CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Exploring Quantitative Ethnomedicinal Studies of Endemic Flora of Wah Cantt Rawalpindi, Pakistan

by

Muhammad Akbar Sajjad Khan

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Every challenging work needs self-efforts as well as the guidance of elders. I dedicate this thesis to my parents whose affection makes me able to get such success and to my teachers whose encouragement has always been my source of inspiration.

CERTIFICATE OF APPROVAL

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Abstract

Wah Cantt tehsil Taxila, district Rawalpindi are one among the world biodiversity hotspots harboring many endemic medicinal plants. Despite augmentation in the documentation of ethno-medicinal knowledge of medicinal plant species, information regarding endemic species is still underway. Current research highlights the traditional medicinal uses of rare endemic and unexplored group of plants having potential for novel medicinal constituents with effective pharmacological activities. In total, 64 informants (41 male and 23 female) including seventeen traditional healers were interviewed using semi-structured questionnaire, personal observations and group discussions. For data analysis, quantitative analytical approach was adopted using ethno pharmacological indices as Relative frequency of citations and Fidelity Level. 82 plant species were reported. Plant species were belonged to 37 different families. Among the families, the dominant families were *Solanaceae, Rosaceae* (6 species) each, followed by *Fabaceae, Amaranthaceae* (5 species) each, *Brassicaceae* (4 species), *Asparagaceae, Myrtaceae, Rutaceae, Moraceae, Poaceae, Euphorbiaceae* (3 species) each, *Lamiaceae, Amaryllidaceae, Melliaceae, Apiaceae, Areaceae, Asteraceae* (2 species) each, while rest of families have only one species. These plant species were diverse in nature. By habit, there were 51 (62.19%) herbs, 25 (30.48%) trees and 06 (7.31%) shrubs. There were 51% cultivated and 49% wild species. These reported species have been used in different categories e.g., food, fodder, furniture, ornamental, fuel, building material etc. Highest number of endemics was used in fever, skin infections, stomach disorders, kidney disorders, certain allergic reactions, cancer, asthma, piles, obesity, ulcer, fever, liver diseases and many other diseases. In the present research, collected data was then transferred to excel sheet and then quantitatively analyzed it by using statistical techniques like frequency of citation (FC), Relative frequency citation (RFC), Uni-variable (UV) and Uni-variable independent (UVI) respectively. The value of RFC ranging from 0.625 to 0.015 and the value of UV ranging from 04 to 01. It was found that values of RFC and UV may vary among plant species. The highest RFC value plant species was *Cannabis sativa* and the lowest ranked species was *Trachyspermum ammi*. Like this, *Azadirachta indica* comprised highest UV (04)

and *Asphodelustenuifolius Cavan* comprised lowest UV (01). Even though they are rare, endemic plant species provide a significant contribution to ethnomedical knowledge, and communities choose to use them. The present study serves as a baseline for the identification of some other medicinally important plant species from nearby areas.

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Abbreviations

BASE: Building Assessment Survey and Evaluation

FC: Fidelity Citation

FDA: Food and Drug Administration

GAP: Good Agriculture Practice

GEMS: Global Environment Monitoring System

GF: Growth Factor

MAK: Maximum Workplace Concentration

MCC: Medicines Control Council

MFC: Multifunctional Column

MHW: Ministry of Health and Welfare

MS: Mass Spectrometry

NIH: National Institutes of Health

OR: Odds Ratio

OSHA: Occupational Safety and Health Administration

RFC: Relative Frequency Citation

RR: Relative Risk

STEL: Short-Term Exposure Limit

UV: Ultraviolet Detection

WHO: World Health Organization

Chapter 1

Introduction

"Ethno-medicine" is the study of biological knowledge about plants, products derived from plants, animals and their products. It is a small, dense and specialized field comprising the work of ethno-botany and ethno-zoology. On the other hand it is a very vast field that covers cultural to biological knowledge. This is an inter disciplinary field of many other studies such as anthropology, archaeo zoology, archaeobotany, ecology and many others by which researcher can construct the past-life of biotic factors i.e. plants and animals [1]. "Ethno-medicine "helps to study practices of different communities and to check their ability of self-sufficiency. Field of "ethno-medicine" can be divided into three major study areas: economic (uses of plants and animals), cognitive (how people know about benefits of plants and animals), and ecological (how plants and animals influence the daily life of people.) "Ethno-medicine" further divided into two main branches: Ethno-botany and ethno-zoology [2].

In 1896, *John Harsh Berger* used the term "Ethno-botany" and explained it as the study of relationships between human beings and plants [2].Ethno-botany also defined as that it is a field of sharing knowledge and research with local and indigenous people because they know the basic uses of any plant [3].from histories, plants are being used as food, shelter and medicines. Later on potential of plants and their products were also reported by many people. It explored new field of study which have discovered potential of wild plants against different diseases [4].

It is estimated by *World Health Organization* (WHO) that about 65-80% world's population depends upon plants and their products for their health care. Above mentioned figure are about developing countries and the reason behind it poverty and lack of facilitation of modern medicines [5]. Ethno-botany plays significant role in this regard and helps to study the relationship between plant diversity, local community and culture. About 25% drugs sources are plants. Medicinal plants are commonly used by villagers in different countries of world [6]. Plants are also used as food, shelter, clothing and for religious purposes [7].

In sub-continent, Muslims brought "*Unani*" medicines system. "*Ayurveda*" system of medicines is also important among the people of sub-continent. It is important system of medicines in Hindu civilization as well. Term "Ayurved" comes from Sansikrat which means "Science of life" and has the history of 3500 to 5000 years [3]. Now, Ethno-botany can be defined as scientific study of interactions between plants and human beings. Folk medicinal knowledge has great value in this regard [5]. In different areas of world, different societies have floristic diversity around them. These conditions develop different associations and relationships with biodiversity [8]. Knowledge on the basis of practices and experiences of ancestors transfer from generation to generation. People living in villages used practices of their ancestors to cure their health and for different other uses [9]. Botanist paid their best attentions to collect ethno-botanical and folk medicinal knowledge in different areas of world. They reported a large number of plants which are used in various diseases such as asthma, fever, stomach problem, constipation, eye and skin problems [3].

Essential oils produced by plants are commonly used in daily life. When these applied to skin, they show significance effects on the body. Aromatherapies and local experiences explored the therapeutic properties of these oils [10]. Along this many edible plants are available which are used as vegetable as well as for food purposes. These plants include chili pepper, seaweed, blackberries etc [5]. Herbs also contributed as therapeutic agents to heal the wounds [11]. Along this shrubs also play a keen role in folk medicinal knowledge and used as food, shelter, fodder and medicines [12]. Ethno medicine explores many uses of plants and animals.

For example food, religious, textile, obtaining dyes, currency, rituals, domestic, social etc [13].

On the other hand wild animals and their products play important role in daily life [9]. Evidences are available that people of Egypt and Mesopotamia used animals for healing purposes. In modern system of medicines, products derived from animals play fundamental role [14]. Animals have being hunted from centuries in order to get food and safety from large predators. Products derived from animals are used in many ways e.g. as food, cloths, for medicinal and religious purposes [15]. Products include butter, meat, milk, bones, horn, musk, skin, fin, honey, mucus, eggs, urine etc.

In many parts of world, animals are used as healing purposes where ethno-zoological practices are common [16]. Potential of medicinal animals pieces are largely unknown and folk medicinal practices are understood poorly. About 1500 animal species are used as medicines source in China,15-20% of Ayurvedic medicines are obtained from animals in India. In Latin America, 584 medicinal animal species have been reported [17]. In Africa, folk medicinal practices are at peak level.

They used both animals and plants to cure diseases. People depend upon natural resources to cure diseases [13]. Over-hunting and over-utilization of animals and plants lead to threats to biodiversity [18]. Pakistan is a land of awesome sight bestowed with unique biodiversity. Large number of medicinal plant and animal species are present in different areas of country [19]. Mountainous people used natural resources as food and medicines [9]. Taxila is also known as city of black stones and it flourished during 6th century B.C. It was a great center of trade and learning. It is an important archeological city and its references are found with respect to Alexander the great, religious documents of Sanskrit, Chinese tourists and in many others. City lost during the period of Ashoka after the invasion of Alexander. In 19th century, Sir John Marshall excavated the lost city, which was known as Takshasila in past [20]. In different areas of world, different societies have floristic diversity around them. These conditions develop different associations and relationships with biodiversity and they have impact on them [21].

1.1 Research Gap

Wah Cantt, Rawalpindi is an area with having a rich diversity of important medicinal plants. The majority of these species are unexplored and neglected for a research study. Little is known about their ethnobotany and traditional uses of important species found in this area. A detailed study is needed to explore the important medicinal flora of this area with help of local peoples.

1.2 Aim and Objectives

The aim of the study is to explore the indigenous knowledge of medicinal plants found in different parts of the study site and to highlight the ethnomedicinal importance of endemic plants from Wah Cantt, region, Rawalpindi Pakistan. The objectives of this study are:

1. To highlight the traditional medicinal uses of rare endemic medicinal plants of Wah Cantt, Rawalpindi Pakistan
2. To report the unexplored group of medicinal plants of Wah Cantt Tehsil taxila, District Rawalpindi Pakistan.

Chapter 2

Review of Literature

The purpose of this literature review is to highlight concept of "Ethno-medicine". This review here fit in different researchers and views of pertaining to "Ethno-medicine".

Jharoli et al. [21] stated that most of the studies regarding ethno-medicine were conducted in European countries. Ethno-medicine study was conducted in two cross-culture areas of Europe that are Serbians and Albaniansin South-Western plateau. It was found that many plants, animals, minerals and their products were used in medical remediation by local communities. This included 129 botanical taxa, 204 local plants, 31 animal derived products and 27 mineral based remedies. These practices were totally different from Western therapeutic mode of treatment. Above mentioned communities retain their cultural adaptations and practices regarding health curing, although they lived together during the past 3 centuries.

Alam et al. [5] documented that in Ethiopia, 80% people dependent upon indigenous plant species for health aliment. The route of administration was orally and leaves of different plant used for this purpose. These practices save cultural habits as well as knowledge of biodiversity. It was documented that there were 31 medicinal plants, from which 18 were wild, 11 of them were cultivated. Above mentioned plant species cure almost 32 human diseases. *Khan and Khatoon* [16]

reported that in India, Singhason hill range in Karbi Anlong district is richly diverse area of Assam containing great floristic diversity. Like other hilly areas, there are no modern health care facilities are available. Local people used plants against anti-dots and against snake and spider bite. It is documented that out of 42 species of medicinal plants, 11 used against snake bite.

Ali and *Qaiser* [4] documented 83 taxa in Chitral Valley which were used by local people. They used different plant parts and make decoctions from them and used in different health remediation. However extensive collection, poor collection method and erosion of soil are major causes of depletion of local flora. Precautionary measures are needed to conserve biodiversity.

Alam et al. [1] said that folk medicinal knowledge of Chaghrzai Valley, District Bunar, Pakistan showed that old aged women have great knowledge about uses of indigenous plant species. Studies showed 141 plant species were used in health cure treatment including laxative, anti-jaundice, anti-diabetic, carminative and anti-allergic.

Huges et al. [13] done ethno-botanical survey of Chaghrzai Valley by they reported that some plant species used individually for health care along their casual production. However some other species are mixed together and used in health remedy. It is reported that district Bunar is now facing deforestation, biotic interference and over grazing. *Kim and Song* [22] documented traditional uses of medicinal plants in Bheri district, Muzaffarabad. They revealed that many plants and their products were used in health care and folk medicinal knowledge which showed 24 species were most important. Few species were used in Ethnoveterinary and in Pharmacology.

Ahmad et al. [23] found that medicinal plants can also be used against sexual diseases e.g. leucorrhoea and spermatorrhoea. These plants are also used in cattle diseases as well. Studies of Barroha, Bharakahu and Maanga, Islamabad that there were 34 plant species which have medicinal potential.These plants are important among poor people for their medicinal uses. Usually women and children collect them. In Pakistan, 60,000 plant species are present, in which 12% are medicinal

in nature. Different studies were conducted in different areas. Survey of Kohat Pass, Khyber Pakhtunkhwa showed that 60 species used by local people, From them 90% species used as medicinal purposes, 31% as food, 25 % as fodder and fuel.

Martin [8] stated that in Sulaiman range, Takht-e-Sulaiman is the highest peak. Here the facilities of communication and travelling are very low. Local people are highly dependent on the natural resources including plants. They used plants for medicinal purposes as well. Almost 66 important species are reported which are used in ethno-botanical practices including 39 herbs, 11shrubsand 16 trees.

Mootoosamy and Mahomood [24] reported 48 plant species used by native people of Harmosh and Bugrote valleys, in Gilgit Northern areas of Pakistan. They used them daily in food, for shelter, agricultural tools and fuel. Like Khan and Khatoon, Noor and Kalsoom documented 43 plant species from Ratwal village, district Attock, Pakistan. They found that these species are also used as food, fodder, timber, fuel and as medicinal source.

Gulshan et al. [22].found 97 ethno botanical potential Species from Ranyal Hills, District Shangla Pakistan. Shrubs also play an important role in ethno botany. It is revealed by Ajaib. They surveyed District Kotli, Azad Jammu & Kashmir and reported 38 shrub species which are used by native communities.

Ilyas et al. [18] reported the same area, he also reported 113 plant species which have are used by indigenous people.

Gulshan et al. [12] reported 27 herbs which are used as therapeutic agents and good source of medicines among tribal communities of Northern Himalaya range, District Abbotabad, Pakistan.

