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Ethnopharmacological treatment of Cough in Piran, Malakand, Pakistan

[Tratamiento etnofarmacológico de la tos en Piran, Malakand, Pakistán]

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Abstract: The current study was designed to investigate the traditional recipes used to treat cough in Tehsil Piran, Malakand, Pakistan. These recipes were explored and quantitively analyzed for the first time. A total of 30 species of the plants, 6 animal products and one salt were reported to be used by the community to treat cough. *Punica granatum* L. and *Olea ferruginea* Royle dominated with Use value (UV) of 0.84 and *Origanum vulgare* L. with least use value of 0.1. The frequency citation (FC) of the *Papaver somniferum* L. is higher (98) while the lowest one is *Verbascum thapsus* L. (0.13). The large number of traditional recipes used for cough in this area shows that primary health care is still amalgamated in this culture. In future studies, these recipes may be further exploited as a base for modern medicine.

Keywords: Ethnopharmacology; Medicinal plants; Animal and mineral products; Cough; Malakand.

Resumen: Este estudio fue diseñado con el propósito de investigar las recetas tradicionales utilizadas para tratar la tos en Tehsil Piran, Malakand, Pakistán. Estas recetas fueron exploradas y analizadas cuantitativamente por primera vez. Se constata que la comunidad utilizó un total de 30 especies de plantas, 6 productos animales y una sal para tratar la tos. *Punica granatum* L. y *Olea ferruginea* Royle se destacaron con un valor de uso (UV) de 0.84 y *Origanum vulgare* L. con un valor de uso mínimo de 0.1. La cita de frecuencia (FC) del *Papaver somniferum* L. es más alta (98) mientras que la más baja es *Verbascum thapsus* L. (0.13). La gran cantidad de recetas tradicionales utilizadas para la tos en esta área muestra que la atención primaria de salud todavía está amalgamada en esta cultura. En futuros estudios, estas recetas pueden explotarse aún más como base para la medicina moderna.

Palabras clave: Etnofarmacología; Plantas medicinales; Productos animales y minerales; Tos; Malakand

INTRODUCTION

Cough is a protective immune response of the respiratory airways to expel or eliminate irritants and mucous. It is the most common symptom for which individuals seeks medical advice (Irwin & Madison, 2000). The common causes of cough may be either of viral, or bacterial or chemical origin that include common cold, chronic bronchitis, rhinitis, sinusitis, asthma environmental agents smoke, dust, angiotensin converting enzymes inhibitors and synthetic opioid analgesic (Soghier & Kinjo, 2018). World Health Organization reported 142,512 pertussis cases and 89000 deaths in 2015 worldwide. In Pakistan, almost 4 cases of pertussis per one thousand infants have been reported in 2016 (Pakistan, 2018).

According to World Health Organization 80% of the Asian population relies on the medicinal plants for prevention and treatment of various diseases including cough (Jan *et al*., 2018). The total of 25% of herbal plants are used in developed countries for active constituent's separation (Bodeker & Ong, 2005). The practice of traditional medicines varies from region to region and country to country (Togola, 2008). The origin of 50% pharmaceutical products is traced back to ethnomedicinal knowledge (Van Wyk *et al*., 1997). Different communities and ethnic groups use medicinal plants, animal and minerals to treat different diseases. The people of the rural areas used traditional remedies to treat maladies. They use traditional medicines due to i) knowledge from parents with firm belief, ii) knowledge of usage without consulting a physician, and iii) general perception of safety and economy.

The Malakand area is rich of medicinal flora, to date the area has not been investigated that how this community use traditional medicine to treat cough. This study is reported for the first time to treat cough, using natural medicine. The study will provide a firm base to determine modern natural product-based remedy to treat cough. The objective of the study is to document and quantitatively analyze the traditional cough management recipes that will preserve the traditional knowledge of the community for long time and later use.

MATERIALS AND METHODS

Study area

The current study conducted in Piran, Malakand area (different villages), the area geographically coordinates 34°33'56" latitude to north and 71°55'52" longitude to east, the rainfall annually in the area varies from 590-600 mm (Karim, 2008). The study carried out in 18 local villages including Bagh, Krapa, Nawagai, Maizru banda, Ajlai banda, Sabaoon, Rangmala, Kandharu, Karamar, Made Patay, Geralai, Banju, Koz chum, Gurgurai, Dub, Bagardara, Kajura, Atam banda Khyber Pakhtun Khwa, Pakistan.

