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MEDICINAL USES OF ROSACEAE FAMILY PLANTS IN INDIGENOUS PRACTICES OF MASTUNG, PAKISTAN: POTENTIAL LEADS FOR PHARMACOLOGICAL AND PHYTOCHEMICAL RESEARCH

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Abstract
Medicinal plants have served as the foundation of traditional healthcare for centuries and still have significant health values for different disease. In the present study, the traditional medicinal applications of Rosaceae species among residents of Mastung District, Balochistan, Pakistan, have been documented and evaluated. Ethnomedicinal data were obtained using pre-tested, unstructured, structured together with semi-structured interviews with the indigenous people of various age groups, which include traditional herbal practitioners (pansars). 200 informants were recruited for the survey, comprising 58 males, 37 females and 5 pansar informants. The collected data was quantitatively analysed using ethnobotanical measures including Use Value (UV), Use Report (UR), Frequency Citation (FC), Relative Frequency Citation (RFC) and Informant Consensus Factor (ICF). In the present investigation, 68 medicinal species of 22 Rosaceae genera were recorded during the investigation. The main life form identified throughout the study region was shrubs. Medical plant taxa that proved to be most commonly reported were Pyrus malus, Prunus persica, Prunus amygdalus, Rosa indica, Cydonia oblonga, Potentilla multifida, Agrimonia eupatoria, Malus pumila and Fragaria vesca. Uses of fruits, leaves and flowers for herbal treatments against different health conditions were among the most widely utilized plant organs. The maximum Informant Consensus Factor (ICF = 0.77) was observed for respiratory ailments, while the lowest value was for disorders of eyes and vision (ICF = 0.22). Pyrus malus had the highest Frequency Citation (FC = 13), Use Report (UR = 9) and Relative Frequency Citation (RFC = 0.06) values, and Potentilla multifida had the highest Use Value (UV = 1.82). The predominant mode of preparation of the remedies remained decoction (52%). The findings revealed the ethnomedicinal values that have been retained among the local communities, and they emphasized the significance of conserving these medicinal plant resources for future pharmaceutical studies and development of drugs from natural products.

Keywords: Balochistan, Rosaceae, Medicinal Plants, Mastung.

INTRODUCTION

Ethnobotany refers to the study of various communities and the utilization of plants by them and the conservation of the knowledge related to their use. The plant has been utilized by the people since ancient times as a cure for infection. The global community from different cultures regularly uses different methods to find the cure (Khalil et al., 2014). The disease that create conventional pharmaceuticals and therapeutic practices (Chinese Greek, Greco-Islamic, Ayurvedic). They received their therapeutic plant information from the elderly members of their community as transmission of information is age-to-age (Rastogi and Dhawan, 1982).

There is a substantial value in the family Rosaceae, with an array of differentiated species. It involves a lot of economically valuable product which provides healthy and medicinal benefits to the human being. As of late, whole genome reordering of noteworthy harvest plants was released. Genomics knowledge is the interpretation of plant physiology and the developmental process.

The Rosaceae family ranks among the world's most diversified and economically significant botanical families, with almost 100 genera and approximately 3,000 species spread throughout the world. Many fruiting trees, ornamental plants, shrubs, herbs and nut-bearing plants are found here, which are utilized for food, medicine and commercial purposes. The edible parts are apples, pears, peach, plum, strawberry, almond, raspberry and cherry. Many species of the Rosaceae family exhibit nutritional as well as bioactive compounds with antioxidant and therapeutic properties. The plant family has been reported to have pharmacological potential with phytochemicals like ellagic acid present in strawberries and raspberries have been shown to suppress the proliferation of malignant cells and to promote apoptosis in cancer cells.

Medicinal plants are traditionally harvested and traded extensively throughout regional herbal markets of Balochistan. Useful plant resources harvested by local communities and sold to herbal traders and used to prepare traditional medicines. Though important in health care and of economic value, the scientific documentation and correct use of these plants are still not adequate. The province's floral diversity is high which helps the long-term conservation of many therapeutically important plant resources having significant therapeutic potential.

The occurrence of medicinal plant species was found to be concentrated within the certain areas of Balochistan as observed in previous studies. The International Trade Center identified a number of medicinal herbs such as basil, bay, dill, marjoram, mint, oregano, parsley, sage, savory, tarragon and thyme as commercially important as well as widely traded herbs. Due to their economic and medicinal importance, the Balochistan Agricultural Research and Development Centre (BARDC), Quetta, has started surveys to appraise the cultivation potential of medicinal and aromatic plants in Balochistan province (Ahmad et al., 2008). District Mastung, a subdivision of Kalat District in the northwest of Balochistan is well known as an ethnobotanical rich district. The district is a significant site for ethnobotanical documentation and research due to its indigenous communities' rich ethnobotanical knowledge regarding medicinal plant utilization.

MATERIALS AND METHODS

3.1 Geography of Study Area Mastung District

District Mastung lies situated in the north-western region within Balochistan, Pakistan and lies adjacent to the Quetta Valley. The name "Mastung" originates is derived from a pair of local terms: "Mas", which means "high mountain," and "Tung", which means "opening" / "passage". The administrative region became an independent administration in 1991. It is geographically positioned at the geographical coordinates located at 29°48′ North latitude with 66°50′ East longitude, above mean sea level at about 5583 ft.

From administrative point of view Mastung is divided into three Tehsils: Mastung, Dasht and Kardigap, each of which is divided into 12 Union Councils. The district is bounded by Quetta in the north, Kalat in the south, Chaghi in the west, Bolan in the north east and the land of Khartoum in the east (Anon, 1997).

Figure 1: District Mastung and neighbourhood.

The district is characterized by essentially cold dry climatic conditions. Moreover, summers are mostly hot and dry while winter months are harsh, and snow is common during December to February. Much of the annual rainfall falls in the months of January, February and March and this influences the seasonal vegetation of the area.

Mastung is situated close to Hazarganji National Park, about 20km from Quetta. It is one of the important protected areas in Balochistan with its ecological significance and abundant biodiversity.

Population of Mastung is culturally and linguistically diverse. The local communities speak mainly Brahvi and Persian. Moreover, Urdu, Dehwari, Balochi, Sindhi, and Hindko are also used in interethnic communication. The majority of the residents speak their native languages and Urdu is used as a medium of communication between different communities.

The district is known for its seasonal migration because of its severe winter condition. In cold seasons, many families move from their villages to other areas like Kacchi (Bolan District), Larkana and Jacobabad for a short period of time because of the extreme cold weather. But migration to other countries is relatively small, at 17.7% of the total migrant population. This seasonal movement generally starts from October and most families come back to Mastung with the onset of spring, normally around the month of March (Anon, 1997).

3.2 District Mastung and its Socio- Economic Conditions

The Mastung district has a diverse population of medicinal plant taxa which are extensively employed by locals for the management of various health disorders. Due to the limited poor availability of modern medical facilities, many people still utilize these plant resources in their medical care and they are also a major part of primary health care. Agriculture is the main livelihood in this district, and more than 47% of the district's population makes their living from it. Barley, wheat, fodder crops, cumin, potatoes, melons, and a variety of vegetables are the major agricultural products. Besides agriculture, there are a number of local people who pick herbs in forest, mountain, plain and desert region and sell to other local herbal markets and traditional herbal practitioners (Pansars) at reasonable rates. Later on these medicinal plants are supplied to the pharmaceutical companies in fresh or dried form at higher market values by pansars. Hence, sustainable utilisation, conservation and cultivation of these plant resources is crucial for ensuring the socio-economic development of the local communities and they will be available for future generations (Anon, 1997).

