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Ethno botanical study of medicinal plants used to treat human ailments in Sebeta Hawas District, Surround Finfine Special Zone of Oromia Regional State, Central Ethiopia

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Table of Contents

Acknowledgements ..... **i**

List of figures……..ii

List of Tables……iii

List of Appendix……..IV

Abstract……v

1. INTRODUCTION **1**

1.1Background 1

1.2 Statement of the Problem 3

1.3. Objectives of the Study 4

1.3.1 General Objective 4
1.3.2 Specific Objectives 4

1.4. Delimitation of the study 4

1.5 Significance of the Study 4

2. LITERATURE REVIEW **5**

2.1. History and Development of Ethno Botany 5

2.2 Indigenous knowledge and medicinal plants 6

2.3 Application of Medicinal Plants in Different Part of the Worlds 7

2.3.1 Use of Medicinal Plants in the Developed Worlds 7
2.3.2. Uses of Medicinal Plants in Africa 8

2.4 Overview of Medicinal plants in Ethiopia 9

2.4.1. Utilization Status of Traditional Medicines in Ethiopia 10
2.4.2. Ethno medicine Research in Ethiopia 10

2.5. Medicinal Plants and Development of Modern Drugs 12

2.5.1 Role of Medicinal Plants in New Drug Developments 12
2.5.2. Traditional and Modern Medicines and Their Integration 14

2.6. The Role of Ethno botanical Study and Medicinal Plant in Ethiopia 15

2.6.1 Medicinal Plants for Human Healthcare System 15
2.6.2 Role of Ethno botanical studies for Conservation of Biodiversity in Ethiopia 16

2.7. Threats to and conservation of medicinal plants in Ethiopia 17
2.7.1 Threats to medicinal plants 17
2.7.2 Conservation of medicinal plants 18
3. Material and methods 19
3.1 Description of the study site 19
3.1.2 Topography and geographical Location 19
3.1.3. Land use 20
4.1.4. Vegetation 20
3.1.5. Climate 21
3.2. Study Design 23
3.2.1. Reconnaissance survey and study site selection 23
3.2.2. Informant Selection 23
3.2.3. Ethno botanical Data Collection 23
3.2.4. Semi-Structured Interviews 24
3.2.5. Field Observations 24
3.2.6. Ethical Considerations 24
3.2.7. Plant data collection 24
3.2.8. Plant specimen identification 24
3.2.9. Data analysis 24
4. Result and Discussion 27
4.1. Medicinal plants of the study area 29
4.1.1. Sources of medicinal plants used to treat human ailments 29
4.1.2. Habits of medicinal plants used to treat human ailments 30
4.1.3. Parts of medicinal plants used to treat human ailments 31
4.1.4. Methods of preparation of medicinal plants used to treat human ailments 32
4.1.5. Routes of administration of medicinal plants used to treat human ailments 32
4.1.6. Applications 33
4.2. Major human diseases and plant species used by local people 34
4.3. Dosage of medicinal plants used 36
4.4. Condition of remedy preparation of Herbal Medicine 37
4.5. Solvent and additives 37
4.6. Ranking of most important medicinal plants 38
4.6.1. Informant consensus 38
4.6.2. Preference Ranking 40
4.6.3. Paired comparison 41

4.6.4. Fidelity level index (Fl) 42
4.7. Threats of medicinal plants in the study area 43
4.7.1. Factors threatening medicinal plants 43
4.8. Conservation practices of medicinal plants in the study area 45
4.9. Threatened Medicinal Plants 46
5. CONCLUSION 47
6. RECOMMENDATION 48
7. References……49
8.Appendix……55

List of figures

Figure 1: Climadiagram showing rainfall distribution and temperature variation ……..22

Figure 2: Habits of medicinal plants collected from Sebeta Hawas District…….30

Figure 3: Parts of medicinal plants used to treat human……....31

Figure 4: Routes of administration of medicinal plants used to treat human ailments …….....33

Figure 5: Graph showing ways of application of plant remedies……...34

Figure 6: Condition of remedy preparation of Herbal Medicine…….....37

Figure 7: Photo during data collection……...69

List of tables

Table1: Secio-demographic characteristic of respondents……....28

Table 2: Medicinal plant species in different families……...29

Table 3: Human ailments and number of plant species used……..35

Table 4: Solvents and additives used in medicinal preparation…….38

Table 5: List of Medicinal plants and the corresponding informants……39

Table 6: Preference ranking of medicinal plants used for treating stomach……..41

Table 7: Paired comparisons of five medicinal plants used to treat fibril illness……..42

Table 8: Fidelity index of some medicinal plants in Sebeta Hawas district……..42

Table 9: Ranking of threats to medicinal plants……45

List of Appendices

Appendix 1: List of medicinal plants used for treating human ailments……...55

Appendix 2: List of human diseases treated by medicinal plants……..57

Appendix 3: List of informants contacted in the ethno botanical study……59

Appendix 4: Medicinal plants used for treating human ailments……..61

Appendix 5: Photo during data collection……..……..66

Appendix 6: Check list of semi structured questions used for interview…….……....67

ABSTRACT

An ethnobotanical study of medicinal plants used to treat human ailments by local people in Sebeta Hawas District; Oromiya Regional State was conducted from October 2016 to September2017. Semi-structured interviews, field observations and various ranking and comparison methods were employed and information was collected from a sample of 48 informants (14 females and 34 males). These included 8 key and 40 randomly selected informants. A total of 56 plant species were collected, and all of them were claimed to be traditional medicinal plants. The Lamiaceae, which contributed 7 (12.50%) species, stood first followed by Fabaceae, Solanaceae and Euphorbiaceae with 6, 5 and 4 species respectively Most of the species (36) were collected from the wild while 12 were collected from homegardens. A total of 56 species were mentioned for the treatment of 34 human ailments. Herbs were the most used plants, accounting for 26 (46.42%) species, followed by shrubs, trees and climbers. The most frequently used plant part was the leaves (53.57%) and fresh plant materials (53.57%). The common route medicine administration were oral (57.14%), followed by dermal and nasal. Some of the remedies are taken with additives and solvents including water (39%), honey (21%) and butter (13%). The most widely used method of preparation was crushing (23.21%) chewing (19.64%) followed by pounding (16%). The most commonly used application of medicinal plant was drinking (19.64%) followed by eating (12.5%) and put on (8.92%).Medicinal plants with higher informant consensus included Ruta chalepensis,Citrus limon and Cymbopogon citratus, while the disease category with the highest ICF value (0.96) was fibril illness.

Key words: *Human ailment, Medicinal plant, Sebeta Hawas*

List of Abbreviations

UNESCO = United Nations Educational, Scientific and Cultural Organization

SFSZO = Surround Finfine Special Zone of Oromia

IK = Indigenous Knowledge

CBD = conventional biological diversity

NGO = Nongovernmental organization

IBC = international broad casting convection

MP = medicinal plants

CAM=complementary and alternative medicine

TMP = traditional medicinal plants

UK = United Kingdom

UNCTAD = United Nations Conference on Trade and Development

SWLMO = Sebeta Wereda Land Management Office

1. INTRODUCTION

1.1Background of the Study

Developing countries have continued to rely on the use of traditional medicinal plants as their primary source of health care. Ethnobotany is broadly defined as the study of the relationship between plants and people (McClatchy, 2009). There has been a move towards incorporating traditional medicine within national drug polices and greater professionalism by increased commercialization of pharmaceutical production using traditional medicinal plants with known efficacy. The complex knowledge, beliefs and practices generally known as indigenous knowledge (IK) or traditional knowledge develops and changes with time. Indigenous knowledge includes time-tested practices that developed in the processes of interaction of humans with their environment (Debela *et al*., 2006).

People in different parts of the world depend on plant resources for their basic needs and are aware of many useful species occurring in their ecosystem. They have continuously developed their knowledge of traditional plant uses and plant resource management (Assefa *et al*., 2010). Medicinal plants are one part of the plant resources that have a potential capacity for treatment of various diseases. Plants are a great source of medicines, especially in traditional medicine, which are useful in the treatment of various diseases (Bako *et al*., 2005). Traditional medicine has not only played a vital role in providing healing, but has also contributed to the discovery of most pharmaceutically active substances in plants (Sakkir *et al*., 2012).

The use of such plants for health purpose started from long time ago probably at the first moment when a human being got sick. Means, some 3000 years, humankind was well aware of the medicinal properties of some plants growing around him (Sofowora, 1982 cited in Weldegerima, 2009). Even though such human and medicinal plants interaction started from prehistoric times, still they are the most important health care source for the vast majority of the population around the world. It is estimated that 70-80% of people worldwide rely on traditional herbal medicine to meet their primary health care needs and also for income generation and livelihood improvement (WHO, 2002).In our country, Ethiopia, also around 90% of the population uses and/or depend on

traditional medicine due to the cultural acceptability of healers and local pharmacopeias, the relatively low cost of traditional medicine and difficult to access the modern health facilities (WHO, 2002; Bekele, 2007). It is endowed with diverse biological resources due to significant geographical diversity, which favored the formation of different habitat and vegetation zones (Assefa *et al*., 2010).

Ethiopia is also home to a diverse mix of ethnic, cultural and linguistic groups (Bekele, 2007; Assefa *et al*., 2010). According to the same reports, diverse combination of social and cultural backgrounds contributed much to the existence of rich indigenous knowledge, including managing and using medicinal plants against human and livestock ailments.

Environmental degradation, agricultural expansion, loss of forests and woodlands, over-harvesting, fire, cultivation of marginal lands, overgrazing and urbanization appear to be the major threats to the medicinal plants of Ethiopia. Such a threat poses a significant threat to the future wellbeing of the human and animal populations that have for generations, relied on these resources to combat various ailments (Bekele, 2007). Therefore, documentation of indigenous and related knowledge on the utilization and conservation of Medicinal plant(MP) is required from each part of the region to know the major threats towards Medicinal plants (MPs) and to share the general knowledge on conservation measures that have been taken by the local people. However, Ethnobotanical studies on medicinal plants in the country are limited as compare to the multiethnic and cultural diversity of the people, the diverse flora of the country and vital role played by traditional medicinal plants for the primary healthcare (Hunde *et al*., 2006).

Similarly, in the study area there is no any study or documentation with the same issue before. However, the people use traditional medicines continuously to combat human ailments. Therefore, like any other areas of Ethiopia, the study area need documentation of ethnobotanical knowledge and to share the knowledge of the local people about the use and conservation measure that the people use.

1.2 Statement of the Problem

The People in developing countries like Africa, highly dependent on traditional medicine for primary health care for both humans and livestock. However, the indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation through oral means. There is a gap in recording and documenting medicinal plants in the country. In addition, the indigenous knowledge on usage of medicinal plants as remedies are getting lost owing to migration from rural to urban areas, industrialization, expansion of modern education and the secrecy associated with the use of medicinal plants. In most parts of Ethiopia, the wild plants and forests are declining due to human impact like deforestation, agricultural expansion, over exploitation and population growth. A similar problem is observed in Sebeta Hawas district, Oromia Regional State.

The study area is highly suffering habitat and plant species loss due to continued deforestation as a result of shortage of farm land to accommodate the population of the district. Therefore, ethno botanical study of medicinal plants is required to document them and the associated knowledge before they are lost. As far as the knowledge of the community is concerned, there has not been any study on the ethnobotany of medicinal plants and indigenous knowledge for the treatment of human ailments in Sebeta Hawas district. Similarly, in the study area there is no any study or documentation with the same issue before. However, the people use traditional medicines continuously to combat human ailments. Therefore, like any other areas of Ethiopia, the study area need documentation of ethnobotanical knowledge and to share the knowledge of the local people about the use and conservation measure that the people use.

1.3. Objectives of the Study

1.3.1 General Objective

The general objective of the study was to conduct ethnbotanical study on medicinal plants for treatment of human ailments and related knowledge of the people of Sebeta Hawas District.

1.3.2 Specific Objectives

The specific objectives include:

- Collecting, identify and document medicinal plants used for treatment of human ailments in the study area.
- Recording methods of preparation, route of administration, plant parts used and their dosage by the local people.
- Assessing the major threats of medicinal plants in the area
- To come up with recommendation based on the results of the study.

1.4. Delimitation of the study

The study is delimited to assess the study of medicinal plants which used to treat human ailments in Sebeta Hawas district with specific reference to three kebeles. This is due to shortage of time and problem in willingness for active participation in responding interview questions by all respondents of the study district.

1.5 Significance of the Study

The findings of this study will help people of the study area to know the role of medicinal plants to treat human ailment. Therefore, this study will fill the knowledge gap regarding the use of medicinal plants in the district. Problems associated with medicinal plants and related knowledge and give attention for the threatened medicinal plants. In addition, the documentation of the indigenous knowledge of medicinal plants in the study site may be used as a reference material for those who want to conduct research in further ethnobotanical study and development of modern drug, hence this study initiate to fill the gaps in the documentation of ethnobotanical knowledge in the study area.