Ali and Qaisar [4] said that it is very important to know ecological systems and animal interactions with their ecosystem to conserve them. Many species of animal species become endangered due to lack knowledge about ecology.Ethno-Zoology and ecology have great importance in order to conservation management. Forest reserve, Pangolin (*Manistricuspis*) is used as food, medicine and for religious

purposes. These species are most sensitive to forest age as compare to composition of forest.

Mesfin et al. [25] documented that animals are being used in many traditional practices and in folk medicinal knowledge from past history. In Korea 77animals that produce 1160 practices/ usage. From these 77 species, 44 species have medicinal uses. But now species are facing extinction due to overuse.

Nanyingi et al. [26] reported that animals also have great importance in religious and ritual practices. In Nigeria, 55 species identified in order to use in local medicinal forms. Over hunting and use of animal based products lead to some species become endangered.

Zubaida et al. [14] found that in Island of Mauritius People used different animal derived products e.g. butter, milk, bons, horns, eggs, meat etc. they used these products against diabetic, nutritional and metabolic disorders.

Ali and Qaiser [4] stated that 69 animals/ animal based products are used in folk medicinal practices in the district of Tamil Nadu, India. These animals and their products are used against human illness.

Khan and Khatoon [16] reported that people of Pachmalai hills of Tamil Nadu, India used different animal products e.g. bones, butter, milk and animal based products in their daily life. These hills are rich in floristic diversity as well. *Das* [10] defines zoo-therapy healing diseases by using animal and animal derived products. Silent Valley, Kerala, India documented that ethno-zoological trend and studies increased during last decade. 68 species used in health remediation.

Kim and song [22] found that in Shensha, district Kotli, Azad Kashmir 112 plant species used in ethno-botanical practices. Most of the parts which are used are leaves, stem, fruits and seeds. These products are also used as medicines, fodder and fuel. *Niet* et al. [29] surveyed Thar desert, Sindh (Pakistan) and reported 87 ethno botanical important species. The most frequent cited plants were belonging to family Amaranthaceous. *Aab* [27] reported 91 plant and 61 animal species in their survey during 2011-12 at Kala Chitta hills of Pothwar region, Pakistan. They

reported that these species are used in number of diseases like asthma, bronchial diseases, stomach diseases, eye infection, ear pain, nose bleed, sexual diseases, skin treatments and many more. Other than these uses, species are highly used in cultural and traditional practices.

Hussain [28] surveyed in North-West Punjab, Pakistan to document the folk indigenous knowledge of herbal remedies for skin diseases. They reported total six plant species show inhibitory effect against skin microbes.

Menthaarvensis showed high anti-bacterial activity. Most of the used part was leaves of plants. Other used parts were roots and seeds.

Pieroni [30] surveyed coastal areas of Karachi and documented 54 important medicinal plants. They reported that majority of plants were xerophytes followed by halophytes. These plants were extensively used against intestinal diseases.

Review [31] conducted ethno-medicinal survey in Taindol village, district Jhansi, region of Bundelkhand Uttar Pradesh, India regarding medicinal plants. He reported 57 plant species *Euphorbiaceae, Fabaceae, Moraceae, Poaceae, Solanaceae and Rutaceae*. Most of the used plant part was leaves and used externally to cure wounds. These plants used in case of eye diseases, high blood pressure, insomnia, jaundice, headache, intestinal infection, glaucoma, snake bite, purify blood and many more.

Nanyingi et al. [26] interviewed practitioners in Brahmanbaria, Narsinghdi, and Raj shahi districts of Bangladesh. Practitioners reported thirteen animal species which included goat, bull, cockroach, turtle, fox, wild cattle etc. These species were used in asthma, eye disorder, mental disorders, severe pain in body, epilepsy and many others. Whole body, bones, hairs and other body parts were used in different recipes.

Ilyas et al. [28] performed survey in *Mech* tribe in Duars of West Bengal (India) and reported 20 different species of animals along with11 species of plants.These species were used in different disease such as skin problems, anemia, eye sight, paralysis etc. *Qureshi* et al. [32] carried out survey about traditional man-animal

relationship in Chhindwara district of Madhya Pradesh (India) and reported various animal species which were used in 35 different medicinal purposes. This purposes included asthma, tuberculosis, weakness, paralysis, cough etc. Some species also used in religious practices. These species also used as good food resource. Flesh and internal parts were eaten to obtain protein content. Exoskeleton and endoskeleton were used in religious purposes because both cannot decompose easily. It was believed that it prevented from evil eye. A lot of species were used in agriculture practices. Presences of some species at certain time showed weather forecast or indication of rain fall in the area. *Qureshi* et al. [33] tried to explore the antidote value of floristic diversity of Singhas on Hills, Karbiang long district of Assam (India).There are less modern health facilities in the area and people depend on tradition medicine to cure diseases. They reported 42 medicinal plants which are used as antidotes. These species were used in case of food poisoning, insect and spider poisoning, snake poisoning and other poisons. These plants were used as decoration, as paste, infusion and as direct.

Rauf [34] carried out work on ethno-zoological practices among tribal inhabitants in Khowai district of Tripura, North-East India and documented many animal which were used in 23 health problems including asthma, arthritis, fever etc. He reported total 25 animal species and out of these 28% were invertebrates. Phylum Arthopoda has highest use value and among vertebrates (72%), class mammalian was dominant. *Rahul* [35] reported Ethno zoological study of traditional medicinal animal used by the people of Kafta-Humera district, Northern Ethiopia was conducted by Yirga. They selected informants on the basis of experience and recognition. They recorded sixteen species which were used in 18 different human ailments. The majority of animals were domestic and the used parts were blood, bile, pancreas, milk, urine, hair and fecal matter. The preparations methods were crushing, squeezing, cooked and direct form. *Jamil and murtaza* [2] conducted a survey on wild animals in ethno-zoological practices among Yorubas of south-western Nigeria. They reported 55 animal species used in health treatment. Out of these, 21 are listed as threatened in Nigeria‘s Endangered species. So, there is a need to control the hunting and consumption of these species. *Rahul* [35]

performed ethno pharmacological survey in Samburu district of Kenya. They were documented 55 plant species. These species were used in case of malaria, digestive disorders and respiratory problems. Among plant forms, there were high ranked shrubs followed by trees, herbs and lianas. Leaves were frequently used followed by roots, stem, fruits and whole plant.

Rasheed et al. [36] conduct the ethno-ecological study of plants of Qalagi Hills,Kabal Valley(Swat,Pakistan) by *Ilyas* he showed that due to hilly and less remote areas, people depend upon natural products. They used plants as food, fodder, forage, fuel and form any other purposes. Local communities used plant and animal based products for health remediation. They have close relationship with their ecosystem. Ethno-ecological studies of Qalagi Hills revealed that most of plants used as medicines.

Khan and Khatoon [16] founded that different vertebrates and invertebrates and their products used by different Nanga Tribes. These animals are identified by English as well as their zoological names. 26 species used by Nanga Tribes in human health aliment.

Chapter 3

Materials and Methods

3.1 Research Methodology

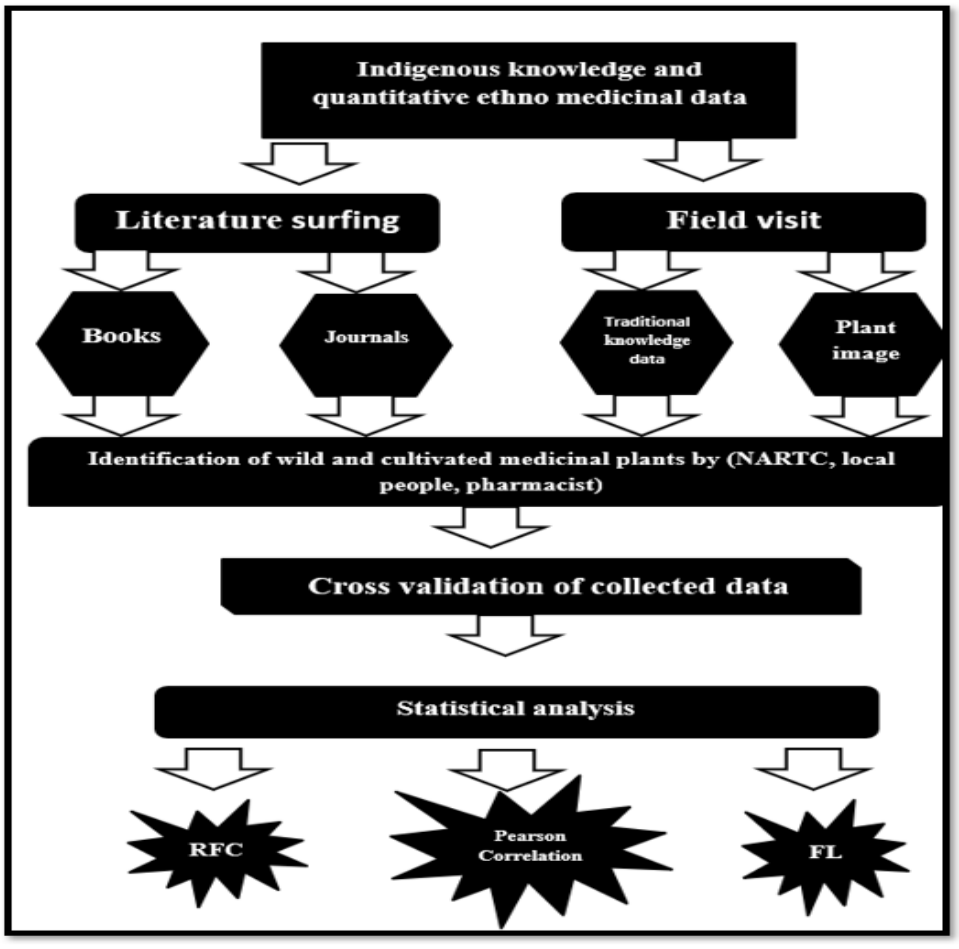

FIGURE 3.1: Flow chart of research methodology.

3.2 Geography and Climate of Study Area

Wah cantt, Tehsil-Taxila is also known as city of black stones and it flourished during 6th century BC.It was a great center of trade and learning. It is an important archeological city and its references are found with respect to Alexander the great, religious documents of Sanskrit, Chinese tourists and in many others, City lost during the period of Ashoka after the invasion of Alexander. In 19th century, Sir John Marshall excavated the lost city, which was known as Takshasila in past.The excavated sites are Sirkap, Dahrmarajika Stupa, Sir-sukh, Mohra Maradu and Jolian. Remains are kept in Taxila museum for tourists [37].

Now a day, it is located 16 km apart from Islamabad and 33km North-West from Rawalpindi district of Punjab, Pakistan. Average rainfall is 990mm with moist subtropical weather. The altitude is about 550 meters and most of rainfall occurs in monsoon [38].

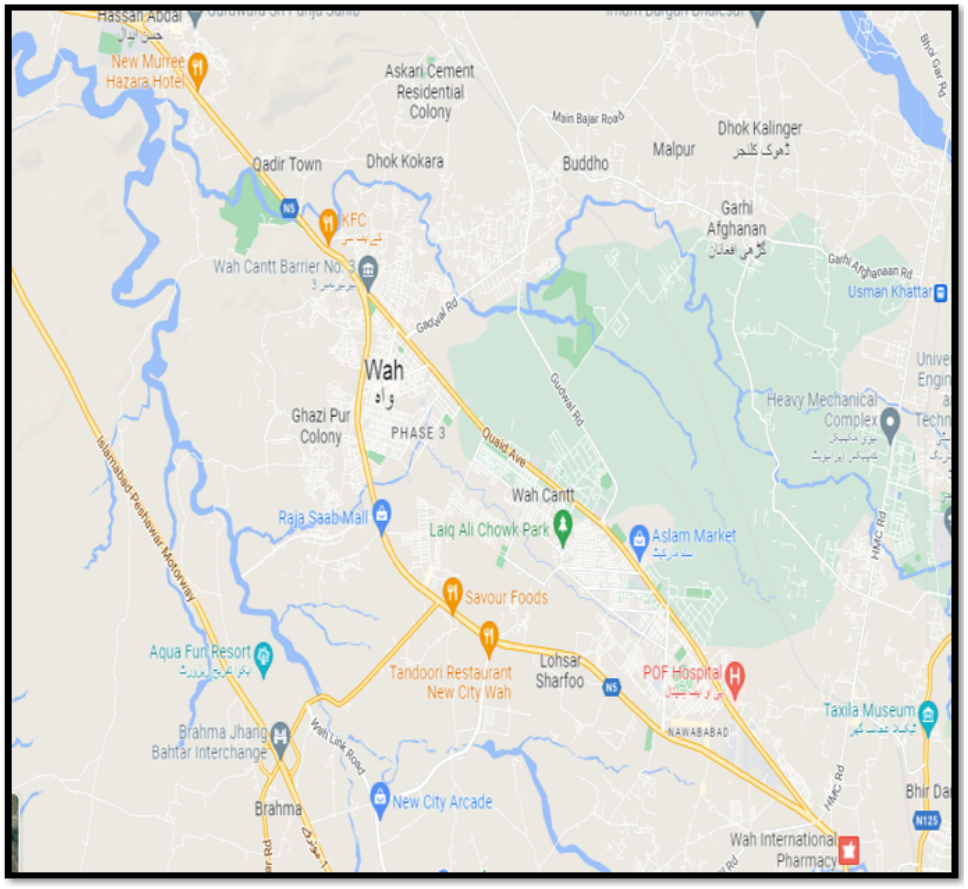

FIGURE 3.2: Map of Wah cantt tehsil Taxila,district Rawalpindi

Taxila city is surrounded by Margallah Hills from North-east and by Kalla Chitta hill range from district Attock, from north-west. The southern side is partially surrounded low peak mountains. It is the foot-step area to northern areas. Land is productive so, crops and seasonal vegetables and fruits can grow. At some places, there are natural springs. The most famous place is Mughal Garden,Wah. Rainfall is the main source for diversity of flora and fauna [39].