3.3 Interviews on Site

Ethnobotanical information data were gathered through randomly selected free-listing questionnaire-based interviews, according to the methodology described by (Ghorbani et al., 2011). The traditional knowledge, therapeutic uses and indigenous perceptions regarding the recorded plant species among local inhabitants of District Mastung were documented using structured questionnaires. To facilitate communication, interviews were performed in the native languages: Brahvi, Dehwari and Urdu. The survey was conducted with 200 informants, including 58% male, 37% female and 5% local pansars (traditional herbal practitioners). The respondents were classified into five distinct categories: 20–29, 30–39, 40–49, 50–59, and 60 years and above. To obtain comprehensive ethnomedicinal information from different communities of the study region, information were obtained from 12 villages of the investigation area viz. Khad Koocha, Killi Kandawa, Killi Terri, Dasht, Sungur, Kamak, Daringarh, Panjpai, Killi Khazai, Spezand, Kanak, and Pringabad.

3.4 Collection and identification of plants

Ethnomedicinal information and the plant materials were gathered from various places of District Mastung during the study period in all four seasons from 2017 to 2018. Field surveys were done in the selected villages of District Mastung, including Khad Koocha, Killi Kandawa, Killi Terri, Dasht, Kamak, Daringarh, Panjpai, Killi Khazai, Spezand, Kanak, and Pringabad. All the collected specimens were properly dried and preserved in the standard herbarium practice techniques outlined by Jain and Rao (1977) for further identification and documentation. The plant species reconfirmed from the flora of Pakistan (Nasir and Ali, 1970–1979; Nasir and Ali, 1980–1989; Ali and Nasir, 1989–1991; Ali and Qaiser, 1993–2007) also counseled. All the voucher found plants were deposited in the herbarium of the Botany Department of Sardar Bahadur Khan Women University, Quetta.

3.5 Collection of Data

The ethnomedicines information has been gathered from randomly selected locations in the District Mastung where there was also rich flora during the field survey, from July 2018 to April 2019. The study was based upon documenting indigenous knowledge regarding medicinal flora among the local people together with indigenous herbal practitioners (pansars), who are well known for their knowledge of medicinal plant resources and their traditional applications. The methodology of Cavestro (2003) was used for Participatory Rural Appraisal (PRA) in conducting field surveys, data recording and photographic documentation. Prior to conducting the face-to-face interviews, written voluntary informed consent was secured from every participant. Data obtained from the survey comprised member number of the household, household ownership, household members, occupation of the informant, sources of income, medicinal plants used, aim of use, amount of plant material used, preparation and administration methods, plant collection sources and abundance of medicinal plant resources. Study participants were categorized under five age groups: 20–29, 30–39, 40–49, 50–59, and 60 years and older. Moreover, data on ethnic population of District Mastung was also collected due to the ethnic diversity in the area.

3.6 Collection and identification of plants

A collection of 180 plant samples was obtained from various study sites in District Mastung for medicinal uses of local communities and herbal practitioners for various diseases. All obtained specimens were processed followed by preservation at the Herbarium, Department of Botany, Sardar Bahadur Khan Women University, Quetta, Pakistan. Each specimen was carefully dried, preserved in a 1% solution of mercuric chloride to prevent deterioration and fixed onto herbarium sheets for good long-term storage and further examination. The mounted specimens were taxonomically identified by experts of the Department of Botany, Sardar Bahadur Khan Women University, Quetta, Pakistan. Once identified, all voucher specimens underwent verification through comparing with the Flora of Pakistan and kept in the same herbarium for permanent record (Ali and Nasir 1989–1991; Ali and Qaiser 1993–2011).

3.7 Data analysis

Different micro-statistical tools such as frequency of citation (FC), use value (UV), Use Report (UR), Relative Frequency Citation (RFC) and Information Consensus Factor (ICF) (Phillips and Gentry, 1993) were used to check and support the reliability and validity of ethnomedicinal information.

3.7.1 Frequency of citation (FC)

For each plant species given by informants with indigenous medicinal use, the information was defined as the frequency of citation (Phillips and Gentry, 1993).

3.7.2 Use value (UV)

Reported plants were given a relative importance using the formula adopted by Phillips and Gentry, (1993):
$UVi=\Sigma Ui/Ni$
Here, Ui=number of use reports by each informer for specific plant species i.
Ni=the total number of informer interviewed for specific plant species i.

3.7.3 Use Report (UR)

The Use Report (UR) was derived from the aggregate count of documented plant taxa cited reported by all survey respondents in the ethnobotanical survey in this study.

3.7.4 Relative Frequency Citation (RFC)

The Relative Frequency Citation (RFC) index was calculated as follows:
$RFC=FC/N$
RFC is obtained by dividing the number of informants who mentioned the use of a useful species FC or Frequency of Citation by the total number of informants (Tardio and Santayana, 2008).

3.7.5 Informant consensus factor (ICF)

The informant consensus factor (ICF) was calculated for aliments to determine the consensus among the informants regarding the reported remedies (Phillips and Gentry, 1993). ICF was calculated as follows:
ICF=nur-nt/nur-1

nur stands for number of used citations in each category and nt is the number of species used for a specific disease.

RESULTS AND DISCUSSION

4.1 Demographic Uses of Plants

As part of the ethnobotanical survey, 200 residents of District Mastung participated in the study. The respondents were 58% male, 37% female and were divided into five age groups for demographic analysis. Table 1 shows that the largest percentage of informants was the 60 years and over age group. Sixty-eight medicinal plant species were recorded and are shown in Table 2, including their scientific names, vernacular names, ethnomedicinal uses, plant organs utilized, methods employed for utilization, Frequency Citation (FC) and Relative Frequency Citation (RFC). Twenty-two genera belonging to the Rosaceae family are represented in the recorded species (Table 2).

The 22 genera of the Rosaceae family recorded as medicinal plants were Pyrus, Prunus, Fragaria, Eriobotrya, Rosa, Potentilla, Crataegus, Rubus, Spiraea, Prinsepia, Cotoneaster, Amygdalus, Cydonia, Sorbaria, Geum, Agrimonia, Duchesnea, Comarum, Poterium, Cerasus, Malus, and Padus. The fruits (42%) were identified as the predominant widely used plant component, with leaves (24%) (Fig. 3). The tradition among the herbals was decoction as the predominant preparation technique, (52%), with infusion ranking second (17%). Sixty-eight species were recorded, of which 28 were traditionally used to treat gastrointestinal disorders. Moreover, plant species were given for treatment of certain diseases. For example, Pyrus malus was applied for gastric ailment, fever and diarrhoea, Pyrus communis for stomach pain, diarrhoea, constipation and nausea, whereas Prunus

amygdalus was widely used for bronchial diseases, diabetes, kidney diseases and hoarseness. Respiratory diseases exhibited the greatest Informant Consensus Factor (ICF) of (0.77) among all disease categories. Similarly, Potentilla multifida was the most useful plant in terms of Use Value (UV) (1.82). Pyrus malus recorded the maximum Relative Frequency Citation (RFC: 0.06) along with the highest Use Report (UR: 9) values (Table 2).