2. LITERATURE REVIEW

2.1. History and Development of Ethnobotany

There has been an ever-increasing interest by anthropologists, botanists and explorers of the world to document the potential use or economic potential of plants used by indigenous people (Cotton, 1996). Christopher Columbus initiated this in 1442 when he discovered the use of tobacco plant (*Nicotianaspp*) by local people of Cuba. Around 1858, British explorer, R. Spuce noted for the first time the psychoactive properties of the vine plant *(Banisteriopsis cappi*) (Cotton, 1996). Such works gradually yielded a firm base for the study of direct interactions between human and other organisms through documenting, analysis and use of indigenous knowledge of biological entity. Eventually, the work on ethnobotany promoted this subject to be an independent field of study in biological sciences. Since then, different authors used various ways of defining ethnobotany.

Even today, no definitive agreement in its interpretation has been reached. This stemmed from the fact that the term has been given different interpretation and definition depending on the interest of the workers involved in the study (Cotton, 1996). Martin (1995) broadly defined the term of ethno botany as the subject dealing with the study of direct interactions between humans and plants. However, Balick and Cox (1996) expanded this field of study by including the use of plants for food, medicinal, forage and for any other economic purpose within field of ethnobotany. According to Cotton (1996), ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people.

According to Balick and Cox (1996), research concerned with ethnobotany involves recording the knowledge on the cultural interaction of people with plants, finding out how local people have traditionally used plants for various purposes, and how they incorporate plants into their cultural tradition and religion. However, to get more detailed and reliable information in this concern, ethno botanical investigation needs to involve scholars from different field of studies such as plant taxonomy, plant ecology, anthropology, linguistic, economic botany, pharmacology and the like (Martin, 1995).

There are various techniques of inquiry tools based on the aims and objectives of the ethno botanical study at hand (Martin, 1995; Alexiades, 1996). These inquiry techniques include participant observation, simulation, field interviews, and group discussion, checklist interview and market survey.

2.2 Indigenous knowledge and medicinal plants

In all countries of the world there exists traditional knowledge related to the health of humans and animals. It is usually unwritten and preserved in the culture through oral tradition. It refers to the knowledge system of indigenous people and minority cultures (UNESCO, 1994). In the scientific viewpoint, traditional knowledge is first and foremost a resource which is considered as a body of information and set of skills developed by a group of people over time (Nakashima, 2000). In the past studies, many researchers have expressed their appreciation of the wealth of useful information embedded in traditional knowledge and recognized the utility of integrating scientific and traditional knowledge (Martin, 1995; Cotton, 1996). However, the integration of indigenous knowledge into science requires the extraction of relevant knowledge through a process of scientific validation and evaluation in order to identify the useful information, objective from subjective and the indigenous science from indigenous belief (Nakashima, 2000).

The body of traditional knowledge is dynamic and practitioners make efforts to widen their knowledge exchange of information with each other or through reading of traditional pharmacopeia. Therefore, modernization including modern medicine and introduced culture are probably issues involved in changing the focus of people's educational endeavors towards indigenous knowledge. This modernization has been accompanied by the inability of people, particularly the young to recognize value in traditional ways as related to their daily lives (Abebe, 2001).

The majority of people in developing countries particularly Africa will continue to rely on modern medicine for much of their primary healthcare. Side by side however, there will be continuing declines in traditional knowledge about medical plants and in traditional medical systems due to both natural and anthropogenic activities. As each generation matures, skills perceived as immediately useful are gained while others with a lesser perception of immediate value may be lost (Hamilton, 2003).

According to the same author, plants always used as central significance to human welfare. They provide food, fuel and medicine as well as materials for construction and the manufacture of crafts and many other products for indigenous people. All cultures from ancient times to the present day have used plants as sources of medicines. A medicinal plant is any plant, which in one or more of its organs contains active ingredients which can be used for therapeutic purposes or contain foundation compounds that can be used for the synthesis of useful drugs (Sofowora, 1982). Thus, plants have formed the basis of traditional medicine system that existed for thousands of years and continue to provide sources of remedies (Balick and Cox, 1996). Modern medicine has its roots in ancient medicine and it is likely that many important new remedies will be discovered and commercialized in the future as it has been now by following the leads provided by traditional knowledge and experience.

2.3 Application of Medicinal Plants in Different Part of the Worlds

2.3.1 Use of Medicinal Plants in the Developed Worlds

In fact, majority of the developing country is relied on TMPs for the primary healthcare. This is not only because of poverty, shortage of allopathic doctors, and less access of hospitals but also due to the fact that it is more culturally accepted and does not produce complications for harming the physiology and anatomy of a patient as modern medicine may does (WHO, 2002; Hamilton *et al.*, 2003). While showing how far these TMs goes in line with our physiological needs, Hippocrates who mainly remembered as a father of medicine said that herbal remedies contain synergistic and/ or side effects neutralizing combinations (Gilani and Rahman, 2005).

The interest of MPs is not only for developing countries but also it is true for developed worlds. For example, India, Korea, Japan, China, and Malaysia are frequently cited countries in using

traditional medicine (WHO, 2002). According to the same report, countries like Australia, Europe and North America increasingly used "complementary and alternative medicine" (CAM) in parallel to allopathic (orthodox) medicine, particularly for treating and managing chronic disease. The same report showed that 31% of the population in Belgium, 49% of the population in France and 70% of the population in Canada uses CAM at least once.

The other report of the United Nations Conference on Trade and Development (UNCTAD) revealed that in United states of America (USA) medicinal plants have been used as one alternative therapies and its application increased from 34% in 1990 to 42% in 1997 (UNCTAD, 2000). In Latin America 71% of the population in Chile and 40% of population in Columbia has been reported to use TMs (WHO, 1999). In many Asian countries TMs are widely used even though western medicines are often readily available (Velasquez, 2008).

Not only the indigenous people but also allopathic doctors are well aware of the use of TMs. For example 40% of all general allopathic practitioners of United Kingdom (UK) offer some form of TM referral. In Germany 80% of the physicians prescribe herbals. In Japan about 70-85% of physicians prescribe herbal medicine to their patients (WHO, 1999; Elujoba *et al.,* 2005).

2.3.2. Uses of Medicinal Plants in Africa

As elsewhere in other continents, Africans have been supposed to use medicinal plants to safe guard against disease since time immemorial (Lewu and Afolayan, 2009; Izugbara and Duru, 2008). According to WHO (2002), about 80% of the populations in Africa primarily rely on traditional medicine. As a matter of testimonial there has been found documentary evidences like that of medicinal plants of East Africa (Kokwaro, 1976), Medicinal plants of North Africa (Boulos, 1983). Ayensu (1979 cited in Boulos 1983) have documented medicinal plants of West Africa. Hutching and Terblanche (1989) also emphasized the use of herbal remedies for the physical and physiological health care in South Africa.

WHO (2002) reported the degree of some specific African countries towards the use of TMs; and accordingly 70% of the Benin people use TMs. Similarly 70% of Rwandans, 60% of Tanzanians, 60% of Uganda peoples are reported to rely on TMs. The same organization in 2003 reported the use of TMs in treating and/ or proactive prevention for some chronic disease. For example in Ghana, Mali, Nigeria and Zambia, the first line treatment for 60% of children with malaria is the use of herbal medicine, and in South Africa, 70% of people living with HIV/AIDS use traditional medicine (WHO, 2003).

2.4 Overview of Medicinal plants in Ethiopia

Ethiopia is believed to be home for about 6,500 species of higher plants with approximately 12% endemism, and hence one of the six plant biodiversity rich countries of Africa (Bekele, 2007). The diversity is also considerable in the lower plants but exact estimate of these have to be made. The genetic diversity contained in the various biotic make up is also high thus making the country a critical diversity hot spot for plants (UNEP, 1995).

Ethiopia has a significant portion of two of the world's 25 biodiversity rich areas hot spot i.e. the eastern Afromontane Biodiversity Hotspot and the Horn of Africa-Biodiversity Hot Spot. These hotspots house a lot of the useful wild biodiversity, particularly that of medicinal plants. The biodiversity richness of Ethiopia was known since 5000 years ago when ancient Egyptians Greeks and Romans used it as a source of unique commodities like Frankincense, Myrrh and other plant products, which are also used for medicine preparation (Thulin, 2004).

Most Ethiopian traditional medicinal knowledge is kept in strict secrecy; however, it is dynamic in that the practitioners make every effort to widen their scope by reciprocal exchange of limited information with each other or through reading the traditional pharmacopeias (Abebe, 1986). According to the same report, there are three treatment features of Ethiopian traditional medicines i.e. curative, prophylactic and preventive. Sometimes, the treatment could have a curative as well as a prophylactic effect and it is occasionally claimed that the prophylaxis could even be

genetically fixed and can protect the offspring. Preventive remedies are usually prepared as ornamental, to be borne by the patients against evil spirits or psychosomatic disorders. Other therapies of preventive nature are employed against snake bites, intestinal worms, and miscarriages. Regulatory drugs are also commonly used to correct the time and the amount of flow of the menstruation cycle of women. Rejuvinative and restorative remedies are also employed to counter the effect of aging, and to overcome impotence, malnutrition, infertility etc. Traditional medicine is an integral part of the local culture and is a major public health system; what we call modern medicine is an offshoot of traditional medicine.

2.4.1. Utilization Status of Traditional Medicines in Ethiopia

As known, Ethiopia is a land of mosaic topographies which is responsible to have diverse floras and faunas, a land of multiple ethnic groups, and a land of Lucy, which signifies to be the origin of mankind is not that much surprise to have diverse indigenous culture (Abebe and Ayehu, 1993). These traditional practices associated with plant base health care systems are in use since time immemorial (Abebe, 1986) and was supposed to be the only system available for health care before the introduction of allopathic medicine to get cured from disease arising from worms, fungi, virus and protozoa (Abebe, 2001). According to this scholar 80% of the populations in Ethiopia use TMPs as the primarily health care system. Other report by WHO (2002) stated that 90% of the Ethiopian populations using TMPs for their primary health care. This percentage is greater than other developing counties like Benin (70%), Rwanda (70%), Tanzania (60%), and Uganda (60%). This implies that the uses of traditional medicine in Ethiopia for primary health care are becoming accepted and popular as compare to other African countries.

2.4.2. Ethnomedicinal Research in Ethiopia

About eighty percent of Ethiopia depends on medicinal plants for primary health care. Although the contribution of medicinal plant species to modern health system and the poor society who live mainly in the rural area is very high, lack of detailed descriptions of the medicinal plants has made it difficult for the researchers to decide the identity of these plants universally with the only reference being the local names of the plants and there is very little attention in modern research

and development and the effort made to upgrade is not satisfactory. One of the reasons is that the traditional medicinal plant species are not well described (Tadesse and Demissew, 1992).

According to Demissie and Dagne (2001), when research is conducted on the medicinal plant species, it must target on the fact that the providers of the indigenous knowledge should get a fair share on the benefits of the development of medicines. According to Awas (2007), detailed information on medicinal plants of Ethiopia could only be obtained when studies are under taken in various parts of the country where little or no botanical and ethno botanical studies have been conducted.

Scientific research on medicinal plants provides additional evidence to the present knowledge of medicinal plants which has been handed down from generation to generation (WHO, 1998). As it has already been stated by Cunningham (1993) and Alexiades (1996), it is better to involve traditionally medical practitioners in pharmaceutical companies. The modern health professionals and some of the consumers ask for scientific based evidence. This encourages for better and more research work. According to Kannon (2004), research on medicinal plants should direct for quality control and the research should examine active herbal constitute for efficacy and toxicity of the herbs.

To preserve indigenous knowledge of plants use in general and of traditional medicine in particular, an ethno botanical survey of lesser-studied socio-cultural groups is very crucial. However, in Ethiopia research and documentation on medicinal plants have been started only very recently (Tadesse and Demissew, 1992). Limited number of these papers dealt with specific socio-cultural groups in specific areas. When compared to the country's varied flora and the socio-cultural diversity, these studies are incomplete as medicinal plant healing systems differed from culture to culture. Due to this, attention should be given to the field of ethno medicine of the country with all necessary endeavors to have a full picture of the country’s medicinal plants potentials

2.5. Medicinal Plants and Development of Modern Drugs

2.5.1 Role of Medicinal Plants in New Drug Developments

Medicinal plants are important element of indigenous medicinal systems worldwide. Traditional medicine is able to contribute significantly to the common goal of health for all by its capacity to maintain health and treat diseases (WHO, 2000). Ethno pharmacological surveys provide the rational for selection and scientific investigation of medicinal plants, since some of these indigenous remedies have successfully been used by significant number of people. Over extended periods of time the importance of traditional knowledge system in drug discovery process is exemplified by the isolation of artemisinin from the herb sweet worm wood *(Artemisia annua*) this plant was used traditionally in Chinese herbal medicine for over 2000 years for the treatment of fever and malaria, and was rediscovered by Chinese scientists in the 1970's. Historically, botanicals have been our most fruitful arena in the search for new medicine. Searching new drug from traditionally used medicinal plants can therefore be the shortest path of success. However, a report has showed that, a success rate in the search of new drugs from randomly synthesized chemicals is only one in 10,000.

