

## DIVERSITY OF TRADITIONALLY USED POLYHERBAL MEDICINES

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### Abstract

Ethnobotanical indigenous knowledge provides the base for formulation of alternative drugs and fulfills primary health care needs. There is not much data documented and published regarding use of traditional polyherbal formulations in Dera Ismail Khan, Pakistan. Present research provides valuable ethnopharmacological information about the use of polyherbal traditional medicines. Data was collected from 2016-2018 through questionnaires' survey of local communities in their native languages. Total 150 informants (100 females and 50 males) were selected for polyherbal ethnomedicinal information based on their experience. Plant species were collected, identified, and deposited in Kohat University of Science and Technology, herbarium. Data was further analyzed by using various ethnobotanical indices i.e., Frequency Citation, Relative Frequency Citation and Use Value. Ethnographic data showed that females' participants were more inclined towards traditional medicines. A total of 50 different mixtures of plants belonging to different families were documented. Most of the recipes were used for gastrointestinal ailments followed by respiratory ailments, weight loss, obesity, and reproductive complaints. Dominant plant families were Apiaceae, Zingiberaceae, Leguminosae, Lamiaceae and Rosaceae. Powder and decoction methods were the best for crude drug preparation and fruit was the dominant plant part in these polyherbal therapies. Traditionally used polyherbal formulations provide alternative source of medicines with synergistic/additive effects and less toxicity. Polyherbal mixtures are useful to treat acute and common complications by reducing their symptoms and diseases cycle. The study diverts the attention of chemists and pharmacologists to produce novel and effective medicines from natural sources. The study also provides a link between industries, policymakers, and local people for the conservation of threatened flora and its associated indigenous knowledge. There is a dire need to provide scientific base of these polyherbal traditional mixtures through *In vitro* and *In vivo* hypothesis.

**Key words:** Polyherbal formulations; Traditional knowledge; Herbal industries.

### Introduction

Plants are the crucial components of the universe and considered as an excellent source of medicines. Among 422,000 reported flowering plants, approximately 50,000 plants are used for medicinal purposes in treating various ailments (Hamilton, 2004). Among 52,600 traditionally practitioner locally called Hakims 45,000 are working only in the rural areas of Pakistan to provide primary health care (Williams & Ahmad, 2004). Their medicines are polyherbal formulations and in the form of crude drugs such as poultices, teas, powders, and tinctures (Samuelsson, 2004).

In the past years there is a lot of published literature available on use of individual medicinal plants for the treatment of various human diseases but now days polyherbal combinations, their isolated compounds become the major concerns in synthetic drugs and found effective may be due to synergistic effects (Aslam *et al.*, 2016). Documented published literature on various synergistic studies that plants used in combination with other plants had active role in curing ulcers, diabetes mellitus, inflammatory, bacterial, and other microbial infections (Alamgeer *et al.*, 2018; Adwan *et al.*, 2010; Haule *et al.*, 2012). It is also observed that activities of polyherbal extract's against various pathogens are greater than single plant extracts and found to be more effective therapy due to

synergistic effects of active phytochemicals (Haule *et al.*, 2012). Although it is thought that plant remedies are harmless having no risk for the consumers but there are some plants causing toxic effects if not taken properly or in excess amount. Therefore, some standards of efficacy and safety measures should be applied for herbal formulations (Ahmad & Sher, 2001).

The highest popularity of the medicinal plants in the rural areas is due to the high cost of allopathic drugs and their adverse effects as well their traditional belief also encourages them to use polyherbal medicine practices for the safer and effective treatment of diseases (Alamgeer *et al.*, 2018). Dera Ismail Khan District situated near the Indus river of Pakistan is endowed with a varied medicinal rich flora and traditional knowledge have been documented regarding use of single medicinal plants, but little attention is paid about the use of polyherbal use of traditional medicines. This valuable traditional knowledge about polyherbal formulation will become extinct due to limited with older people. Therefore, this study is the first attempt to explore the detailed polyherbal formulation practices in district Dera Ismail Khan. This study will be an important aspect of conservational approach regarding indigenous knowledge about polyherbal traditional medicines for the treatment of various human diseases and further selects the highly preferred polyherbal recipes for phytochemical, pharmacological and toxicological analyses.

## Materials and Methods

**Ethical approval:** After taking the oral consent from local people this research study was approved from Advanced Studies and Research Board, Kohat University of Science and Technology, Kohat.

Before data collection local administrative persons of the region were visited and were explained to them the main idea of the study to get their permission. Informed consent was obtained from all the participants before taking interviews. Authorship of any traditional knowledge of all the participants is maintained and any use of this knowledge, other than for article publication, does require further prior consent of the local communities.

**Study area:** This data was documented in the rural and urban areas of district Dera Ismail Khan abbreviated as D. I. Khan, which is situated in south of Khyber Pakhtunkhwa, Pakistan. D. I. Khan has an area of 7326 square kilometers and is located between  $31^{\circ} 15'$  and  $32^{\circ} 32'$  N latitude and between  $70^{\circ} 11'$  and  $71^{\circ} 20'$  E longitude (Fig. 1). Topographically, this area is a combination of hills and plains. It consists of flat dry plains, known as Daman, which makes up about 80

percent of the area. D.I. Khan is adjacent to South Waziristan agency and Suleiman Range in the West, Koh Sheikh Buddin in the North and Indus River in the East and endowed with diverse flora (Marwat *et al.*, 2008). This area is inhabited by different tribes and clans namely Pathan, Awan, Malik, Baloach, Syed, Sheikh, Jat and Mughals.

The study area supports xerophytic and aquatic vegetation and their associated species of wild fauna. Dominant plant families are Lamiaceae, Fabaceae and Apiaceae while *Mentha*, *Ocimum*, *Acacia nilotica*, *Calotropis procera*, *Morus alba* and *Eucalyptus camaldulensis* are dominant plants. Famous fruits of the study area are Dhakki date and Paniyala mangoes that are exported to the other countries. Famous crops are wheat, sugar cane, rice, and cotton. Most of the population is rural with lack of modern health facilities and is more dependent upon natural resources especially plants for their healthcare. People living in urban areas have good income sources and highest educational level as well other facilities while peoples living in rural areas are deprived of such facilities. They have diverse traditional knowledge about the uses of monoherbal and polyherbal formulation for the treatment of various human diseases (Mussarat *et al.*, 2014).