3.3 Socio Economic Conditions of Wah Cantt Tehsil Taxila

According to economical point of view, it is also an important city due to Heavy Industries Taxila (HIT), Heavy Mechanical complex (HMC), Pakistan ordinance Factories (POF), Wah Cantt and Hattar Industrial Estate. It is also famous for stone work and sculptures and stone art pieces can easily be seen along Khanpur road.

There is huge diversity in flora and fauna of the Taxila valley. There are many medicinal and economical valued plants and animals which are used by local communities in their daily life. Although it is surrounded by well-known industries but its local communities highly depend upon natural resources. Many people are engaged with industrial units but large number of people also used traditional recipes for curing diseases. These methods are transferred generation to generation. People are highly dependent on plants and animals for medicines, food, shelter, transport, fuel, clothing etc.

There are many other social and political activities in the city because it occupies value as a tehsil. Grand trunk road linked district Rawalpindi to Attock districts of Punjab. Prime location facilitates the movement of goods across different cities and human activities are highly disturbed biodiversity in the study area .

Wah Cantonment is a military cantonment located in the Punjab province of Pakistan. It is a part of Taxila Tehsil of Rawalpindi District. It is the 24th largest

city of Pakistan by population. It is located 30 km to the northwest of Islamabad-Rawalpindi, and is to the southwest of Haripur District, Khyber Pakhtunkhwa.

3.4 Ethnographic Composition and Ethno-Medicinal Documentation

Ethnic composition of Taxila valley is relatively diverse. Local language spoken in the area is Punjabi and mainly resides are Malik, Chudary, Gujjar and Kashmiri, Awan and others. Interviews were conducted in local geographical area (Taxila), formal and informal discussions about plants and animals and their products were obtained and reported. Interviews were simple. Ethno medicinal data was collected by semi-structured, questionnaires, group discussion, walk-in-interview and 24 hour recall method. Interviews were followed by voucher specimens.

3.5 Ethno-Medicinal Sample Collection

Plant specimens were collected, air-dried and pressed. Specimen identification done by local people as well as by Taxonomists at Plant Taxonomy. Plant specimens were mounted on standard size herbarium sheets for future reference.

3.6 Ethno-Medicinal Data Preservation

The field data documented on window based computer program (Microsoft Office). Data will be arranged in tabulated and graphical form based on numerical values.

Local importance of each species will be given by frequency of citation (FC, the number of informants mentioning the use of species) divided by total number of informants of survey. [39]. Relative frequency citation (RFC) will be calculated by following formula which was mentioned below:

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

3.7 Use Value

The Use Value (UV) shows relative importance of specimens known locally.

It is calculated by following formula:

$$UV = \sum Ui/N$$

Here Ui is number of uses mentioned by each informant for a given specimen and N is the total number of informants.

3.8 Pearson Correlation Coefficient

It is a good measure to numerically determine the linear relationship between two variables. Person's or relation coefficient is the ratio between covariance between two variables to their standard deviations. It can be calculated as:

$$r = COV(X, Y)SD(X)xSD(Y)$$

Here r is Person correlation coefficient of given sample, COV is covariance, X and Y are variables for interested to explore relationships and SD is standard deviation. Similarly SD(Y)can be calculated.

Chapter 4

Results and Discussions

4.1 Collection of Samples and Interviews from Local People

Different species of plants that can be used as a medicine for the treatment of diseases and cure of some diseases.

FIGURE 4.1: (A)Interview from Homeopathic doctor, Dr Nasir Mehmood.

Dr Nasir Mehmood is homeopathic doctor in wah cantt, tehsil Taxila, District Rawalpindi, and have a great experience related to plants based cure.

FIGURE 4.2: (B)Interview from Hakeem, Sehzad mansoor

Sehzad mansoor is an hakeem and run shop in the village of wah cantt name Gadwal, and having a great knowlodge about plants and products produce by the plants.

FIGURE 4.3: (C) Interview from Herbalist, Hamza Ahmed

Hamza ahmed is an herbalist and run his shop in sadaat colony, he has a great knowledge about plants.

FIGURE 4.4: (D) An interview from local people.

Local people have a great knowledge about the areas where medicinal plants are present and used for what purpose.

FIGURE 4.5: (E) Interview from stone artist at Sirkap remains, Taxila.

Stone artist have also a great knowledge about the areas where medicinal plants are present and used for what purpose.

FIGURE 4.6: (F) Flora festival of HIT taxila.

FIGURE 4.7: (G) Flora festival of HIT taxila and collection of important medicinal species.

4.1.1 Fresh Plant Samples

The fresh samples was collected of different plant species that can be used as a medicine for the treatment of diseases and cure of some diseases.

FIGURE 4.8: (A) *Calatropis procera*

The above figure 4.8 was the fresh sample of *Calatropis procera* which was used for treatment of different diseases.

FIGURE 4.9: (B) *Racinus communed.*

The above figure 4.9 was the fresh sample of *Racinus communed* which was used for treatment of different diseases.

FIGURE 4.10: (C) *Cannabis sativa.*

The above figure 4.10 was the fresh sample of *Cannabis sativa* which was used for treatment of different diseases.

FIGURE 4.11: (D) *Withania coagulans.*

The above figure 4.11 was the fresh sample of *Withania coagulans* which was used for treatment of different diseases.

FIGURE 4.12: (E) *Zea mays.*

The above figure 4.12 was the fresh sample of *Zea mays* which was used for treatment of different diseases.

FIGURE 4.13: (F) *Trianthema portulacastrum.*

The above figure 4.13 was the fresh sample of *Trianthema portulacastrum* which was used for treatment of different diseases.

FIGURE 4.14: (G) *Parthenium hysterophorus.*

The above figure 4.14 was the fresh sample of *Parthenium hysterophorus* which was used for treatment of different diseases.

FIGURE 4.15: (H) *Fiscus carica.*

The above figure 4.15 was the fresh sample of *Fiscus carica* which was used for treatment of different diseases.

4.1.2 Dried plant samples of Wah Cantt, Tehsil Taxila, District Rawalpindi

The dried samples was collected of different plant species that can be used as a medicine for the treatment of diseases and cure of some diseases.

FIGURE 4.16: (A) *Calatropis procera.*

The above figure 4.16 was the dried sample of *Calatropis procera* which was used for treatment of different diseases.

FIGURE 4.17: (B) *Racinus Communid.*

The above figure 4.17 was the dried sample of *Racinus Communid* which was used for treatment of different diseases.

FIGURE 4.18: (C) *Cannabis sativa.*

The above figure 4.18 was the dried sample of *Cannabis sativa* which was used for treatment of different diseases.

FIGURE 4.19: (D) *Withania coagulans.*

The above figure 4.19 was the dried sample of *Withania coagulans* which was used for treatment of different diseases.

FIGURE 4.20: (E) *Zea mays.*

The above figure 4.20 was the dried sample of *Zea mays* which was used for treatment of different diseases.

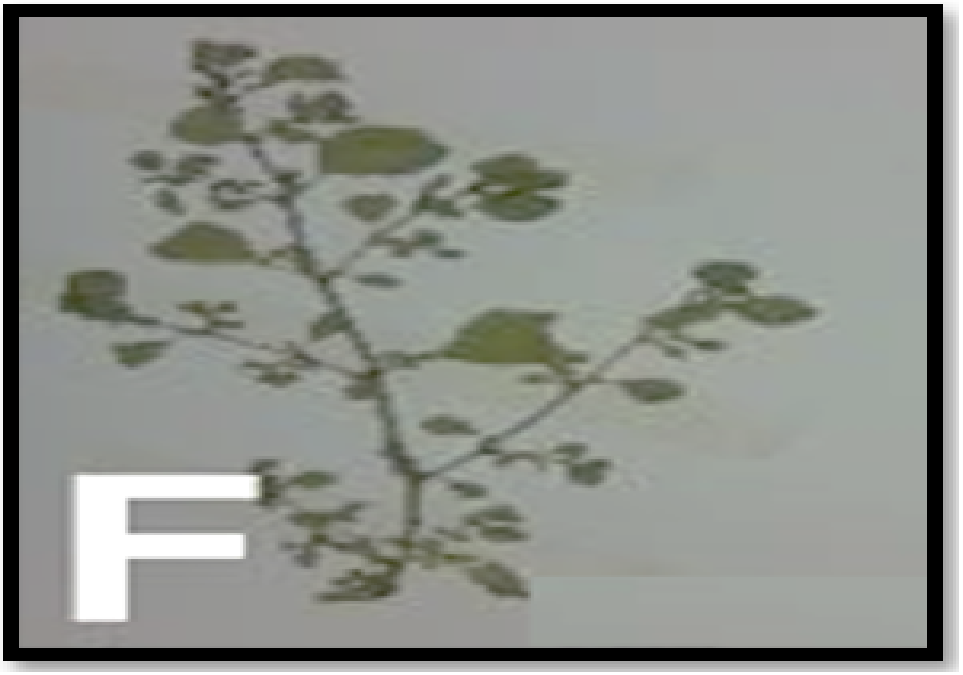

FIGURE 4.21: (F) *Trianthema portulacastrum.*

The above figure 4.21 was the dried sample of *Trianthema portulacastrum* which was used for treatment of different diseases.

FIGURE 4.22: (G) *Parthenium hysterophorus.*

The above figure 4.22 was the dried sample of *Parthenium hysterophorus* which was used for treatment of different diseases.

FIGURE 4.23: (H) *Fiscus carica*.

The above figure 4.23 was the dried sample of *Fiscus carica* which was used for treatment of different diseases.

4.2 Ethnographic Composition and Ethnographic Documentation

This study was carried out at wah cantt Tehsil Taxila valley where 64 informants were interviewed. According to gender, there were 41 (64.06 %) males and 23 (35.93%) females. Different age groups were observed, among these 1 (1.56%) informant was less than 20years, 15 (23.43%) were between 20 to30years, 10 (15.62%) between31 to 40years, 11(17.18%) between 41to50years, 13(20.31%) between 51 to 60 years and 14 (21.87%) were above 60 years. According to marital status, 58(90.62%) were married, 4 (6.25%) were unmarried and 2 (2.13%) were widowed. Although the near city, Wah Cantt has the literacy rate is about 99% but many old informants were illiterate. According to education level, there were 36 (56.25%) were illiterate, 10(15.62%) elementary, 07 (10.93%) secondary, 04 (6.25%) college and 07 (10.93%) were at university level. These were mostly young individuals.

It was also observed that 06 (9.37%) were farmer, 14 (21.87%) retired, 04 (6.25%) government employees and 40 (62.5%) were others. Most of the people 60 (93.75%) were residing in villages and 04 (6.25%) in city. Main local language spoken in the area is Punjabi, other languages include Hindko and Pashto. Mainly 05 ethnic groups were observed in study area including 38(59.37%) were Malik, 13(20.31%) were Gujjar, 07(10.93%) were Kashmiri, 02 (3.12%) were Awan and 04 (6.25%) were Pakhtoon. There were only 03 (4.68%) herbalists. Probably all informants were residing up to 15 years in study area in table (4.1).

TABLE 4.1: Demographic Composition of Wah cantt, tehsil Taxila, district Rawalpindi.

Demographic Feature	**Criteria**	**Number of People**	**Fidelity Level**
Gender of Informants	Male	41	64.06
	Female	23	35.93
Age of Informants	Less than 20	01	1.56
	Between 20-30	15	23.43
	Between 31-40	10	15.62
	Between 41-50	11	17.18
	Between 51-60	13	20.31
	Above 60	14	21.87
Marital Status	Married	58	90.62
	Unmarried	04	6.25
	Widow	02	3.12

TABLE 4.1: Demographic Composition of Wah cantt, tehsil Taxila, district Rawalpindi.

Demographic Feature	**Criteria**	**Number of People**	**Fidelity Level**
Educational Level	Illiterate	36	56.25
	Elementary	10	15.62
	Secondary	07	10.93
	College	04	6.25
	University	07	10.93
Employment Status	Farmer	06	9.37
	Retired	14	21.87
	Govt. employment	04	6.25
	Others	40	62.5
Residence	Village	60	93.75
	City	04	6.25
Ethnic Group	Malik	38	59.37
	Gujjar	13	20.31
	Kashmiri	07	10.93
	Awan	02	3.12
	Pakhtoon	04	6.25
Experience	Herbalists	03	4.687
	Local People	61	95.312

TABLE 4.1: Demographic Composition of Wah cantt, tehsil Taxila, district Rawalpindi.

Demographic Feature	**Criteria**	**Number of People**	**Fidelity Level**
Duration of Residence in Surveyed Area	Less than 15 years	0	0
	More than 15 Years	64	100

4.3 Inclusion and Exclusions

1. In demographic features like age of respondents is more than 20 is and above as much are counted.
2. Married and unmarried both are counted in research.
3. Education is not mandatory people who have a knowledge about medicinal properties of plants is counted in research.
4. Employment status is not mandatory people who have a knowledge about medicinal properties of plants is counted in research.
5. The respondents who live in village and cities are counted in research.
6. Every cast respondent is mentioned but who have a knowledge about the medicinal properties of plants.
7. Experience people like herbalist, Hakeem, Pharmacist and Doctors are include in research.
8. Respondents they are less than 20 years are not counted in research for the accurate results.