The results of the present ethnomedicinal study have shown a similar trend with the results obtained from Batan Island, Philippines by the study done by Abe and Ohtani (2013). Their study revealed that women has more knowledge about traditional use of medicinal plant products for making herbal medicines than men (Ahmad et al., 2014; Jamila and Mostafa, 2014). The present survey also revealed that the awareness about medicinal plants among the rural people was more than that of the people of Mastung City. The wide application of ethnomedicinal plant species in the study area seems to be affected by different factors including the frequency of plant use, ethnomedicinal traditions, availability of medicinal plant resources and household environment, which is in agreement with the observations made by Ziyyat (1997).

4.2 Use reports and use categories of the area

There are various medicinally important plant species which are utilized for the management of various diseases by indigenous local communities. Ailments reported were categorized in 13 main categories of disease. This classification had been done by medicinal experts based on ethnomedicinal data collected during the survey and related diseases were classified in related categories. These categories were gastrointestinal, respiratory, dermatological, musculoskeletal, gynecological, circulatory, eye, glandular, urogenital disorders and skin tonics. Those health conditions that could not be categorized in the major divisions were listed separately including loss of appetite among young children, burning of the hands and feet, sweating, overweight, and body edema. Gastrointestinal disorders represented the disease category containing the largest number of medicinal plant species in District Mastung with 28 medicinal plant species reported, followed by respiratory disorders with 13 species. Different subcategories of native herbs used in the world have varied gastrointestinal diseases as the primary diseases. The herbal plants were used by many ethnic groups for its healing properties of the ailments by the treatment of the ailment (Ankli et al., 1999; Bennett and Prance, 2000). Ethnopharmaceutical studies from all over the world showed that the gastrointestinal disorder is assigned to number one category (Heinrich et al., 1998; Miraldi et al., 2001; Ghorbani, 2005; Ghorbani et al., 2011; Mosaddegh et al., 2012). Due to poor nutritional, sanitation and contaminated water resources of rural area was one of the major cause of the spread of this disease. Nasab and Khosravi (2014) conducted a similar research on ethnobotanical species and their uses against the cure of high prevalence gastrointestinal disorders in the district of Wana in Pakistan. The research findings confirmed the result of the work done by Ullah et al., (2013) and Nasab and Khosravi (2014), but on the other hand, these findings were also confirmed by Sadeghi et al., (2014) who stated that digestive and respiratory problems are the dominant ones. The researcher compared the above-mentioned documents with the diseases that are prevalent in Balochistan (Pakistan) and in Iran and found similar diseases and noticed that the individuals of in cooperation nation state gave the same resident tag to the same plant.

4.3 Various Plants of Rosaceae having one Local Name

Plants were identified by certain external features by the residents of District Mastung. For example, despite the variation in the plant parts that produce fruit, they use the same name for the genus Prunus, such as Prunus amygdalus, Prunus dulcis, Prunus procera etc. are all similar plants locally that are given the same name Badam. All the diseases are used locally on the same species of Rosa, and there is no mention of any particular species, such as Rosa indica, Rosa atlantica, Rosa persica and Rosa moschata.

4.4 Methods of Herbal Drugs

Within the District of Mastung, the principal mode for the preparation of herbal remedies was decoction and infusion. The findings indicate that the largest proportion (52%) corresponded to 36 documented plant species, classified under the decoction category, whereas 17% represented 12 species prepared as infusion (Fig. 4). These findings were similar to those reported by Gurdal and Kultur (2013), who found that decoction and infusion were the two most common methods of herbal preparation; and Ahmad (2014) who reported that decoction and infusion were the two most common methods of herbal preparation. Juice, tea, soup, cooked, raw, paste, gum, oil, milk and powder. As follows is the most commonly used of these ten methods of internal use. A powdered gum was often used and mainly external medicinal preparations of herbal plant juice, latex and secretions were reported.

4.5 Parts of plants as medicinal remedies

Among the recorded Rosaceae species, fruits represented the most frequently utilized plant part (42%). The leaves (24%), flowers (17%) and roots (17%) are used, but other parts are also beneficial for medicinal uses (Fig. 3). It has also been noted from research documents, papers of Bonet et al. (1999) and Neves et al. (2009) the most accessible part of the plants are leaves which are used for various treatments than any other parts of the plant, for the explanation why the availability of leaves rather than other part is more useful, most of the area is mountainous

and receive very little rainfall. For this reason, the majority of the plants are herb and wild shrubs. As a result of which villagers pluck leaves, fruits, flowers or even collect whole herbaceous plants for making their medicinal remedies. Herbal plants are ecologically common, frequent and dominant throughout the world (Ibrar et al., 2007; Jan et al., 2011) not only in our research. In the study conducted by Ahmad et al. (2014), within Chail Valley, Pakistan, herbaceous taxa were recognized as the prevailing life-form category. Similar results were reported by Qureshi (2012) in Hingol National Park in Balochistan which are used very frequently to prepare remedies from the whole plant (27.13 percent) followed by leaves (21.28 percent). Collection of leaves, flowers or fruits of the whole plant due to local requirement (as it is essential by the resident people) poses a substantial threat to naturally occurring populations of wild medicinal plant species. Fruits (42%), leaves (24%), flowers (17%) and seeds (15%) were also other amounts of the crop used by the locals (Fig. 3). Many seeds and whole crop is being used which contribute to the endangered persistence conditions of many wild kinds. The least used pieces are gums and shoots.

4.6 Quantitative Analysis

4.6.1 Informant's consensus factor (ICF)

Informant Consensus Factor (ICF) indices derived for the documented medicinal plant taxa were quantitatively evaluated over a range of 0.0–1.0 (Table 3). The greatest ICF estimate was recorded for respiratory diseases (0.77). The next highest ICF value corresponded to hepatitis (0.75). Rubus sanctus was traditionally employed for the management of snakebite and scorpion envenomation. The lowest degree of concordance among respondents was observed in the therapeutic utilization of medicinal plants for the clinical management of glandular ailments as well as antidotes, and both categories demonstrated a null ICF. Jamila and Mostafa (2014) found that the ICF value for respiratory disorders is the second highest (0.83), whereas the eye and vision disorder category exhibited the lowest value (0.22). Although rural communities have improved access to public healthcare services, the practice of indigenous therapeutic traditions continues to remain prevalent.