Data collection form

This survey was carried out from May to September 2019, to identify and record ethnopharmacological treatment of cough by various ethnic groups in the area. The first targets in this study were traditional healers (local Hakims), the study objectives were explained to them. The total of 105 participants were interviewed in total of 18 local villages.

The people of the local area were interviewed in local languages (Pashto and Gujru). The most frequently asked questions were related to; the local name of the plants, medicinal use, parts used of the plants, the method of preparation, complete ingredients of the recipes, administration and adverse effects. The data collection forms were prepared as given in Table No. 1 and the interviewers were guided to keep the local social and ethical norms. The information was collected via interview with the permission of elders of the local area.

Interviews

A total of 105 participants was interviewed on average of 10 minutes. All the products of natural origin were considered as part of the traditional recipes that were used to treat cough. Only 08 women were interviewed due to the cultural norms of the area.

Collection, identification, and preservation of plants

The total of 30 plants of 24 families were collected from 18 different villages (Bagh, Krapa, Nawagai, Maizru banda, Ajlai banda, Sabaoon, Rangmala, Kandharu, Karamar, Made Patay, Geralai, Banju, Koz chum, Gurgurai, Dub, Bagardara, Kajura, Atam banda) and of 14 different ethnic groups of the Malakand Top areas.

The plants were collected when they were completely ripened and developed. Each part of the plants was collected as recommended by participants. These parts were leaves, barks, stems and flowers depending upon the richness of chemical constituents. The information was recorded using proforma see Table No. 1. The collected plants were dried, pressed on herbarium sheets and stored in Herbarium Department of Botany Shaheed Benazir Bhutto University. The plants were identified by Dr.

Latif Ahmad (Taxonomist), Department of Botany Shaheed Benazir Bhutto University Sheringal Pakistan.

Table No. 1
Proforma for medicinal plants collection

A). Participant detail	
Name	
Gender	
Age	
Occupation	
Residency	
Ethnic group	
B). Participant knowledge related to cough treatment	
Plants name which used anti-cough in the area?	
Which parts of the plants used?	
How to formulate the dosage form?	
Adverse effects of the plants?	
C). Participants comments about cough	
What is cough?	
How cough occurred and how you diagnose?	

The plants were collected when they were completely ripened and developed. Each part of the plants was collected as recommended by participants. These parts were leaves, barks, stems and flowers depending upon the richness of chemical constituents. The information was recorded using proforma see Table No. 1. The collected plants were dried, pressed on herbarium sheets and stored in Herbarium Department of Botany Shaheed Benazir Bhutto University. The plants were identified by Dr. Latif Ahmad (Taxonomist), Department of Botany Shaheed Benazir Bhutto University Sheringal Pakistan.

Analysis and documentation of the data
The data were collected using proforma as shown in the Table No. 1, analyzed and tabulated through Microsoft Excel.

Use Value (UV)
It is quantitative indicator used to find the relative importance of medicinal species based on participants. UV can be found by the following formula:

$$\mathbf{UV = \sum Ui / N}$$

In above equation Ui shows the number of use reports cited by each participants and N is the number of all participants (Gairola *et al*., 2013).

Relative Frequency Citations (RFC)
The terms FC and RFC are quantitative indicators for giving value to the medicinal plants in the world of Ethnobotany. The FC is the number of people mentioned the plant and RFC shows the FC/Participants multiplied with 100.

$$\mathbf{RFC = FC/ N (0 < RFC < 1)}$$

In the above equation the FC is number of participants cited the plant and N is total participants (Vitalini *et al*., 2013; Yaseen *et al*., 2015).

RESULTS AND DISCUSSION
Demographic distribution of the participants
This study was conducted in the local area of Piran, Malakand. The total number of participants were 105, the age of the informants involved were from 20–80 years see Table No. 2. The numbers of participants

interviewed in the age of 40–60 was common. 92% male while 8 % female were interviewed. The reason behind the gender difference was the local cultural norms of the area. Firm belief on traditions may be the reason of using the herbal medicines (Table No. 2).

