massage and removal of skin wrinkles	dermal	5	0.04	0.40	2	1▲,2■,3■,4■,5■,6■
Mentha arvensis L. Lamiaceae H.UOM.BG.556	podina	herb	leaves	vomiting, nausea, dysentery	dried leaves are taken with curd and tea is prepared	oral	57	0.45	0.05	3	1■,2■,3■,4■,5▲,6■
Mentha longifolia L. Lamiaceae H.UOM.BG.557	welany	herb	Whole plant	indigestion, vomiting, cholera	extract of leaves mixed with garlic	oral	46	0.36	0.07	3	1■,2●,3■,4■,5▲,6■
Micromeria biflora B. Lamiaceae H.UOM.BG.558	Shamakay	herb	leaves	flu, tooth aches and poultice	young leaves are used to make tea	oral	37	0.29	0.08	3	1■,2▲,3■,4■,5■,6■
Nasturtium officinale R. Brassicaceae H.UOM.BG.559	Tarmeera	herb	shoot	blood purifier, diuretic	Leaves used as salad, boiled, and powder taken	oral	22	0.17	0.09	2	1■,2■,3■,4■,5●,6■
Origanum vulgare L. Lamiaceae H.UOM.BG.560	shamakay	herb	whole plant	stomach-ache, colds, flu, asthma, fevers and painful menstruation, muscular pains and arthritis	powder mixed with milk, plant paste is externally applied	Oral	29	0.23	0.28	8	1■,2▲,3■,4■,5■,6■
Parthenium hysterophorus L. Asteraceae H.UOM.BG.561	ganda botay	herb	leaves	laxative, anti-malarial	leaf powder are taken orally	oral	4	0.03	0.50	2	1▲,2■,3■,4■,5●,6■
Picea smithiana W. Pinaceae H.UOM.BG.562	mangazai	tree	leaves	kidney stones, rheumatism	infusion of fresh leaves is used	oral	11	0.09	0.18	2	1■,2■,3■,4■,5■,6■
Pinus gerardiana W. Pinaceae H.UOM.BG.563	chalghoza	tree	seed	swelling, tumours, wounds	seeds are grinded to get oil	dermal	16	0.13	0.19	3	1■,2■,3■,4■,5■,6■
Pinus wallichiana A.B. Pinaceae H.UOM.BG.564	peoch	tree	resin	cracked (wounded) heels	resin is used as a cream topically applied on foot	dermal	12	0.09	0.08	1	1■,2■,3■,4■,5■,6■
Platanus orientalis L. Platanaceae H.UOM.BG.565	Chinar	tree	bark	kidney stones, dysentry	stem bark is boiled in water to make decoction	oral	10	0.08	0.20	2	1■,2■,3■,4■,5■,6■
Polygonum barbatum L. Polygonaceae H.UOM.BG.566	peramol	herb	whole plant	stomach disorders, constipation, infections	fresh leaf and shoot is cooked	oral	13	0.10	0.23	3	1●,2■,3■,4■,5▲,6■
Pyrus pashia V. Rosaceae H.UOM.BG.567	Batangi	tree	Fruit	constipation	ripened fruits are eaten as raw	oral	19	0.15	0.05	1	1■,2■,3■,4■,5■,6■
Ranunculus muricatus L. Ranunculaceae H.UOM.BG.568	zyargwalay	herb	leaves	skin infection	fresh leaf paste is applied on skin	dermal	9	0.07	0.11	1	1▲,2■,3■,4■,5▲,6■
Rosa webbiana W. Rosaceae H.UOM.BG.569	gulab	shrub	flowers	respiratory problems, wounds healing	flowers and bark is crushed to get extract	oral	15	0.12	0.13	2	1■,2■,3■,4■,5■,6■
Rubus ellipticus S. Rosaceae H.UOM.BG.570	Gooraja	shrub	whole plant	fever, gastric troubles, diarrhea, wounds, fever, colic, cough and sore throat	fresh roots are boiled in water to get decoction	oral	12	0.09	0.67	8	1■,2■,3■,4■,5■,6■
Rubus fruticosus L. Rosaceae H.UOM.BG.571	karwara	shrub	whole plant	dysentery, whooping cough, antidiarrheal	Infusion of leaves and young shoots is used	oral	13	0.10	0.23	3	1■,2■,3■,4■,5●,6■
Rubus sanctus S. Rosaceae H.UOM.BG.572	bagana	shrub	whole plant	hemorrhoids and diabetes mellitus	Infusion of leaves is used	oral	10	0.08	0.20	2	1■,2■,3■,4■,5■,6■
Rumex dentatus L. Polygonaceae H.UOM.BG.573	shalkhay	herb	leaves	astringent, emollient, purgative	Leaves extract is prepared with salt	oral	13	0.10	0.23	3	1▲,2■,3■,4■,5■,6■
Rumex hastatus D. Polygonaceae H.UOM.BG.574	tharokay	shrub	leaves	jaundice	fresh leaves and roots are crushed and mixed with water	oral	17	0.13	0.06	1	1■,2▲,3■,4■,5▲,6■