4.6.2 Relative Frequency Citation (RFC), Frequency Citation (FC), Use Report (UR) and Use Value (UV)

The maximum Use Value (UV) indices were documented for the species Potentilla multifida (1.82), Geum urbanum (1.47), Padus cornuta (1.47), Pyrus amygdalus, Rosa indica, Eriobotrya japonica, Malus pumila, Prunus avium, Prunus dulcis, Rubus hoffineisterianus, Cotoneaster nummularia, Rosa alba, Cydonia oblonga, Fragaria indica, Crataegus oxycantha, Prunus armeniaca, Prunus institia, Potentilla fulgens, Spirea chinesis, Dushcenea indica and Rosa webianna (1.46 each), whereas the minimum Use Value was observed for Rosa persica (1.33) and Pyrus communis (1.20). This represented the inaugural quantitative ethnobotanical investigation conducted within the study region, making comparisons with other areas of the province impractical. No comparable quantitative ethnobotanical studies have been reported from other regions of Pakistan. Available records for plant taxa are stated by Abbasi (2013), Ahmad (2014) and Bano (2014), and it is evident that there is a difference. For example, in the Abbasi (2013) study, the most referred to species are Ficus carica and Ficus palmata. Bano (2014) has done the study of Hippophae rhamnoides, received a very high Use Value of 1.64, with Rosa brunonii (1.47) ranking next, and Capparis spinosa. The observed variations could be attributed to geographical differences in vegetation patterns and environmental conditions. The numbers for the species are stated by Abbasi (2013), Ahmad (2014) and Bano (2014), and it is evident that there is a difference. For example, in the Abbasi (2013) study, the most referred to species are Ficus carica and Ficus palmata. Bano (2014) has conducted the study of Hippophae rhamnoides and has recorded a considerably higher use-value (1.64), followed by Rosa brunonii (1.47) and Capparis spinosa. Such differences occur among life forms and environmental conditions due to the dissimilarities of an area. The highest RFC was of Pyrus malus (0.06), followed by Prunus persica (0.05), Prunus amygdalus (0.05), and Rosa indica (0.05); while, the lowest RFC was obtained in the case of Crataegus songarica, Rosa alba, Rosa webbiana, Malus brocatta, and Rubus pendunculosus with the value of 0.007 (Table 2). This finding indicates that there is high local awareness of these species and that they are among the top medicinal flora used throughout the study area. Potentilla multifida (0.03): This species is unique and the rural people purchase lots of herbal plants from pansars; the plant is also collected from habitat. However, Crataegus songarica (0.007) is rather localized in the area. The narrow distribution and the small population of the plant sites is the primary reason that the sites are not easily approached.

The highest RFC was recorded for Pyrus malus (0.06), followed by Prunus persica (0.05), Prunus amygdalus (0.05), and Rosa indica (0.05). In contrast, the lowest RFC value (0.007) was observed for Crataegus songarica, Rosa alba, Rosa webbiana, Malus brocatta, and Rubus pendunculosus (Table 2). These findings suggest that these species are well recognized by the local population and rank among the most commonly utilized medicinal plants across the study area. Potentilla multifida (0.03) is a distinctive species, and rural communities obtain large quantities of herbal plants from local pansars; it is also collected directly from its natural habitat. However, Crataegus songarica (0.007) is relatively restricted in its distribution within the area. Its limited geographic range and small population size are the main reasons why its habitats are not easily accessible.

The species with the highest Use Report (UR) values were Pyrus malus, Prunus amygdalus, Rosa indica, and Prunus persica, whereas 13 species each recorded the lowest UR value of one (Table 2). Among these, Malus baccata, Rosa webbiana, and Padus cornuta exhibited the minimum UR values. The results obtained in the present investigation differed from those reported by Nasab and Khosravi (2014), who documented that Malva sylvestris accounted for the highest number of use reports (41).

The species with the highest FC values were most common, such as Pyrus malus (13), Prunus amygdalus (11.7), Rosa indica (11.7) and Prunus persica (10). For 14 species 1.4 species reported least value, including Rubus hoffineisterianus, Rosa alba, and Rosa webianna, and the rest.

4.7 Threatened ethnomedicinal wild species of Mastung

Literacy rate in the study region is also low and among the villagers of Mastung who are involved in animal husbandry and agriculture, the rate is even lower. Various native species are harvested by the tribes and sold at lower prices to the herb dealers, while other plant materials are sold at higher price to the pharmaceutical companies. This practice can lead to reduction and may even cause extinction of some medicinal plant species, hence, appropriate conservation measures should be undertaken by authorities concerned to protect them. If they destroy the wild plants of the sites, it will improve the socioeconomic well-being of the local communities who belong within the region; if they produce the plant growth, it will be beneficial.