Table No. 2
Participants information's

S.NO	Age of participants	Time for individual interview (Min)	Participants	Percentage (%)
1	01-20	7	12	11.42
2	20-30	12	13	12.38
3	30-40	10	22	20.95
4	50-60	9	16	15.2
5	60-70	13	30	28.5
6	70-80	9	12	11.4
Total		10 min average	105	100

***In above table min = minutes**

Diversity of medicinal plants and their nature

Total of 30 plants species (24 families) were identified (Table No. 3A & Table No. 3B). The most extensively used families were Lamiaceae, Moraceae, Solanaceae and Fabaceae (Figure No. 1). In current study, the life form of the species were herbs 57%, trees 30%, and shrubs 13% as shown in (Figure No. 2).

Morphological parts and method of preparations of the medicinal plants

In this study, distinct portions of the medicinal plants were employed for the treatment of cough such as seeds, rhizomes, fruits, whole plant, bark, fruits, bulb, roots, aerial parts, and leaves. Leaves (37%) were the dominant part utilized, followed by whole plants (17%), and fruits (10%) (Figure No. 3). To the best of our knowledge, in Pakistan leaves as dominant life form of herbal medicine to treat cough is reported for the first time. Leaves exist one of the chief and easily available part without harming the plant life if collected (Giday *et al*., 2003). It is a center of secondary metabolites production and plays active role in photosynthesis and other biosynthetic pathways which can give more medicinal value to it (Ghorbani, 2005). The over exploitation of the root, bark or stem for herbal preparation might be dangerous to the existence of the plant itself (Ghimire *et al*., 2008).