Table 2. (Cont'd).

Botanical name/Family/V. No.	L. name	Habit	Part use	Therapeutic uses	Herbal formulation	Route	FC	RFC	UV	UR	Previous studies
Rumex nepalensis B. Polygonaceae H.UOM.BG.575	ghra shalkhay	herb	leaves	diabetes	Can be used raw as vegetable	oral	10	0.08	0.10	1	1■,2■,3■,4■,5■,6■
Salix alba L. Salicaceae H.UOM.BG.576	Wala	tree	Bark	pain and fever	bark is boiled in water and decoction is prepared	oral	43	0.34	0.05	2	1■,2■,3■,4■,5■,6■
Salvia lanata R. Lamiaceae H.UOM.BG.577	keyand	shrub	whole plant	cough & cold, bowel evacuation	Aerial parts and roots are crushed into powder	oral	20	0.16	0.15	3	1■,2■,3■,4■,5■,6■
Salvia moorcroftiana W. Lamiaceae H.UOM.BG.578	khardag	shrub	leaves	wound healing, dysentery, poultice on wounds, cold, cough	Crushed leaves and dried root powder is taken with water	oral	35	0.27	0.14	5	1■,2■,3■,4■,5▲,6■
Salvia rubicola W. Lamiaceae H.UOM.BG.579	sursanda	shrub	leaves	cough, cold, wounds	fresh are used as poultice	oral	8	0.06	0.38	3	1■,2■,3■,4■,5■,6■
Salvia splendens S. Lamiaceae H.UOM.BG.580	kharghwag	shrub	flower	diabetes	flower kept overnight in water	oral	11	0.09	0.09	1	1■,2■,3■,4■,5■,6■
Sambucus wightiana.W.Adoxaceae H.UOM.BG.581	chejgian	herb	fruits	stomach disorders,	eaten as raw to initiate vomiting for stomach wash	oral	33	0.26	0.03	1	1■,2■,3■,4■,5■,6■
Silene conoidea L. Caryophyllaceae H.UOM.BG.582	bashka	herb	seeds	pimples, backache	paste of seed and young leaves is prepared	oral	18	0.14	0.11	2	1■,2■,3■,4■,5■,6■
Silene vulgaris M. Caryophyllaceae H.UOM.BG.583	Matorangay	herb	leaves	respiratory diseases, cough, asthma	leaves and flowers are boiled in water to make decoction	oral	16	0.13	0.19	3	1■,2■,3■,4■,5■,6■
Silybum marianum L. Asteraceae H.UOM.BG.584	Worajakai	herb	leaves	jaundice and tuberculosis.	fresh leaves are crushed along with water and sugar	oral	20	0.16	0.10	2	1■,2■,3■,4■,5■,6■
Sisymbrium irio L. Brassicaceae H.UOM.BG.585	arway	herb	seeds, fruit	typhoid, small pox, chest debility cholera, cough, fever,	fresh juice of plant is mixed with sugar or water	oral	8	0.06	0.63	5	1▲,2■,3■,4■,5■,6■
Solanum nigrum N. Solanaceae H.UOM.BG.586	thor kamacho	herb	leaves	eye pain, expectorant, laxative, leprosy, sedative	leaves and fruits are crushed and taken with water	oral	50	0.39	0.10	5	1●,2■,3■,4●,5■,6●
Solanum pseudocapsicum L. Solanaceae H.UOM.BG.587	kamacho	herb	fruit	diabetes	can be eaten as raw	oral	11	0.09	0.09	1	1■,2■,3■,4■,5■,6■
Solanum surattense B. Solanaceae H.UOM.BG.588	maraghonay	herb	whole plant	intestinal worms, indigestion, toothache, cough, asthma, chest pain	decoction of fresh pieces of stem boiled in water with black pepper	oral	16	0.13	0.38	6	1●,2■,3■,4■,5●,6●
Sonchus asper L. Asteraceae H.UOM.BG.589	shawdapai	herb	leaves	fever, constipation	leaves decoction is taken orally	oral	32	0.25	0.06	2	1●,2■,3■,4■,5■,6▲
Sorbaria tomentosa L. Rosaceae H.UOM.BG.590	jejrai	shrub	fruit	Skin diseases,	inflorescence is mixed with mustard oil and applied on the skin	dermal	10	0.08	0.10	1	1■,2■,3■,4■,5■,6■
Stellaria media L. Caryophylla H.UOM.BG.591	olalai	herb	leaves	swelling joints and broken bones	fresh leaves paste is applied topically	dermal	16	0.13	0.13	2	1●,2■,3■,4■,5■,6■
Taraxacum oficinale N. Asteraceae H.UOM.BG.592	budabudai	herb	rhizome	jaundice	fresh rhizome with boil in water and decoction is prepared	oral	11	0.09	0.09	1	1■,2■,3■,4■,5■,6●
Urtica dioica L. Urticaceae H.UOM.BG.593	sezonkay	herb	whole plant	external irritant	juice is collected	dermal	10	0.08	0.10	1	1■,2■,3■,4■,5■,6■
Viola canescens W. Violaceae H.UOM.BG.594	banafsha	herb	whole plant	fever and chills, muscle tension, sore throat.	plant is boiled in water with honey to make decoction	oral	42	0.33	0.10	4	1■,2■,3■,4■,5■,6■
Withania somnifera L. Solanaceae H.UOM.BG.595	kotilal	shrub	whole plant	urinary and renal complaints, malarial fever	decoction of the plant is made	oral	39	0.30	0.08	3	1●,2●,3■,4■,5■,6▲
Zanthoxylum armatum D. Rutaceae H.UOM.BG.596	Dambara	shrub	fruit	stomach disorders, tooth problems	powder of dry fruit is used with additives	oral	47	0.37	0.04	2	1■,2●,3■,4■,5▲,6■