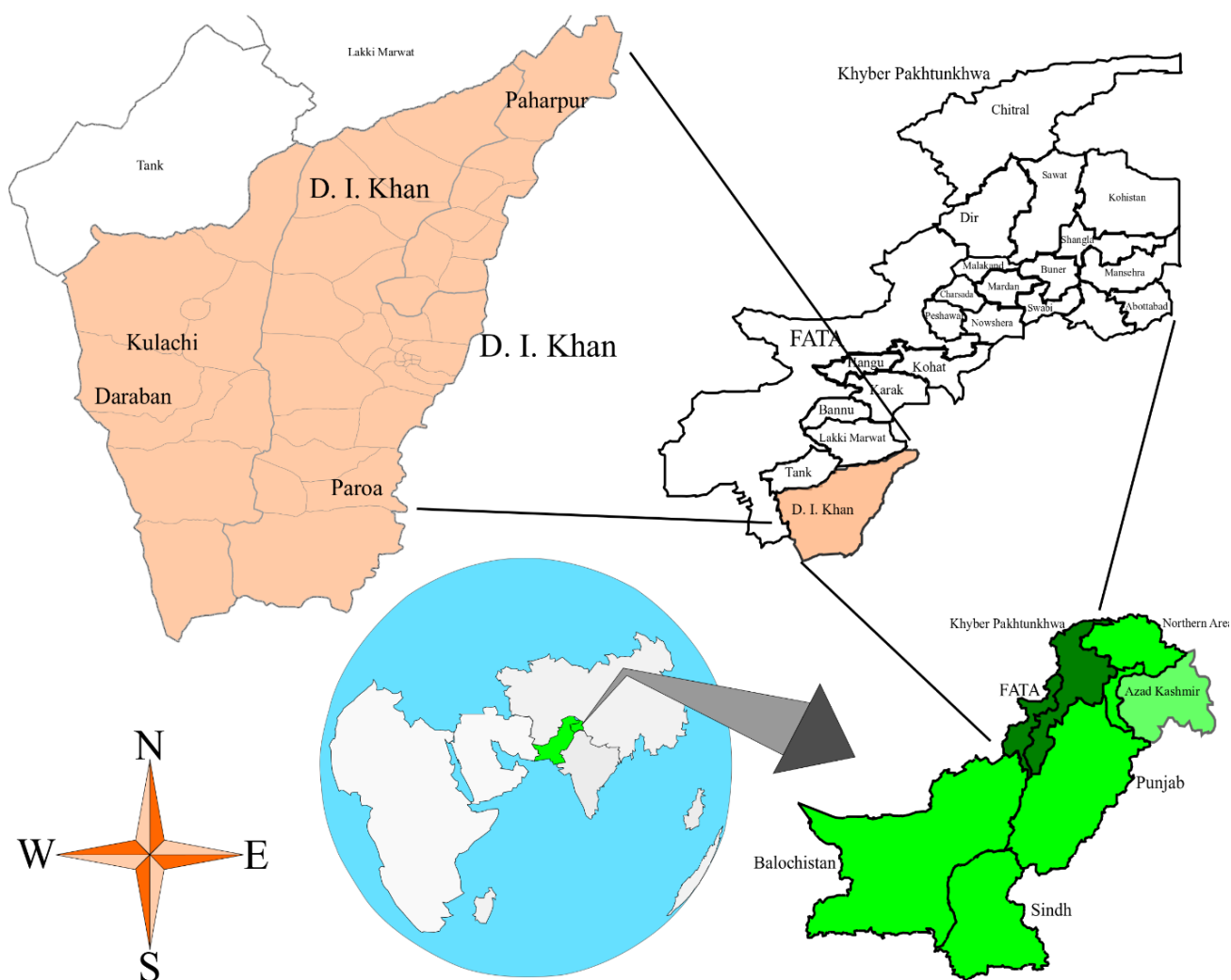


Fig. 1. Sketch of the study area.

**Data collection and field surveys:** Ethnomedicinal data was collected from 2016-2018 in different seasons. Total 150 informants were interviewed (100 females and 50 males) in local languages through a semi-structured questionnaire. The first part of questionnaire contained information about demographic data of informants like age, gender, educational status and income source while remaining part was mainly focused on polyherbal medicine, their individual plants, local name and plant parts of medicinal plants, other additional ingredients, method of polyherbal remedy preparation, disease name, mode of administration and dosage information for children and adults. Plant species were collected from study area and identified at Department of Botany Kohat University of Science and Technology, Kohat and submitted to herbarium. Voucher numbers were given in table with each plant species. Taxonomic identification, correction and synonym of the collected plant species used in polyherbal traditional medicines was authenticated by using the international plant name index (<http://www.ipni.org>), the plant list ([www.theplantlist.org](http://www.theplantlist.org)) and Flora of Pakistan (Ali & Qaiser, 1995-2009).

**Data quality assurance:** For data verification each informant was visited at least for three times. Only validated and relevant data was subjected to further organization and analysis process. Moreover, authors were trained to collect medicinal plants from the area as well gathering therapy formulation related information, their uses, pointing out missing information, and duplication of material to maintain data quality.

**Data organization:** Data was organized and analyzed using Microsoft Excel software 2010. Plants were categorized into herbs, shrubs and trees according to their habit. Plant parts used in polyherbal medicines were categorized into fruit, leaves, whole plant, seeds, bark, root, and so forth. Tables were formulated from the data given by traditional peoples regarding polyherbal remedy preparation for the treatment of human diseases. Table 1 present the data about polyherbal traditional medicine preparation and their usage to treat various human diseases in the study region. Questionnaire data was analyzed for basic categorization of the informants' gender, age groups, literacy ratio and occupation.

### Quantitative analysis

Data on polyherbal medicines and cultural values were analyzed using some indices like frequency of citation (FC), relative frequency of citation (RFC) and use value (UV).

**Frequency of citation (FC):** FC is the number of informants who reported ethnomedicinal uses of each polyherbal recipe (Hoffman & Gallaher, 2007).