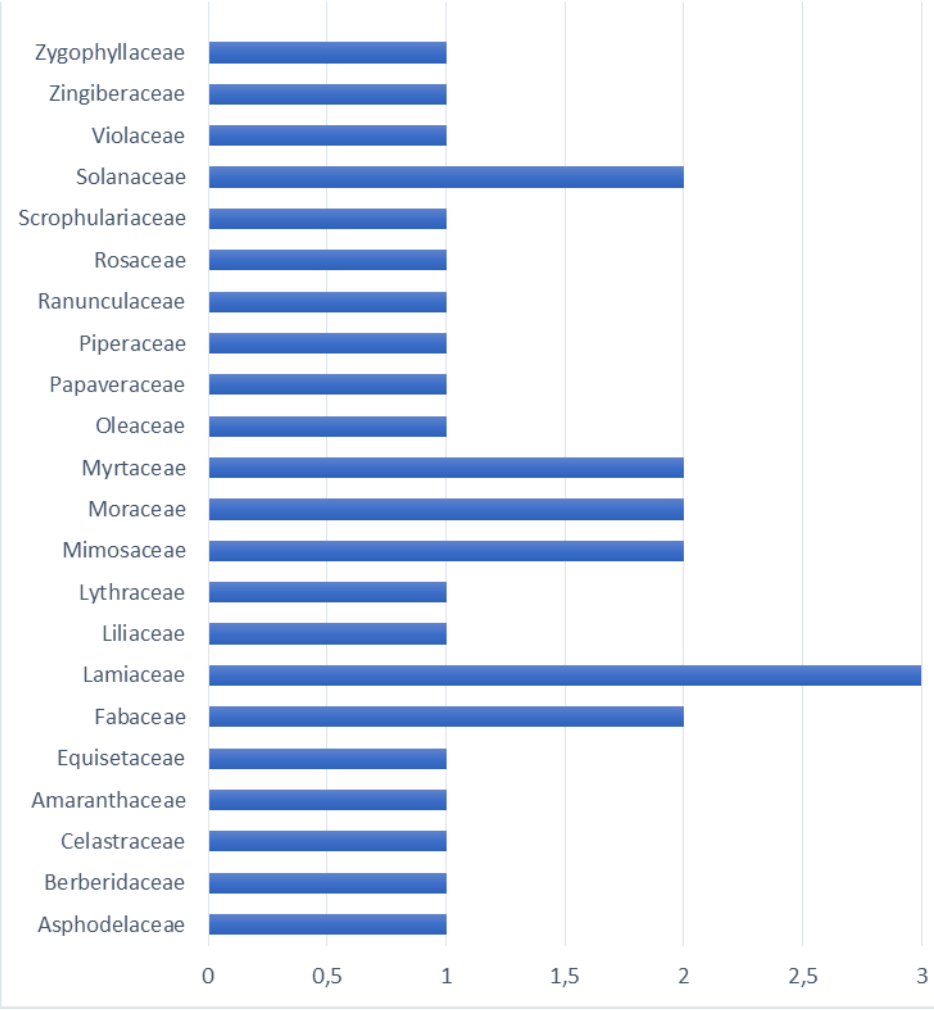

Figure No. 1
Medicinal plants families in current study

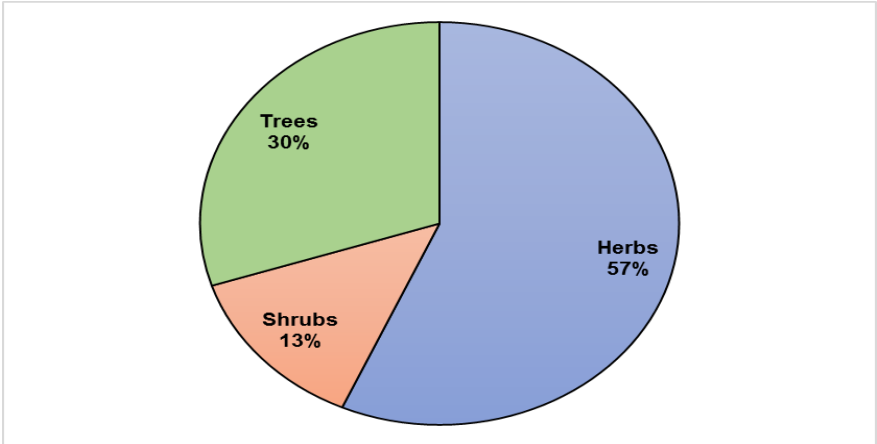

Figure No. 2
Life forms of medicinal plants

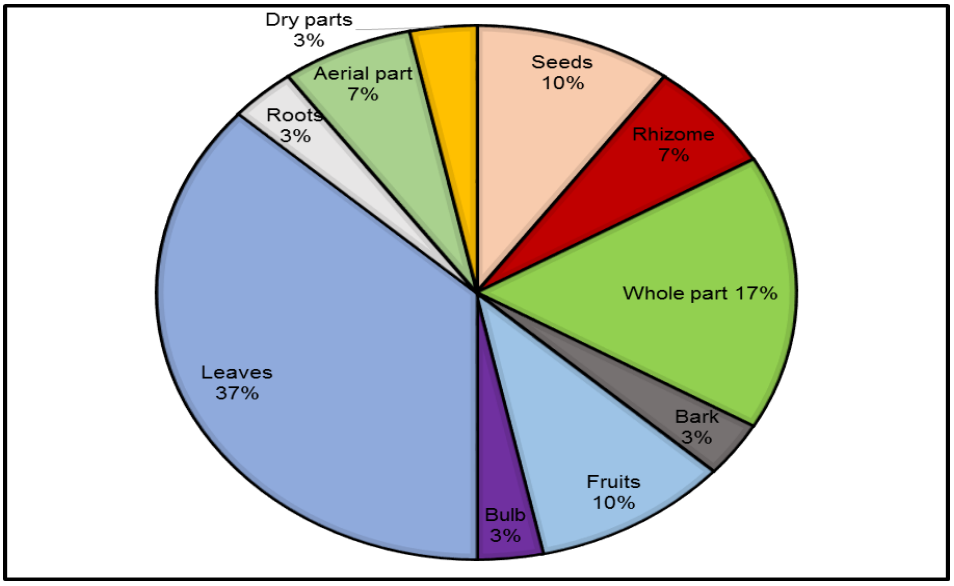

Figure No. 3
Parts of the plants used to treat cough
(WP: whole plant; AP: aerial parts)

In additionally, there are various factor affecting the efficacy of herbal remedies, e.g. collection, drying and crushing (Telefo *et al*., 2011). Most of the recipes were for oral use and were consist of decoction 37%, extract and powder 13%, boiled, paste and direct use were 7%, and other forms were 3% (Figure No. 4). Decoction is one of the major forms of herbal preparation because of the ease to prepare it just by mixing with boiling water (Nadembega *et al*., 2011). Pakistani people mostly prefer to use decoction (Mehmood *et al*., 2011), however, most of the traditional healers used dried powered plant material as they can be mixed with honey, salts, sugar, or banana to enhance the palatability of the preparations (Islam *et al*., 2013).