●(Same use), ▲ (Different use), ■ (Use not reported/New reports)

Part used, mode of preparation and application: The people of the locality used leaves (34%) commonly for the preparation of ethno medicines followed by whole plant (23%), fruit (9%),other aerial parts than leaves (4%), rhizome, root (5%), seed (7% each), bulb and flower (3%), tuber, latex (1% each) and bark (3%) (Fig. 1). Same findings were also observed by (Khan *et al.*, 2014) that leaves were commonly used at national level for the preparation of ethno medicine by the inhabitants in North of Khyber Pakhtunkhwa, Pakistan, near the border with Afghanistan and at international level by the inhabitants of Italy (Leto *et al.*, 2013). It has already been observed that herbalist prefer to harvest leaves for the preparation of herbal medicine as compared to root, stem and whole plant in order to prolong and save plant life (Zheng & Xing, 2009). Some plant species such as Euphobia, Solanum, Urtica and Polygonum are considered poisonous; however, taken to cure different health disorders by the people of the study area. Plant species with effective chemical constituents are often described as medicinal as well as poisons, side effects depend on preparation and dose taken (Bernhoft, 2010). No side effects were reported from inhabitants due to moderate doze taken of the above mentioned plant species. Different methods like decoction, crushed,

infusion, juice, extract, latex and oil are applied for the preparation of herbal medicines by the people of the study area. The most frequently used method for the preparation of ethno medicine was decoction (41%) followed by crushed (27%), infusion and juice (11%), extract (5%), latex (3%) and oil (2%) (Fig. 2). Our results are in agreement with other study at national level (Hassan *et al.*, 2017a; Khan *et al.*, 2014) and at international level (Chellappandian *et al.*, 2012), where healer use decoction for the preparation of ethnomedicines. Due to bitter and unpleasant taste of ethnomedicine the inhabitants use additive like sugar, milk, desi ghee, wheat flour, salt and honey etc. The main practice in preparation of herbal medicine is decoction being easy method in which only the water volume is reduced (Ssegawa & Kasenene, 2007). Mostly the ethno medicines were taken (76%) orally followed by dermal (23%) and ear drops (1%) (Fig. 4). Our findings are in agreement at national international level with (Namukobe *et al.*, 2011; Hassan *et al.*, 2017b; Kamatenesi-Mugisha & Oryem-Origa, 2007; Ssegawa & Kasenene, 2007).

For external use, oil, paste, poultice was observed common, majority of them were in practice against skin infections, irritation, wounds, insect bites and to joints pain. The findings are in line with (Umair *et al.*, 2017).
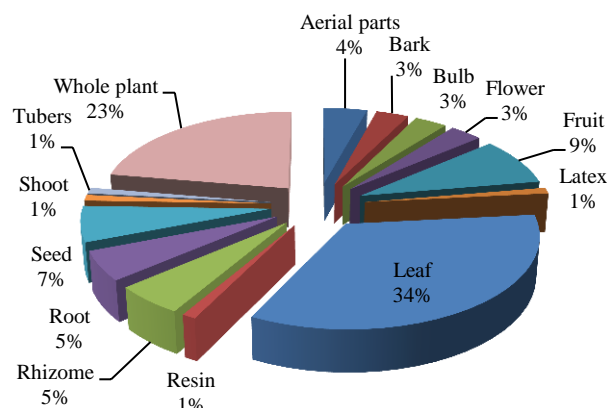

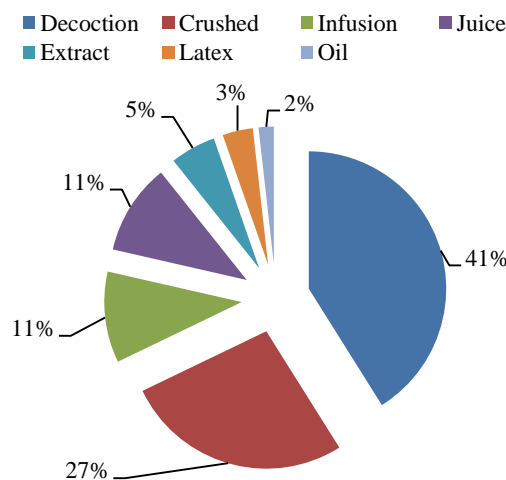Fig. 1. Part used for preparation of ethno medicine.
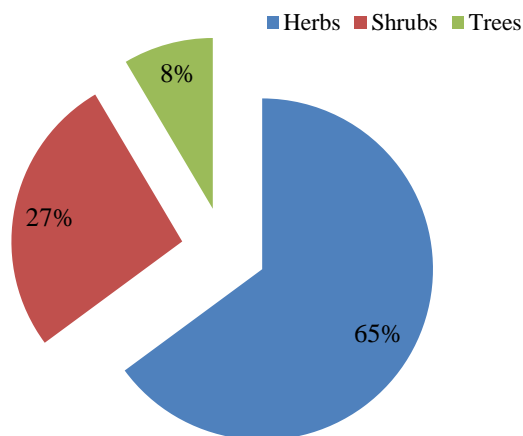

Fig. 2. Methods for preparation of ethno medicine.
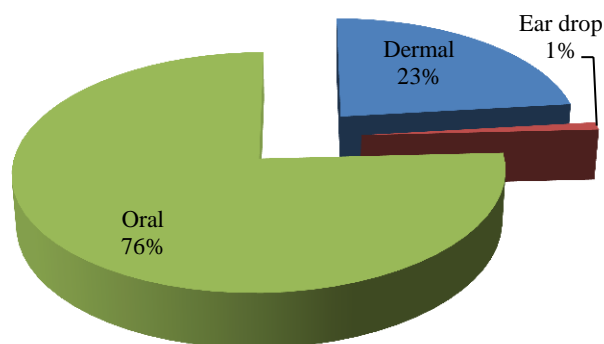

Fig. 3. Plant habit of medicinal plants.