**Relative frequency of citation:** Relative frequency of citation (RFC) determines the local importance of each polyherbal recipe. It was calculated by Formula  $RFC = FC/N$ , where FC is the number of respondents mentioning the medicinal use of that recipe and N is the total number of respondents in the survey. RFC varies from 0 to 1. When RFC value is 0, it denotes that a smaller number of

informants had refers that polyherbal formulation as useful and when RFC value is 1, it means that a greater number of respondents in the survey refer that polyherbal formulation as useful (Hoffman & Gallaher 2007).

**Use value (UV):** The use value (UV) is used to prove the relative importance of ethnomedicine. UV of a polyherbal mixture is calculated by formula:

$$UV = \sum U/N$$

where UV is the use value of individual polyherbal recipe, U is the number of uses for that polyherbal recipe and N represents the number of respondents who describe that recipe (Trotter & Logan, 1986; Phillips & Gentry, 1993).

### Results and Discussion

A total of 150 respondents (100 females and 50 males) participated in collecting traditional information regarding use of polyherbal medicines. These respondents were grouped into different classes based on their age, educational level, and occupation (Fig. 2). In the present study the number of female informants was more than male informants. It might be due to having more information about traditional recipes of plants as well females were more involved in household activities, caring of house members and their children. These results were similar with a monoherbal study conducted in same area on individual medicinal plants (Mussarat *et al.*, 2014). Mostly aged male participants had more relevant information of traditional medicines than young males. Informants of above 40–50-year age have maximum information of polyherbal recipes. Most of the inhabitants had university level education and it shows the high literacy rate in the area and more inclination towards natural medicines. This data is contrary with other studies conducted in the study area and somewhere else (Mussarat *et al.*, 2014; Umair *et al.*, 2017). In female participants mostly were teachers and had social role in the community, these educated female participant had more belief on traditional medicines and avoid allopathic medicine due to its side effects while male participant take interest in traditional therapies due to direct interaction with field and agriculture activities.

A total 50 polyherbal traditional recipes were documented which were commonly used by inhabitants to cure different diseases. These polyherbal traditional medicines were mixtures of different plants parts with required concentration. Fruit (63) and seeds (50) were the major plant parts used in preparation these traditional polyherbal formulations. Other used parts were leaves, flower, rhizome, bark, gum, roots, buds, and whole plants (Fig. 3). These finding were similar with other ethnomedicinal studies conducted in the region (Mussarat *et al.*, 2014). Herbs and shrubs were major life form of plant species used in preparation of these natural medicines (Fig. 4). These findings were similar with many other studies documented for monoherbal therapies where herbs were the dominant plant status (Ahmad *et al.*, 2011; Aziz *et al.*, 2018). A study revealed that herbs were easily accessible to local communities for collection (Uniyal *et al.*, 2006). Most of these plant species were cultivated in their fields or found wild in nearby hills. Different preparation modes were used to make these

polyherbal formulations such as decoction, infusion, powder, tea, paste making, juice, extract and cooked or fried the plant parts with required amount of extra ingredients (Fig. 5). Powder and decoction were the most common mode of preparation used in this study. These results were similar with study of Malik *et al.*, (2018) where powder and decoction were most common used methods. These methods also give a logical proof because in this case all the gradients are mixed up with each other causing a good effect on human body. In decoction mode of preparation as plants parts were boiled in water to eradicate microbes and extract had active ingredients in plants (Alamgeer *et al.*, 2018). Two methods topically and orally were mode of utilization in this study. Both these methods are preferred all over the world as route of administration for medicines (Shaheen *et al.*, 2017). Some extra ingredients were also mixed with plant constituents to minimize the bitter taste of plants and for ease swallowing. These ingredients were sugar, honey, milk, curd, common salt, black salt, and water.

The information of plants with botanical, common name and family name, habit, mode of utilization, formulation and dosage are given in Table 1. These polyherbal medicines are the mixtures of two or more than two plants with same or different concentrations of desired plant parts belonging to same or different families. The dominant plant family was Apiaceae followed by Zingiberaceae, Fabaceae, Rosaceae, Lamiaceae and so on (Fig. 6). Participants had mentioned a variety of medicinal properties of different species in these families. These polyherbal medicines were used to treat various diseases (Table 1). The use of polyherbal ethnomedicines is a way towards the formulation of new synergistic combinations of plant parts or their phytoconstituents with each other or with the commercially available antibiotics. Yam *et al.*,

(1998), Aqil *et al.*, (2005), Braga *et al.*, (2005) reported the synergistic effects with significant reduction in the minimum inhibitory concentrations (MIC) of the antibiotics, resulting from the combination of different antibiotics with different crude plant extracts against pathogens. Majority of polyherbal recipes were used to treat gastrointestinal disorders followed by respiratory ailments, weight loss and obesity, reproductive complaints and so on. Among 50 polyherbal formulations 24 were used for different gastrointestinal complaints like constipation, diarrhea, stomach pain, gas troubles, vomiting and intestinal worms (Fig. 7). Among 50 recipes 6 polyherbal mixtures were used to cure different respiratory problems like cough and cold, chest infections, bronchial problems, and pneumonia and 6 were used to treat reproductive disorders like menses pain, delivery pain, abortion and to conceive pregnancy. Other 6 recipes were used to treat obesity problems and weight loss. Inhabitants had a strong traditional believes on these polyherbal medicine for curing these diseases and all these medicines were present in their homes in dry or fresh form. Gastrointestinal diseases remained the first cured disease category in other documented published monoherbal studies (Shaheen *et al.*, 2017; Mussarat *et al.*, 2014). The highest use of Apiaceae, Zingiberaceae, Fabaceae, Lamiaceae and Rosaceae in these medicines seemed to be a reason because most of the species of these families were used for gastrointestinal problems and had carminative effects. Species of Apiaceae were also annual, biennial, and perennial and had a vast distribution. Fabaceae was also used as dominant family in other studies (Shaheen *et al.*, 2017; Alamgeer *et al.*, 2018). Species of Lamiaceae and Rosaceae had high number of uses for gastrointestinal diseases (Dogan & Ugulu, 2013; Aziz *et al.*, 2018).