9. Less than 15 year of residence at wah cantt people data is also not included in research.

4.3.1 Ethno Botanical Data

During survey, total 82 plant species have been reported by local people who belong to 37 different families 4.2, 4.3. The most documented families were Solanaceae, Rosaceae (6 species) each, followed by Fabaceae, Amaranthaceae (5species) each, Brassicaceae(4species), Asparagaceae, Myrtaceae, Rutaceae, Moraceae, Poaceae, Euphorbiaceae(3species) each, Lamiaceae, Amaryllidaceae, Melliaceae, Apiaceae, Areaceae, Asteraceae (2 species) each, while rest of families have only one species (Figure 4.24).

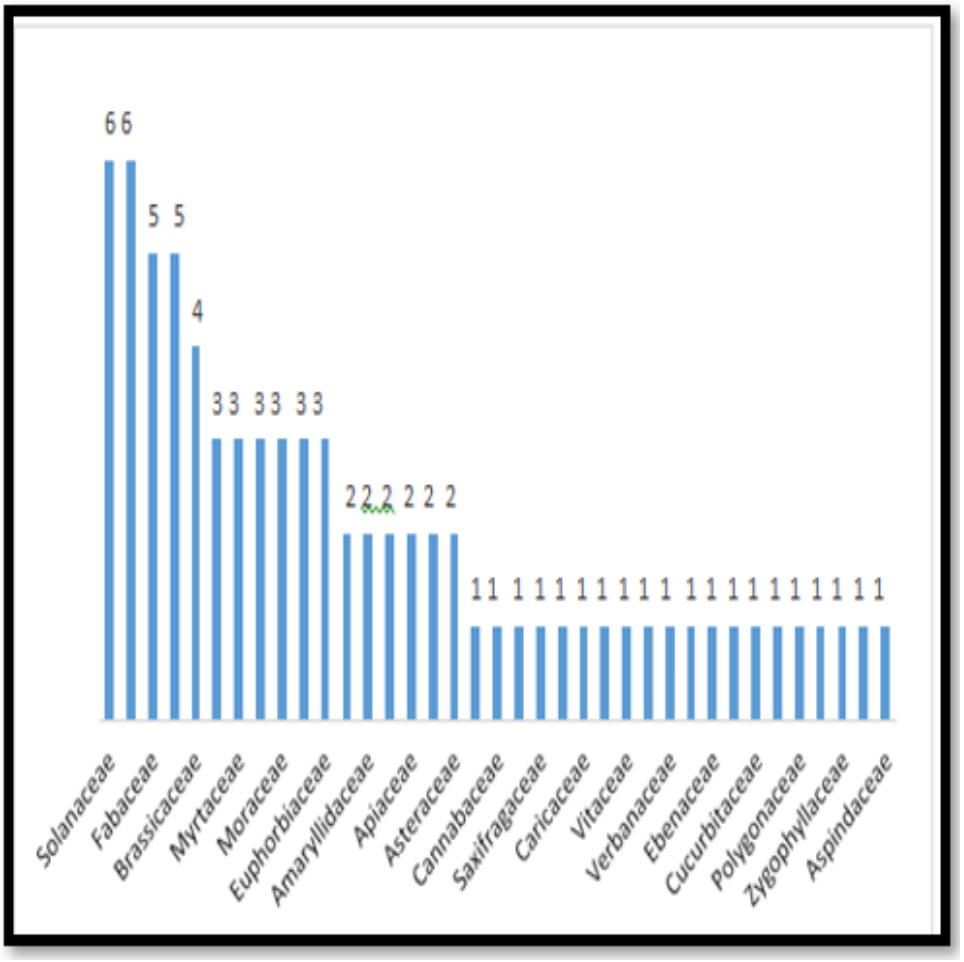

FIGURE 4.24: Family value Index

Table 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Phulai	*Acacia modesta*	Fabaceae	Stem	Direct
Puthkanda	*Achyranthus aspera*	Amaranthaceae	Leaves, root and stem	Direct, leaves decoration And ash.
Piaz	*Allium cepa*	Alliaceae	Whole plant	Direct
Lehsan	*Allium sativum*	Alliaceae	Bulb	Powder
Kohrghandal	*Aloe vera*	Alliaceae	Whole plant	Gel, Direct cooked
Cholai	*Amaranthus viridus*	Amaranthaceae	Whole plant	Cooked
Piazi	*Asphodelus tenufolius Cavan*	Liliaceae	Whole plant	Powder
Jhangli jai	*Avena fatua*	Poaceae	Seeds	Powder
Neem	*Azadirachta indica*	Meliaceae	Leaves, gum, Seed	Direct
Zakhm-e-hayat	*Bergenia ciliiata*	Saxifragaceae	Leaves	Direct

TABLE 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Chukandar	*Beta vulgaris*	Amaranthaceae	Under ground stem	Direct
Sarso	*Brassica compestris*	Brassicaceae	Whole plant	Oil
Shaljum	*Brassicarapa*	Brassicaceae	underground stem	Direct
Ak	*Calatropis procera*	Asclepiadaceae	Milky sap	Sap
Bhang	*Cannabis sativa*	Cannabaceae	Leaves, stem	Decoction, powder
Papeeta	*Carica papaya*	Caricaceae	Leaves, fruits	Paste
Pohli	*Carthamus oxycantha*	Asteraceae	Leaves and seeds	Decoction
Chattri	*Cepseella bursa-pestoris*	Brassicaceae	Whole plant	Direct
Bathu	*Chenopodium album*	Amaranthaceae	Whole plant	Cooked
Cheebar	*Citrullus lanatus*	Cucurbitaceae	Fruit	Pulp
Lemon	*Citrus limon*	Rutaceae	Fruit	Juice
Chakotra	*Citrus maxima*	Rutaceae	Fruit	Direct
Malta	*Citrus sinensis*	Rutaceae	Fruit peel	Powder

Table 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Kacha-Aloo	*Colocasia esculenta*	Areaceae	underground stem	Cooked
Lehli	*Convolvulus arvensis*	Convolvulaceae	Whole plant	Paste
Dhania	*Coriandrum sativum*	Apiaceae	Whole plant	Extract
Ghass	*Cynodon dactylon*	Poaceae	Whole plant	Extract
Datura	*Datura stramonium*	Solanaceae	Leaves	Extract
Amlok	*Diospyrus lotus*	Ebenaceae	Fruit	Direct
Lokat	*Eribotrya japonica*	Rosaceae	Leaves and fruits	Decoction
Safeeda	*Eucalyptus oblique*	Myrtaceae	Leaves	Decoction
Chatridodhal	*Euphorbia hellioscopia*	Euphorbiaceae	Whole plant	Sap
Hazarbooti	*Euphorbia prostrata*	Euphorbiaceae	Whole plant	Cooked
Anjeer	*Ficus carica*	Moraceae	Fruits	Decoction
Chatarpapra	*Fumaria indica*	Fumariaceae	Whole plant	Direct
Falsy	*Grewia asiatica*	Malvaceae	Leaves, Seeds	Joshanda, paste, juice, powder

Table 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Motia	*Jasminium sambac*	Oleaceae	Flowers	Direct
Punch Phuli	*Lantana camara*	Verbanaceae	Whole plant	Sap
Matri/ jhangli matter	*Lathyrus aphaca*	Fabaceae	Un ripe Seeds	Direct
Leechi	*Litchi Chinensis*	Sapindaceae	Fruit	Direct
Sonchal	*Malva sylvestris*	Malvaceae	Stem and Leaves	Decoction
Aam	*Mangifera indica*	Anacardiaceae	Fruit and seeds.	Powder, paste
Gul e Bashi	*Mirabilis jalapa*	Nyctaginaceae	Flower	Paste
Dhareek	*Melia azedarach*	Meliaceae	Tips of new born	Direct
Podeena (Mint)	*Mentha arvensis*	Lamiaceae	Whole plant	Decoction, Direct
Shahtoot	*Morus alba*	Moraceae	Fruit	Direct
Kalatoot	*Morus nigra*	Moraceae	Fruit	Decoction
Gul-e-nargis	*Narcissus pseudonarcissus*	Amaryllidaceae	Leaves, Bulb	Paste

TABLE 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Niaz-boow	*Ocimum basilicum*	Lamiaceae	Leaves	Direct
Khattibooti	*Oxalis corniculata*	Oxalidaceae	Leaves and roots	Direct
Kaali Jhaari	*Parthenium hysterophorus*	Asteraceae	Whole plant	Decoction
Dumbi sitti	*Phalaris minor*	Poaceae	Leaves and seeds	Jhoshanda, porridge
Kachnar	*Phanera veriegata*	Fabaceae	Bark, Flower, Pods	Direct/ powder
Khajoor	*Phoenix dactylifera*	Areaceae	Fruit	Direct
Kulfa	*Portulaca oleraceae*	Portulacaceae	Whole plant	Cooked
Khobani	*Prunus armeniaca*	Rosaceae	Fruit	Direct
Alu Bukhara	*Prunus domestica*	Rosaceae	Leaves and fruit	Joshanda
Amrood	*Psidium guajava*	Myrtaceae	Leaves	Sap
Anaar	*Punica granatum*	Lythraceae	Flowers, Fruit	Powder, juice
Nashpati	*Pyrus communis*	Rosaceae	Fruit, Seeds	Direct powder

Table 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Saib	*Pyrus malus*	Rosaceae	Fruit	Direct
Mooli	*Raphanus sativus*	Brassicaceae	Whole plant	Direct
Arind	*Ricinus communis*	Euphorbiaceae	Roots and Leaves	Decoction And Powder
Ghulab	*Rosa indica*	Rosaceae	Petals	Direct
Jangli Palak	*Rumex dentatus*	Polygonaceae	Whole plant	Powder
Tamator	*Solanum lycopersicum*	Solanaceae	Fruit	Juice
Kandiyari mokri	*Solanum surrettense*	Solanaceae	Leaves fruit	Decoction
Aloo	*Solanum tuberosum*	Solanaceae	Tuber	Direct
Kachmach	*Solanum villosum*	Solanaceae	Leaves, Stem	Decoction
Dhodal	*Sonchus asper*	Asteraceae	Whole plant	Infusion
Palak	*Spianci aoleracea*	Amaranthaceae	Leaves	Cooked

TABLE 4.2: a)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Scientific Name**	**Family**	**Plant Part Used**	**Mode of Utilization**
Jaman	*Syzygium cumini*	Myrtaceae	Leaves, Fruit	Sap, powder
Ajwain	*Trachyspermum Ammi*	Apiaceae	Seeds	Decoction
Itsit	*Trianthema portulacastrum*	Aizoaceae	Leaves	Cooked
Keekar	*Vachellianilotica*	Fabaceae	Leaves, Bark and pods	Decoction,powder
Paakhar/bakhra	*Tribulu sterrestris*	Zygophyllaceae	Roots and Fruit	Powder
Meethi	*Trigonella foenum*	Fabaceae	Whole plant	Cooked
Ghandam	*Triticum aestivum*	Poaceae	Grains	Flour
Angoor	*Vitus venifera*	Vitaceae	Fruit	Direct
Askan	*Withania coagulans*	Solanaceae	Fruit	Dried
Beeri	*Zizipus mauritiana*	Rhamaceae	Leaves, stem,fruits	Decoction, Fruit extract
Makai	*Zea mays*	Poaceae	Flowers and seeds	Decoction, paste

In the table below 4.3 the uses and mode of administration of the 82 plants were mentioned.

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Phulai	Direct	Bleeding gums and teeth, furniture, misvak	Oral
Puthkanda	Direct, leaves decoration And ash.	Bleeding gums, blood pressure, pain, piles, kidney stone, pneumonia, saag.	Oral
Piaz	Direct	Eye wash, kill abdominal worms, infection, vegetable, Salad.	External/ oral
Lehsan	Powder	Anti-inflammatory, fatigue	External /oral
Kohrghandal	Gel, Direct cooked	Allergy, soothing effects to bleeding gums, reduce yellowness of teeth, anti-fungal, anti-bacterial, prevents from acne pain, Ornamental.	External/ oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Cholai	Cooked	Women diseases, irregular menstrual	Oral
Piazi	Powder	Stomach disorders, peptic ulcer.	Internal /oral
Jhangli jai	Powder	Lowers cholesterol level, nutrient and fibers rich, skin treatments, cholera, fodder, reduce wheat Production.	External /oral
Neem	Direct	Malaria, jaundice, pain of bones and joints, block nasal pathway, furniture, shadow. Anti-inflammatory,	External /oral and nasal
Zakhm-e-hayat	Direct	reduce pain, give opening To Pus filled skin areas, ornamental.	External

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Chukandar	Direct	Diabetes, salad, Nutrients rich cooking oil, pickle, anti-dandruff, skiN treatment, joints pain, stomach acidity, redness of mouth, surgical wounds, water proof barrier during bath after surgery, anti-fungal, anti-septic, cholesterol level maintainace, ear pain, saag, fodder	Oral
Sarso	Oil		External /oral
Shaljum	Direct	Control blood sugar level, diuretic.	Oral
Ak	Sap	Insects bite, redness on skin, jaundice, highly allergic.	External