Fig. 4. Mode of application of ethno medicine.

Informant consensus factor (ICF): Informant consensus Factor (ICF) was applied to analyse medicinal plants usage with respect to definite culture applicability. For ICF calculation ailments were classified into 13 different disease categories based on use reports (Table 3). Highest number of use reports (107) were observed for antispasmodic and lowest (12) for menstrual disorder. Out of total (13.58%) plant species were taken for circulatory disorders followed by gastrointestinal, dermatitis (11.73%), antispasmodic, antidiabetic, antiseptic (10.49%), antidiarrheal (9.88%), febrifuge (9.26%), diuretic, piles (3.09%), circulatory disorders (2.47%), menstrual disorder and tonic (1.85%) (Table 3). Informants consensus factor is commonly applied for plant selection for pharmacological and phytochemical analysis (Giday *et al.*, 2007). Our findings signify that more plant species were taken in the study area as antispasmodic and gastrointestinal disorders, which might be due to bad hygiene, use of wood as fuel for cooking and heat purpose. Winter time is extremely cold due to heavy rain and snow fall. The peoples of the locality get heat energy only from wood fuel mostly as the locality lack gas facility.

Similar results have already been reported at national level (Khan *et al.*, 2011, 2014; Hassan *et al.*, 2017c) and international level (Kadir *et al.*, 2012; Singh *et al.*, 2012) described plant species taken as gastrointestinal and antispasmodic. High Informant consensus factor, ICF (0.84) was observed for antispasmodic and lowest (0.8) for piles which is similar with the study of (Umair *et al.*, 2017; Zahoor *et al.*, 2017).

Fidelity level (FL): Fidelity level shows informant's percentage appealing the use of definite medicinal plant species for the similar major purpose. All the reported ailments can be grouped into major classes before calculating the FL values (Giday *et al.*, 2009). Fidelity level (FL) of high valued 32 medicinal plants was observed from 55.56 to 95.45% (Table 4). The plant having high FL value specifies the use of particular plant species for a particular disease in the locality (Bibi *et al.*,

2014). High fidelity level 95.45% was observed for *Berberis lyceum* (Skin sores, wounds washing), *Salix alba* (Pain and fever) and lowest 55.56% *Rubus fruticosus* for whooping cough (Table 4). *Berberis lyceum* with 92% FL value has already been reported for anti-diarrhoeal by (Hassan *et al.*, 2017a) *Salix alba* against fever and astringent, *Rubus fruticosus* anti-diarrhoeal and tonic (Shinwari *et al.*, 2006).

Direct matrix ranking (DMR): Direct Matrix Ranking is applied to equate the usage of plant diversity based on data collection from respondents, which enable us to identify the extent of stress and threatens of plant species (Cotton, 1996; Martin, 1995). A total of 12 knowledgeable and experienced informants were chosen for DMR data collection. The informants were allowed to give rank to medicinal plant species like (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, and 0 = not used) to each plant species. The average scores given to each plant species was summed up and ranked. Rank wise *Alnus nitida* got higest rank (23), *Ficus carica* (20), *Abies Pindrow* (19) and lowest by *Sisymbrium irio* (9), *Allium cepa* (8), *Viola canescens* (7) respectively (Table 5). Such kind of study has already been conducted in different parts of Pakistan by (Khan *et al.*, 2014; Hassan *et al.*, 2017c) in which high DMR was observed for *Olea ferroginea* as (24).