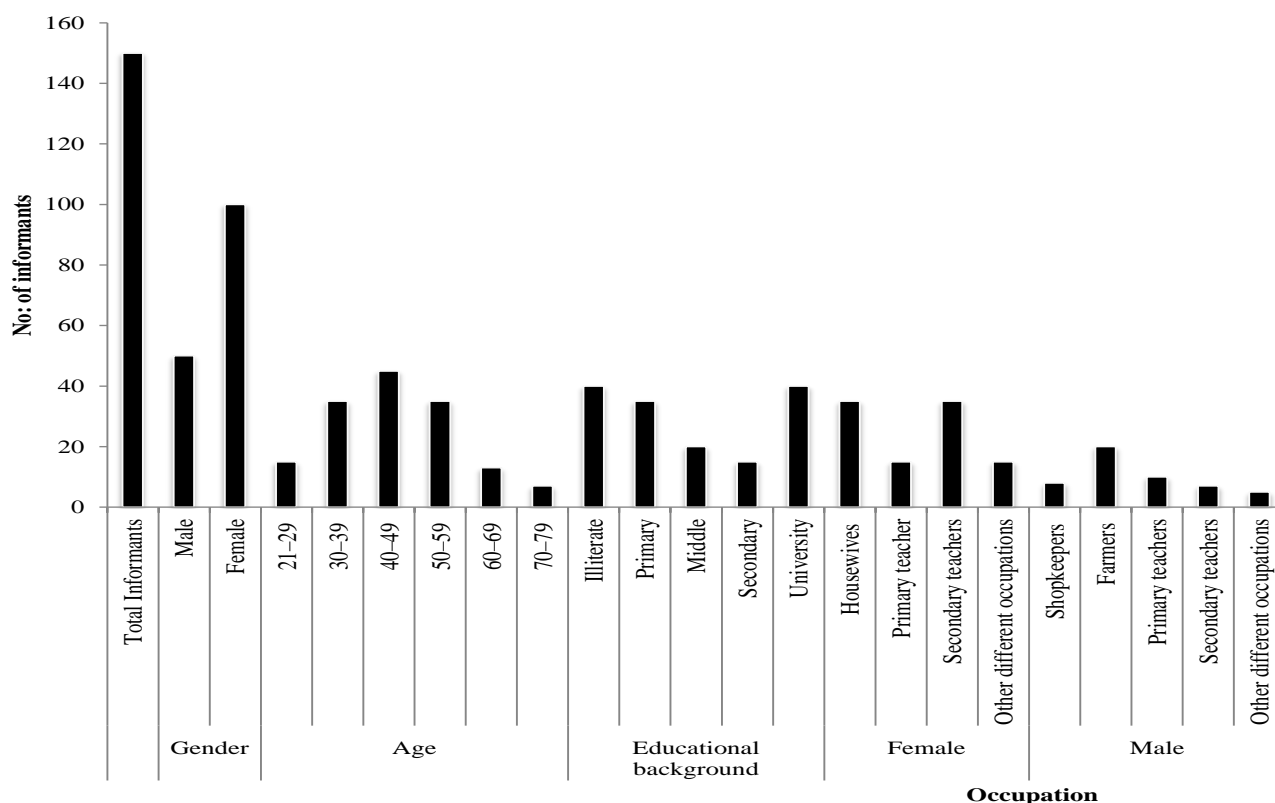


Fig. 2. Ethnographic data of local informants.

Table 1. Polyherbal ethnomedicines used by local people in the study area.

Recipes No:	Plants Botanical name / family	Local name of Plant / Habit	Part used	Other ingredients	Disease and Recipe formulation	Dosage and treatment		Toxicity of plant/ Removal effect traditionally	FC	RFC	UV
						Children	Alders				
01.	<i>Calotropis procera</i> L.	Aak /S	Leaves	Brassica seed oil, Mansil	Brassica oil is boiled and twenty one leaves of <i>C. procera</i> are cooked in it, mixed three gram mansil (white silica) in it, used for allergy. This recipe is known as muskha kharishh locally.	Massage the affected area once a day, Not given orally	Massage the affected area once a day	If taken orally, cause vomiting and severe diarrhea /Milk and clarified butter are mixed and given orally	2	0.01	0.5
	Dryand.KUSTH-470 Asclepediaceae										
	<i>Brassica rapa</i> L. ( <i>Brassica campestris</i> L.) KUSTH-428a Brassicaceae	Sarsoon/ S	Seeds								
	<i>Prunus dulcis</i> (Mill.) D.A. Webb KUSTH-486 Rosaceae	Badam/ T	Fruit								
	<i>Elettaria cardamomum</i> (L.) Maton KUSTH-487 Zingiberaceae	Choti ilaichee / T	Fruit								
02.	<i>Foeniculum vulgare</i> Mill. KUSTH-345 Apiaceae	Saunf / H	Seeds	Sugar	<i>P. dulcis</i> three in number, two <i>E. cardamomum</i> , Twenty gram <i>F. vulgare</i> , Forty gram <i>P.somniferum</i> , ten gram <i>C. sativum</i> and five leaves of <i>M. sylvestris</i> are kept in one cup of water for whole night. In morning all these are blended and strained through fine cloth resulted material is called Ghota locally used for headache and to make brain strong	Half cup in early morning	One cup in early morning for one month	Not toxic	5	0.033	0.4
	<i>Papaver somniferum</i> L. KUSTH-478 Paparvaceae	Khashkhash /H	Fruit								
	<i>Coriandrum sativum</i> L. KUSTH-331a Apiaceae	Khusk Dhania/ H	Seeds								
	<i>Mentha longifolia</i> L. ( <i>Mentha sylvestris</i> ) L. KUSTH-353a Lamiaceae	Podina/H	Leaves								
	<i>Withania coagulans</i> (Stocks) Dunal. KUSTH-376 Solanaceae	Paneer/S	Fruit								
03.	<i>Piper nigrum</i> L. KUSTH-462 Piperaceae	Kali mirch /S	Buds	Salt, nashadar (sal ammoniac) kala namak (Black salt, Sulemani namak, Himalayan black salt)	All plants parts are taken in equal quantity mixed required amount of salt and make powder called Hazma Phakki and take after dinner for gastric pain, indigestion.	1 g powder once a day	2 g powder twice a day	Extra doses cause nausea and vomiting	10	0.066	0.2
	<i>Trachyspermum ammi</i> (L.) Sprague. KUSTH-759 Apiaceae	Ajwain/ H	Seeds								
	<i>Cuminum cyminum</i> L. KUSTH-479 Apiaceae	Zeera /H	Seeds								
	<i>Foeniculum vulgare</i> Mill. KUSTH-345 Apiaceae	Sounf /H	Seeds								
	<i>Curculigo orchoides</i> Gaertn. KUSTH-495 Amaryllidaceae	Mosli siyah/ H	Fruit								
04.	<i>Chlorophytum borivilianum</i> Santapau & R.R. Fern. KUSTH-486 Liliaceae	Mosli sufaid /H	Fruit	NA	Plants parts are crushed in equal amount for stomach pain and other stomach problems, diarrhea, constipation	Not given	Once a day	NA	2	0.01	2
	<i>Citrus limon</i> L. Obesk. KUSTH-327a Rutaceae	Lemon surkh /S	Fruit								
	<i>Butea monosperma</i> (Lam.) Taub. KUSTH-501 Leguminosae	Qamarkas/ T	Fruit								
	<i>Elettaria cardamomum</i> (L.) Maton KUSTH-487 Zingiberaceae	Ilaitchi /T	Fruit								
	<i>Asparagus racemosus</i> Willd. KUSTH-502 Liliaceae	Satawari/ H	Root								
<i>Hygrophila auriculata</i> (Schumacher.) Heine ( <i>Asteracantha longifolia</i> ) (L.) Nees KUSTH-504 Acanthaceae	Tal makhana /H	Fruit									
<i>Nigella sativa</i> L. KUSTH-748 Ranunculaceae	Kalonji /H	Fruit									