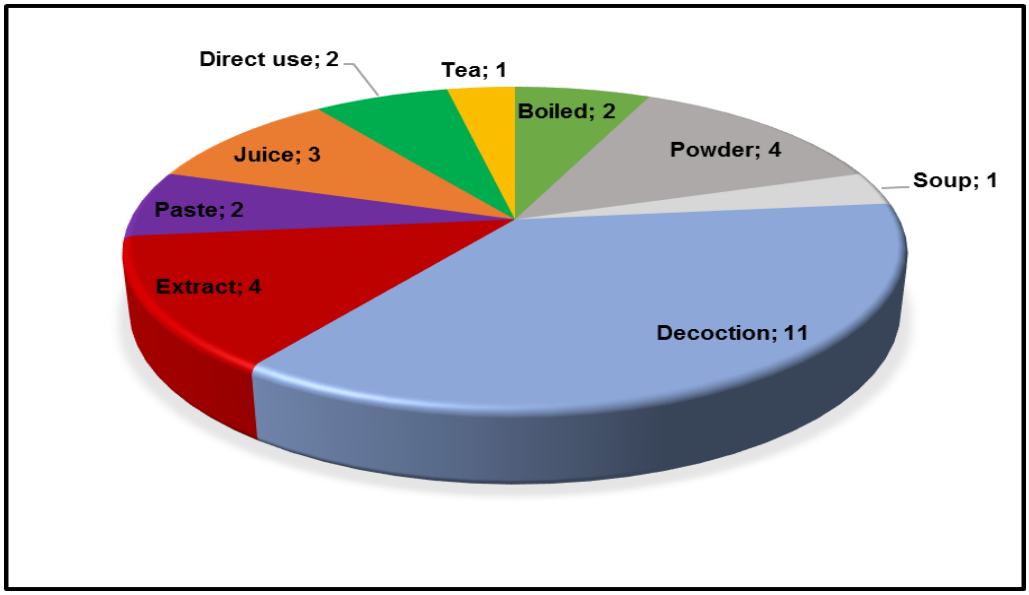

Figure No. 4
Different Dosage-forms used in the treatment of cough

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Table No. 3A
Plants collected in the study

Scientific name	Local name	Status	Growth Form	Part Used
Apiaceae				
Foeniculum vulgare Mill.	Kaga	Cultivated	Herb	Fruit
Asphodelaceae				
Aloe vera (L.) Burm.	Zoqam boty	Cultivated	Herb	Leaves
Berberidaceae				
Berberis lycium Royle.	Kwaray	Wild	Shrub	Rhizome
Celastraceae				
Maytenus royleanus (Wall. ex Lawson)	Azghakay	Wild	Shrub	Roots
Amaranthaceae				
Chenopodium ambrosioides L.	Skha botay	Wild	Shrub	W.P
Equisetaceae				
Equisetum arvensis L.	Bandaky	Wild	Herb	W.P
Fabaceae				
Glycyrrhiza glabra L.	Khog largy	Wild	Shrub	W.P
Phaseolus vulgaris L.	Lobia	Cultivated	Herb	Seed
Lamiaceae				
Mentha X piperita L.	Pudina	Cultivated	Herb	W.P
Ajuga bracteosa Wall.ex Benth.	Gotee	Wild	Herb	W.P
Origanum vulgare L.	Shomaky	Wild	Herb	A.P
Liliaceae				
Allium sativum L.	Ugha	Cultivated	Herb	Bulb
Lythraceae				
Punica granatum L.	Anar	Wild	Tree	Fruit, bark
Mimosaceae				
Acacia modesta Wall.	Palosa	Wild	Tree	Leaves
Acacia nilotica L.	Kikar	Wild	Tree	Leaves
Moraceae				
Morus alba L.	Spen toot	Wild	Tree	Fruit
Morus nigra L.	Toor toot	Wild	Tree	Fruit
Myrtaceae				
Psidium guajava L.	Amrood	Cultivated	Tree	Leaves
Eucalyptus camaldulensis Dehnh.	Lachi	Wild	Tree	Leaves
Oleaceae				
Olea ferruginea Royle	Khona	Wild	Tree	Leaves
Papaveraceae				
Papaver somniferum L.	Opium	Cultivated	Herb	Dry parts
Piperaceae				
Piper nigrum L.	Toor mirch	Cultivated	Herb	Seed
Ranunculaceae				
Nigella sativa L.	Kalwanji	Cultivated	Herb	Seed
Rosaceae				