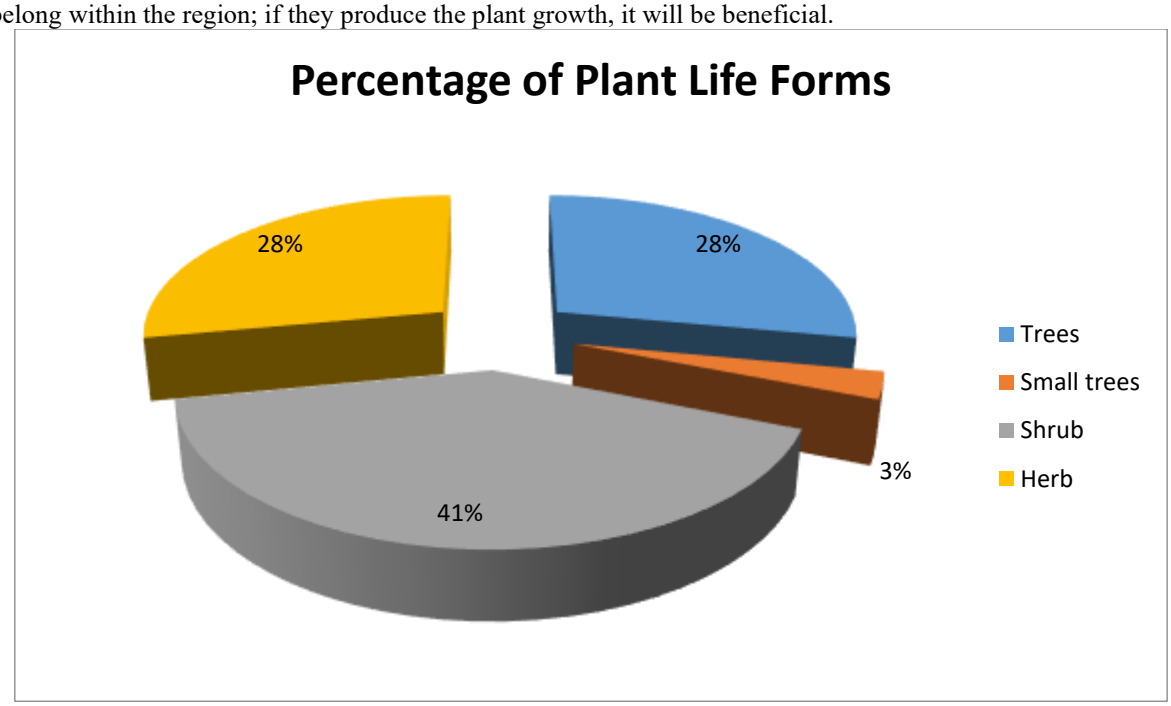

Figure 2 Percentage of Life Forms Used

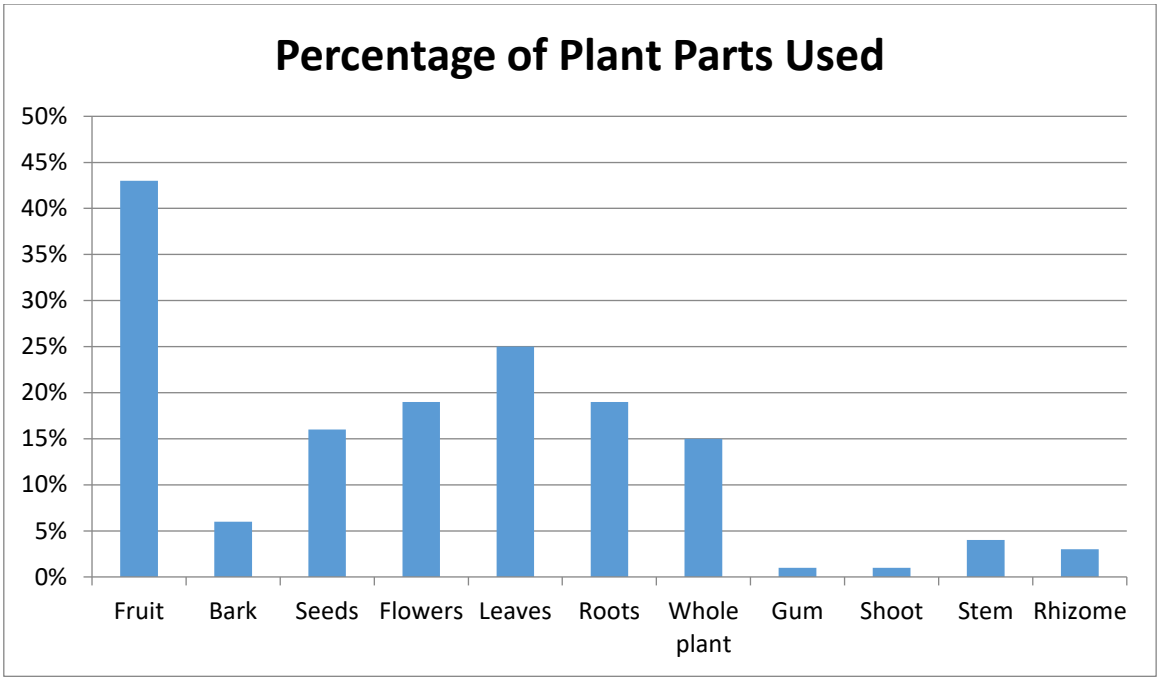

Figure 3 Percentages of Plants Parts Used

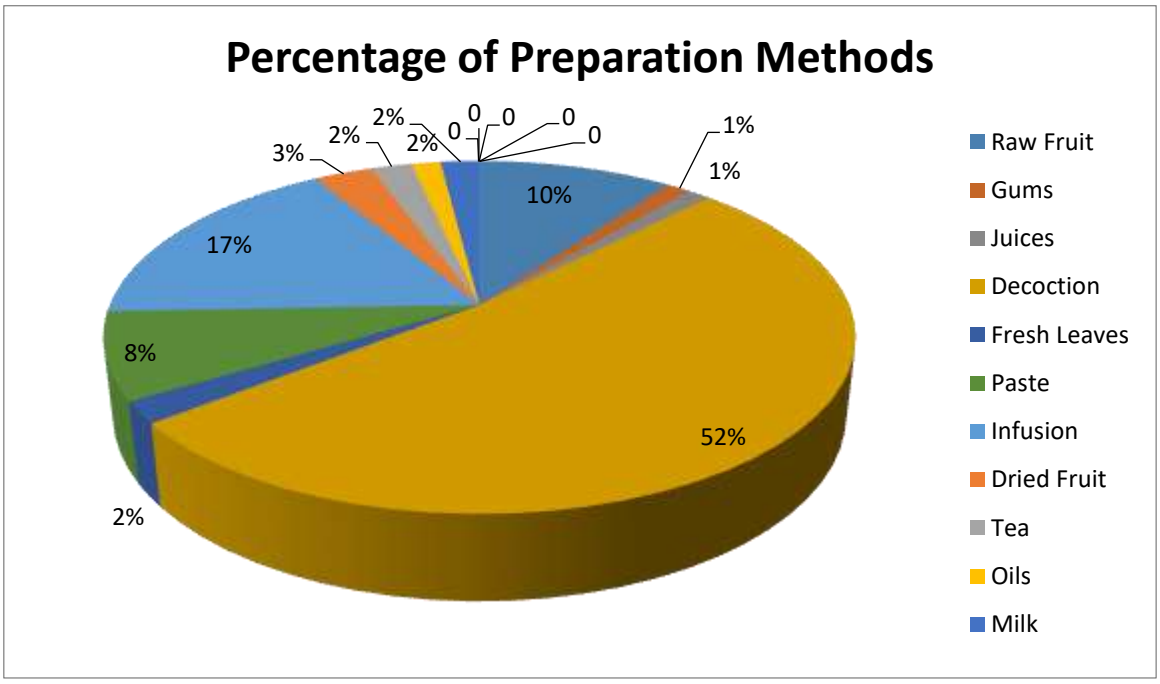

Figure 4 Percentages of Drug Preparation Methods

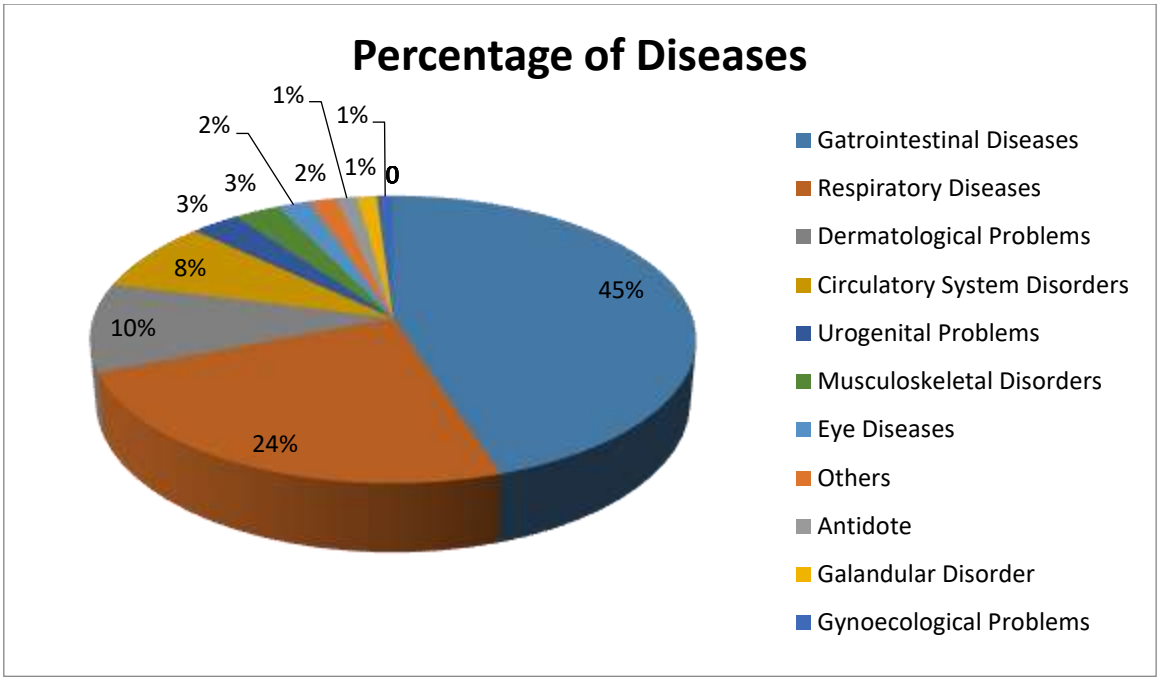

Figure 5 Percentages of Diseases

Table. 1. Demographic information of the informants in research area.