Historically**,** plants have provided a source of inspiration for novel drug compounds, as plants derived medicine have made large contribution to human health and well-being. Their role in the development of new drugs could be either by serving as a natural blue print for the development of new drugs, or as Phytomedicines to be used for the treatment of diseases . Rapid development and advances in science, technology, and the world economy have drastically changed the world and environment. With remarkable improvement in human health care on one hand and environmental deterioration on the other a growing demand for natural products and Phytomedicines has shifted research and development works in to new drug discovery.

Many research institutions in this field have turned to TM, mainly the use of plants as source of new drugs. TMs play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelty in drug (Pramono, 2002). In addition, an increasing reliance on the use of medicinal plants in the industrialized societies has been traced to

the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies (UNESCO, 1998). Furthermore, chemical structures derived from plants can be used as models for synthetic compounds (WHO, 2000). Most of plant derived drugs were originally discovered through the study of traditional cures and folk knowledge of indigenous people (Balick and Cox, 1996).

Analysis of the number and sources of anticancer and anti-infective agents, reported from 1984 to 1995 indicates that over 60% of the approved drugs and pre-DNA (New Drug Application) candidates (for the period 1989-1995), excluding biological aspects developed in this disease are of natural origin. A recent review reported that at least 119 compounds derived from 90 species could be considered as important drugs currently in use in one or more countries, with 77% of this being derived used in traditional medicine. Further evidence of the importance of natural products is provided by the fact that closes to half of the best -selling. Pharmaceuticals in 1983 to 1987 were either natural products or their derivatives. This elaborates that traditional medical knowledge of medicinal plants and their use by indigenous cultures are not only useful for conservation of cultural traditional and biodiversity but also for community health care and drug development in the present and future (Muthu *et al.,* 2006).

In general, many investigations indicated the relevance of Ethno botanical information on medicinal plants is often used to guide chemical screening of drug development. Traditional herbs which have proven clinical efficacy and safety were the first chosen for screening. Then plant materials collected and identified with reference to Ethno botanical information and photochemical analysis were screened in consultation with local users of the herbal medicines are tested through photochemistry, pharmacy, animal experiments and clinical trials. It is then possible to use them in the formulation of new medicines according to government regulations concerning new medicinal developments.

2.5.2. Traditional and Modern Medicines and Their Integration

Traditional and modern system of medicine was developed by different philosophies in different cultural background. They looked at health, diseases and causes of diseases in different ways. These differences bring different approaches to health and diseases. These inurns have resulted in attitudes ranging from complete rejection of traditional medicine by traditional medicine practitioners to all a parallel existence with little communication over patient care (Kanno, 2004).

Integration of traditional medicine with modern medicine may mean incorporation of traditional medicine in to the general health service system (Kanno, 2004). Integration is defined as an increase of health coverage through collaboration, communication, harmonization and partnership building between modern and traditional system of medicine, while ensuring intellectual property right and protection of traditional medicine knowledge. The availability of evidence on safety, efficacy and quality will promote the integration in to health systems of traditional medicine practices and products (Kanno, 2004).

In Ethiopia, knowledge on traditional medicine is rejected by some medical doctors trained in Western medicine, as it is not considered to have scientific bases. However, both old and modern arts of healing should exist together and may be integrated (Kanno, 2004). It has been stated that the modern medicine sector in Ethiopia, unlike many other countries, has not yet integrated and benefited from the traditional medicinal plant resources. China, India, Cameron and Ghana, for example, have advanced on the use of traditional medicinal plants in a modern context. The wide utilization of plant-based traditional health care is mainly attributed the fact that it makes use of locally available plant resources.

An insight into traditional remedies, often selected for use over the centuries, is not only one of the means to palliate present health problems of countries like Ethiopia, but also is part of the universal effort to unveil sources for new or superior drugs against diseases which remain intractable. In response to these diseases, Ethiopians have attempted to come up with remedies or practices that

restore or enhance good health. Knowledge of the remedies and practices is based either on oral tradition or on information that is codified in the early medico-religious manuscripts. The former is a subject of separate study under preparation by the senior author. Thus, the present volume is entirely based on information drawn from ancient medico-religious manuscripts or traditional pharmacopoeias. More than 80% of the developing world continues traditional medicines, predominantly plants, for primary health care (Farnsworth *et al.*, 1985).

2.6. The Role of Ethnobotanical Study and Medicinal Plant in Ethiopia

2.6.1 Medicinal Plants for Human Healthcare System

As in any African countries, the use of plants in religious ceremonies as well as for magic and medicinal purposes is common in Ethiopia. This knowledge of traditional medicine has been passed on by word of mouth from one generation to the next by herbalists and knowledgeable elders. About 80% of the Ethiopian population depends on traditional medicine for their health care practices. However, as time goes on, the traditional knowledge is gradually worn away for reasons mainly attributed to environmental degradation and deforestation, which in turn brought about the loss of some species including medicinal plants **(**Desissa, 2000**)**.

Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of various afflictions in Ethiopia (Fullas, 2007). For the role-played by plant derived products in human and livestock health, systematic scientific investigations are vital (WHO, 1998). Plants play a major role in providing prototype molecules for possible development into conventional drugs by the pharmaceutical industry (Fullas, 2007). However, only small fractions of the world's plants have been investigated scientifically so far, but, human kind has already reaped enormous benefits from it (Farnsworth, 1985).

2.6.2 Role of Ethnobotanical studies for Conservation of Biodiversity in Ethiopia

The term ethnobotany is a broad term. It is derived from the term ethno and botany. Ethno- refers to race, people, cultural group, nation where as botany is the science of plants. Hence it is the science of people's interactions with plants (Albuquerque *et al.*, 2008). This discipline is found to be a novel form of science to create a partnership between indigenous peoples and researchers aiming for the conservation of bio diversities (Laird, 2002).

Ethnomedicine, that encompasses indigenous knowledge, besides studying the actual medicinal values of plants, it plays a great role for the conservation of biodiversity. Studies conducted in Ethiopia have found out some cultural believes and traditional practices which are so vital in contributing to the conservation of medicinal plants in particular and biodiversity as a whole. For example, Tolosa (2007) listed out various local beliefs and cultural traditions used for the conservation of medicinal plants in Gimbi woreda (Western Wellega). The other study by Mesfin (2007) also documented and suggested on cultural and spiritual beliefs used for the conservation of MPs in Wonago woreda (SNNPR). Other cultural practices for example the Geda culture (Abba Geda) in Oromo also do have an important contribution in Biodiversity conservation. Wassie (2008) also noted the role of Ethiopian Orthodox Church (EOC) in northern part of Ethiopia for the conservation of biological diversity (CBD).

Thus, Ethnobotany if strengthen and work together with its stakeholders like the local communities, governments, educators, NGOs, and others can address future environmental degradations and accelerating loss of cultural knowledge and language (Hamilton, et al., 2003).This can be if we keep for example chapter 26 of Agenda 21, "Recognizing & Strengthening the Role of Indigenous People and Their Communities," and article 8(j) of the CBD that legally obliges governments to protect and promote indigenous knowledge systems for the conservation and sustainable use of BD so that indigenous people involve in preserving their knowledge and practices relating to conservation (Davidson-Hunt, 2000; Smallacombe, 2010).

2.7. Threats to and conservation of medicinal plants in Ethiopia

2.7.1 Threats to medicinal plants

Many of the threats to medicinal plant species are similar to those causing endangerment to plant diversity generally. The most serious proximate threats generally are habitat loss, habitat degradation and over-harvesting (Hamilton, 1997; Maundu *et al*., 2006). Medicinal plants can have other uses besides as sources of medicines, and the threats from over-harvesting may be due to effects of collection for purposes other than medicinal. The majority of species of plants in traditional or herbal medical treatments are harvested in the wild rather than cultivated. As a result, many plant species have become extinct and some are endangered. It is therefore necessary that systematic cultivation of medicinal plants be introduced in order to protect threatened species.

As population grows, demand for traditional medicines will increase, and pressure on medicinal plant resources will become greater than ever (Hamilton, 2003). Like other developing countries, the loss of valuable medicinal plants in Ethiopia due to population pressure, loss of habitat, agricultural expansion and deforestation is widely reported by different workers in Ethiopia (Asfaw, 2001; Zewudu, 2002; Balemie *et al*., 2004). Thus, documentation of medicinal use of plants is becoming increasingly urgent because of the rapid loss of the natural habitat for some of these plants due to anthropogenic activities.

2.7.2 Conservation of medicinal plants

Laterally the term Conservation is defined as the sustainable use of biological resources. The concept of sustainability is now seen as the guiding principle for economic and social development, particularly with reference to biological resources. According to Asfaw (2001), medicinal plants are considered to be at conservation risk due to over use and destructive harvesting (roots and barks collection).

Abebe and Ayehu (1993) found that many medicinal preparations use roots, stem and bark by effectively killing the plant in harvest. Plant parts used to prepare remedies are different; however, root is the most widely used part. Such wide utilization of root part for human and livestock aliments with no replacement has severe effect on the future availability of the plant. Recent work of Yineger (2005) confirms the fact that of the total plant parts to prepare remedies root is widely used with 64 species (35.5%) followed by leaf 47 species (25.97%) which hence affects sustainable utilization. This implies that the major factor for the loss of medicinal plants in Ethiopia.

In a broad sense, conservation is achieved using in-situ and ex-situ means. In-situ conservation is conservation of species in their natural habitat. Some traditional medicinal plants have to be conserved in-situ due to difficulty for domestication and management (Asfaw, 2001). Moreover, some plants fail to produce the desired amount and quantity of the active principles under cultivation out of their natural habitats. Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Asfaw, 2001), this can be possible in places of worship (churches, mosques, grave yards, so on), scared grooves, farm margins, river banks, road sides, live fences of gardens and fields.

Medicinal plants also can be conserved using appropriate conservational methods in gene banks and botanical gardens. This type of conservation of medicinal plants can also be possible in home gardens, as the home garden is strategic and ideal farming system for the conservation, production and enhancement of medicinal plants (Asfaw, 2001)

3. Material and methods

3.1 Description of the study area

3.1.2 Topography and geographical Location

This study was conducted in Sebeta Hawas District formerly called Alemgena Wereda together with Sebeta town before 1900s (8^0 26′03″N $8^0$51′27″N) and (38^0 54′54″ E). The Wereda is located between 24 km and 45 km south west of the capital Addis Ababa in Oromia Region, Central Ethiopia. It has an area of 87,532 hectares. Sebeta Hawas District is found in Oromiya Regional State and is bound by Akaki Wereda in the east, Kersa and Tole weredas in the south Welmera Wereda in the North and Ilu and Ejere weredas in the West. The wereda has two access roads leading to Jimma and Buta jira (SAWRADO). The land feature of Sebeta Hawas Wereda is characterized by mountains and hills (Wachacha and Hoche Mts) and marshy plains (Furi-Gara-Bello, Gejja Ballachis and Jammo) and surrounded by the Awash water shade in the west (Tesfaye Gutema, 1997). The altitudinal range of this area extends from 1800 m above sea level to 3385m above sea level (SAWRADO, 2001). The soil type of the area is 61% black soil 34% red soil and 5% mixtures of black and red soils. The percentages of the composition of these soil types are different in each selected site of the study area. Many of the study sites are found at the bottom of hilly sides and are more prone to the effect of leaching and soil erosion

3.1.3. Land use

Agricultural activity is the dominant means of livelihood for the majority of Sebeta Hawas Wereda population. People of the study area use and classify land through functional categorization i.e. grazing land, agricultural land, homestead land and forestland. According to the annual report of Sebeta Hawas Wereda Rural and Agricultural Development Office (SAWRADO), out of 87,532 hectares of land, 73,838 hectares (84.4%) are used for agriculture to cultivate different crop types for household consumption and for local market, 3.689 hectares (4.2%) for grazing land, (SAWRADO, 2006).

4.1.4. Vegetation

The vegetation of Ethiopia is divided into eight major types. These are desert and semi-desert scrubland, *Acacia-Commiphora* woodland, moist evergreen montane forest with two subtypes, lowland semi-evergreen forest, *Combretum-Terminalia* woodland and savannah, dry evergreen montane forest and grassland complex, Afro-alpine and sub-Afro-alpine vegetation and riparian and swamp vegetation (Sebsebe Demissew *et al*., 2004). In countries like Ethiopia where lives of many rural communities are directly related to natural resources, forest mean everything i.e., it serves as source of food, medicine, income generating activities, building and agricultural material and household energy. Therefore, all efforts toward its conservation and sustainable use of its products are not easy task (Vivero *et al*., 2005; Mengistu Hulluka, 2001).

According to the study conducted by Oromia Urban Planning Institute (OUPI, 2006) on physical and socio-economic condition of Sebeta Town, the vegetation type of the study area belongs to montane forest. As it was observed during the study, there are only remnants of trees, bushes and shrubs in agricultural fields. Rapid population growth, high utilization of forest trees for construction and fuel wood purposes and rapid expansion of farmland in order

to feed the rapidly growing population threaten this existing trees and shrubs of the study area (RSIC, 2006).