Table 1. (Cont'd).

Recipes No:	Plants Botanical name / family	Local name of Plant / Habit	Part used	Other ingredients	Disease and Recipe formulation	Dosage and treatment duration		Toxicity of plant/ Removal effect traditionally	FC	RFC	UV
						Children	Alders				
09.	<i>Mentha longifolia</i> L. ( <i>Mentha sylvestris</i> ) L. KUSTH-353a Lamiaceae	Podina/ H	Leaves	Salt	Ten gram of <i>M. sylvestris</i> and <i>P. granatum</i> are taken to make fine powder or safoof used for diarrhea, dysentery	Half spoon with cold water	One table spoon with cold water thrice a day for 4-5days	Not for asthma patients	7	0.04	0.28
		Anar ka chilka /T	Fruit cover								
10.	<i>Camellia sinensis</i> L. KUSTH-464 Theaceae <i>Citrus limon</i> L. Osbeck KUSTH-327a Rutaceae <i>Zingiber officinale</i> Roscoe. KUSTH-763 Zingiberaceae	Sabz chaaye/ H	Leaves	Sugar	Ten gram of <i>C. sinensis</i> and <i>C. limon</i> and half tablespoon sugar are boiled in water for five minutes to make decoction. Juice NA of lemon is added to this and used for obesity and indigestion	One cup in early morning depends on severity		More dosage cause on diarrhea/ Curd is used	17	0.11	0.11
		Lemon/S	Fruit								
		Adrak/ Stund/ H	Rhizome								
		Chilka Ispaghol/ H	Chilka								
11.	<i>Citrus limon</i> L. Osbeck KUSTH-327a Rutaceae <i>Foeniculum vulgare</i> Mill. KUSTH-345 Apiaceae <i>Mentha longifolia</i> L. ( <i>Mentha sylvestris</i> ) L. KUSTH-353a Lamiaceae <i>Nigella sativa</i> L. KUSTH-748 Ranunculaceae	Lemon/S	Fruit	Honey	One tablespoon of <i>P. ovata</i> , juice of <i>C. limon</i> , <i>F. vulgare</i> , <i>N. sativa</i> , juice of <i>M. sylvestris</i> leaves and honey are added in one glass of water and boiled. One glass in early morning taken for obesity/ weight loss	As required		No harmful effect	4	0.02	0.5
		Saunf/ H	Seeds								
		Podina/ H	Leaves								
		Kalonji/ H	Seeds								
12.	<i>Momordica charantia</i> L. KUSTH-772 Cucurbitaceae <i>Phoenix dactylifera</i> L. KUSTH-359a Arecaceae	Karela/ H	Fruit's Cover	Salt	Fruits are blended in water, seeds powder is added. Water is strained through fine cloth used for diabetes	One cup as required		NA	9	0.06	0.11
		Ajwa Khajoor/ T	Seeds								
13.	<i>Syzygium cumini</i> (L.) Skeels ( <i>Eugenia jambolana</i> L.) KUSTH-766 Myrtaceae <i>Punica granatum</i> L. KUSTH-753 Lythraceae	Jaman/ T	Seeds	Curd, sugar, water	10 g of both plant parts are crushed to fine powder and mixed with curd and sugar, take with water for typhoid, diarrhea also useful for diabetes patient	Half spoon 3 times a day for As necessary		NA	2	0.01	1.5
		Anar/ T	Fruit cover								
14.	<i>Acacia catechu</i> (L.F.) Willd. KUSTH-771 Leguminosae <i>Elettaria cardamomum</i> (L.) Maton KUSTH-487 Zingiberaceae	Katha/ T	Bark	Sangri misri, batasheer	10 g of <i>A. catechu</i> and 5 g of <i>E. cardamomum</i> crushed and used for mouth swelling, stomach heat and kidney pain	As necessary		Not toxic	8	0.16	0.37
		Illachi/ T	Fruit								
15.	<i>Triticum aestivum</i> L. KUSTH-760 Poaceae <i>Punica granatum</i> L. KUSTH-753 Lythraceae	Gandam/ H	Seeds	Gur/Jaggry water	Powder of <i>T. aestivum</i> and seeds of <i>P. granatum</i> are mixed, fried a little then mixed with gur and make semi solid material which is used to conceive pregnancy	Once time a week		Not toxic	2	0.01	0.5
		Anar dana/ T	Seeds								
16.	<i>Dalbergia sissoo</i> (DC) Roxb. KUSTH-775 Leguminosae <i>Ocimum basilicum</i> L. KUSTH-356a Lamiaceae	Tali/ T	Bark	NA	Grind both parts equally and chewed for blisters in mouth, cough and flu	As needed		Not toxic	3	0.02	1
		Niazboon/ H	Leaves								











Table 1. (Cont'd).