Use value (UV) and relative frequency of citation (RFC): Use vale and Relative frequency of citation play an important role in high valued medicinal plant selection for presence of bioactive compounds which need additional evaluation for their important phytochemicals (Ahmad *et al.*, 2016).Use value was high (0.67) for *Urtica dioica* (0.63) while lowest (0.03) for *Platanus orientalis* (Table 2). Our results are in agreement with (Shinwari *et al.*, 2017) who also observed UV (0.04) for *Urtica dioica* .The RFC was observed high for *Ajuga bracteosa* (0.45) and lowest for *Parthenium hysterophorus* (0.3) (Table 2). Our results are in agreement with (Ahmad *et al.*, 2014) who observed RFC (0.24) for *Ajuga bracteosa*.

Table 3. Informant consensus factor (ICF) of different reported medicinal plant species against various disorders.

Disorders	Number of use reports (Nur)	Use reports percentage	Number of taxa used (Nt)	Taxa percentage	ICF
Antispasmodic	107	14.99	17	10.49	0.84
Gastrointestinal	86	12.04	19	11.73	0.78
Anti-diabetic	58	8.12	17	10.49	0.71
Dermatitis	50	7.00	19	11.73	0.63
Febrifuge	76	10.64	15	9.26	0.81
Menstrual Disorder	12	1.68	3	1.85	0.81
Diuretic	36	5.04	5	3.09	0.88
Tonic	22	3.08	3	1.85	0.9
Antiseptic	98	13.73	17	10.49	0.83
Anti-diarrheal	53	7.42	16	9.88	0.71
Piles	21	2.94	5	3.09	0.8
Circulatory	13	1.82	4	2.47	0.75
Pain Killer	82	11.48	22	13.58	0.74

Table 4. Highly utilized species of the study are along with Fidelity level and major disorders.

Botanical Nane	N	NA	Major Disorders	Ip	Iu	FL
Achillea millefolium L.	21	1	Stomach ache	15	19	78.95
Achyranthes aspera L.	41	6	Cough	13	21	61.90
Ajuga bracteosa W.	57	8	Internal colic	17	21	80.95
Ajuga parviflora B.	37	4	Tonsillitis	19	23	82.61
Allium sativum L.	21	1	Earache	12	13	92.31
Artemisia vulgaris L.	21	3	Skin diseases	9	10	90.00
Berberis lycium R.	55	5	Skin sores	21	22	95.45
Berberis vulgaris L.	57	3	Internal wounds	20	21	95.24
Bergenia stracheyi H.T	26	6	Pus discharge and ulcer	7	11	63.64
Bistorta affinis D.	47	3	Fever	16	20	80.00
Cannabis sativa L.	43	4	Liver inflammations	11	14	78.57
Chenopodium album L.	20	2	Intestinal worms	7	8	87.50
Chrysanthemum griffithii C.	18	1	Irregular menstruation	6	10	60.00
Cichorium intybus L.	48	6	Anti-inflammatory	16	21	76.19
Cotoneaster microphyllus Wall	36	3	Constrict body tissues	10	14	71.43
Dactylorhiza hatagirea D.	34	2	Sex stimulant	14	16	87.50
Debregeasia saeneb F.	23	1	Gastroenteritis	9	13	69.23
Gymnosporia royleana Wall	30	3	Diarrhoea	10	11	90.91
Ipomoea purpurea L.	32	4	Blood coagulation	7	10	70.00
Mentha arvensis L.	57	3	Vomiting	14	17	82.35
Mentha longifolia L.	46	3	Indigestion	16	17	94.12
Micromeria biflora B.	37	3	Flu	15	18	83.33
Origanum vulgare L.	29	8	Asthma	14	19	73.68
Rubus fruticosus L.	13	3	Whooping cough	5	9	55.56
Salix alba L.	43	2	Pain and fever	21	22	95.45
Salvia moorcroftiana W.	35	5	Wound healing	7	9	77.78
Sambucus wightiana W.	33	1	bloating	11	14	78.57
Solanum nigrum N.	50	5	Expectorant	15	18	83.33
Sonchus asper L.	32	2	Constipation	7	10	70.00
Viola canescens W.	42	4	Sore throat	16	19	84.21
Withania somnifera L.	39	3	Urinary and renal complaints	14	17	82.35
Zanthoxylum armatum D.	47	2	Tooth problems	11	16	68.75

Table 5. DMR Score of most frequently used medicinal plants species.