Total participants interviewed	200
Demographic status	**Percentage**
Local people	75
Migrants	25
Gender	
Male	58
Female	37
Pansars	5
Literacy	
Primary School	18
Secondary school	11
High school	12
College	08
Illiterate	51
Marital Status	
Single	15
Married	85
Age	
Between 20-29	07
Between 30-39	16
Between 40-49	20
Between 50-59	25
Above 60 years	32

Table 2. List of medicinal plants of Rosaceae family used by the local communities of district Mastung

S No	Taxonomic Name	Vernacular Name	Life Form	Part Used	Preparation Method	Disease Treatment	Distribution	FC	UR	UV	RFC
1.	Pyrus malus	Apple/ Saib	Tree	Fruit, bark and seeds.	Raw fruit, acids, juice. Bark can be used as decoction.	Digestion problems, stomach diseases, denitrification, diarrhea, fevers, eye diseases, skin inflammation, hair conditioning, purgative.	Mastung	13	9	1.4	0.06
2.	Malus baccata Borkh.	Beeha	Tree	Fruit	Juice, Raw fruit.	Anodyne to relive headaches.	Other city	1.4	1	1.4	0.007
3.	Malus pumila Mill.	Manra	Tree	Fruit	Juice, raw fruit.	Alzheimer's, diabetes, heart diseases, weight loss, cholesterol.	Mastung	7.3	5	1.46	0.03
4.	Pyrus communis	Pear/ Nashpati	Tree	Fruit.	Raw fruit, juice.	Indigestion, diarrhea, constipation, nausea and vomiting, and liver scarring (cirrhosis).	Mastung	7.3	6	1.2	0.03
5.	Pyrus pashia. Buch and Ham ex. D. Don.	Batangi	Tree	Fruit	Infusion, Paste, Decoction.	Sedative, astringent, mouth wash, pterygium, infected eyes of cattle.	Quetta	7.3	5	1.46	0.03
6.	Pyrus pyrifolia L.	Desi nakh	Tree	Fruit and leaves.	Juice, Raw fruit.	Astringent, febrifuge, antiseptic.	Mastung	4.4	3	1.46	0.02
7.	Prunus persica	Peach/ Aaroo	Tree	Fruit, Seed, bark, flowers, leaves	Raw fruit, decoction, fresh leaves, dried leaves, syrup made of flowers.	Digestion problems, stomach diseases, gastric problems, coughs, chronic bronchitis, wounds, jaundice.	Mastung	10	7	1.4	0.05

8.	Prunus domestica	Plum/ Alocha	Large shrub or small tree	Fruit, flower.	Raw fruit, dried fruit, decoction, essence.	Constipation, wounds.	Mastung	2.9	2	1.4	0.014
9.	Prunus armeniaca	Apricot/ Khobani	Small tree	Fruit and Seed	Raw fruit, dried fruit, oils, decoction.	Skin problems, digestion problems, hair treatment.	Mastung	4.4	3	1.46	0.02
10.	Prunus amygdalus	Almond/ Badam	Tree	Seed	Raw seed, Oils, milk, blanched.	Diabetes, bronchial diseases, tickling coughs, hoarseness, costiveness, nephritic pains, kidney disorders, heartburn.	Mastung	11.7	8	1.46	0.05
11.	Prunus dulcis	Bitter Almond/ Karwa Badam	Tree	Seed	Powder, Paste, Oils, Milk.	Skin cosmetics, hair and skin conditions.	Mastung	4.4	3	1.46	0.02
12.	Amygdalus brahuica subsp. Afghanica	Mazhmonk/ Mashmonk.	Tree	Gum	Gum powder	Chest infection and wounded eyes.	Mastung	2.9	2	1.45	0.01
13.	Prunus avium	Cherry	Tree	Fruit, bark of root.	Raw fruit, Decoction, infusion.	Bronchial complaints, anemia, constipation.	Ziarat	4.4	3	1.46	0.02
14.	Prunus institia L.C.K Schneid.	Alu balu	Tree	Shoot, stem and leaves.	Decoction, infusion, oil.	Laxative, digestion, osteoporosis.	Quetta	4.4	3	1.46	0.02
15.	Prunus padus Hook. F.	Barith	Tree or shrub	Fruit and leaves.	Decoction and infusion.	Anodyne, diuretic, febrifuge and sedative. For treatment of cold.	Other city.	5.88	4	1.45	0.029

16.	Prunus cerasifera Ehrh.	Alubukhara	Tree	Stem and fruit.	Decoction	Laxatives.	Quetta	1.4	1	1.46	0.02
17.	Prunus cornuta L.	Guni	Tree	Fruit	Raw fruit, paste, Decoction.	Asthma and cardiac problems, leukoderma.	Kech	4.4	3	1.46	0.02
18.	Fragaria ananassa	Strawberry	Herb	Fruit, leaves	Raw fruit, decoction.	Digestion problems, fever, diarrhea, dysentery.	Mastung	6	4	1.5	0.03
19.	Fragaria indica	Da zamakay toot	Herb	Fruit	Decoction	Laxative, abscesses, weeping eczema, ring worm, snake and insect bite.	Quetta	7.3	5	1.46	0.03
20.	Fragaria nubicola L. ex. Laticaita.	Punjakha	Herb	Root and fruit	Decoction	Stomach ulcers, outer wounds.	Mastung	4.4	3	1.46	0.22
21.	Fragaria vesca L.	Jangli meva	Herb	Whole plant.	Decoction	Digestion, backache, vomiting, astringent, urinary infections.	Mastung	7.35	5	1.46	0.03
22.	Rosa indica	Rose/ Gulab	Shrub	Flower and leaf	Raw petals, dried petals, decoction, oils.	Heart diseases, stomach diseases, liver diseases, vomiting, coughs, jaundice, infections, eye diseases.	Mastung	11.7	8	1.46	0.05
23.	Rosa persica	Wild Rose/ Jangli Gulab	Shrub	Flower and leaf	Raw petals, dried petals, seeds, rose hips.	Diarrhea, dysentery, allaying thirst, coughs, spitting of blood, colic.	Mastung	8	6	1.33	0.04
24.	Rosa alba L.	Chitta Gulab	Shrub	Whole plant.	Decoction, tonic, infusion, paste.	Diabetes.	Mastung	1.4	1	1.4	0.007

25.	Rosa webbiana Wall. Ex. Royle.	Thorny	Shrub	Fruit	Decoction	Asthma	Mastung	1.4	1	1.4	0.007
26.	Rosa brunonii Lindl.	Chahal	Shrub	Flowers	Decoction, infusion.	Constipation and abdominal pains.	Mastung	2.9	2	1.45	0.01
27.	Rosa macrophylla L.	Wan Gulab	Shrub	Root	Infusion.	Eye troubles and burns.	Mastung	2.9	2	1.45	0.01
28.	Rosa moschata L. J. Herrm.	Zangali Gulaab	Shrub	Flower	Decoction and infusion.	Stomach disorders.	Quetta	1.4	1	1.4	0.007
29.	Rosa damascene Mill.	Gulab	Shrub	Flowers	Infusion	Astringent, tonic, cephalic, cardiac, aperients.	Mastung	7.3	5	1.46	0.03
30.	Rosa canina L.	-	Shrub	Fruit	Tea, Infusion.	Kidney stone, diabetes, eye disorders.	Mastung	4.4	3	1.46	0.02
31.	Rosa sirecea Lindley.	Zangli gulab	Shrub	Flowers	Decoction	Eye diseases.	Mastung	1.4	1	1.4	0.007
32.	Potentilla eriocarpa Wall. Ex Lehm.	Malli chaw	Herb	Root	Powder	Curing toothaches.	Other city	1.6	1	1.6	0.008
33.	Potentilla multifidi L.	-	Herb	Root	Decoction, paste, infusion.	Hepatitis, enterobiasis, uterine hemorrhage, diabetes.	Mastung	7.3	4	1.82	0.03