Recipes No:	Plants Botanical name / family	Local name of Plant / Habit	Part used	Other ingredients	Disease and Recipe formulation	Dosage and treatment duration		Toxicity of plant/ Removal effect traditionally	FC	RFC	UV
						Children	Alders				
	<i>Citrus limon</i> L. Osbeck KUSTH-327a Rutaceae	Lemon/ S	Fruit		Extract of all these plant parts are mixed in equal quantity and used for diarrhea and indigestion for children	1 spoon 2 times a day	Not used	NA	17	0.11	0.12
43.	<i>Rosa indica</i> L. KUSTH-754 Rosaceae	Arqe gulab/ S	Flower	NA							
	<i>Foeniculum vulgare</i> Mill. KUSTH-345 Apiaceae	Arqe soumf/ H	Seeds								
	<i>Curcuma longa</i> L. KUSTH-1639 Zingiberaceae	Haldi/ H	Rhizome		Powder of <i>C. longa</i> is mixed in <i>B. campestris</i> seeds oil and used topically with cotton on injured places for remove pain and inflammation	2 times a day	2 times a day	NA	20	0.13	0.1
44.	<i>Brassica rapa</i> L. ( <i>Brassica campestris</i> L.) KUSTH-428a Brassicaceae	Sarsoon/ H	Seeds	NA							
	<i>Annonum subulatum</i> Roxb. KUSTH-803 Zingiberaceae	Bari illachi/ H	Fruit	Clarified butter, Semolina, Sugar	<i>A. subulatum</i> two in number and three normal piece of bark of <i>C. zeylanicum</i> are cooked with semolina in clarified butter and used for blood flow in paralysis		Once a day	NA	11	0.07	0.09
45.	<i>Cinnamomum verum</i> J.Presl ( <i>Cinnamomum zeylanicum</i> Blume.) KUSTH-463 Lauraceae	Dar cheeni/ T	Bark								
	<i>Saccharum officinarum</i> L. KUSTH-755 Poaceae	Gana/ H	Fruit juice	Salt	Jaundice, to purify blood and digestion		One glass a day for one weak	NA	21	0.14	0.14
46.	<i>Citrus limon</i> L. Osbeck KUSTH-327a Rutaceae	Lemon/ S	Fruit juice								
	<i>Gossypium arboreum</i> L. KUSTH-804 Malvaceae	Cotton/ S	Flower								
47.	<i>Rosa indica</i> L. KUSTH-754 Rosaceae	Rose/ S	Flower	Sangri nasti, Water	200 g of all plant parts and 200 g of sangri nasti are boiled in 1 litre of water and used for NA heart diseases and to open closed valve		One tea spoon 2 times a day	NA	2	0.01	1
	<i>Foeniculum vulgare</i> Mill. KUSTH-345 Apiaceae	Sounf/ H	Seeds								
	<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry KUSTH-512 Myrtaceae	Lowang/ T	Buds								
48.	<i>Brassica rapa</i> L. ( <i>Brassica campestris</i> L.) KUSTH-428a Brassicaceae	Sarsoon/ H	Seeds		Buds of <i>S. aromaticum</i> are boiled in <i>B. campestris</i> seeds oil and used for earache	1-2 drops	1-2 drops	NA	5	0.03	0.2
	<i>Pramus dulcis</i> (Mill.) D.A. Webb. KUSTH-486 Rosaceae	Badam/ T	Fruit	Milk	75 g of <i>P. dulcis</i> and 5-7 fruit of <i>P. dactylifera</i> crushed in grinder with one cup of milk taken before breakfast to increase memory	1 cup	1 cup	Not toxic	11	0.07	0.09
49.	<i>Phoenix dactylifera</i> L. KUSTH-359a Areaceae	Khajoor/ T	Fruit								
	<i>Cicer arietinum</i> L. KUSTH-323a Leguminosae	Chana/ H	Seeds								
50.	<i>Citrus limon</i> L. Osbeck KUSTH-327a Rutaceae	Lemon/ S	Fruit juice	Milk or malai	Grind all plant parts in powder form and mix it with required milk add some drop of lemon juice and used topically on face to reduce pimples and as whitening agent	NA	3 times a weak	A little bit burning on sensitive skin	12	0.08	0.16
	<i>Solanum lycopersicum</i> L. KUSTH-469 Solanaceae	Tomato/ H	Fruit								

H=Herb, S= Shrub, T= Tree, KUSTH= Kohat University of Science and Technology Herbarium, NA= Not available

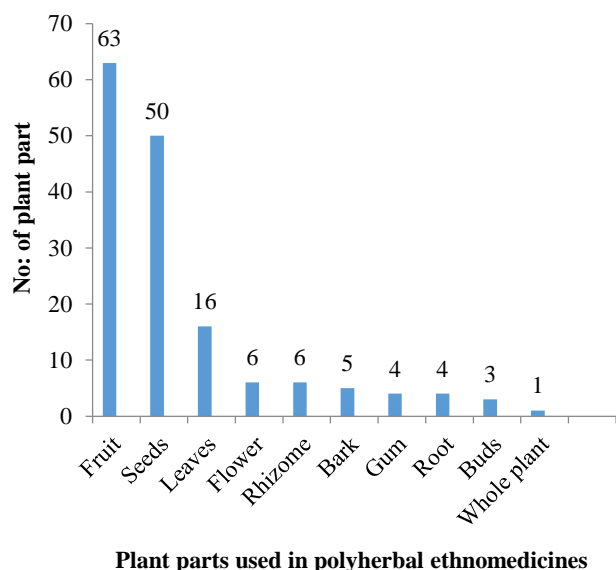


Fig. 3. Plant parts used in polyherbal medicines.