3.1.5. Climate

The Wereda is divided into two agro-ecological zones high land locally called *Baddaa* (12%) and midland (*Badda daree)* (88%) (SAWRADO, 2006). The study area experiences alternating wet and dry seasons. The main rain falls between June and September, locally called "*rooba gannaa"* and light rains between January and March locally called "*rooba arfaasaa"*. Since there are no recorded temperature data obtained from National Metrological Service (NMS), the comparable area, Alemgena Wereda that is found at 2280 m a.s.l with similar altitiude to Sebeta Hawas District found at 2245 m a.s.l was used to compute the last 10 years of temperature data from 1995 to 2006. From this data, the annual mean maximum and the minimum temperatures for the years 1995 to 2006 are 25.4^0C and 13.9^0C, respectively.

The annual mean maximum and the minimum temperature were recorded in May and July respectively. The total mean annual rainfall from 1995 to 2006 is 1054.7 mm and the highest rainfall recorded was in July .The climatic data is given in Figure 2.

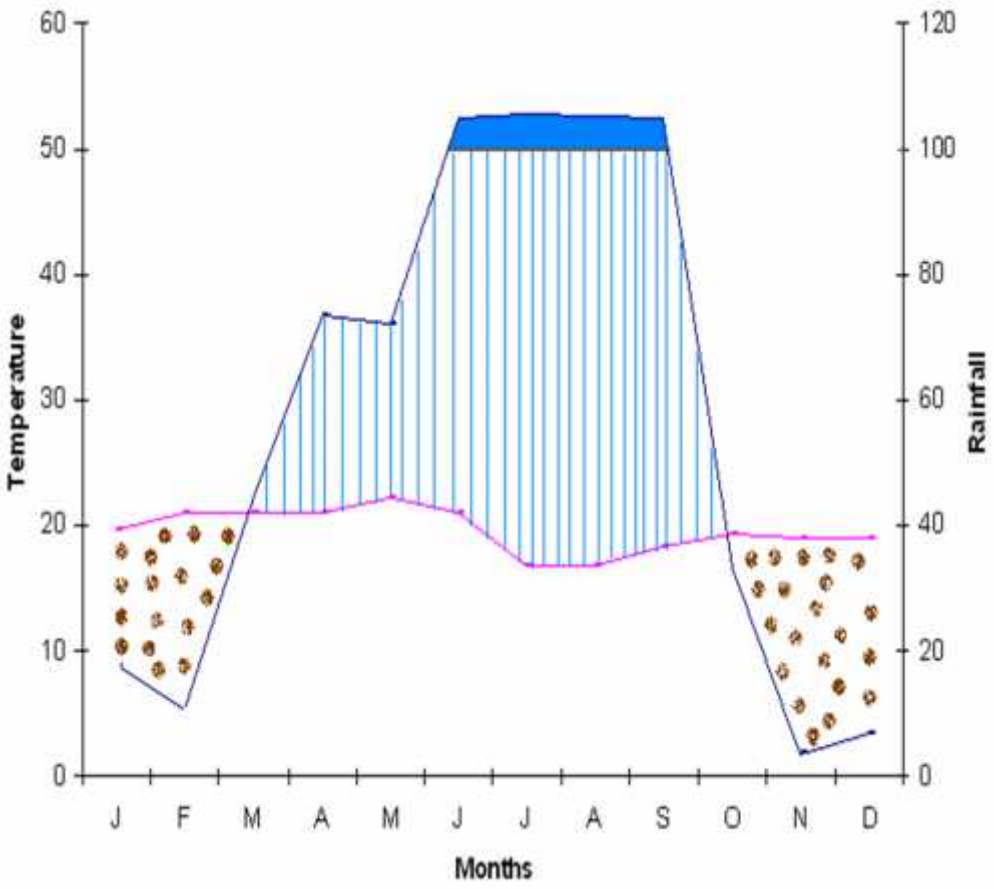

Figure 1. Climadiagram showing rainfall distribution and temperature variation of Sebeta District from 1996-2006. Data source: National Metrological Service Agency (2009)

3.2. Study Design

Selected informants were organized into research team, involve in observation and respond to interview questions. The informants were selected from the sampled kebeles. The interviews for informants were based on knowledge, utilization, threat as well as conservation of medicinal plants.

3.2.1. Reconnaissance survey and study site selection

Prior to ethno botanical data collection, reconnaissance survey were conducted for two days to know the general condition of the study area to select study sites.

3.2.2. Informant Selection

Informant selection were performed by using random sampling techniques from both sexes (male and female) which means 40 informants were taken by simple random techniques those are all age groups above 20 years in the study area. Purposive sampling technique was used for selecting 8 key informants based on the recommendation of elders and local administrators.

3.2.3. Ethnobotanical Data Collection

Forty eight informants (36 males and 12 females) were selected from the selected three ‘kebeles’ of the district. Based on the recommendation from elders and local authorities 8 key informants were selected by purposive sampling techniques. The ages of the healers were between 25 years and 77 years. A brief group discussion was made with the informants at each ‘kebele’ prior to data collection to get their consent and to explain to them that their cooperation is a valuable contribution to the documentation of the traditional medicinal plants of the district. Interview, group discussion, and field observation were employed to collect data on knowledge and management of medicinal plants. The group discussions were conducted to elaborate the methods of preparation, administration and conservation of the medicinal plants. Interviews were conducted in ‘Afan Oromo’ language. During the study period, each informant was visited two to three times in order to confirm the reliability of the information. The responses that were not in harmony with each other were rejected. The information was collected about the plant names, methods of preparation and combination of herbal medicines, modes of administration and the ailment treated.

3.2.4. Semi-Structured Interviews

Semi-structured interview was used to collect data on the medicinal plants found in the area, parts used, preparation method, ingredients added, condition of the plant used, method of administration, conservation strategies, local name of the plants and plant types. All the resulting data were recorded and filled in the data collection format for further analysis as recommended by Martin, 1995.

3.2.5. Field Observations

Field observations were performed with key informants (guides selected among the local people). Full notes on the prevailing facts and information about the history of medicinal plants, and plants used and responses to the questions information were recorded on site. At a later stage, data on specific aspects of the plants used by people were collected for the purposes of ranking; comparing and quantifying was generated.

3.2.6. Ethical Considerations

Data collection was performed after permission obtained from Sebeta Hawas District administrative office and the informants who were targeted for the research.

3.2.7. Plant data collection

The information on the local names of plants, source of collection (wild, homegarden), conservation practices, ways of harvesting (collected in large quantity) identifying plant species that need priority for conservation were collected.

3.2.8. Plant specimen identification

Medicinal plant species collected from the study area were identified using published volumes of Flora of Ethiopia and Eritrea. Voucher specimens were deposited at Jimma University Herbarium.

3.2.9. Data analysis

Data were collected and entered into the computer and were checked for completeness. All the data were analyzed using Microsoft excel 2007 by descriptive statistics like frequencies and percentages.

3.2.9.1. Descriptive statistics

Descriptive statistical methods, percentage and frequency were employed to analyze and summarize the data on medicinal plants and associated knowledge. The most useful information gathered on medicinal plants reported by local people: medicinal value, methods of preparation, route of application, ailment treated, part and habit used were analyzed through descriptive statistical analysis. Facilities in MS Excel spread sheet were utilized to make simple calculations, determine proportions and draw bar graphs.

3.2.9.2. Informant consensus

In order to evaluate the reliability of information during the interview, informants were contacted 3 times for the same ideas and the validity of the information was proved and recorded. Consequently, as the idea of the informant deviated from the original information, it was rejected from informant consensus factor since it considered as unreliable. Only the relevant ones were taken into account and statistically analyzed. The method was adopted from Alexiades (1996). Similarly, informant consensus factor was analyzed for one of plant attributes reported by informants and calculated as follows:

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Where: ICF = Informant Consensus Factor,

N_{ur} = number of use citation and

N_t = number of species used.

3.2.9.3. Preference ranking

Preference ranking was computed following Martin (1995) for six most important medicinal plants used in treating febrile illness. Eight key informants were selected to assess the degree of effectiveness of these six medicinal plants against the disease. The medicinal plant believed to be most effective to treat the illness has got the highest value (6), and the one with the least effective got the lowest value (1). The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the most effective medicinal plants used by the community to treat the disease.

3.2.9.4. Paired comparison

This analytical tool can be used for evaluating the degree of preferences or levels of importance of Certain selected plants/parts of plants (Nemarundwe and Richards, 2002). Paired comparisons to indicate the efficacy and popularity of five medicinal plant species used to treat stomach ache were employed as described by Martin (1995). In such a way that seven key informants were randomly selected by flipping coins and allowed to show their responses independently for pairs of five traditional medicinal plants that are noted for treating the stomach. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses recorded, total value summarized and rank made based on the report of the informants.

3.2.9.5. Fidelity level

The fidelity level was calculated for those frequently reported diseases by informants in order to identify the most important medicinal plant species used to treat. It was calculated by using the formula: $FL = (N_i/N) \times 100$ where, N_i is the number of informants that claim use of a plant species to treat a particular disease and N is the number of informants that use the plant as a medicine to treat any given disease. It was designed to quantify the importance of the species for a particular given purpose (Alexiades, 1996).

4. Result and Discussion

4.1. Indigenous knowledge of local people on health concept

In the study area, health (“Fayyaa" in Afaan Oromoo) is perceived as special asset provided by God ("Waaqayyo"). The local people believe or understand as health problems are the cause for health upset caused either with organisms “ilbiisotaa” or can be sent from God as punishment “dheekkamsa Waaqayyoo” for wrong doings. They can also classify health problems, as those that can be treated and that cannot. From discussion made with elders, the community expressed the value of their health by using different proverbs.

- “Waa,ee fayyaa kan dhukkubsatetu beeka” meaning sicked person know the value of health.
- “Fayyaan muka nyaata” to show that healthy man does everything, can even devour any available food.
- ‘‘Fayyaan culullee dha.’’ meaning a healthy person is like a kite. This is to say that a healthy person can do things he wants to do.

From these local sayings, it is clear that health is considered as a great asset, and a life engine for any aspect of life activities in the area.

4.1. Indigenous Beliefs on Medicinal Plants

The local people of Sebeta district use their shared knowledge in order to manage health problems at home by using different medicinal plants found around them before looking for other options such as modern health services. For example, diseases such as: evil eye, evil spirit and febrile illness believed to be cured by treating with medicinal plants. Some healers connect the knowledge with spiritualism. One traditional healer among the informants believes that “the medicine works for him/her if and only if a patient pays him certain amount of money”. Then he will ask his spirit to make the medicine effective against that particular disease and only after that he will collect and give the medicine for the patient in need. This might indicate the secrecy of traditional medicinal

Most of the traditional healers 8 (50%) were in the age group of 52-56 years. About71% of the respondents were males. Most responds (68.75%) were Orthodox followers and most of them 24 (50%) could not read and write (Table 1).

Table 2: Secio-demographic characteristic of respondents and knowledge of medicinal plants in Sebeta Hawas (n = 48)

Variables		Number (frequency)	Percentage %
Age group	18-35	19	39.5
	36-55	23	47.9
	56-75	34	70.8
	Above 75	2	4.2
Sex	Male	34	70.83
	Female	14	29.16
Religion	Muslims	7	14.58
	Muslim (M)	2	4.16
	Muslim(F)	5	10.41
	Orthodox	33	68.75
	Orthodox (M)	27	56.25
	Orthodox (F)	6	12.5
	Protestant	8	16.66
	Protestant(M)	6	12.5
	Protestant(F)	2	4.16
Educational status	Illiterate	24	50%
	Primary	22	45%
	Secondary	2	4.16%
	Diploma	_	_

4.1. Diversity of Medicinal plants of the study area

Table 2: Medicinal plant species in different families

Family	Number of species	Percent
Lamiaceae	7	12.50
Fabaceae	6	10.71
Poaceae	5	7.81
Solanaceae	4	6.25
Asteraceae	3	5.35
Rutaceae	2	4.68
Euphorbiaceae	3	3.57
Cucurbitaceae	1	1.78
Malvaceae	1	1.78
Polygonaceae	2	3.57
The remaining 21 families	1 each	35.93

4.1.1. Sources of medicinal plants used to treat human ailments

From the total (56 species) collected, the highest number of species belong to family Lamiaceae (7, 12.5%) followed by Fabaceae (6, 10.71%). The remaining 21 families account for one species each (1.78%) (Appendices 4). Among these, (36, 64.28%) species were collected from the wild, (12, 21.42%) species from homegardens and (8, 14.28%) species from cultivated fields. This finding is a good indicator for the presence of more diversity of plant species in the wild than in the homegardens of the study area. The majority of medicinal plant species were obtained from the wild and homegardens. The dominance of herbs is due to active ingredients availability to local people and their abundance in the area. This finding is in line with Endalew Amenu (2007) and Ermias Lulekal (2005) in which herbs were the dominant growth form of medicinal plants.