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Bhang	Decoction, powder	Cholera, bloody stool, abdominal pain, colic, fuel and building material.	Oral
Papeeta	Paste	Dengue Fever, expectorant, gastric discomfort, tumors of breast, ornamentals as well as fruiting.	External
Pohli	Decoction	Jaundice, dysentery, reduce wheat production.	Oral
Chattri	Direct	Urinary track diseases, infection, stop bleeding.	External and internal
Bathu	Cooked	Anti-bacterial, saag, constipation, thoracic ulcer, urinary problem and stones, forage.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Cheebar	Pulp	Digestive problems, purgative, lethal, fruits	Oral
Lemon	Juice	Expelling fish bone from pharynx.	External/ oral
Chakotra	Direct	Diabetes, maintain sugar level, constipation, fruiting plant.	Internal /oral
Malta	Powder	Face wash, fruiting and shadow, ornamental, Dry peel used in dishes.	External /oral
Kacha-Aloo	Cooked	Constipation, intestinal diseases, tonic for patient, vegetable.	Oral
Lehli	Paste	Wound bleeding, Reduce pain.	External
Dhania	Extract	Kidney stone, cooling effects, digestive problems, chuttnies,	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Ghass	Extract	Reduce sense of thirst, epilepsy, blood diseases.	Internal /oral
Datura	Extract	Depression, addictive, highly allergic in nature.	External
Amlok	Direct	Fiber rich, intestinal ulcer, constipation, shadow.	Oral
Lokat	Decoction	Digestive problems, Blood purifier, diabetes, diarrhea, depression, vomiting, fuel and shadow.	Internal /oral
Safeeda	Decoction	Block nasal cavity, remove mucous and sputum, fuel.	Nasal

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Chatridodhal	Sap	Anti-septic, warts, poisonous, no other common use.	External
Hazarbooti	Cooked	Saag, constipation, digestive problems, no other common use.	Oral
Anjeer	Decoction	Whooping Cough, menses, fruits, shadow, furniture.	Oral
Chatarpapra	Direct	Liver disorders, cooling effects in jaundice, anti-allergic, cooking as saag but not common.	External /Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Falsy	Joshanda, paste, juice, powder	Jaundice, expel worms Of intestine, relief in pain, fuel.	External oral
Motia	Direct	Ornamental, Itar formation	External
Punch \Phuli	Sap	Wounds, boils, warts, allergic.	External
Matri/ jhangli matter	Direct	Cooked as garden peas, ripened form in addictive, common in wheat season, dried pods are toxic.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
		Sunburn,	
Leechi	Direct	Fruit and shadow.	Oral
Sonchal	Decoction	Digestive problems, saag.	Oral
Aam	Powder, paste	Kidney stone, pain of teeth and gum, Insect and dog bite, stool, Intestinal strength, Fruit and shadow, used in pickles and fuel.	Oral
Gul e B ashi	Paste	Pus filled wounds, saag.	External
Dhareek	Direct	Remove acne, shadow, furniture fuel.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Podeena (Mint)	Decoction, Direct	Abdominal pain and vomiting, pimples, stomach problems, kidney stones, facial acne, chutneys, mouth blisters, allergy.	External /oral
Shahtoot	Direct	Sore throat, flu, chest discomfort, forage, shadow.	Oral
Kalatoot	Decoction	Fever and flu, cough, bronchial dilator.	Oral
Gul-e-nargis	Paste	Healing wounds, ornamental.	External
Niaz-boow	Direct	Anti-cancerous, aromatic, ornamental.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Khattibooti	Direct	Dry skin, appetizer, warts, Cholera and no other common use.	External /oral
Kaali Jhaari	Decoction	Fever, Highly allergic.	Oral
Dumbi sitti	Jhoshanda, porridge	Cough, cholera and diarrhea, fodder, reduce wheat crop production.	Oral
Kachnar	Direct/ powder	Vegetable, High blood pressure, anti-allergic, blood purifier, adverse insect bite, spiritual effects.	Oral
Khajoor	Direct	Cough, Heart attack tonic for week patients	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Kulfa	Cooked	Remove waste material from liver, stomach tonic, lowers sense of thirst in diabetes, saag.	Oral
Khobani	Direct	Liver disorders, Planted for fruit.	Oral
Alu Bukhara	Joshanda	Flu, constipation, lubricate intestine, gum and fruits.	Oral
Amrood	Sap	Abdominal Pain, cholera, fruiting and shade.	Oral
Anaar	Powder, juice	Stop teeth bleeding and removal of yellowness, jaundice, fuel and fruit.	External /oral
Nashpati	Direct powder	Digestion, heart diseases, fruit.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Saib	Direct	Constipation, anemia, pregnancy, fuel and fruits.	Oral
Mooli	Direct	Stomach and liver diseases, jaundice, stomach discomfort, constipation, piles, obesity, asthma, bronchial dilator, skin treatment, insect bite, Salad.	Oral
Arind	Decoction and Powder	Jaundice, Expel worms Of intestine, Relief in pain, fuel.	External/oral
Ghulab	Direct	Maintain blood sugar, ritual, aromatic, itar, Ornamental.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Jangli Palak	Powder	Asthma, Skin diseases, saag	External/oral
Tamator	Juice	Face wash, acne,	External/oral
Kandiyari mokri	Decoction	Expel intestinal worms, Teeth pain, Reduce crop production.	Oral
Aloo	Direct	Reduce pain in burn injury, vegetable, full of nutrients.	External/oral
Kachmach	Decoction	Constipation, Indication of rabbits in particular area.	Oral
Dhodal	Infusion	Infusion used as drink, Febri fuge, allergic.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Palak	Cooked	Anemia, anti-cancerous, anti-oxidant, reduce highly blood pressure, boost immune system, saag.	Oral
Jaman	Sap, powder	Abdominal pain, cholera, pain and bleeding of teeth, diabetes, maintain sugar level, fruits and shadow.	Oral
Ajwain	Decoction direct	Stomach disorders, Peptic ulcer, diarrhea, bloody stool, fever, pickles and dishes.	Oral
It sit	Cooked	Saag, kidney and urinary track diseases.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Keekar	Decoction, powder	Dysentery, Kidney pain, Bleeding gums, fuel.	Oral
Paakhar /bakhra	Powder	Digestive and urinary track disorders, Whooping cough, thorns cause severe pain and bleeding.	Oral
Meethi	Cooked	Hair fall, make hairs healthy, used in curries, asthma, used by bodybuilders, diabetes, reduce chance of infection.	Oral
Ghandam	Flour	Cholera, abdominal diseases, cereal, fodder, skin treatments.	Oral

TABLE 4.3: (b)Ethno medicinal data of Wah cantt, tehsil Taxila, District Rawalpindi.

Common Name / Local Name	**Mode of Utilization**	**Uses**	**Mode of Administration**
Angoor	Direct	Constipation, measles, chicken pox, cough, make body and brain healthy, ornamental, fruit.	Oral
Askan	Dried	Digestive and liver disorders, cooked as saag.	Oral
Beeri	Decoction, Fruit extract	Falling hairs, expel intestinal worms, ritual uses, furniture.	external/oral
Makai	Decoction, paste	Boils, measles, fever, reduce wheat production.	Oral.

It was observed that among 82 species there were leaves of 25 species were used, followed by fruits of 23 species, 19 whole plant species, seeds of 12 species, stem

or bark and flower of 07 species, roots of 03 species, pods and sap of 02 species and oil of one species were used in health and other uses (Figure 4.25).

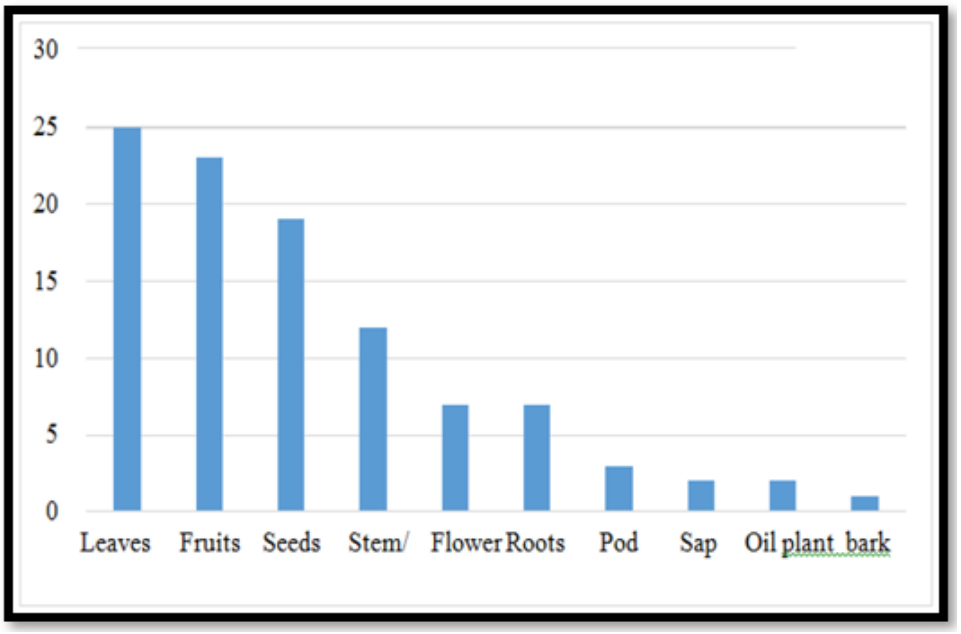

FIGURE 4.25: Number of species of particular part used

Below mentioned plant parts were used in different preparations. Most common methods were direct 30species, decoction 16 species, powder 15 species, cooked 09 species, paste 07 species and extract 04 species (Figure 4.26).

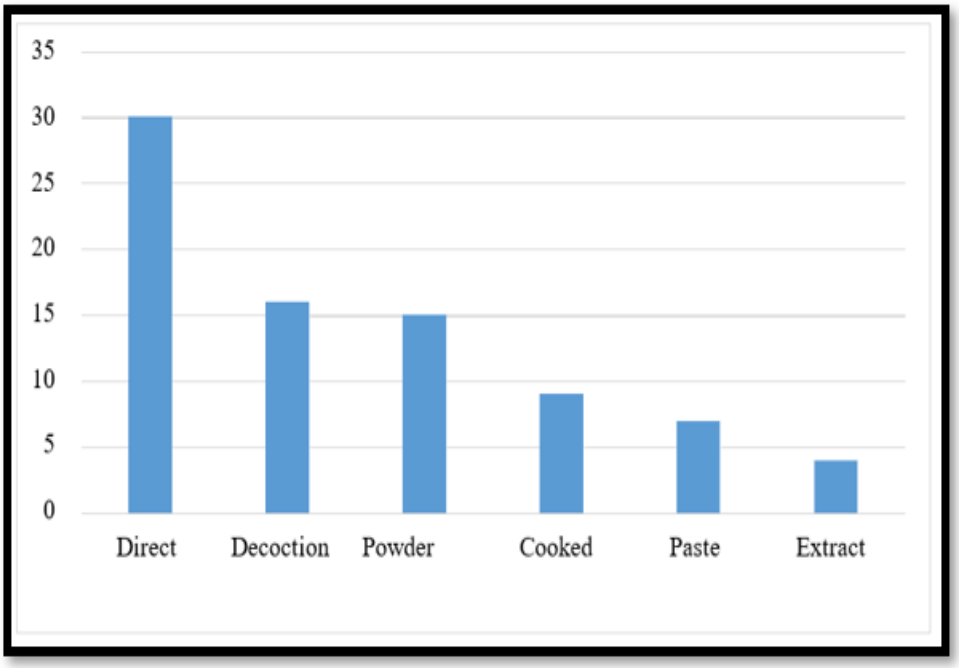

FIGURE 4.26: Mode of Utilization.

4.3.2 Medicinal Plant Diversity

There were many medicinal and economical important plant species which are also reported by Ahmad in neighboring area Kala Chitta hills of Potowar region. Most of the new age people were unfamiliar with the uses of local plant species but old people have immense knowledge. Other than medicinal uses people also used these species for other purposes. Among these uses, 42% for food, 10% ornamental, 09% shadow, 08% others, 07% fodder, for age, fuel each, 06% toxic, 5% no common use other than medicinal, 04% for building/ furniture and 02% were ritual uses (Figure 4.27).

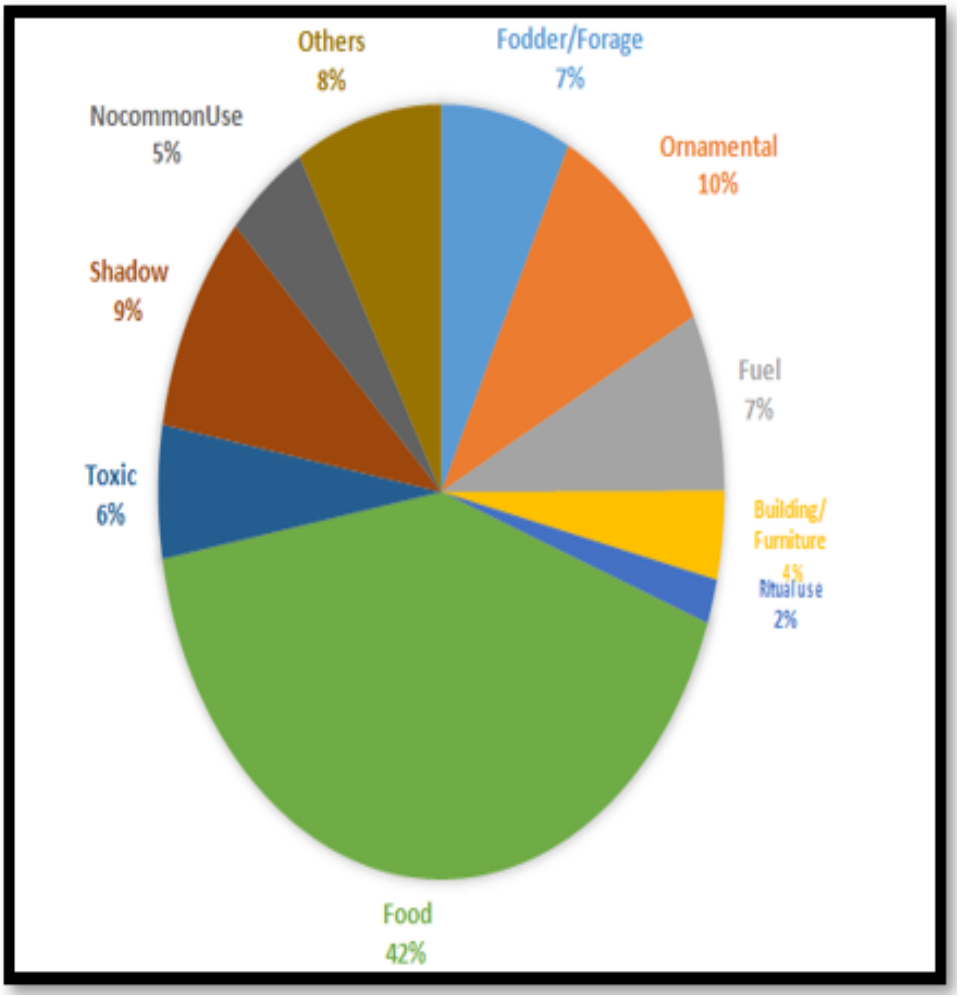

FIGURE 4.27: Percentage of different uses of Plants by local communities of Wah Cantt Tehsil Taxila.