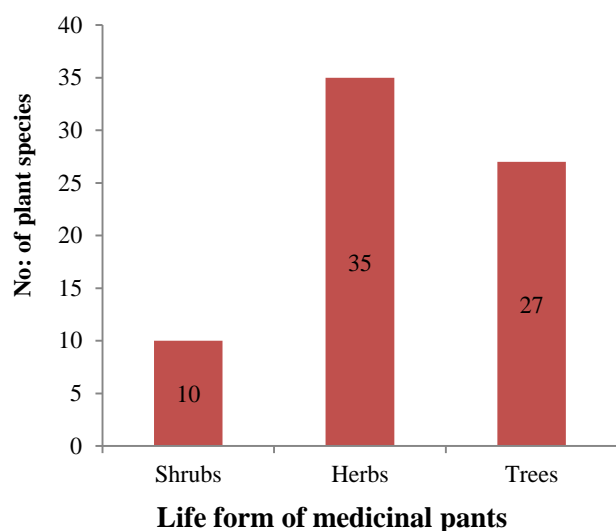


Fig. 4. Habit wise categorization of medicinal plant species.

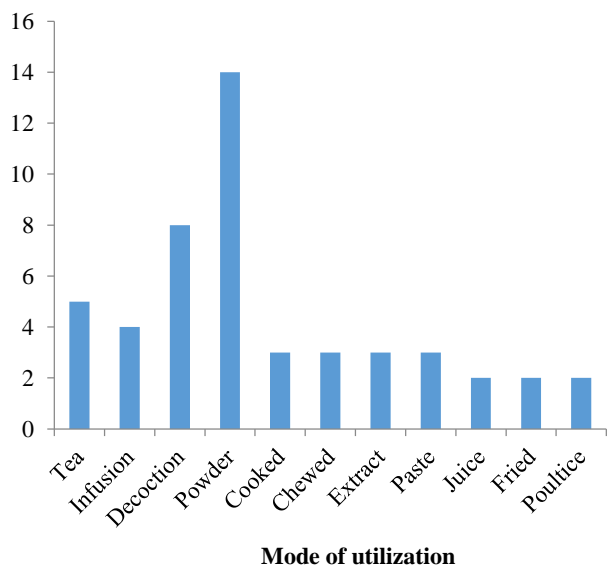


Fig. 5. Mode of utilization of medicinal plants.

Many usages of polyherbal medicines against gastrointestinal diseases showed that there was high prevalence of these ailments in the area. Tariq *et al.*, (2015) reported that these diseases were common in Southern regions due to lack of hygienic mode of living and unavailability of pure water. Polyherbal mixture used to treat gastrointestinal infections mostly consists of *Withania coagulance*, *Piper nigrum*, *Trachyspermum ammi*, *Cuminum cyminum*, *Citrullus colocynthis* and *Foeniculum vulgare* with different ratio. *W. coagulance* and *T. ammi* individually was prescribed for digestive and colic pain (Marwat *et al.*, 2008; Ahmad *et al.*, 2011). Individually *C. colocynthis* and *F. vulgare* was prescribed traditionally for constipation and vomiting and carminative respectively in study area (Mussarat *et al.*, 2014). *Punica grantum* is famous traditionally for digestive problems was remained the main constituent of polyherbal formulation (Khalid *et al.*, 2017; Marwat *et al.*, 2008). Extracts of *F. vulgare*, *Rosa indica* and *Citrus lemon* were mixed in equal quantity and given to children for diarrhea and indigestion. All the plants in this recipe used individually for many ailments including gastric problems. An herbal product of *R. indica* called Gulkand is also used traditionally for digestive problems and found effective and it also gone through experimental trial (Sindhura *et al.*, 2013; Mussarat *et al.*, 2014). Khan & Shinwari, (2016) also describes the importance of Rosaceae for its therapeutic purposes. Individual plants in all these polyherbal recipes have also been documented and used traditionally for treatment of different gastrointestinal ailments (Adnan *et al.*, 2015; Tariq *et al.*, 2015). *Acacia modesta* is considered as valuable medicinal plant in literature and all parts of the plant have analgesic and anti-inflammatory effects which rationalize the traditional concept of use (Rahman *et al.*, 2015). Polyherbal formulations used for gastrointestinal ailments of different pharmaceutical industries have also common plants (Zeb *et al.*, 2013). So, polyherbal medicines used traditionally in study area will be a good addition in pharmaceutical industries.

Among 50 recipes 6 recipes are used for curing respiratory and reproductive disorders. Leaves of *Ocimum basilicum* recommended for cough and flu and gastrointestinal problems in other regions as well in the study area (Marwat *et al.*, 2008; Mussarat *et al.*, 2014). Combination action of honey with some plants including *Glycyrrhiza glabra* show a very good effect against respiratory tract pathogens and reduction of minimum inhibitory concentration (Shalanimol & Priya, 2017). Combination of plant extract with each other or with antibiotics presents good antibacterial effects. These combinations showed synergistic antibacterial effect and could lead to new antibacterial drug designing (Islam *et al.*, 2015; Padalia *et al.*, 2016). *In vitro* and *In vivo* studies against respiratory pathogens are recommended of all polyherbal traditionally used formulations in present study for scientific validation. Common plants in polyherbal formulations used to treat reproductive complaints were *Foeniculum vulgare*, *Areca catechu*, *Astragalus gummifera*, *Cuminum cyminum*, *Plantago ovate*, *Cicer arietinum*, *Elettaria cardamomum*, *Cocos nucifera*, and *Trachyspermum ammi* mix with different ratio for curing leucorrhea, abortion, menses pain and to conceive pregnancy. Tsobou *et al.*, 2016 studied the medicinal plants used for curing reproductive health care problems in

Cameroon, Central Africa and provide a traditional data of such medicines used by females. Ansari *et al.*, 2017 have reviewed the literature about plants regarding anti-fertility effects of different plants and concluded that phytotherapy has a significant role in regulating fertility rate, so these polyherbal mixtures should be evaluated for scientific trial.