34.	Potentilla nepalensis Hook.	Da ghar shalkhay	Herb	Root	Decoction	Blood purifier and fever.	Other city	2.9	2	1.45	0.01
35.	Potentilla raptens L.	-	Herb	Whole plant, roots.	Infusion, decoction, paste.	Astringent and anti inflammatory in uterine and intestinial infections, diarrhea, gargle, sore throat.	Mastung	5.8	4	1.45	0.02
36.	Potentilla anserine L. H.K.F.	-	Herb	Whole plant	Decoction, paste.	Sore throats, wounds, inflammations and diabetes.	Mastung	5.8	4	1.45	0.02
37.	Potentilla fulgens Wall. Ex. Hook.	-	Herb	Root, whole plant.	Decoction, paste.	Stomach disorders, toothache and diabetes.	Mastung	4.4	3	1.46	0.02
38.	Potentilla sundaica Lindle.	-	Herb	Root, stem and leaves.	Decoction, infusion.	Antidote to snake bite, itches and abscesses.	Mastung	4.4	3	1.46	0.02
39.	Potentilla fruticosa Linn.	-	Shrub	Whole plant.	Infusion, juice.	indigestion, impairment of immune systems.	Mastung	2.9	2	1.45	0.01
40.	Crataegus songarcia G. Koch.	Dakh	Shrub	Flower	Decoction	Constipation.	Mastung	1.4	1	1.4	0.007
41.	Crataegus songarica C. Koch.	Ghonii	Shrub or small tree	Whole plant.	Decoction	Reducing labor pain during childbirth, arrhythmia	Other city	1.4	2	1.4	0.007
42.	Crataegus oxycantha H.K.F.	Tampsa	Tree	Fruit and leaves.	Decoction	Asthma, heart diseases, hypertention.	Mastung	4.4	3	1.46	0.02

43.	Crataegus oxycantha Jacq.	Bansangli	Shrub	Seeds	Powder	Heart diseases, hypertrophy and tonic.	Mastung	4.4	3	1.46	0.02
44.	Rubus hoffineisterianus Kunth and Bouch.	Assaa	Shrub	Leaves	Paste	Skin diseases.	Balochistan	1.4	1	1.4	0.007
45.	Rubus fruticosus L.	Akha	Herb	Root, fruit and leaves.	Decoction, paste.	Hepatitis and diarrhea.	Quetta	2.9	2	1.45	0.01
46.	Rubus ellipticus Smith.	Goraj	Tree	Root and fruit	Decoction	Fever, gastric troubles, diarrhea, dysentery, colic, sore throat.	Quetta	8.8	6	1.46	0.04
47.	Rubus ulmifolius Schott.	Karwara	Shrub	Root, rhizome and leaves.	Decoction and Infusion.	Tonic, aphrodisiac, skin diseases.	Mastung	4.4	3	1.46	0.02
48.	Rubus micropetalus	Sohnepbah	Shrub	Fruit and bark	Decoction	Cough, mouth ulcers.	Mastung	2.9	2	1.45	0.01
49.	Rubus sanctus Schreber.	Alish	Shrub	Whole Plant	Decoction	Infected insect bites, wounds, pimples.	Mastung	4.4	3	1.46	0.02
50.	Rubus pendunculosus D. Don.	Karwarva	Shrub	Fruit	Raw Fruit.	Blood circulation.	Mastung	1.47	1	1.47	0.007
51.	Rubus moloccanmus L.	-	Shrub	Root, fruit, leaves.	Oil	Nocturnal micturition, astringent.	Other city.	4.4	3	1.46	0.02

52.	Spiraea bella Sims.	-	Shrub	Seeds	Powder or Paste	Sores and Wounds	Mastung	2.9	2	1.45	0.01
53.	Spiraea chinesis Maxim.	Krachay	Herb	Fruit and leaves	Decoction, tonic	Pregnancy, antiseptic, stomach ache.	Mastung	4.4	3	1.46	0.02
54.	Prinsepia utilis Royle.	-	Shrub	Seeds	Powder	Diarrhea and Rheumatic pains.	Mastung	2.9	2	1.45	0.01
55.	Coloneaster microphyllus Wall. Ex. Lindl.	-	Shrub	Fruit and leaves.	Decoction.	Diarrhea and wounds.	Mastung	2.9	2	1.45	0.01
56.	Coloneaster numumularia Fisch and Mey.	Mekin	Shrub	Seeds and fruit.	Powder	Blood purifier.	Quetta	1.4	1	1.4	0.007
57.	Cydonia oblonga Mill.	Bhae	Tree	Fruit	Decoction, Paste, Raw Fruit.	Cough, piles, rectal bleeding, gums bleeding, kidney disorders and abdominal pains.	Mastung	8.8	6	1.46	0.04
58.	Sorbaria tomentosa (Lindl.) Rehder.	Beree	Shrub	Flowers and Stem.	Decoction and infusion.	Antiseptic, asthma and rashes on newborn babies.	Mastung	2.9	2	1.45	0.01
59.	Geum elatum Wall. Ex G. Don.	Shoonkar	Herb	Root	Decoction	Dysentery, diarrhea.	Other city	2.9	2	1.45	0.01
60.	Geum urbanum L.	Bohay	Herb	Root	Decoction	Fever	Mastung	1.47	1	1.47	0.007

61.	Agrimonia eupatoria L.	Kanachika	Herb	Leaves	Decoction and infusion.	Astringent, tonic, diuretic, mouthwash, bile retention, kidney inflammation.	Mastung	8.8	6	1.46	0.04
62.	Duchesnea indica (Andr.) Focke.	Budimewa	Herb	Whole plant	Decoction, infusion.	Weeping, eczema, tonsillitis, snake and insect bite.	Quetta	4.4	3	1.46	0.02
63.	Comarum salesovianum (Stephan) Asch. and Graebner.	Noghurdoom woosh	Shrub	Flower	Infusion	Eye infections	Other city	1.4	1	1.4	0.007
64.	Poterium sanguisorba L.	Mashkik	Herb	Whole Plant	Decoction, Infusion, powder.	Tonic, refreshing agent, digestion, diuretic, salad.	Kech.	7.3	5	1.46	0.03
65.	Cerasus avium L. Moench.	-	Tree	Fruit	Decoction, tonic.	Anemia, persistent, cough.	Ziarat	4.4	ss3	1.46	0.02
66.	Padus cornuta (Royle) Carr.	Kalakat	Tree	Seeds	Oil	Substitute for almond oil.	Mastung	1.47	1	1.47	0.007
67.	Filepedula ulmaria L. Maxim.	-	Herb	Flowers and Rhizome.	Powder, Decoction and tea.	Influenza, rheumatism, odema, diarrhea, astringent.	Other city.	7.35	5	1.46	0.03
68.	Eriobotrya japanica	Loquat	Small tree	Fruit, flower, leaf and seeds.	Raw fruit, decoction, cooked.	Bronchitis, coughs, feverish colds.	Other city and Mastung.	4.4	3	1.46	0.02

Table 3: Percentage of Species and Citations in each Medicinal Use Category.