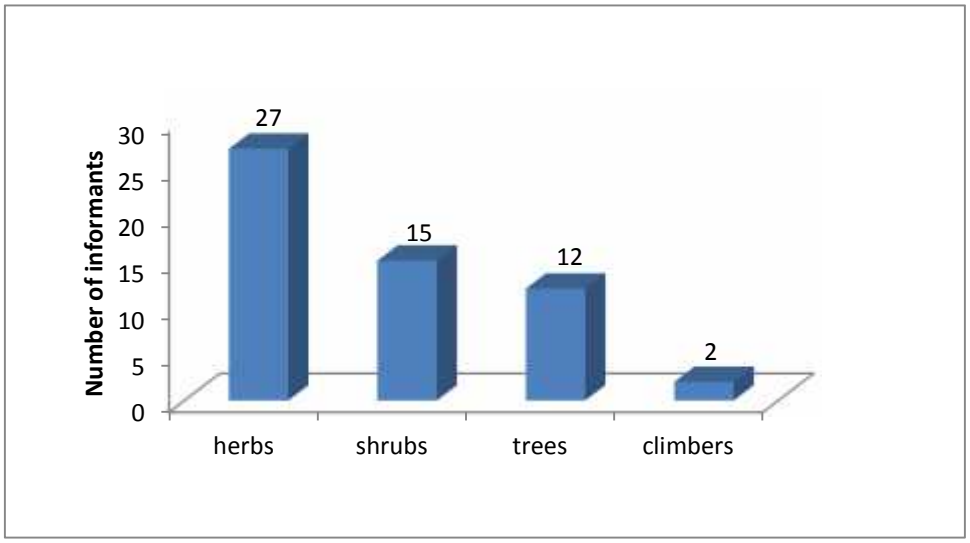

Figure 2: Habits of medicinal plants collected from Sebeta Hawas District

Most of the medicinal plant species collected and identified in this study were also medicinally used in other parts of Ethiopia. For example, of the 56 medicinal plants collected from Sebeta District, 26 (46.42%) of them were reported by Mekonnen Abebe (2013) from Gololcha District, Bale Zone, 22 (39.28%) by Behilu Etana (2010) from Goma District, Jimma Zone and 23 (41%) by Etana Tolasa (2007) from Gimbi District, Western Wellega as medicinally important to cure human and livestock ailments. Such widespread report on the use of these plants by different groups of societies in different areas could be attributed to different cultural groups which could validate the medicinal properties of these species. Of the 56 medicinal plants studied, 36 (64.28%) species were gathered from the wild and 12 (21.42%) species were collected from homegardens, 8 (14.28) species were gathered from cultivated land. This result indicates that the local communities mostly depend on medicinal plants collected from the wild than those from the homegardens. The number of medicinal plants obtained in homegardens is also promising. This finding agrees with Haile Yineger and Delenasaw Yewhalaw (2008); Endalew Amenu (2007); Etana Tolasa (2007).

4.1.2. Habits of medicinal plants used to treat human ailments

Regarding the habit distribution, herbs were the most common growth form (46.42 %) while climbers were the least (3%) contributor. The dominance of herbs is due to easy availability to local people and their

abundance in the area. This finding is in line with most medicinal plant inventories in Ethiopia (Debela Hunde, 2001; Ermias Lulekal, 2005; Endalew Amenu, 2007) in which herbs are the dominant growth forms of medicinal plants.

4.1.3. Parts of medicinal plants used to treat human ailments

Leaves were the most reported plant parts in the preparation of remedies. The preference of leaves to other plant parts could be due to ease of preparation and the chemical constituents of leaf for the treatment of diseases. Remedy preparation that involves roots, bulbs, barks or stems have effects that pose a lasting danger to the continuity of an individual plant compared to leaves. In this study area, the fear of high threat of medicinal plants due to plant parts used for the purpose of medicine is minimal as leaves were the most harvested plant parts used in the area which has little effect on the survival of mother plant. This finding is in line with the results of other ethnomedicinal studies made by Endalew Amenu (2007); Etana Tolasa (2007); Haile Yineger and Delenasaw Yewhalaw (2007) who reported that leaves were the most cited plant parts used in remedy preparations.

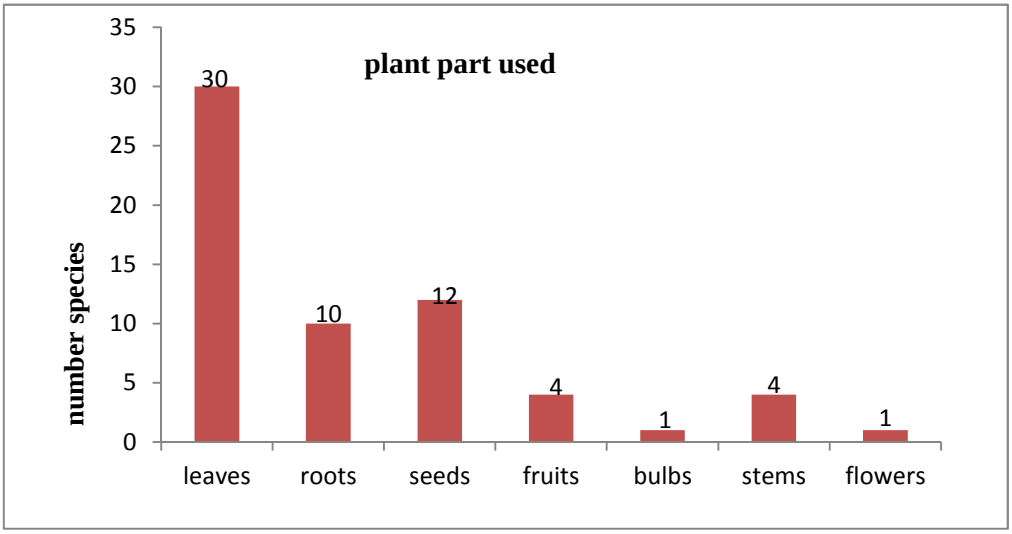

Fig.3 Parts of medicinal plants used to treat human ailments

4.1.4. Methods of preparation of medicinal plants used to treat human ailments

Regarding the preparation of medicine for human, the local community employs various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of ailment treated and the actual site of the ailment. The principal methods of remedy preparation were crushing, which accounts for 13 (23.21%), followed by chewing 11 (19.64%), pounding 9 (16%), squeezing 8 (14.28%) powdering 6 (10.71%), boiling 3 (5.35%), cooking, warming, directly putting, directly rubbing smashing and burning 7 (12.5%) the remaining proportion is accounted for methods like eaten, drying, fumigating, tie, painting, and the combination of each methods.

4.1.5. Routes of administration of medicinal plants used to treat human ailments

There are various routes of administration of traditional medicine prepared by the local community. The major routes of administration in the study area were oral, dermal, nasal, and optical. In the study area, oral administration is the dominant route (57.14%) of the cases followed by dermal (25%), nasal (14.28%), eye and ear (3.56%) (Figure 12). Similar results were obtained by Ermias Lulekal (2005) and others that indicated oral administration dominate over others routes of administration.

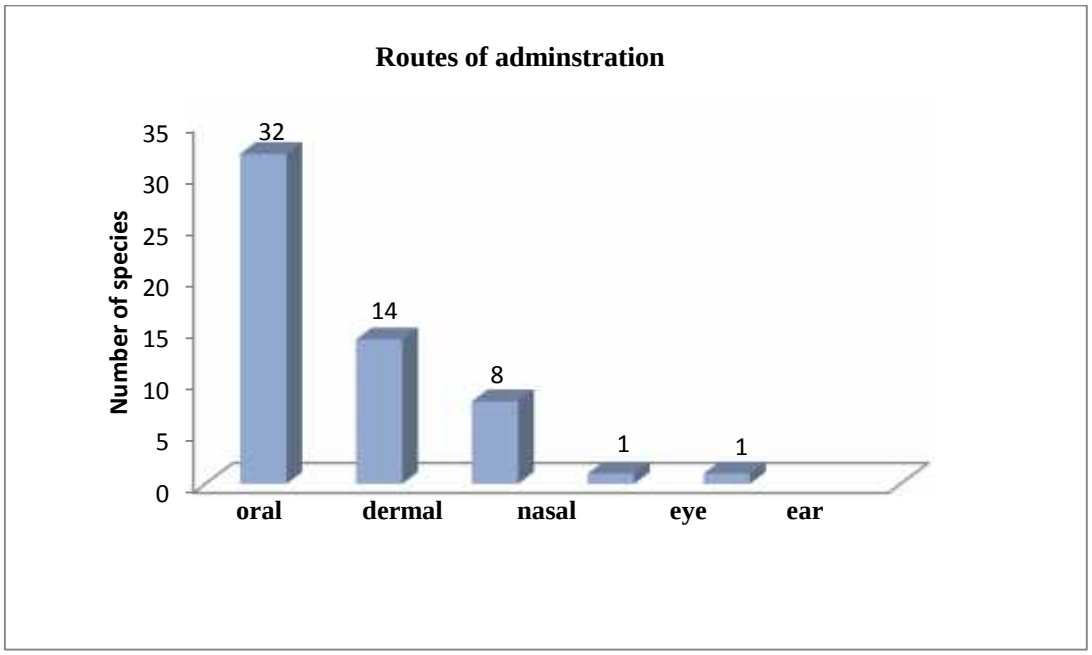

Fig.4: Routes of administration of medicinal plants used to treat human ailments

4.1.6 Applications

The prepared traditional medicines are applied in a number of methods. Drinking accounted for the largest 11 (19.64%), followed by 7 (12.5%) eating, sniffing, swallowing and put on 5 (8.92%) each and others (Figure 5). Internal ailments were commonly treated by making the patient drink herbal preparations; tooth infection were treated by crushing and put on the remedial plant part on the tooth surface; skin infections such as ringworm were treated by painting herbal preparations on an infected skin. Some plants do have different applications for different disease types. This preparation is used for different diseases by diverse application techniques. For instance, putting the leaves on tooth surface is used to cure toothache, and to tie on swollen body part is used to cure swelling.

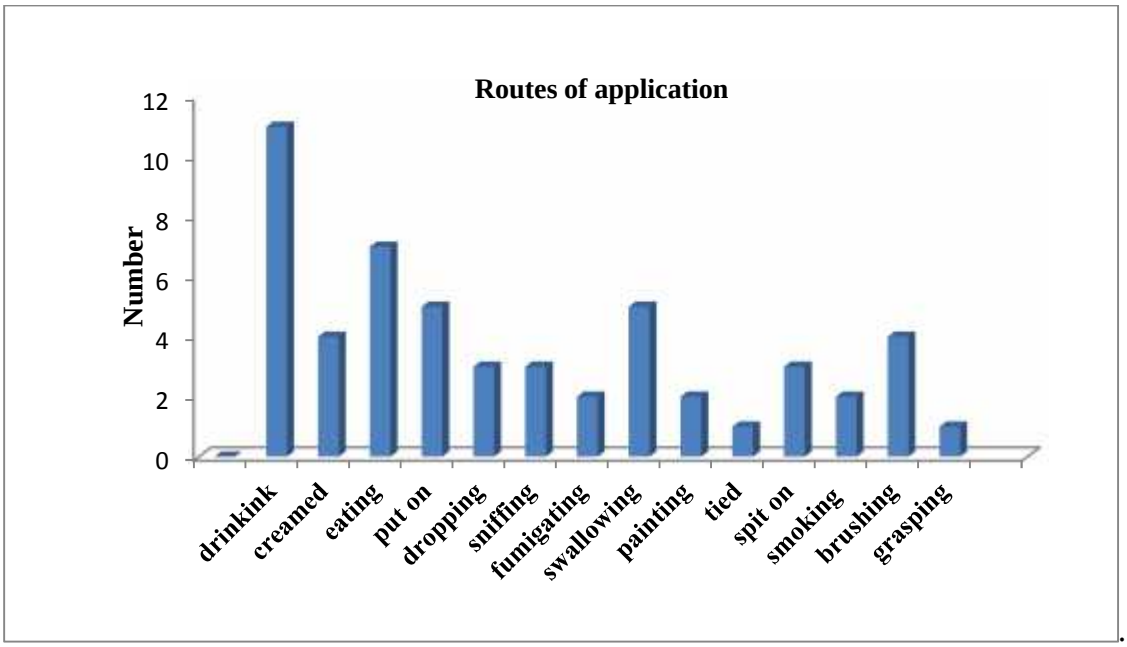

Fig.5: Graph showing ways of application of plant remedies in human ailment treatment

4.2. Major human diseases and plant species used by local people

While more than 34 different diseases of humans were recorded as human health problems that are treated by 56 plant species, one species can treat a single disease or a number of diseases. The practitioners of the area commonly diagnose each health problem by an interview and visual inspection of the patient. This shows that large numbers of diseases have got solution by traditional medicine different investigations in Ethiopia. For example, Endalew Amenu (2007) reported 47 human diseases treated by 48 plant species, Etana Tolasa (2007) reported 77 plant species used to treat 49 diseases of humans and Seyoum Getaneh (2009) reported 78 plant species that were used to treat 50 diseases of humans.