These species were diverse in nature. By the habit, there were 51(62.19%) herbs, 25 (30.48%) trees and 06 (7.31%) shrubs (Figure 4.28).

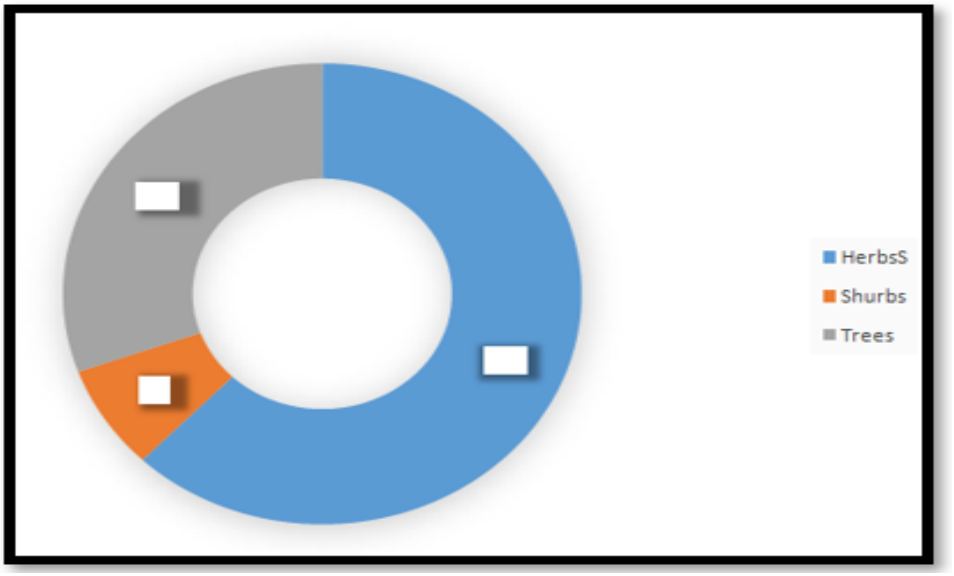

FIGURE 4.28: Habits of Plants.

There were 51% cultivated and 49% wild species (Figure 4.29).

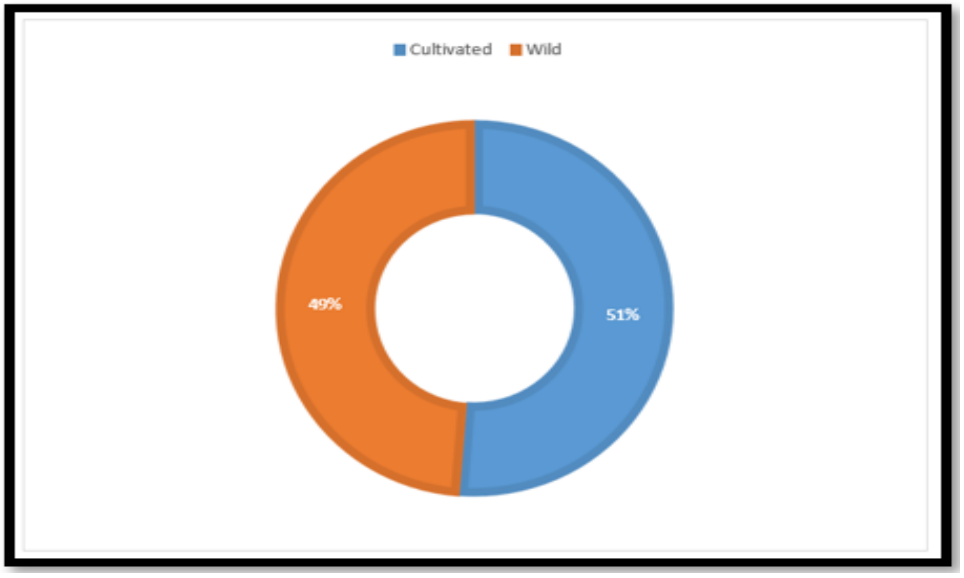

FIGURE 4.29: Habits of Plants.

4.3.3 Statistical Data of Relative Frequency

As mentioned above that there were 82 documented species. All species were highly medicinal. These species were used externally, orally and internally. Among these species there were 17 species which are used against digestive problems followed by skin treatment, stomach, bleeding gums and teeth (09 species), cholera,

bronchial diseases, jaundice (07 species), kidney disorders, constipation and diabetes(06 species), allergy, wound healing, intestinal worms, colic, abdominal pain (06species), blood diseases, insect bite (05 species), obesity, ulcer, fever, liver diseases (04species), cough, asthma, falling hairs, warts (03species), piles, cancer, depression, pregnancy (02species) each. Modern people diagnose their diseases in modern laboratories however most of the communities prefer herbal medication by signs and symptoms (Figure 4.30) and (4.31).

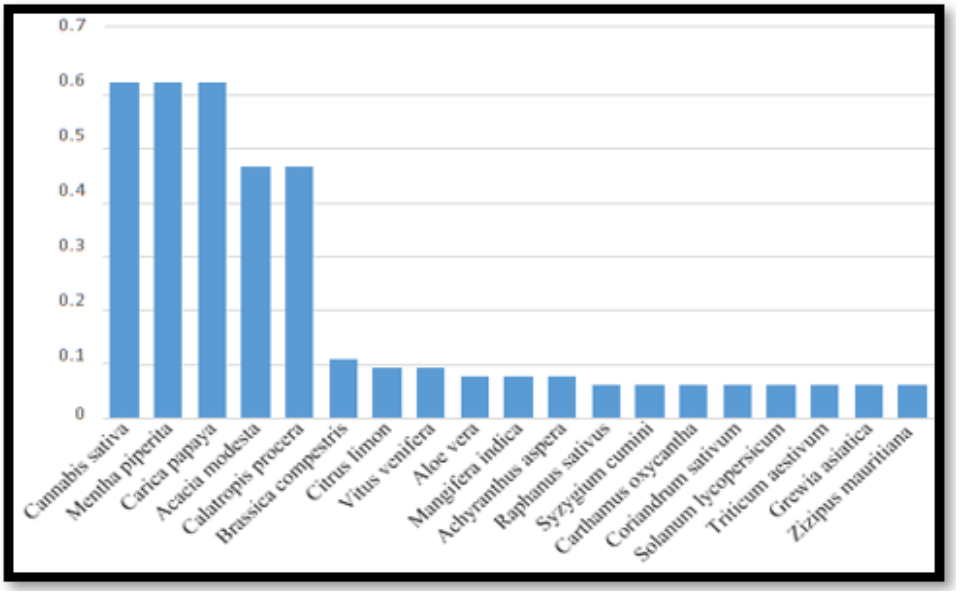

FIGURE 4.30: Data showing the Highest RFC value for 20 plants.

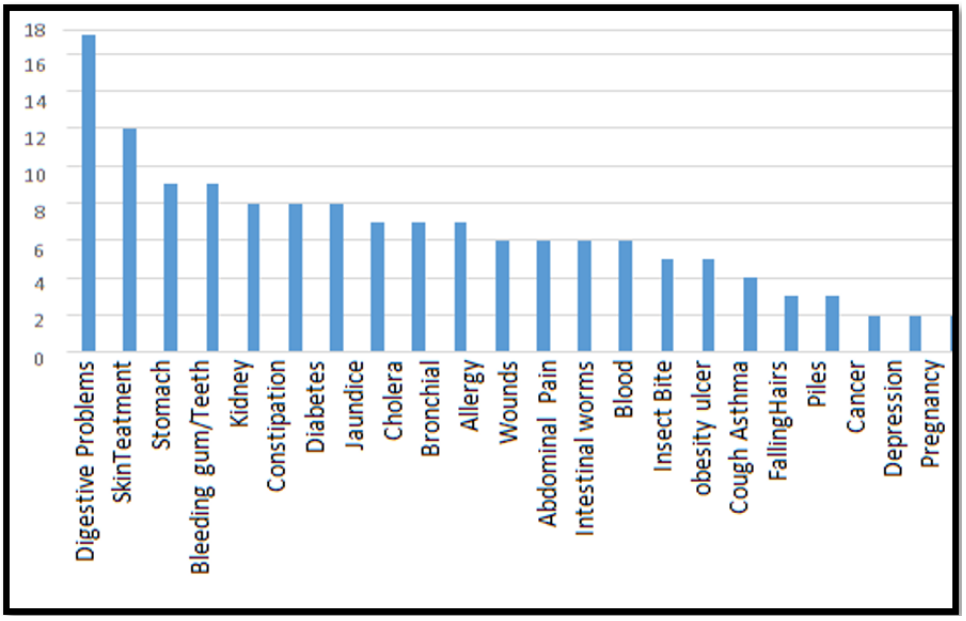

FIGURE 4.31: Different diseases treated by plant species

4.4 Data on Quantitative Ethno Medicinal Uses

4.4.1 Relative Frequency of Citation and Use Value

Quantitative ethno medicinall information in the study area have been analyzed using quantitative indices. Highest value of relative frequency citation (RFC) ranked *Cannabis sativa*, *Carica papaya*, *Mentha arvensis* (0.625) each, first followed by *Calatropis procera*, *Acacia modesta* (0.468) each, second *Brassica compestris* (0.109) third, *Citrus limon*, *Vitus vinifera* (0.093) each, forth *Aloe vera*, *Mangiferaindica*, *Acryanthus aspera* (0.078) at last. In addition to RFC, quantitative data related to use value (UV) have also been calculated. There were 20 most used species in the local area. Among these, *Azadirachta indica*, *Oxalis corniculate* (04) both have highest use value, followed by *Raphanus sativus* (3.5) stood at second, *Acaciamodesta* (3.333) third, *Brassica compestris* (3.142) third and *Phaneraveriegata* (3.00) at fourth position. Leaves and seeds of *Azadirachtaindica* used in malaria, jaundice, pain of bones and joints, block nasal pathway, making furniture and planted for shadow. Leaves of plant can also be used as forage for animals. Arshad et al. [6] reported this plant with dissimilar use during the ethnobiological studies at Kalla Chitta hills of pothwar region. They reported that leaves of plant used in case of blood purification.

The value of RFC ranging from 0.625 to 0.015. The highest RFC plant species was *Cannabis sativa* and the lowest ranked species was *Trachyspermum ammi*. Like this, the highest use value (UV) ranging from 04 to 01. *Azadirachta indica* comprised highest UV (04) and *Asphodelustenuifolius Cavan* comprised lowest UV (01).

4.4.2 Person Correlation Coefficient

The person correlation coefficient is used to find nature of linear relationship between RFC and UV and it‘s numerical value was found to be 0.263 with P-value below 1% (0.17). This relationship was providing an evidence of positive significant

association between local importance of each species and the relative importance of animal use. It means that greater the use of species by the people tend to increase the number of useful fauna. The patterns across the species were matching that's why RFC and UV were positively correlated. However, the values of RFC and UV across some species were different. Some have high RFC and UV and some vice versa. This variation across species was numerically calculated by r2 which states that about 68.9% variations in RFC can be correlated by that of UV 4.4. In this table PC stand for Pearson correlation.