Prunus persica L.	Shaltalo	Wild	Tree	Leaves
Scrophulariaceae				
Verbascum thapsus L.	Khardagh	Khardagh	Herb	Leaves
Solanaceae				
Solanum nigrum L.	Kachmacho	Wild	Herb	Leaves
Hyoscyamus nigra L.	Dewanabang	Wild	Herb	Leaves
Violaceae				
Viola canescens Wall. Ex	Benafsha	Wild	Herb	A.P
Zingiberaceae				
Zingiber officinale Roscoe	Adrak	Cultivated	Herb	Rhizome
Zygophyllaceae				
Tribulus terrestris L.	Markundai	Wild	Herb	Leaves

***In above table WP, whole plant; A.P, aerial parts;**

Table No. 3B
Plants collected in the study

Scientific name	Local name	Preparation form	Duration of therapy	Toxicity	UV	FC	RFC
Apiaceae							
Foeniculum vulgare Mill.	Kaga	Powder	5D	None	0.62	80	0.76
Asphodelaceae							
Aloe vera (L.) Burm.	Zoqam boty	Paste	1-2W	HrG	0.2	15	0.14
Berberidaceae							
Berberis lycium Royle.	Kwaray	Powder	2-3W	Weakness	0.48	82	0.78
Celastraceae							
Maytenus royleanus (Wall. ex Lawson)	Azghakay	Decoction	1W	None	0.53	75	0.71
Amaranthaceae							
Chenopodium ambrosioides L.	Skha botay	Soup	3D	Convulsions	0.23	17	0.16
Equisetaceae							
Equisetum arvensis L.	Bandaky	Juice	1W	None	0.13	15	0.14
Fabaceae							
Glycyrrhiza glabra L.	Khog largy	Decoction	1W	None	0.63	80	0.76
Phaseolus vulgaris L.	Lobia	Boiled	1W	None	0.66	75	0.71
Lamiaceae							
Mentha X piperita L.	Pudina	Decoction	6-8D	None	0.6	82	0.78
Ajuga bracteosa Wall.ex Benth.	Gotee	Decoction	4D	Weakness 0.62		80	0.76
Origanum vulgare L.	Shomaky	Extract	2-5D	None	0.1	10	0.09
Liliaceae							
Allium sativum L.	Ugha	Extract	2D	None	0.23	21	0.2
Lythraceae							
Punica granatum L.	Anar	Powder	2-3D	None	0.84	83	0.79
Mimosaceae							
Acacia modesta Wall.	Palosa	Decoction	3D	None	0.3	50	0.47
Acacia nilotica L.	Kikar	Decoction	2-4D	None	0.33	60	0.57

Moraceae							
Morus alba L.	Spen toot	Direct use	4D	None	0.16	12	0.11
Morus nigra L.	Toor toot	Direct use	4D	None	0.2	15	0.14
Myrtaceae							
Psidium guajava L.	Amrood	Boiled	2D	None	0.3	65	0.61
Eucalyptus camaldulensis Dehnh.	Lachi	Decoction	2D	None	0.16	12	0.11
Oleaceae							
Olea ferruginea Royle	Khona	Extract	3D	Weakness 0.84		95	0.9
Papaveraceae							
Papaver somniferum L.	Opium	Decoction	3D	RD	0.81	98	0.93
Piperaceae							
Piper nigrum L.	Toor mirch	Powder	1W	None	0.81	86	0.81
Ranunculaceae							
Nigella sativa L.	Kalwanji	Decoction	1W	None	0.4	15	0.14
Rosaceae							
Prunus persica L.	Shaltalo	Paste	1W	None	0.2	5	0.04
Scrophulariaceae							
Verbascum thapsus L.	Khardagh	Decoction	3D	None	0.13	0.13	0.14
Solanaceae							
Solanum nigrum L.	Kachmacho	Tea	1W	None	0.33	15	0.14
Hyoscyamus nigra L.	Dewanabang	Extract	3D	None	0.2	15	0.14
Violaceae							
Viola canescens Wall. Ex	Benafsha	Juice	4-6D	None	0.48	62	0.59
Zingiberaceae							
Zingiber officinale Roscoe	Adrak	Decoction	1W	None	0.61	81	0.77
Zygophyllaceae							
Tribulus terrestris L.	Markundai	Juice	1W	None	0.39	51	0.48