According to the informants, about 11% of plant species was used to treat stomachache followed by tonsillitis (9%)

Table 3: Human ailments and number of plant species used

Disease treated	**Total Species**	**Percent**
Stomach ache	6	10.71
Tonsillitis	5	8.92
Fibril illness	4	7.14
Malaria	3	5.35
Cough	3	5.35
Eye infection	3	5.35
Evil eye	3	5.35
Spider urine	3	5.35
Snake bite	2	3.57
Skin rash	2	3.57
Sudden sickness	2	3.57
Common cold	2	3.57
Tooth ache	2	3.57
Influenza	1	1.78
Influenza	1	1.78
Kidneys problem	1	1.78
Liver problem	1	1.78
Head ache	1	1.78
Skin cut	1	1.78
Ring worm	1	1.78
Rabies	1	1.78
Snake sight	1	1.78
Dandruff	1	1.78
Asthma	1	1.78
Ascaris	1	1.78
Wound	1	1.78
Broken bone	1	1.78
Amoeba case	1	1.78
Diarrhoea	1	1.78
Ear disease	1	1.78
Tape worm	1	1.78
Scabies	1	1.78
Swelling	1	1.78
Abdominal crumb	1	1.78

4.3. Dosage of medicinal plants used

People of the study area used various units of measurement and the duration of administration to determine the dosage. Local units such as finger length (e.g., for bark, root, stem,), different measuring materials (e.g., spoon, coffee cup, tea cup and glass cups) and numbers (e.g., for leaves, seeds, fruits, bulbs, flowers and latex) were used to estimate and fix the amount of medicine. But, these measurements are not accurate enough to determine the precise amount. For medicinal plants that are taken topically they do not have clear cut dosage. Sofowora (1982) and Dawit Abebe (1986) have also discussed lack of precision and standardization as one drawback for the recognition of the traditional healthcare system. Until recovery from the disease, disappearance of the symptoms of the diseases, vanishing out of the disease sign and judgment of the healer to stop the treatment were some of the criteria used in determining duration in the administration of the dosage. However, from the interview made during the study, it was found that there was disagreement among the healers concerning the dosage system used. For example, some informants suggested that four or five drops of the latex from *Euphorbia ampliphylla* is used to treat STDs, ascariasis and rabies, while some suggested that only one drop is enough for the same problem. Still some others suggested that they apply the latex randomly without such measuring system or without mentioning a fixed by saying "drop of latex". Although the measurements used to determine the dosages are not standardized and doses given depend on the age, physical appearances and heath conditions; that is, children are given less dose than adults, physically strong individuals take more dose than weak individuals depending on the type of disease. Though such prescription difference was practiced, still the amount prescribed by healers for both children and adults might not conform to the standard prescriptions as in modern medical literature. According to Dawit Abebe and Ahadu Ayehu (1993), the real drawback in traditional medicine system mostly arises from lack of precision in dosage.

The absence of any adverse effects of traditional medicines after administration were also more frequently mentioned by the traditional healers but some of the preparations were reported to have some adverse effects like diarrhea and vomiting. The traditional healers indicated that they use antidotes for the adverse effects of some traditional medicines like eating cooked teff flour and honey drinking boiled coffee, "tella" after taking the medicine.

4.4. Condition of remedy preparation of Herbal Medicine

The results showed that herbal remedies were prepared using fresh material (30, 53.57%), while (24, 42.85%) used dried plant material and (2, 13%) either fresh or dried (Figure 6). Similarly, a study conducted by Teshale Sori *et al*., (2004) in Borana, Oromia Reginal State southwestern Ethiopia showed that using fresh materials for different health problems is more than dry materials or dry or fresh.

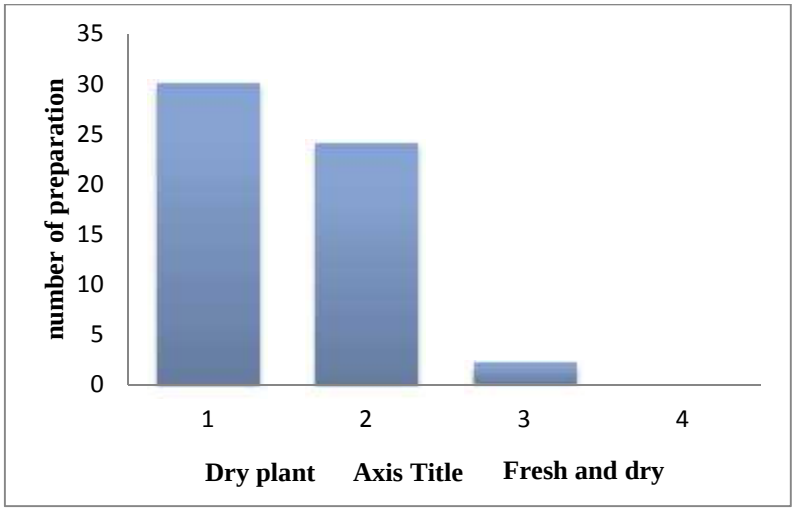

Fig.6: Condition of remedy preparation of Herbal Medicine

4.5. Solvent and additives

Some of the remedies are taken with different additive and solvents, the solvent used is water. The most widely used additives in the study area were honey while the least used additive was “teff “flour the additives include butter, honey, ‘teff’ flour, boiled coffee or tea and water (Table 11). These additives have importance in reduction of pain, to get better taste and reduce adverse effects such as vomiting and diarrhea and enhance the efficacy and healing conditions as explained by informants. For example, the leaves of *Cordia Africana* are burned and the remaining ash is mixed with butter and creamed on affected part until recovery to treat tumors (spider poison).

Table 4: Solvents and additives used in medicinal preparation

Solvents and additives	No- of solvent and additives cited	Percent of total
Water	9	39%
Honey	5	21%
Butter	3	13%
Tea	2	8.6%
Salt	2	8.6%
"teff'' flour	1	4.34%
Boiled coffee	1	4.34%

4.6. Ranking of most important medicinal plants

4.6.1. Informant consensus

Plants which are popular due to the wide range of diseases that they treat have local names and well known by the local people. Certain species were independently cited by many of the informants for their medicinal uses against human ailments. The outcome of this study showed that some medicinal plants are popular than and highest informant consensus goes to *Ocimum lamiifolium* which is cited by 32 informants. The popularity of this medicinal plant is due to people preference for the species to treat fibrile illness in the community by collecting it from homegardens of many people. *Allium sativum* is cited by 30 informants and 28 informants cited *Ruta chalepensis* species and others (Table 5).

Table 5: List of Medicinal plants and the corresponding informants

Scientific Name	**Local name**	**No. of informants**	**% of informants**
Ocimum lamiifolium	Damaakasee	32	57.14
Allium sativum	Qullubbii adii	30	53.57
Ruta chalepensis	Xeenaaddaami	28	50
Croton macrostachyus	Bakkanniisa	25	44.64
Eucalyptus globulus	Baargamoo adii	22	39.28
Cymbopogon citratus	Xajjisaara	22	39.28
Cymbopogon citratus	Ibicha	20	35.71
Cymbopogon citratus	Loomii	20	35.21
Hagenia abbyssinica	Heexoo	19	33.92
Capsicum frutescens	Mixmixa	18	32.14
Aloe pubescens	Hargiisa	18	32.14
Aloe pubescens	Geeshoo	15	26.78
Olea europaea L. ssp	Ejersa	15	26.78
Lepidium sativum L	Feexoo	15	26.78
Plantago lanceolata	Qorxobbii	14	25
Solanum incunum	Hiddii saree	14	25
Echinops kebericho Mesfin	Qarabichoo	13	23.21
Acmella caulirhiza	Gutichaa	13	23.21
Justicia schimperiana	Dhummuugaa	12	21.42
Rumex nepalensis	Shultii	12	21.42
Capparis tomentosa	Harangamaa	12	21.42
Cynodon dactylon	Coqorsa	11	19.64
Otostegia integrifolia	Xuunjiitii	11	19.64
Carissa spinarum L.	Agamsa	10	17.85
Lycopersicon esculentum	Timaatima	10	17.85
Hordeum vulgare	Garbuu	10	17.85
Satureja abyssinica	Xoosinyii	9	16.07
Linum usitatissimum	Talbaa	9	16.07
Snowdenia polystachya	Manjii	8	14.28
Pedocarpus falcatus	Birbirsa	8	14.28
Acacia abbyssinica	Laaftoo	8	14.28
Ocimum basilicum	Bassobilaa	7	12.5
Euphorbia lathryis	Adaamii	7	12.5
Phytolacca dodecandra	Andoodee	7	12.5

4.6.2. Preference Ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of six medicinal plants that were reported for treating stomach ache was conducted after selecting six key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (6) for the medicinal plant which they thought most effective in treating wound and the lowest number (1) for the least effective plant in treating wound. *Ruta chalepensi*s scored 32 ranked first indicating that it is the most effective in treating stomach ache followed by *Citrus limon* scored 28 and the least effective was *Rumex nepalensis* (Table 6).

Table 6: Preference ranking of medicinal plants used for treating stomach ache (R = respondents)

Medicinal Plants	Informants R_1-R_6						Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6		
Ruta Chalepensis	5	6	6	5	6	4	32	1st
Cymbopgon citrutus	4	5	5	4	5	3	27	3rd
Carica papaya	5	3	2	3	4	2	19	5th
Citrus limon	4	5	6	4	5	4	28	2nd
Capsicum frutesens	4	4	5	3	4	3	23	4th
Rumex nepalensis	3	2	2	3	2	3	15	6th

4.6.3. Paired comparison

A paired comparison made to determine the most preferred medicinal plants among the five species that were used to treat fibril illness in the study area, the responses of eight key informants, showed that *Schinus molle* ranked first followed by *Acmella caulirhiza* **(**Table 7). Therefore, this result indicated that *Schinus molle* is the most preferred while *Acmella caulirhiza* is the least favored over the other plant species cited in treating fibril illness.

Table 7: Paired comparisons of five medicinal plants used to treat fibril illness

Medicinal Plants	Informants R_1-R_8								Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8		
Schinus molle	3	5	6	4	5	6	4	5	38	1st
Rhamnus prinoides	2	4	5	4	3	2	2	5	27	3rd
Otostegiaintegrifolia	4	3	3	2	4	2	4	3	25	4th
Acmella caulirhiza	5	4	4	5	3	6	5	4	36	2nd
Solanum incunum	3	2	2	3	3	4	2	3	22	5th

4.6.4. Fidelity level index (Fl)

Fidelity level (FL) values were calculated for some commonly used medicinal plants against some commonly reported ailments: *Ocimum lamiifolium* (against febrile illness), *Allium sativum* (*against* cough), *Ruta chalepensis* (against stomach ache), *Croton macrostachyus* (against ring worm), *Vernonia amygdalina* (against malaria), *Acmella caulirhiza* (against tonsillitis) and *Justicia schimperiana* (against rabies) (Table 8). The medicinal plants that were widely used by the local people to treat one or very few ailments would have higher FL values than those that were less popular (Tilahun Teklehaymanot and Mirutse Giday, 2007). For example, *Ocimum lamiifolium* and *Allium sativum* were reported by many informants to treat febrile illness and cough and hence had 94.44% and 93.75% FL respectively. High FLs could also be indicator of efficacy of the reported plants to cure specific ailments.

Table 8: Fidelity index of some medicinal plants in Sebeta Hawas district

Medicinal Plants	ailments treated	N_i	N	FL	FL%
Ocimum lamiifolium	Febrile illness	17	18	0.94	94.44
Allium sativum	Cough	15	16	0.93	93.75
Ruta chalepensis	Stomach ache	14	16	0.87	87.50
Croton macrostachyus	Ring worm	12	15	0.80	80.00
Vernonia amygdalina	Malaria	11	14	0.78	78.57
Acmella caulirhiza	Tonsillitis	10	13	0.76	76.92
Justicia schimperiana	Rabies	10	14	0.71	71.42

4.7. Threats of medicinal plants in the study area

4.7.1. Factors threatening medicinal plants

The cause of treat to medicinal plants in Sebeta Hawas district can be generally grouped in to natural and human induced factors. However, as reported in this study most of the causes for the threats to medicinal plants and the associated indigenous knowledge are the anthropogenic factors such as deforestation due to over exploitation of plants for different uses including charcoal making, fire wood collection, collection of construction woods, overgrazing, cutting and burning of plants to create new agricultural lands. According to the informants expansion of town and industry are also a big threat to medicinal plant in the study area. Informants ranked agricultural expansion as the most serious threat to the medicinal plants followed by fire wood and charcoal collection and lower levels of threats by the other factors such as drought and fodder. (Table10). Similar study by Fisseha Mesfin (2007) in Wonago District showed that, there are different threats in medicinal plants such as agricultural expansion (24.4%), fire wood collection and others. Furthermore, the negative impact of deforestation on medicinal plants was also reported in Mirutse Giday (1999). The study showed that the District is relatively rich in medicinal plant diversity and associated indigenous knowledge. However, anthropogenic factors coupled with acculturation and very poor conservation efforts threaten medicinal plant survival in the area.

Above all, depending on the age of the healers passing the knowledge of numerous species of ethnomedicinal plants use, management and ways of preparation are threatened. From discussion with informants, it was observed that the forefathers tell information only to one or few family members to use in secrecy. As a result, these old aged healers provide the knowledge with doubtful accuracy to the learners. Many researches done in some parts of Ethiopia also revealed that many of the traditional healers reported to transfer their knowledge and use of ethnomedicinal plants orally to their favorite family members. Such transfer of indigenous knowledge is liable to erosion as it could vanish when knowledgeable elders die before the knowledge is transferred.