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Phulai	Acacia modesta	Fabaceae	3	0.468	3.333	3
Puthkanda	Achyranthus aspera	Amaranthaceae	5	0.078	1.4	2
Piaz	Allium cepa	Alliaceae	1	0.015	1	3
Lehsan	Allium sativum	Alliaceae	2	0.031	3	3
Kohr ghandal	Aloe vera	Alliaceae	5	0.078	2.4	2
Cholai	Amaranthus viridus	Amaranthaceae	2	0.031	2	2
Piazi	Asphodelus tenuifolius Cavan	Liliaceae	1	0.015	1	2
Jhangli jai	Avena fatua	Poaceae	3	0.046	1.333	3

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Neem	Azadirachta indica	Meliaceae	2	0.031	4	3
Zakhm-e-hayat	Bergenia ciliiata	Saxifragaceae	2	0.031	1.5	2
Chukandar	Beta vulgaris	Amaranthaceae	2	0.031	2	3
Sarso	Brassica compestris	Brassicaceae	7	0.109	3.142	5
Shaljum	Brassica rapa	Brassicaceae	3	0.046	2.333	2
Ak	Calatropis procera	Asclepiadaceae	3	0.468	1.333	2
Bhang	Cannabis sativa	Cannabaceae	4	0.625	2.25	3
Papeeta	Carica papaya	Caricaceae	4	0.625	1.5	3
Pohli	Carthamus oxycantha	Asteraceae	4	0.062	2	2
Chattri	Cepseella bursa-pestoris	Brassicaceae	1	0.015	3	1
Bathu	Chenopodium album	Amaranthaceae	3	0.046	2	3
Cheebar	Citrullus lanatus	Cucurbitaceae	1	0.015	3	3

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Lemon	Citrus limon	Rutaceae	6	0.093	1.666	5
Chakotra	Citrus maxima	Rutaceae	3	0.046	1.333	2
Malta	Citrus sinensis	Rutaceae	2	0.031	2.5	5
Kacha-Aloo	Colocasia esculenta	Areaceae	2	0.031	2	2
Lehli	Convolvulus arvensis	Convolvulaceae	3	0.046	1	2
Dhania	Coriandrum sativum	Apiaceae	4	0.062	1.75	3
Ghass	Cynodon dactylon	Poaceae	2	0.031	2.5	3
Datura	Datura stramonium	Solanaceae	2	0.031	1.5	3
Amlok	Diospyrus lotus	Ebenaceae	1	0.015	3	4
Lokat	Eribotrya japonica	Rosaceae	3	0.046	3	3
Safeeda	Eucalyptus oblique	Myrtaceae	2	0.031	2	2
Chatri dodhal	Euphorbia hellioscopia	Euphorbiaceae	2	0.031	2.5	2
Hazar booti	Euphorbia prostrata	Euphorbiaceae	2	0.031	1.5	2

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Anjeer	Ficus carica	Moraceae	3	0.046	1.666	3
Chatar papra	Fumaria indica	Fumariaceae	2	0.031	3	2
Falsy	Grewia asiatica	Malvaceae	4	0.062	1.75	2
Motia	Jasminium sambac	Oleaceae	1	0.015	2	2
Punch Phuli	Lantana camara	Verbanaceae	2	0.031	2	1
Matri/ jhangli mattar	Lathyrus aphaca	Fabaceae	2	0.031	2.5	3
Leechi	Litchi Chinensis	Sapindaceae	2	0.031	1	3
Sonchal	Malva sylvestris	Malvaceae	2	0.031	2	2
Aam	Mangifera indica	Anacardiaceae	5	0.078	2.4	5
Gule bashi	Mirabilis jalapa	Nyctaginaceae	2	0.031	1.5	2
Dhareek	Melia azedarach	Meliaceae	2	0.031	2	4
Podeena	Mentha arvensis	Lamiaceae	5	0.625	1.6	3

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Shahtoot	Morus alba	Moraceae	2	0.031	3	3
Kalatoot	Morus nigra	Moraceae	3	0.046	3	3
Gul-e-nargis	Narcissus pseudonarcissus	Amaryllidaceae	2	0.031	1	2
Niaz-boow	Ocimum basilicum	Lamiaceae	2	0.031	1.5	3
Khatti booti	Oxalis corniculata	Oxalidaceae	1	0.015	4	1
Kaali Jhaari	Parthenium hysterophorus	Asteraceae	2	0.031	1.5	2
Dumbi sitti	Phalaris minor	Poaceae	2	0.031	2	3
Kachnar	Phanera veriegata	Fabaceae	3	0.046	3	3
Khajoor	Phoenix dactylifera	Areaceae	3	0.046	2	2
Kulfa	Portula caoleraceae	Portulacaceae	2	0.031	3	2
Khobani	Prunus armeniaca	Rosaceae	2	0.031	1.5	2
Alu Bukhara	Prunus domestica	Rosaceae	4	0.062	1.5	2

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Amrood	Psidium guajava	Myrtaceae	2	0.031	2.5	3
Anaar	Punica granatum	Lythraceae	3	0.046	2.5	3
Nashpati	Pyrus communis	Rosaceae	1	0.015	3	2
Saib	Pyrus malus	Rosaceae	3	0.046	1.333	3
Mooli	Rapha nussativus	Brassicaceae	4	0.062	3.5	2
Arind	Ricinus communis	Euphorbiaceae	4	0.062	1.25	2
Ghulab	Rosa indica	Rosaceae	2	0.031	1.5	5
Jangli Palak	Rumex dentatus	Polygonaceae	2	0.031	2	2
Tamator	Solanum lycopersicum	Solanaceae	4	0.062	1.75	3
Kandiyari/ Mokri	Solanum surrettense	Solanaceae	3	0.046	1.666	2
Aloo	Solanum tuberosum	Solanaceae	1	0.015	2	3
Kachmach	Solanum villosum	Solanaceae	2	0.031	1.5	2

TABLE 4.4: Quantitative data of plants recorded from Wah cantt tehsil Taxila.

Common Name/ Local Name	**Scientific Name**	**Family**	**FC**	**PC RFC**	**PC UV**	**UVI**
Dhodal	Sonchus asper	Asteraceae	1	0.015	3	3
Palak	Spianciao leracea	Amaranthaceae	3	0.046	2.5	2
Jaman	Syzygium cumini	Myrtaceae	4	0.062	2	3
Ajwain	Trachyspermum ammi	Apiaceae	1	0.015	3	3
Itsit	Trianthema portulacastrum	Aizoaceae	2	0.031	3	2
Paakhar/ Bakhra	Tribulus terrestris	Zygophyllaceae	3	0.046	2.333	2
Meethi	Trigonella foenum	Fabaceae	4	0.062	1.25	2
Ghandam	Triticum aestivum	Poaceae	4	0.062	1.75	3
Keekar	Vachellia nilotica	Fabaceae	2	0.031	2.5	2
Angoor	Vitus venifera	Vitaceae	6	0.093	1.333	3
Askan	Withania coagulans	Solanaceae	2	0.031	1.5	2
Beeri	Z. mauritiana	Rhamaceae	4	0.062	1.5	4
Makai	Zea mays	Poaceae	2	0.031	2.5	2

4.5 Comparative Analysis with Ethno Literature

Ethnobiological study has been done in Wahcantt Taxila Valley. However, (*Arshad et al.* [6] carried out an ethnobiological survey in neighboring Kalla Chitta hills of Pothwar region, district Attock. Their survey depicts strong connection with traditional uses of plants and animals. Ethno botanically they reported total 91 plant species. Among these species there were 29 same reported species as compare to this study. There were 26 species with similar uses and 03 species with dissimilar uses. Other 53 species of present study were not reported by them. There was 89.65% similarity between ethnobotanical uses of both regions. Ethnomedicinal study conducted by *Mahmood et al* [23] at Kalla Chitta hills also shows similar uses of plants with above mentioned survey and with ethnomedicinal uses of Taxila valley. This is due to same cultural and traditional values and practices. The results of *Gulshan et al.* [12] in the region of Dera Ghazi Khan, district Punjab also showed some close association with ethnomedicinal use of Taxila. It was very interesting that Convulvulusarvensis have different uses in above mentioned three areas. In Kalla Chitta hills region, it used against blood diseases, constipation and cooked as saag. In Dera Ghazi Khan, it used as cooling drink and for digestive problems. In Taxila, it is only used for stop bleeding from wounds.The findings of ethnobotanical survey of spring plants at District Dir (lower) Khyber Pakhtunkhwa were also in close association with our results [40]. Results of ethnobotanical survey at Jandool valley, Dir lower also confirmed similarities with our study [41].They also documented that most of the used life form was herbaceous and the leaves are highly consumed part. This showed most of similarities with our findings with special reference to our neighboring country India, they also reported similar ethnobotanical and ethnomedicinal uses [42].

Most of the religious uses of animal show unique and strong link between the Muslims of different areas. However, other ritual practices are also present in different communities. The survey conducted in Hunza reported special ritual practice which is known as *Bitan* and here ethnobiological practices are very common [43]. In contrast, the study in the Margallah Hills National park, Islamabad

amazingly showed minor close association with our study. It was due to great diversity present at the Margallah hills.Fruit is the most frequent part used but medicinal use at high rate is similar with our results [44]. The study conducted in our neighboring country Indian forests of Rajasthan show least indices of similarity. The findings in Tian Mu Shan Biosphere reserve, Zhejiang province, China show least association of similar use index. An ethno zological study conducted in Mount of Abu Wildlife Sanctury, India documented different animal species but most similar uses like medicinal and food. This is due to different diversity, culture and traditional values of local communities. Quantitative ethnobiological results of present study show most of the new facts which allow performing further practices on the study area. The detail comparison of local and other scientist is describe in Appendix 3 table 5.3.

4.6 Threats to Biodiversity and Indigenous Knowledge in Wah Cantt Tehsil Taxila

The most famous Grand Trunk road (G.T road) is passing from the main Taxila city. It is a center of trade and education. It connects district Rawalpindi (Punjab) to district Attock (Punjab). All political and economic activities are at peak level. Area is surrounding by Industrial network including Hattar Industrial estate, Pakistan Ordinance Factories, Heavy Industries and Heavy Mechanical complex Taxila, Askari and Fauji Cement factories and many more. These industries exerted the huge pressure on the biodiversity of the area. Only in Hattar Industrial estate, there are 6634 registered industries in which 1228 are highly polluting [46].All industries open their waste water into open water bodies which results to death of land an aquatic life. Another most drastic activity is stone crushing from Margallah hills which destroys most of plant and animal species.

The activity of crushing is unchecked and a large area has been become barrel. Another activity is the commercialization and colonialization of the land. Both land and timber mafia depleted the natural resources. In recent five to ten years,

FIGURE 4.32: Crushing stones at Margallah Hills near Taxila Cantt

agriculture land shrink and different housing schemes used the land as a commercial plots. These new developed colonies also open their sewage water into natural water resources. Almost all natural resources surrounding the city become polluted. Although all modern medical facilities are available in the city but number of plant traders and herbalists are present in the area. Local communities depend upon indigenous knowledge which passed from generation to generation. But increase in commercialization the folk knowledge becomes endangered Our many informants were old age people. Young generation does not have any considerable knowledge about plants‘ and animals uses.

Chapter 5

Conclusions and Recommendations

Ethno-medicinal is the study of biological knowledge about plants, animals and their products. It allows to explore indigenous practices of people regarding health, culture, clothing, traditions and customs. By using the techniques of data collection, identification, specimen preserving we can predict hypothesis, test and apply statistical analysis. This study gives cultural association and importance of relationship among human beings, plants and animals. Present study was aimed to document an ethno- medicinal association at Wah cantt Tehsil Taxila valley, district Rawalpindi, Punjab. Ethno-medicinal data was collected by open ended and semi-structured questionnaires at gathering places, fellows, house wives, friends, agricultural land in local languages. During the study period (2022), 82 plant species were reported. Plant species were belonged to 37 different families. Among the families, the dominant families were Solanaceae, Rosaceae (6species) each, followed by Fabaceae, Amaranthaceae (5 species) each, Brassicaceae (4 species), Asparagaceae, Myrtaceae, Rutaceae, Moraceae, Poaceae, Euphorbiaceae (3 species) each, Lamiaceae, Amaryllidaceae, Melliaceae, Apiaceae, Areaceae, Asteraceae (2species) each, while rest of families have only one species. These reported species have been used in different categories e.g. food, fodder, furniture, ornamental, fuel, building material etc.. There were 17 species which

are used against digestive problems followed by skin treatment, stomach, bleeding gums and teeth (09species), cholera, bronchial diseases, jaundice (07species), kidney disorders, constipation and diabetes (06species), allergy, wound healing, intestinal worms, colic, abdominal pain (06 species), blood diseases, insect bite (05 species), obesity, ulcer, fever, liver diseases (04species), cough, asthma, falling hairs, warts (03species), piles, cancer, depression, pregnancy (02species) each. Modern people diagnose their diseases in modern laboratories however most of the communities prefer herbal medication by signs and symptoms. These species were diverse in nature.By the habit, there were 51 (62.19%) herbs, 25 (30.48%) trees and 06(7.31%) shrubs . There were 51% cultivated and 49% wild species. The collected data was transferred to excel sheet and quantitatively analyzed by using statistical techniques like FC, RFC, UV, UVI and FVI. It was found that some plant species has high RFC and UV like Cannabis sativa, Carica papaya, Mentha arvensis (0.625) each, first followed by textitCalatropis procera, textitAcacia modesta (0.468) each, second textitBrassica compestris (0.109) third, textitCitrus limon, textitVitus vinifera (0.093) each, forth textitAloe vera, textitMangifera indica, textitAcryanthus aspera (0.078) at last. There were 20 most used species in the local area. Among these, textitAzadirachta indica, textitOxalis corniculate (04) both have highest use value, followed by textitRaphanus sativus (3.5) stood at second, textitAcacia modesta (3.333) third, textitBrassica compestris (3.142) third and textitPhanera veriegata (03) at fourth position . The ranks shows that above mentioned species have highest value among inhabitants. RFC depends upon on the number of informants which mentioned the uses of species and directly depends upon frequency of citation (FC).

Recommendations:

- It is necessary to motivate the local communities to share their knowledge for socio-economic welfare.
- Government should make policies regarding biodiversity conservation.
- Less educated and untrained people should ban to collect any plant or animal species.

- Capturing and hunting of black and brown partridge should ban in the area.
- Beside this, crushing of Margallah hills should stop to conserve biodiversity as well as world heritage.
- Government should make policies regarding industrial units, against timber mafia and housing societies.

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An Appendix

5.1 Appendix 1

Table 5.1: Descriptive Statistics

	Mean	**Std.Deviation**	**N**
Relative Frequency of Citation	.04163	.020021	82
Use Value	2.03211	.771405	82

Table 5.2: Correlations

Sr. No	**Statements**	**Excellent**	**Very good**	**Good**	**Fair**	**Poor**
1	Medicinal plants solve problems like blood diseases, insect bite, obesity, ulcer, fever, liver diseases?					
2	*Carica papaya* (popeta) Delicious and Loaded With Nutrient is it helpful to Protects Against Skin Damage?					