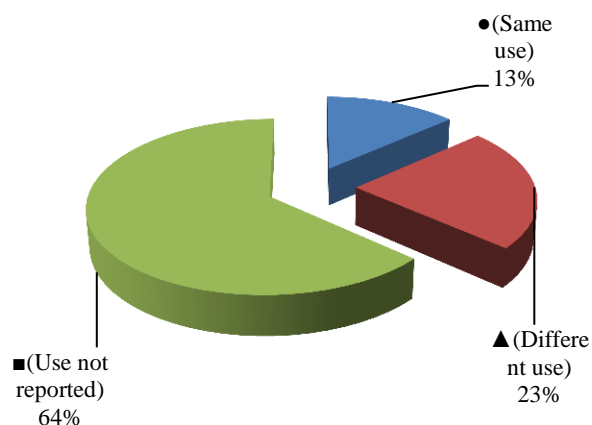| Plant	Agriculture tools	Construction	Fodder	Fuel	Medicinal	Rank
Abies Pindrow R.	5	5	1	5	4	19
Achyranthes aspera L.	0	0	4	1	5	10
Ajuga bracteosa Wall.	0	0	4	2	5	11
Ajuga parviflora B.	0	0	4	2	5	11
Allium cepa L.	0	0	3	0	5	8
Alnus nitida S.	5	5	4	5	4	23
Berberis lycium R.	0	1	4	5	5	15
Cannabis sativa L.	0	0	1	5	5	11
Cichorium intybus L.	0	0	4	0	5	9
Daphne mucronata R.	0	0	4	5	4	13
Ficus carica L.	4	3	4	5	4	20
Origanum vulgare L.	0	0	2	0	5	7
Rubus ellipticus S.	0	0	5	3	5	13
Sisymbrium irio L.	0	0	3	2	4	9
Solanum nigrum N.	0	0	5	2	5	12
Solanum surattense B.	0	0	5	2	5	12
Viola canescens Wall.	0	0	2	0	5	7
Withania somnifera L.	0	0	2	1	5	11
Zanthoxylum armatum D.	0	0	5	5	5	15

Fig. 5. Comparison with other studies.

Comparison with other studies and future influences:
The ethnomedicinal uses of current study were compared with previous 6 most important studies (Ahmad *et al.*, 2014; Hassan *et al.*, 2017c; Ong & Kim, 2014; Parthiban *et al.*, 2016; Umair *et al.*, 2017; Yaseen *et al.*, 2015) at national level (District Swat, Punjab, Sindh) and international level (Philippines and India). Almost, 13% medicinal uses of reported plant species were alike, 23% were dissimilar, while 64% medicinal uses were new as compared to other compared studies (Fig. 5) Some of newly documented medicinal plant species i.e. *Buddleja crispa* (anti-inflammatory), *Iris germanica* (diuretic), *Jasminum humile* (body massage), *Cichorium intybus* (gas trouble), *Origanum vulgare* (flu) etc. should be screened for further analysis.

Conclusion

The inhibitants of the study area use ethno medicines to cure different health disorders as English medicine are not easily accessible. Some aged people were observed very touch with ethno medicines since childhood; which they have learned from their elders. For example, they use *Mentha longifolia* as carminative, *Ajuga bracteosa* for stomach acidity, *Cichorium intybus* as antiasthmatic. Harvesting of medicinal plant for medicinal and fuel wood fuel were common in the study area. The local people were unaware regarding sustainable use, storage and conservation of medicinal plants, which can affect biodiversity of the locality. The most important thing was the inhabitants were agreed to share their ethno botanical knowledge with researchers. In present survey numerous medicinal plants were noted which require advance phytochemical analysis for further drug discovery. Further plant exploration, awareness, conservation, Joint collaboration and wise use of plant resources are recommended.

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