Table 9 Ranking of threats to medicinal plants

Threat	**R_1-R_8**									
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	Total	Rank
Drought	3	2	1	2	3	4	1	2	18	7th
Fire wood	5	4	3	5	2	3	5	4	31	2nd
Charcoal	3	2	4	3	4	2	4	3	25	3rd
Fodder	2	4	3	2	3	1	2	3	20	6th
Urbanization	4	3	2	4	3	2	2	3	23	5th
Construction	2	5	2	3	3	2	4	3	24	4th
Agricultural expantion	5	4	5	5	5	4	6	5	38	1st

4.8. Conservation practices of medicinal plants in the study area

Even though there are many problems facing medicinal plants, the local people of the study area know the importance of conserving the plants under both ex-situ and in-situ conservation methods, though the actual effort on the ground is minimal. For instance, some people and the District Agriculture Office have started conserving the plants by in-situ method (in their natural habitat), live fences, road sides, different places of worship (churches and mosques), in their farm fields or farm margins. Some local people are also conserving medicinal plants by ex-situ method by planting them in their home gardens. In the study area some cultural believes and traditional practices that associated with traditional medicines are found to contribute much to the conservation of medicinal plants in their natural habitat.

4.9. Threatened Medicinal Plants

The ranking of five medicinal plants based on the degree of threats was conducted using eight key informants. The results indicated that *Hagenia abyssinica* is the most threatened followed by *Olea europaea* and *Cordia africana* and the least threatened one is *Eucalyptus globulus*

5. CONCLUSION

Ethnobotanical study of medicinal plants indicates that the study area is rich in its medicinal plant composition and the associated indigenous knowledge. Fifty six medicinal plants were recorded to treat human ailments. The medicinal plant species collected and identified from the wild vegetation were 36 species and those from home gardens were 12 species. In the study area, 34 human ailments were reported which are being treated by traditional medicinal plants of the area. Herbal remedies are prepared from fresh materials (53.57%) and dried plant materials (42.85%). Herbs are highly utilized (46.42%) for medicinal purpose than trees and shrubs. Leaves (53.57%) are used for medicinal purpose more than other plant parts for preparation of human remedies. The remedies are taken with different additive and solvents and water is more frequently used for this purpose. Most of the medicinal plants are administered orally (57.14%). The major threats to medicinal plants and the associated knowledge in the study area are agricultural expansion, firewood collection, charcoal production, drought, uses of plants for construction and grazing in that order. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, influence of modern education and awareness factors are the major ones. Therefore, awareness creation campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness raising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use.

6. RECOMMENDATIONS

Based on the findings of the study the following recommendations are forwarded:

- Encourage the people to cultivate medicinal plants in their homegardens and farmlands. In addition to this, local peoples' management and conservation of local resources need to be maintained.
- The local people need supports through awareness raising education on the sustainable utilization and management of plant resources.
- Encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives.
- Encouraging Government officers and NGOs to participate in conservation of medicinal plants, support local medicines and provide incentives to farmers for cultivation of medicinal plants in homegardens.
- Encourage participation of the local people in conservation activities.

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9. Appendixes

Appendix 1: List of medicinal plants used for treating human ailments in the study area; with scientific name, family, local name, ailment treated and collection number.

Scientific name	**Family**	**Local name**	**Ailment treated**	**Co/No**
Acmella caulirhiza Del.	Asteraceae	Gutichaa	Tonsillitis	TK29
Ajuga integrifolia Buch-Ham.	Lamiaceae	Harma guusa	Stomach ache	TK50
Allium sativum L.	Alliaceae	Qullubbi adii	Asthma and malaria	TK41
Capparis tomentosa Lam.	Capparidaceae	Harangamaa	Ascarisis,evil eye	TK35
Carica papaya L.	Caricaceae	Paappaayaa	Stomach ache	TK19
Citrus limon L.	Rutaceae	Loomii	Common cold	TK01
Croton macrostachyus Del.	Euphorbiaceae	Bakkanniisa	Ring worm, Dandruff	TK14
Cymbopogon citratus L.	Poaceae	Xajjisaara	Stomach ache	TK09
Cynodon dactylon (L.) Prers	Poaceae	Coqorsa	snake sight	TK20
Echinops kebericho Mesfin	Asteraceae	Qarabichoo	Febrile Illness	TK34
Eucalyptus globules Labill.	Myrtaceae	Barzaafii adii	Febrile illness & Influenza	TK12
Euphorbia lathryis L.	Euphorbiaceae	Hadaamii	Heart problem	TK48
Hordeum vulgare L.	Poaceae	Garbuu	Broken bones	TK42
Juniperus procera L.	Cuppressaceae	Gattiraa	Ear disease	TK26
Justicia schimperiana (Hochst.ex.Nees) T. Andres	Acanthaceae	Dhummuugaa	Rabies	TK39
Lagenaria siceraria (Mol.) Standl.	Cucurbitaceae	Dabaaqula	Malaria	TK16
Lepidium sativum L.	Brassicaceae	Feecoo	Febrile Illness	TK45
Lycopersicon esculentum Mill.	Solanaceae	Timaatimii	Skin rash	TK25
Ocimum basilicum L.	Lamiaceae	Bassobilaa	Sudden sickness	TK22
Ocimum lamiifolium Hochst.ex. Benth.	Lamiaceae	Damaakasee	Febrile Illness and cough	TK02
Olea europaea L. ssp. *Cuspidate (*Wall. ex.Don*)*	Oleaceae	Ejersa	Tooth ache	TK08
Otostegia integrifolia Benth.	Lamiaceae	Xunjitii	Tonsillitis	TK49
Pavonia urens Cav.	Malvaceae	Maxxannee	Diarrhea	TK23
Phytolacca dodecandra L'Herit.	Phytolaccaceae	Handoodee	Liver problem	TK11
Plantago lanceolata L.	Plantaginaceae	Qorxobbii	Skin cut	TK21
Rhamnus prinoides L.Herit.	Rhamnaceae	Geshoo	Tonsillitis	TK10
Rumex nepalensis Spreng.	Polygonaceae	Shuultii	Stomach ache	TK06
Ruta chalepensis L.	Rutaceae	Xeenaaddami	Stomach ache	TK17

Scientific name	Family	Local name	Ailment treated	Co/No
Satureja abyssinica(Benth.)Briq	Lamiaceae	Xoosanyii	Cough	TK47
Schinus molle L.	Anacardiaceae	Qundoo	Tonsillitis	TK30
Snowdenia polystachya (Fresen.) Pilg.	Poaceae	Manjii	Malaria	TK37
Tamarindus indica L.	Fabaceae	Misrichii	Spider poison	TK40
Triticum aestivum L.	Poaceae	Qamadii	Swelling, spider urine	TK43
Vernonia amygdalina Del.	Asteraceae	Eebicha	Malaria	TK15
Vicia faba L.	Fabaceae	Baqelaa	Cough	TK53
Premna schimberi Engl.	Lamiaceae	Urgeessaa	Toothache	TK13
Artemissa abyssinica Sch Bipm.ex A.Rich.	Asteraceae	Arrittaa	Eye infection	TK03
Aloe pubescens Reynolds.	Aloaceae	Hargiisa	Skin rush	TK05
Brucea antidysenteria J.F Mill	Simaroubaceae	Qomonyoo	Anthrax, intestinal	TK07
Kalanchoae petitiana A.Rich	Crassulaceae	Bosoqqee	Febril illness	TK24
Ricinus communis L.	Euphorbiaceae	Qobboo	Sudden sickness	TK04
Capsicum frutescens L.	Solanaceae	Mixmixa	Abdominal cramp	TK51
Hagenia abbyssinica(Bruce)J.F Gamal	Rosacceae	Heexoo	Tape worm	TK28
Linum usitatissimum L	Lineaceae	Talbaa	Eye infection	TK44
Lippiaadoensis Hochst.ex Welp	Verbenaceae	Kusaayee	Eye infection	TK52
Rumex abbyssinicus	Polyganaceae	Maqmaqqoo	Scabies	TK56
Solanum incunum L.	Solanceae	Hiddii saree	Tonsilitis	TK32
Acacia abbyssinica	Fabaceae	Laaftoo	Spider poison	TK38
Pedocarpus falcatus		Birbirsa	Wound injury	TK54
Cordia africana .Lam.	Boraginaceae	Waddeessa	Spider poison	TK36
Rhus vulgaris Meikle	Anacardiaceae	Xaaxessaa	Snake bite	TK31
Withania somnifera(L) Dunal	Solanaceae	Hiddiigammoji	Evil eye	TK55
Calpurnia aurea (Ait.) Benth.	Fabaceae	Ceekaa	Bronchial inflammation	TK27
Carissa spinarum L.	Apocynaceae	Agamsa	Evil eye, evil sprite	TK33
Millettia ferruginica (Hchst) Back.	Fabaceae	Birbirraa	Wound injury	TK18
Trigonella foenum. graecum L.	Fabaceae	Sunqoo	“Ajii baasuu”	TK46

Appendix 2: List of human diseases treated by medicinal plants in the study area.

No	Local name(afan Oromo)	English name
1	Qufaa	Common cold
2	Qorra	Cold
3	Madaa mataa	Head sore(skin diseases)
4	Maagaa	Ascaris
5	Hiddaa bofaa	Snake bite
6	Boralee	Tania Pedi's
7	Fincaan shararriitii	Spider urine
8	Dhukkuba sinbiraa	Hepatitis
9	Dhibee laphee	Heart diseases
10	Dhibee gurraa	Ear diseases
11	Cittoo	Scabies
12	Cabiinsa lafee	Broken bone
13	Busaa	Malaria
14	Bowwoo	Headache
15	Arsassee	Tonsillitis
16	Asmii	Asthma
17	Budaa	Evil eye
18	Buutii	Snake sight
19	Ciniinnaa garaa	Stomach ache
20	Dhiitaha	Swelling
21	Dhibee ilkaanii	Toothache
22	Dhukkuba saree	Rabies
23	Dingatanyaa	Sudden sickness
24	Baarolee	Dandruff
25	Garaa kaasaa	Diarrhea

26	Koosoo	Tape worm
27	Madaa	Wound
28	Muraa gogaa	Skin cut
29	Qufaa	Influenza
30	Roobbii	Ring worm
32	Dhukkuba kale	Kidney diseases

Appendix 3: List of informants contacted in the ethno botanical study (Keys: with* are key informants and with + are traditional healers)

S. no	Name	Sex	Age	Kebele	Occupation
1	Begna Lamecha*	M	52	Fullaso	Farmer
2	Irko Dechasa	M	32	Fullaso	Farmer
3	Negasa Tarecha	M	35	Fullaso	Merchant
4	Kebede Werku	M	39	Fullaso	Farmer
5	Seboka Urgecha*	M	38	Fullaso	Farmer
6	Admasu Kebede	M	29	Fullaso	Guard
7	Negasa Urgecha	M	41	Haro jila	Farmer
8	Fita Kumsa	M	40	Haro Jila	Farmer
9	Bedada Tullu	M	35	Haro Jila	Farmer
10	Negese Werku	M	33	Haro Jila	Farmer
11	Beyene Gadisa*	M	69	Fullaso	Farmer
12	Legese Dida*	M	56	Haro Jila	Farmer
13	Mekonin Werku	M	26	Haro Jila	Farmer
14	Derartu Gachena	F	24	Haro Jila	House wife
15	Demitu Dhera	F	34	Fullaso	Farmer
16	Buzu Dinku	F	41	Daleti	House wife
17	Talile Bikila	F	36	Daleti	House wife
18	Dechasa Hirpa	M	37	Fullaso	Farmer
19	Tesfaye Dadi	M	28	Daleti	Merchant
20	Fufa Dandena*	M	44	Daleti	Farmer
21	Jamila Tadese	F	25	Daleti	House wife
22	Beshadu Feyisa	F	35	Haro Jila	Farmer
23	DiribaBacha+	M	49	Haro Jila	Farmer
24	Tullu Cuko	M	26	Haro Jila	Merchant
25	Megersa Chala	M	48	Fullaso	Farmer
26	Mengistu Werku+	M	72	Fullaso	Farmer
27	Awal Mengistu+	M	77	Fullaso	Merchant
28	Lelisa Diriba	M	40	Fullaso	Farmer
29	Teshome Guta	M	38	Haro Jila	Farmer
30	Urgecha Adugna	M	32	Haro Jila	Farmer

S. no	Name	Sex	Age	Kebele	Occupation
31	Boki Adugna	M	46	Fullaso	Farmer
32	Gudeta Chala	M	76	Fullaso	Farmer
33	Bacha Gemeda+	M	52	Daleti	Farmer
34	Hasen Shifa+	M	56	Daleti	Merchant
35	Aregash Abera	F	36	Daleti	Merchant
36	Geresu Jima	M	48	Daleti	Farmer
37	Fekadu Balcha	M	33	Haro Jila	Farmer
38	Engida Alemayehu*	M	55	Haro Jila	Farmer
39	Tsehay Borecha	F	36	Haro Jila	Farmer
40	Fitsum Abebe	M	26	Daleti	Merchant
41	Fatuma Abdulkerim	F	28	Daleti	H.wife
42	Hana Nigussie	F	28	Fullaso	H.wife
43	Hirphasa Dugo*	M	42	Fullaso	Farmer
44	Gadise Abdi	F	38	Haro jila	Farmer
45	Hamza Mohammed	F	34	Daleti	Merchant
46	Kedija Usman	F	39	Daleti	Merchant
47	Hikram Awel	F	28	Daleti	No work
48	Mo,aa Kebede	M	44	Haro jila	Farmer

Appendix 4: Medicinal plants used for treating human ailments, scientific name, family name, local name, habit, habitat, use, part used, mode of preparation, route of administration and disease treated.