***In above table D, day; W, week; HrG, Hyperglycemia; RD, Respiratory depression; UV, use value; FC, frequency of citation; RFC, Relative frequency citation**

Cough is a global issue so various traditional remedies have been reported by different communities. Some of the plants like *Eucalyptus* and *A. nilotica, P. somniferum,* and *V. thapsus* have also been reported in other studies for the treatment of cough (Barkatullah & Hussain, 2009). Similarly, various authors have carried out the ethnobotanical studies in different areas and they reported some species of plants for treating cough such as *Chenopodium ambrosioides* and *Solanum nigrum* in Chakwal area (Qureshi *et al*., 2009). Our recent study corroborated the reported cough suppressive effect of *Z. officinale* (Akwaji *et al*., 2017; Jan *et al*., 2018), *P. guajava, Mentha species* (Vitalini *et al*., 2013) *A. nilotica, A. modesta* (Khan *et al*., 2018) *P. granatum* (Hamayun *et al*., 2003), *F. vulgare* (Abouri *et al*., 2012), *M. nigra* and *P. somniferum* (Bibi *et al*., 2014).

Use values (UV) and relative frequency of citation (RFC)

UV, FC and RFC are quantitative techniques used to assess the usage and relative importance of the plant species (Phillips *et al*., 1994). This information helps in conservation and resources development (Phillips, 1996). Among the 30 species the use value (UV) of *P. granatum* and *O. ferruginea* is higher (0.84). *P. somniferum* has highest FC value (98) while *V. thapsus* has the lowest FC (0.13). The RFC value of *P. somniferum* is highest (0.93) among other species (Figure No. 3). The higher RFC shows the importance of the *P. somniferum* in local Piran community in the treatment of cough.

Table No. 4
List of Animal Products used for the treatment of Cough

Scientific or English name	Local name	Form	Preparation	Duration
Fishes	Tarka	Tarka	Roasted	Once
Chicken	Yakhni	Soap	Shorwa	Twice
Bos Taurus	Shorwa	Yakhni	Yakhni	Once-twice
Meat	Kabab	Tarka	Qema	Once
Whey	Shomlay	Shomlu karhi	Karhi	Once-twice
Hen eggs	Shorwa (Yakhni)	Soap	Boil eggs with black pepper	Once-twice
Honey	Gabin (Shahd)	Direct use of honey	Direct use	Thrice
Salt (NaCl)	Malga	direct	As solid	Eat little when coughing

Adverse effects of the recipes used

During the interviews, it was also a focus to identify possible side effect of the medicinal plants used in treating cough. Among the studied species, *Olea ferruginea, B. lycium* and *A. bracteosa* cause weakness when use for longer duration. *C. ambrosioides* also cause weakness if take in large doses. The weakness producing effect may be due to the glucose lowering effect of the plant (Song *et al*., 2011). Understanding the safe use of herbal drugs needs diligent attention. This is especially evident after the mistaken use of the *Aristolochia* species by a slimming clinic in Belgium resulting in more than 100 cases of the renal failure (Teng *et al*., 2006).

Conclusion and future recommendation

The recent study was conducted for the first time in Piran community (Malakand) about the use of traditional recipes to treat cough. The current documentation will not only preserve significant traditional knowledge to treat cough but will also provide a firm base for future studies. The use of plants by the inhabitants in the management of cough is supported by literature. Apart from in depth investigations of other species *P. granatum* and *O. ferruginea* based standardized formulation may be developed in the management of cough. In the study region, it is evident that the residents depend on medicinal plants to manage health problems. The significant biodiversity preservation is therefore essential. Probable solutions may be the maintenance of biodiversity and ethnomedicinal vegetation of the study zone with the collaboration of government, non-government associations, and resident community. Future studies and community awareness programs must be carried out/initiated to secure harmless and safe use of medicinal plants or traditional recipes.

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