Mixture of seeds of *Cicer arietinum*, fruit juice of *Citrus limon* and *Solanum lycopersicum* used topically on face to reduce pimples and as whitening agent might be due to their antioxidant properties. Powder of *Curcuma longa* is mixed in *Brassica campestris* oil and used topically to remove pain and inflammation. Although both these plants individually recommended for rheumatism and pain but have no scientific base (Alamgeer *et al.*, 2018). Decoction of *P. ovata*, juice of *C. limon*, *F. vulgare*, *N. sativa*, *M. sylvestris* and honey were mixed in one glass of water used for obesity/ weight loss. Powder of *Curcuma zedoaria*, *Terminalia chebula* and *Cassia absus* called Phakki used for Obesity. Obesity is a chronic life-threatening disease throughout the world and allopathic anti-obesity drugs may have hazardous side effects. Flavonoids and p-synephrine from citrus fruits exert anti-obesity effects by regulation of lipid metabolism and energy intake, expenditure, and regulation of adipogenesis (Feng & Wang, 2018). Buds of *Syzygium aromaticum* were boiled in *Brassica campestris* seeds oil and make a decoction used for earache. Al-ameedi *et al.*, 2017 studied the analgesic and anti-inflammatory effect of hydro-alcoholic extract of clove. There is evidence that crude plant extracts are often more potent than isolated constituents which ensure the traditional usage of mixtures of plants. Due to synergism, polyherbalism confers some benefits which are not accessible in single herbal formulations (Karole *et al.*, 2019). As Pakistan is in rank of top twenty for crude drug export so, this polyherbal traditional medicine system is the base for pharmaceutical industries to check their synergistic and antagonistic effects.

Albuquerque *et al.*, (2007) described that many medicinal plants have adverse reactions and proven toxic. This is common observation in ethnobotanical surveys, that traditional healers considered medicinal plants as healthy, beneficial, and completely safe. Some side effects are reported in the current study from the use of polytherapy which were more related with digestive system. For example, twenty-one leaves of *C. gigantia* are cooked in

*Brassica* oil is used for allergy but when taken orally it cause vomiting and severe diarrhea. Milk and clarified butter are mixed and given orally to cure these effects in traditional way. Similarly, extra doses of many other polyherbal formulations also cause vomiting, nausea, and diarrhea (Table 1). Although polyherbal and herbo-mineral formulations combined in a meticulous ratio, it will give an enhanced therapeutic effect and decrease the toxicity but there is still need to evaluate their toxicity on scientific bases. This is the first documented ethnomedicinal polyherbal study especially in the area and generally all over the world. These polyherbal traditional medicines consist of commonly used plants which are found all over the world so, these polyherbal mixtures gain the attention of international repute. Among these recipes most of the recipes are very effective and peoples have strong traditional belief of curing ailments, so there is need to explore them scientifically. In near future some medicinal plant species face the threats of extinction due to overexploitation and little practices of cultivation. This is the pioneer work towards the synergistic effects of plant extracts to overcome on the resistance issue of antibiotics against different microbes in form of alternative medicines.

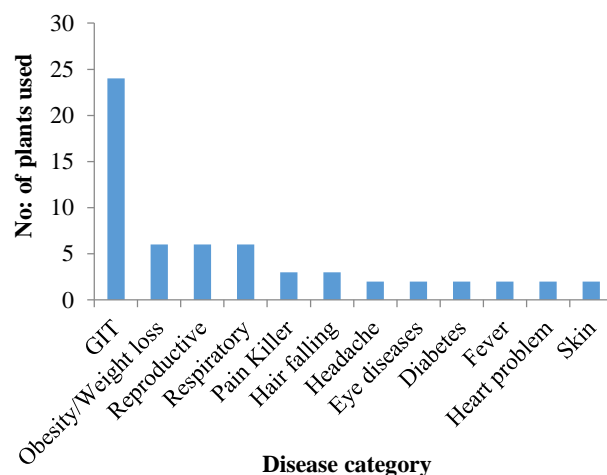


Fig. 7. No. of disease category treated through polyherbal medicines.

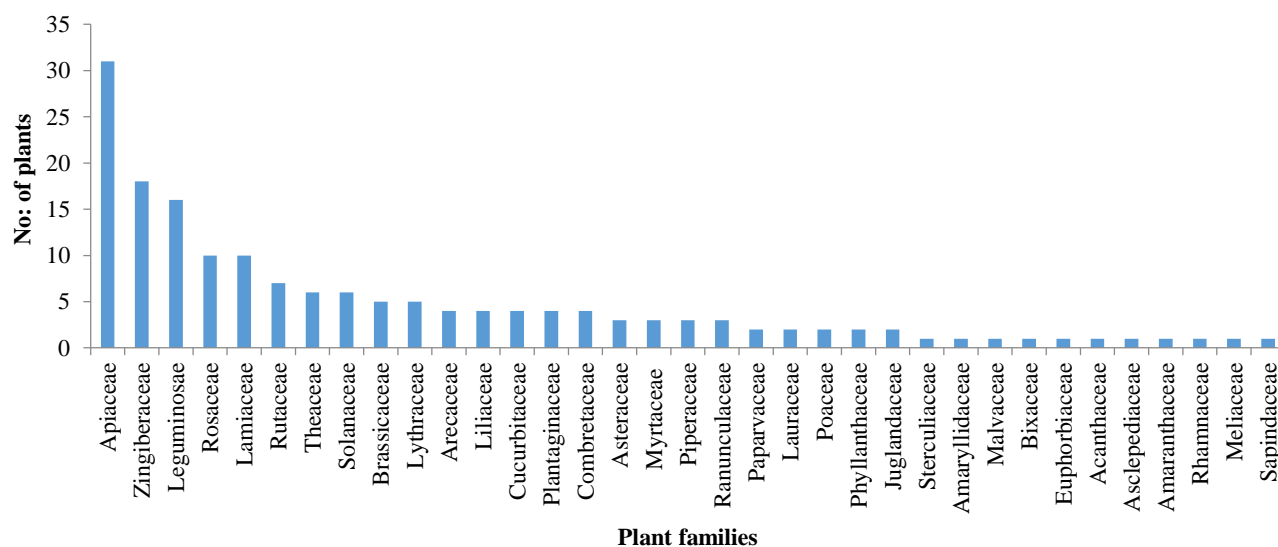


Fig. 6. No. of plants in different families used in polyherbal medicines.

## Conclusions

The study provides very important and long-lasting traditional information for upcoming generation and conserves the natural phenomena of curing diseases. Different practices of cultivating medicinal plants should be promoted in the area for conservation purposes. It is the first study of this area and there is need to explore the other area of the country to document the data regarding polyherbal traditional medicines. This study provides the baseline of manufacturing new allopathic drugs from polyherbal mixtures following their pharmacology and phytochemistry. This data also needs to check the toxicity of traditional recipes of medicines for to give safe natural therapies.

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