Key: Habit (Ha); Habitat (Hab); Use (U); Part used (Pu); Tree (T); Herb (H); Shrub (Sh); Climber (Cl); Wild (W); Home garden (Hg); Cultivated (Cu); Human (Hu); Flower (F); Leaf (L); Bulb (Bu); Root (R); Seed (S) and Fruit (Fr) .

Scientific name	Family name	Local name	Ha	Hab	U	Pu	Mode of preparation	Route of administration	Disease treated
Acmella caulirhiza Del.	Asteraceae	Gutichaa	H	W	Hu	F	Chew flower and hold on tonsil with tounge	Oral	tonsillitis
Ajuga integrifolia Buch-Ham.	Lamiaceae	Harma guusaa	H	W	Hu	F	Boil and drink half a tea cup	Oral	Stomach ache
Allium sativum L.	Alliaceae	Qullubbi adii	H	Hg	Hu	L	Crush and soak to tea cup and drink with tea	Oral	Asthma malaria And common cold
Capparis tomentosa Lam.	Capparidaceae	Harangamaa	Sh	Hg	Hu	R	Dry and pounded and sniffed	Nasal	Evil eye
Carica papaya L.	Caricaceae	Paappaayaa	T	Hg	Hu	L	Crush leaf and mix with water to drink	Oral	Stomach ache
Citrus limon L.	Rutaceae	Loomii	T	Hg	Hu	Fr	Pounded with honey and drinked	Oral	Stomach ache, common cold
Croton macrostachyus Del.	Euphorbiaceae	Bakkanniisa	T	W	Hu	L	Squeeze and rub to infected area	Dermal	Ring worm, dandruff
Cymbopogon citratus L.	Poaceae	Xajjisaara	Sh	Hg	Hu	L	Squeeze and drink	Oral	Stomach ache

Cynodon dactylon (L.) Prers	Poaceae	Coqorsa	H	W	Hu	L	Chew and spit on the swollen part	Dermal	Snake site
Echinops kebericho Mesfin	Asteraceae	Qarabichoo	Sh	W	Hu	R	Crush and smoke the dried form	Nasal	Fibril illness
Eucalyptus globules Labill.	Myrtaceae	Barzaafii adii	T	Cu	Hu	L	Boil and blow in the vapour	Oral	Influenza
Euphorbia lathryis L.	Euphorbiaceae	Hadaamii	T	W	Hu	L	Latex half cup is eaten with dough of eragrositis teff	Oral	Kidneys problem
Hordeum vulgare L.	Poaceae	Garbuu	H	Cu	Hu	S	Crush and eat its forage	Oral	Broken bones
Juniperus procera L.	Cuppressaceae	Gattiraa	T	W	Hu	S	3-4 drops of soln of pounded dry seed is added to ear	Auditoria	Ear diseases
Justicia schimperiana (Hochst.ex.Nees) T. Andres	Acanthaceae	Dhummuugaa	Sh	W	Hu	R	Dried root powdered with other plants and the ingredients are fumigated (sniffed)	Nasal	Rabies
Lagenaria siceraria (Mol.) Standl.	Cucurbitaceae	Dabaaqula	H	Hg	Hu	S	Crush the seed and soak in to a cup of water and drink	Oral	Ascaris
Lepidium sativum L.	Brassicaceae	Feecoo	H	W	Hu	S	Seeds are pounded together with bulbs of Allium sativum &eaten with honey for 5days	Dermal	Cough
Lycopersicon esculentum Mill.	Solanaceae	Timaatimii	H	Hg	Hu	L	Crushed and rubbed against infected skin	Dermal	Skin rush
Ocimum basilicum L.	Lamiaceae	Bassobilaa	H	Hg	Hu	L	Chewing and swallowing the fresh leaf	Oral	Sudden sickness

Ocimumlamiifolium Hochst.ex. Benth.	Lamiaceae	Damaakasee	Sh	W	Hu	L	Squeezed and sniffed nasally	Nasal	Fibrill illness, cough and headache
Olea europaea L. ssp. *Cuspidate (*Wall. ex.Don*)*	Oleaceae	Ejersa	T	W	Hu	L/S	Chew the buds and swallow. Warm stem and hold on the teeth	Oral	Tooth ache and abdominal cramp
Otostegia integrifolia Benth.	Lamiaceae	Xunjitii	Sh	W	Hu	L	Chewing and swallowing the fresh leaf	Oral	Tonsillitis
Pavonia urens Cav.	Malvaceae	Maxxannee	H	W	Hu	L	Leaf of pavonia urens is chewed with salt and swallowed	Oral	Diarrhea
Phytolacca dodecandra L'Herit.	Phytolaccaceae	Handoodee	Sh	W	Hu	L	Crushed and pounded, mix with water and half a cup is drunk.	Oral	Liver problem
Plantago lanceolata L.	Plantaginaceae	Qorxobbii	H	W	Hu	L	Squeeze and paint on the cut surface	Dermal	Skin cut
Rhamnusprinoides L.Herit.	Rhamnaceae	Geshoo	Sh	Hg	Hu	L	Chew and spit in mouth	Oral	Tonsillitis
Rumex nepalensis Spreng.	Polygonaceae	Shuultii	H	W	Hu	R	The root piece is chewed and the juice is swallowed	Oral	Stomach ache and amoeba case
Ruta chalepensis L.	Rutaceae	Xeenaaddaamii	H	W	Hu	L	Squeeze and drink with cymbopogon	Oral	Stomach ache
Satureja abyssinica(Benth.)Briq	Lamiaceae	Xoosinyii	H	W	Hu	L	Boil and drink with tea	Oral	Cough
Schinus molle L.	Anacardiaceae	Qundoo barbaree	T	W	Hu	R	Chewing and swallowing the leaf	Oral	Tonsillitis

Snowdenia polystachya (Fresen.) Pilg.	Poaceae	Manjii	H	W	Hu	L	Powdered fruit of dature stramonium is mixed with honey and 3-4 spoons are eaten with pounded Allium sativum	Oral	Malaria
Tamarindus indica L.	Fabaceae	Misrichii	H	Cu	Hu	S	Seeds are chewed with cynodon dactylon spitted on infected area	Dermal	Spider urine
Triticum aestivum L.	Poaceae	Qamadii	H	Cu	Hu	S	Chew and put the bolus on the swollen part	Dermal	Swelling and spider urine
Vernonia amygdalina Del.	Asteraceae	Eebicha	Sh	W	Hu	L	Crushed and concotted with leaves and drinked	Oral	Malaria
Vicia faba L.	Fabaceae	Baqelaa	H	Cu	Hu	S	Cook and blow in its hot vapour	Oral	Cough
Premna schimberi Engl.	Lamiaceae	Urgeessaa	Sh	W	Hu	L	Chewed and the solutions allowed to be in contact with tooth	Oral	Tooth ache
Artemissa abyssinica Sch Bipm.ex A.Rich.	Asteraceae	Arrittaa	H	Hg	Hu	S	Crushed fresh stem with butter and applied topically	Optical	Eye infection
Aloe pubescens Reynolds.	Aloaceae	Hargiisa	Sh	W	Hu	L	Squeezed latex and creamed on infected area	Dermal	Skin rush
Brucea antidysenteria J.F Mill	Simaroubaceae	Qomonyoo	Sh	W	Hu	S	Pounded and mixed in coffee and drinked	Oral	Anthrax
Kalanchoae petitiana A.Rich	Crassulaceae	Bosoqqee	Sh	W	Hu	L	Smashed together and squeezed over infected part	Dermal	Fibril illness

Ricinus communis L.	Euphorbiaceae	Qobboo	Sh	Hg	Hu	L	The leaves are pounded ,mixed with honey and eaten	Oral	Sudden sickness
Capsicum frutescens L.	Solanaceae	Mixmixa	H	Cu	Hu	Fr	Ripe fruit is crushed and eaten with honey	Oral	Stomach ache
Hagenia abbyssinica(Bruce)J.F Gamal	Rosacceae	Heexoo	Sh	W	Li	R	Dried seed are powdered along with the seed of Guzotia abbyssinica and eaten with" kita"	Oral	Tape worm
Linum usitatissimum L	Lineaceae	Talbaa	H	Cu	Hu	S	Seed directly put in the eye at night to clean out dust particles.	Optical	Eye problem
Lippia_adoensis Hochst.ex Welp	Verbenaceae	Kusaayee	Sh	W	Hu	L	Leaf is directly rubbed on the Affected part of eye lid.	Dermal	Eye infection
Rumex abbyssinicus	Polyganaceae	Maqmaqqoo	H	W	Hu	L	Leaves are smashed and directly rubbed over the skin	Dermal	Scabies
Solanum incunum L.	Solanceae	Hiddii saree	Sh	W	Hu	Fr	Root is squeezed and rinsed with cotton and rolled on tonsillitis	Oral	Tonsillitis
Acacia abyssinica	Fabaceae	Laaftoo	H	W	Hu	L	Leaf buds are chewed together with cynodondoctylon and seeds of lansculinaris	Oral	Spider urine
Podocarpus falcatus		Birbirsa	T	W	Hu	L	Dried sap is powdered and sprayed on the wound	Dermal	Wound injury

Cordia africana .Lam.	Boraginaceae	Waddeessa	T	W	Hu	L	The leaves are burned and the ash is mixed with butter and creamed on affected part.	Dermal	Spider poison and snake bite
Rhus vulgaris Meikle	Anacardiaceae	Xaaxessaa	T	W	Hu	R	A dried root are crushed and fumigated	Nasal	Snake bite
Withania somnifera(L) Dunal	Solanaceae	Hiddii gammoojjii	T	W	Hu	R	Dried roots are crushed and fumigated	Oral	Evil eye
Calpurnia aurea (Ait.) Benth.	Fabaceae	Ceekaa	Sh	W	Hu	R	Root is pounded dry and smoked.	Nasal	Bronchial inflammation
Carissa spinarum L.	Apocynaceae	Agamsa	Sh	W	Hu	R	Roots are dried and crushed and then sniffed or tied to the sick person.	Nasal	Evil eye and evil sprite
Millettia ferruginica (Hchst) Back.	Fabaceae	Birbirraa	T	W	Hu	L	Seeds of milletia ferruginia,root bark of securidacalongepedung ulata and capparis tomentosaare powdered and mixed with water 1 cup for adult and half for children.	Oral	Abdominal cramp
Trigonella foenum. graecum L.	Fabaceae	Sunqoo	H	W	Hu	L	Crush and squeeze	Dermal	Ajii baasuu

Appendix 5: photo during data collection

Photo during data collection

Fig.7. Photo by Taye K.

Appendix 5: Checklist of semi structured questions used for interview for collection of different medicinal plants.

I. General information of respondents

1. Kebele_____ village/specific locality/ _____ Date_____
2. Name _____, Age _____, Sex _____
   Marital status _____ Educational Status _____ Occupation _____
   Religion_____ Ethnic_____
3. Tell me the most common disease of humans in your area _____
4. How local people prevent and control a given diseases in your area?_____
5. Which part of plant is collected for medicinal uses?_____
6. Where do the medicinal plants can be obtained?_____
7. Is the medicinal plant easily accessible and affordable? If not, why?
   _____
   _____
8. Which one is common rout of application (Rout)?
   _____
   _____
9. Are there any restrictions associated with collection of medicinal plants? What is that?
   _____
   _____
10. State the major threats of medicinal plants in the area? A. Habitat loss, B. habitat degradation, C. overharvesting
11. How is the accessibility of medicinal plants compared to the past year? A. increased B. decreased C. constant
12. What are the threats to the medicinal plants in the area? A. Drought B. Fire wood C. Charcoal D. Agricultural expansion E. Urbanization F. Fodder G. Construction

13. Which medicinal plants are the most preferred in your area?_____

14. Which medicinal plant uses for multipurpose?_____

15. How much sold now compared to in past: more_____, some_____, less_____

16. What is the conservation strategy of those plants?

A. planting B. transferring C. keeping from cattle

17. What is the habit of the plant? Tree/ Stem/ Herb/ or / Climber?

18. Habitat of the plant? Cultivated, wild, cultivated /Wild

19. What is the dose?

20. Does the dose differ among males, females and children?

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree of masters in any other universities.

Name: Taye Kebede

Signature_____

Date _____

This thesis has been submitted for examination with my approval as a University advisor:

Dr. Dereje Denu

Signature_____

Date _____

Mr. Desalegn Raga

Signature_____

Date _____