Table 5.2: Correlations

Sr. No	Statements	Excellent	Very good	Good	Fair	Poor
3	Aloe barbadensis miller (Aloe vera) are the gel and latex. Aloe gel might help some skin conditions like psoriasis?					
4	Achyranthes Aspera is used in the treatment of asthma in facilitating delivery, bleeding, dropsy, cold, snake bite, scorpion bite, headache, and skin diseases?					
5	Medicinal plants solve different problems like digestive, skin, stomach, and teeth, cholera, bronchial diseases, jaundice, kidney disorders, constipation and diabetes?					

5.2 Appendix 2

I am a student of BIOSCIENCES department in CAPITAL UNIVERSITY OF SCIENCE & Technology, Islamabad. I am doing a research as a requirement of my degree program MS. Biosciences. My research topic is "Exploring threatened indigenous knowledge and quantitative ethno medicinal studies of the rare endemic flora of Wah Cantt,, Rawalpindi, Pakistan". Following are some questions kindly answers these questions honestly. All of information you will provide, will be used only for research purpose.

The question was available in the below link: https://docs.google.com/forms/d/e/1FAIpQLSdY42q-YtZVEfRS5jrdhDcHguBA8MEr2AIZAkmLX-MkWjJt-A/viewform?usp=sf_link

5.3 Appendix 3

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
A. modesta	Bleeding gums and teeth, furniture, misvak.	Sexual tonic, restaurant.
A. saspera	Bleeding gums, blood pressure, pain, piles, kidney stone	Abdominal pains, Ascites, Blood diseases, Bronchitis, Carminative and useful in treatment of Vomiting

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
A. cepa	Eye wash, kill abdominal worms, infection, vegetable, salad.	Gas trouble.
A. sativum	Anti-inflammatory, fatigue, Make healthy, anti-toxic, obesity, condiment, pickle.	Diuretic, expectorant, effective anti-septic, used in hyper tension and leprosy. Whooping cough, children cold cough. Spider bite.
Aloevera	Allergy, soothing effects to bleeding gums, reduce yellowness soft teeth, anti-fungal, anti-bacterial, prevents from acne pain, ornamental.	General pain, Wound antiseptic, Heart disease, gastritis, stomach diseases, dermatitis.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
A. viridus	Women diseases, Irregular menstrual cycle, saag.	-
Asphodelus tenuifolius Cavan	Stomach disorders, Peptic ulcer, No other common use.	-
A. fatua	Lowers cholesterol level, Nutrient and fibers rich, Skin treatments, cholera, fodder, reduce wheat production.	-
B. ciliiata	Anti-inflammatory, Reduce pain, Give opening to pus filled skin areas, ornamental.	-
B. vulgaris	diabetes, salad, nutrients rich	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
B. compestris	Cooking oil, pickle, anti-dandruff, skin treatment, joints pain, stomach acidity, redness of mouth, surgical wounds, water proof barrier during bath after surgery, anti-fungal, anti-septic, cholesterol level maintenance, ear pain, saag, fodder.	Young leaves and flowering tops were used as vegetable. Oil is extracted from seeds which are used in cooking, Massage Of body and hair, used ointment. Seed cakes locally known as Khal is obtained after extracting oil and are used as fodder for cattle. Use as fodder for animals. It provides high amount of vitamin and other nutrient which is anti-cancer. It helps to induce hypo thyroidism and goiter. It has antiviral, anti-bacterial properties.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
	Control blood sugar level, diuretic,	
B. rapa	Excessive amount can cause irritation in urinary track, vegetable.	-
		Anti-microbial activities, Asthma, Blood impurity,
	Insectsbite,	Bronchitis,
C.	Redness on skin,	Cough,
procera	jaundice,	Cold,
	highly allergic.	Diarrhea, Eczema, Fever, Filariasis, Glandular swellings
		Anti-diarrheal,
	Cholera,	Asthma,
	Bloody stool,	Cancer,
C.	abdominal pain,	Cystitis,
sativa	colic,	Diarrhea,
	fuel and building material.	Dysentery, Diuretic, Epilepsy.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
C. papaya	Dengue Fever, expectorant, gastric discomfort, tumors of breast, ornamental as well as fruiting.	Abdominal disorders, Amenorrhea, Atherosclerosis, Cancer, Dengue Fever, Diabetic, Diarrhea, Dysentery, Dyspepsia, Heart attacks, Heart Disease, High blood pressure, Hyper acidity, Malaria, Strokes, Wounds.
C. oxycantha	Jaundice, dysentery, reduce wheat production.	-
C. ellabursa-pestoris	Urinary track diseases, infection, Stop bleeding.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
C. album	Anti-bacterial, saag, constipation, thoracic ulcer, urinary problem and stones, forage.	Dysentery, Diarrhea and headache. Uses as vegetable and Fodder. Dry leaves are used to reduce pain. Plants are purgative. Oils are obtained from The seeds which is anthelmintic. Roots were heated with water and use for urinary diseases, Jaundice and rheumatism.
C. lanatus	Digestive problems, purgative, lethal, Fruits	-

Table 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
C. limon	Expelling fish bone from pharynx, mosquito bite, irritation, infection, heal sheels, ornamental, food, pickles, salad.	Juice taken as tonic.
C. maxima	Diabetes, Maintain sugar level, constipation, fruiting plant.	-
C. sinensis	Facewash, Fruting and shadow, ornamental, dry peel used in dishes.	-
C. esculenta	comstipation, intestinal diseases, tonic for patient, vegetable.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
C. sarvensis	Wound bleeding, reduce pain, forage.	Fodder for animals. Hairs are washed to remove dandruff from hairs. Use as dysentery and root is purgatives.
C. sativum	Kidneystone, Cooling effects, Digestive problems, chuttnies, condiment.	-
C. dactylon	Reduce sense of thirst, epilepsy, blood diseases.	Anti diabetic, Asthma, Brain tonic, Bronchitis, Carminative, Dysentery, Eye Disorders, Eczema, Fever, Heart tonic, Increasing the number of Red Blood cells, Leprosy.

Table 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
D. stramonium	Depression, addictive, higly allergic in nature.	Ache, Anemia, Asthma, Boils, Fever, Head ache, Glaucoma, Motion sickness, Rattle snake bites, Respiratory tract, Sores, Sprains, Swellings, Tooth ache, Tumors, Urinary difficulties, Urinary tract.
D. lotus	Fiber rich, Intestinal ulcer, constipation, shadow and fruit.	-
E. japonica	Digestive problems, Blood purifier, diabetes, diarrhea, depression, vomiting, fuel and shadow.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
E. oblique	Block nasal cavity, Remove mucous and sputum, fuel.	-
E. helioscopia	Anti-septic, warts, poisonous, no other common use.	It is poisonous and it can cause skin swelling. Seeds were given to cholera patients. Plants used as cathartics. Oil is obtained from the seeds which has purgative property. Root is an thelmintic. Milky juice is used for eruption.
E. prostrata	Saag, constipation, digestive problems, no other common use.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
F. carica	Whooping Cough, menses, fruits, shadow, furniture.	Fruits are used for eating purposes, use as fuel, fodder for animals, Young stems are used for finding water inside the earth, and Milky juice is use for warts to destroy it. Figs are regarded as nutritive, Emollient, demulcent and laxative, used for the cure of piles. Fresh leaves were crushed and boiled in milk.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
F. indica	Liver disorders, Cooling effects in jaundice, anti-allergic, cooking as saag but not common.	Vermifuge for cattle. Medicinally the plants were dried and powdered and used in coffee tea for fever and throat Infection and flue. It is anti-pyretic.
G. asiatica	Jaundice, Expel worms of intestine, Relief in pain, fuel.	-
J. sambac	Ornamental, Itar formation	-
L. camara	Wounds, boils, warts, allergic.	-
L. aphaca	Cooked as garden peas, rippened form in addictive, Common in wheat season, Dried pods are toxic.	-
L. Chinensis	Sun burn, fruit and shadow.	-

Table 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
M. vestris	Digestive problems, saag.	-
M. indica	Kidneystone, pain of teeth and gum, insect and dog bite, stool, intestinal strength, fruit and shadow, used in pickles and fuel.	Anti-allergic, Anti-bacterial, Anti-diabetic, Anti-parasitic, Antitumor, Anti-Viral, Colic, Diarrhea, Dysentery, Gastro protective, Glossitis, Hepato-protective, Hypo lipidmic, Immuno modulation, Liver disorders, Snakebite, Stings, Timpanists.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
M. azedarach	Remove acne, shadow, furniture and fuel.	Amenorrhea, Burning sensation, Cough, Diabetes, Fever, Head ache, Leprosy, Lumbago, Rheumatism, Sciatica, Scrofula.
M. arvensis	Abdominal pain and vomiting, pimples, stomach problems, kidney stones, facial acne, chuttnies, mouth blisters, allergy.	The juice of Mentha arvensis leaves is used for treatment Of boils.
M. azedarach	Remove acne, shadow, furniture and fuel.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
M. nigra	Fever and flu, cough, bronchial dilator, fuel and shadow.	Antibacterial, Astringent, Colds, Diabetes, Diaphoretic, dyspepsia, EyeInfections, Fever, Flu, Hyper tension, Hypo glycemic, Odon talgic, Ophthalmic, Sore throat, Tinnitus, Urinary in continence.
N. suspseudo narcissus	Healing wounds, ornamental.	-
O. basilicum	Anti-cancerous, aromatic, ornamental.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
O. corniculata	Dryskin, appetizer, warts, cholera, and no other common use.	Antibacterial, Antifungal, Anthelmintic, Coldfever, Diarrhea, Diuretic, Dysentery, Insect bites, Skin eczema, Snake bite, Sprains.
P. hysterophorus	Fever, Highly allergic. Cough, Cholera and diarrhea, fodder, reduce wheat crop production.	-
P. minor		-
P. veriegata	Vegetable, High blood pressure, anti-allergic, blood purifier, adverse insect bite, spiritual effects.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
P. dactylifera	Cough, heart attack, tonic for week patients and for pregnant women, constipation and anti-inflammatory, ornamental.	-
P. oleraceae	Remove waste material from liver, Stomach tonic, Lowers sense of thirst in diabetes, saag.	Diuretic, asthma.
P. armeniaca	Liver disorders, Planted for fruit.	-
P. domestica	Flu, constipation, lubricate intestine, gum and fruits.	-
P. guajava	Abdominal Pain, cholera, fruiting and shade.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
P. granatum	Stop teeth bleeding and removal of yellowness, jaundice, Fuel and fruit.	The seeds of Punica granatum are ground and are applied on wounds for their treatment.
P. communis	Digestion, Heart diseases, fruit.	-
P. malus	Constipation, anemia, pregnancy, fuel and fruits.	-
R. sativus	Stomach and liver diseases, jaundice, stomach discomfort, constipation, piles, obesity, asthma, bronchial dilator, skin treatment, insect bite, salad.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
R. communis	Jaundice, expel worms of intestine, relief in pain, fuel.	Antifungal, Boils, Colic, Dysentery, Fever, Gout, Growth of hair, Hydrocele, Itchiness, Leprosy, Nerve pain, Pain, Piles, Rheumatism, Sores, Swellings, Treating colds, Tumors, Warts, Wounds
R. indica	Maintain blood sugar, ritual, aromatic, itar, ornamental.	Eye diseases, Cooling effects on eyes, constipation.

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
R. dentatus	Asthma, Skin diseases, saag	-
S. lycopersicum	Face wash, acne, vegetable, used in different dishes.	-
S. surrettense	Expel intestinal worms, Teeth pain, reduce crop production.	Cough, respiratory trouble, abdominal problems and blood purification.
Solanumt-uberosum	Reduce pain in burn injury, vegetable, full of nutrients.	-
S. villosum	Constipation, Indication of rabbits in Particular area.	-
S. asper	Infusion used as drink, febrifuge, Allergic.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
S. oleracea	Anemia, anti-cancerous, anti-oxidant, reduce highly blood pressure, boost immune system, saag.	-
S. cumini	Abdominal pain, cholera, pain and bleeding of teeth, diabetes, maintain sugar level, fruits and shadow.	Dysentery, diarrhea, bloody stools, Skin infections, wounds.
T. spermumammi	Stomach disorders, Peptic ulcer, diarrhea, bloody stool, fever, pickles and dishes.	-
T. portulacastrum	Saag, Kidney and urinary track diseases.	-

Table 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
T. sterrestris	Digestive and urinary track disorders, whooping cough, thorns cause severe pain and bleeding.	Arthritis, backache, spermatorrhoea, impotence.
T. foenum	Hair fall, Make hairs healthy, Used in curries, asthma, used by body builders, diabetes, reduce chance of infection.	Nigella sativais boiled along with Trigonella foenum vinegar and this mixture is used to cure fungal infection.
T. aestivum	Cholera, Abdominal diseases, cereal, fodder, skin treatments.	-
V. anilotica	Dysentery, Kidney pain, bleeding gums, fuel.	-

TABLE 5.3: Comparison with available data.

Scientific Name	**Local Uses / Novel uses**	**Comparison uses**
V. venifera	Constipation, measles, chicken pox, cough, make body and brain healthy, ornamental, fruit.	-
W. coagulans	Digestive, liver disorders, Cooked as saag.	-
Z. mauritiana	Falling hairs, expel intestinal worms, ritual uses, fuel furniture.	-
M. jalapa	Pus filled wounds, saag.	Blood purifier, purgative, anti-inflammatory, piles, jaundice.
Z. mays	Boils, measles, fever, reduce wheat production.	Inflammation of urinary system, Bladder cleaner, remove kidney stones.