S. No.	Disease Category	No. of Use Reports	Percentage of Use Reports	No. of Species	Percentage of Taxa Used	Informant Consensus Factor (ICF)
1.	Gastrointestinal diseases (astringent, flatulence, hernia, colic, digestion, diarrhea, dysentery, gastric, piles, laxative, stomachache, vermifuge, vomiting)	67	33.5	28	41.1	0.59
2.	Respiratory diseases (asthma, chest problems, cold, cough, expectorant, bronchitis)	55	27.5	13	19.1	0.77
3.	Dermatological problems (ulcers, beauty care, burns, eczema, leprosy, wounds, emollient, demulcent, hair problems)	34	17	12	17.6	0.66
4.	Musculoskeletal disorders (bone fractures, toothache, rheumatism, backache, muscular pain, headache, dislocation)	18	9	5	7.3	0.76
5.	Urogenital problems (diuretic, kidney pain, gonorrhea)	25	12.5	10	14.7	0.62
6.	Others (nutritive, tonic, brain tonic, stimulant, swelling, tonsillitis)	11	5.5	6	8.8	0.5
7.	Glandular disorders (diaphoretic, diabetes)	9	4.5	6	8.8	0.3
8.	Eye diseases (antimony, eye ointment)	12	6	6	8.8	0.5
9.	Infectious diseases (malaria, typhoid, refrigerant)	9	4.5	8	11.7	0.12
10.	Antidote (snake bite, scorpion bite, insect bite)	10	5	6	8.8	0.44
11.	Gynecological problems (delivery, pregnancy, menstrual)	7	3.5	3	4.4	0.66
12.	Circulatory system disorders (heart inflammation, anemia, blood purifiers)	27	13.5	9	13.2	0.69
13.	Hepatitis	9	4.5	3	4.4	0.75

Table 4. List of medicinal plants from Rosaceae family in different countries.

S No.	Botanical Name	Common Name	Part Used	Ailment	References
1.	Potentilla eriocarpa Wall. Ex.Lehm.	Malli Chaw	Roots	Toothache	Dar, 2003.
2.	Cratageus songarica G. Koch.	Dakh	Flower	Constipation	Kumar et al.,, 2009.
3.	Rubus hoffineisteriannus Kunth and Boch.	Assaa	Flower and Leaves	Skin Diseases	Kumar et al.,, 2009.
4.	Spirea bella Sims.	-	Seeds	Wounds	Pala et al.,, 2010.
5.	Prinsepia utilis Royle.	-	Seeds and Bark	Rheumatism	Pala et al.,, 2010.
6.	Rubus fruticosus L.	Akha	Root, Fruit and Leaves.	Hepatitis	Saeed et al.,, 2004.
7.	Cotoneaster microphyllus Wall. Ex. Lindl.	-	Fruit and leaves.	Diarrhea	Pala et al.,, 2010.
8.	Rosa alba L.	Chitta Gulab	Whole Plant	Diabetes	Ahmad et al.,, 2009.
9.	Amygdalus brahuica subsp. Afganica	Mazhmonk	Gum	Chest infection	Tareen et al.,, 2010.
10	Cotoneaster nummularia Fisch. and Mey.	Mekin	Seeds and fruits	Blood purifier	Hussain et al.,, 2007.
11.	Crataegus songarica C. Koch	Ghonii	Whole plant	Labor pain	Hussain et al.,, 2007.
12.	Potentilla multifida L.	-	Root	Hepatitis	Xue et al.,, 2005.
13.	Crataegus oxycantha	Tampsa	Fruit and leaves.	Fencing	Sher et al.,, 2011.
14.	Fragaria indica Andr.	Da zamakay toot	Fruit	Laxative	Sher et al.,, 2011.
15.	Potentilla napelensis Hook.	Da ghar shalkay	Root	Fever	Sher et al.,, 2011.
16.	Potentilla raptens L.	-	Whole plant	Anti-inflammatory	Sher et al.,, 2011.
17.	Cydonia oblonga Mill.	Bhae	Fruit	Cough, piles.	Sabeen and Ahmad, 2009.
18.	Rosa brunonii Lindl.	Chahal	Flower	Constipation	Sabeen and Ahmad, 2009.
19.	Sorbaria tomentosa Lindl.	Beree	Flower	Antiseptic	Hamayun et al.,, 2006.
20.	Geum elatum Wall. Ex. G. don.	Shoonkar	Root	Dysentery	Hamayun et al.,, 2006.
21.	Potentilla anserine L. H.K.F	-	Whole plant	Inflammations	Mari et al.,, 2013.
22.	Agrimonia eupatoria L.	Kanachika	Leaves	Tonic	Adnan et al.,, 2012.
23.	Prunus insititia L.C.K Schnied.	Alu balu	Shoot. Stem and leaves.	Laxative	Adnan et al.,, 2012.
24.	Spirea chinesis Maxim.	Krachay	Fruit	Pregnancy	Ali et al.,, 2011
25.	Potentilla fulgens wall. Ex. Hook.	-	Root	Stomach disorders	Rosangkima and Prasad 2004; Chhetri et al.,, 2005.

26.	Duchesnea indica Andr. Focke.	Budimewa	Whole plant	Eczema	Awan et al.,, 2011.
27.	Rosa webbiana wall. Ex. Royle.	Thorny	Fruit	Asthma	Khan et al.,, 2011.
28.	Comarum salesovianum asch. And Graebner	Noghurdom woosh	Seeds	Eye infections	Khan et al.,, 2011.
29.	Rosa indica Koehne.	Gulaab	Root, flowers and leaves	Tonic	Sabeen and Ahmad, 2009.
30.	Poterium sanguisorba L.	-	Whole plant	Digestion	Shinwari et al.,, 2006.

CONCLUSION

This study was conducted to document the traditional uses of medicinal plants in District Mastung, in the northwestern part of Balochistan, Pakistan. The district is blessed with a diverse array of medicinal plant species, and they still remain to be a crucial part of local people's health care. The traditional knowledge surrounding these precious plant resources, however, is under threat and being lost, especially amongst the younger generation, necessitating documentation of this knowledge. A total of 68 medicinal plant species from 22 genera of Rosaceae family are found in the ethnobotanical survey which are used for the treatment of various human ailments. The informants were recruited from various age groups from each of the districts in Mastung. Leaves and fruits were the most used parts of the plants, and infusion and decoction were the most common methods of making herbal remedies. These medicinal plants were used primarily for gastrointestinal, respiratory, dermatological and various other common ailments. This study also indicates the importance of safeguarding and recording the indigenous medicinal knowledge to the future generations. Raising awareness on local medicinal plants through educational activity can increase the awareness of younger generation on the traditional importance of the medicinal plants and will make them to use the medicinal plants in a sustainable manner. Moreover, the medicinal claims as documented in this study should be confirmed with phytochemical and pharmacological studies to support their therapeutic potential. The information gathered from this study will also be a valuable basis for conserving the plant biodiversity of the area and will be helpful in enhancing the socio-economic welfare of the communities that rely on the plant resources. Hence, adequate conservation measures should be taken to protect these valuable medicinal plants and ensure their sustainable availability for future generations.

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