ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS IN DEJEN DISTRICT, EAST GOJJAM, AMAHARA REGION, ETHIOPIA

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August, 2018

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GRADUATE PROGRAMES

This is to certify that the thesis prepared by Addissie Belay, entitled: *Ethnobotanical study of traditional medicinal plants in Dejen District, East Gojjam, Amhara Regional state, Ethiopia* and Submitted to the School of Graduate Studies of Addis Ababa University in partial Fulfillment of the Requirement of Degree of Master of Science in Biology complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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Abstract

Ethnobotanical study of traditional medicinal in Dejen district,East Gojjam,Amhara region, Ethiopia.

Addissie Belay

Addis Ababa University, August, 2018

Medicinal plants have not been well studied, tested, or documented in Dejen district. Most of the information is still in the hands of the traditional healers. This study was carried out between November 2017 and May2018 to explore ethnobotanical information on the use of medicinal plants in Dejen district. A total of 100 informants were interviewed using semi structured interview, group discussion& field observation. A total of 72 plant species were reported for their medicinal uses in the study area. From those 48 species were recorded for the treatment of human ailments, 17 species for livestock and 7 species for the treatment of both human and livestock ailments. The majority of the plants (49%) were found to be harvested from the wild (natural) habitat. The most frequently used plant parts were leaves (31%) followed by roots (22%) . The most widely used method of preparation was crushing (29.6%) of the different plant parts followed by squeezing (24.1%). In the study area shrubs (52.5%) were the dominant plant forms followed by herbs (23.5%). The common route of administration recorded was oral (35%) followed by dermal (28%). Informant consensus showed that *Zehneria scabra* is the most utilized species by the community. Agricultural expansion, fire wood, construction, drought were the major threats to plants in general and to medicinal plants in particular in the study area. Awareness creation, and running insitu and exsitu conservation of medicinal plants is mandatory to ensure sustainable use of the traditional medicinal plants in the area.

Key words: Ethno botany, Indigenous knowledge, Medicinal plant, Preference ranking, Treatment.

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ACRONYMS

DFEDO	Dejen Finance and Economy Development Office
DHO	Dejen Woreda Health Office
DWAO	Dejen Woreda Administrative Office
FL	Fidelity Level
IBC	Institute of Biodiversity Conservation
NP	Number of informants that use the given plants as a medicine

1. INTRODUCTION

1.1Background and justification

Ethnobotany is a broad term referring to the study of direct interrelations between humans and plants (Martin, 1995; Balick and Cox, 1996). The indispensable dependency of human up on plants for their livelihood was primarily started by domestication and dates back10,000 years (Martin, 1995).

Like any other developing and least developed nations, the available modern health care services of Ethiopia are not only insufficient but also inaccessible and unaffordable to the majority (Haile Yineger *et al*, 2008). This problem along with the rapidly increasing human population towards the use of modern medicines means that the majority of the people in Ethiopia are dependent on traditional medicines of mainly plant origins so as to manage various human ailments (Dawit Abebe, 2001). According to World Health Organization (WHO,2001) traditional medicine is the total combination of knowledge and practices, where explicable or not, used in diagnosing, preventing or eliminating physical, mental or social diseases which may rely exclusively on past experience and observation handed down from generation to generation, verbally or in writing. About 80% of the total population of Ethiopia is depending on traditional medicine to treat different types of human ailments (Dawit Abebe, 2001).It is also indicated that Ethiopia has a long history of traditional medicine and has developed ways to combat disease through it. The ways are also as diverse as different cultures. Healing in Ethiopian traditional medicine is not only concerned with curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental and material wellbeing (Kebede Deribe, 2006).

The use of traditional medicine is still wide spread in Ethiopia, and its acceptability, availability and popularity is no doubt since about 90% of the populations use it for health care needs (WHO, 2002). But, according to Mirutse Gidey and Gobena Ameni (2003), loss of knowledge has been aggravated by the expansion of modern education, which has made the younger generation underestimate its traditional value. Similar to elsewhere in the country, people living in Dejen Wereda have traditional practices which have passed from generation to generation in order to treat human and livestock ailments.

Cotton (1996) figures out that the human tendency to categorize and organize knowledge and experience is universal and that emic classification system throughout the world shows certain structural similarities. In different parts of Amhara region, medicinal plants have been used traditionally to treat different human and livestock ailments. People who live in these areas have traditional knowledge on use of medicinal plant species. However, it is not widely used as it could be because the skills are fragile and not written (documented) easily forgettable as most of the medicinal plants are in the hands of a healers and kept as secret (Fisseha Mesfin, 2007).

The lack of conservation actions and activities is observed in Dejen woreda. Eventhough the Wereda is known to have a relatively better plant resource (ILRI, 2007) and hence, the associated traditional knowledge resource is expected to be significant. The current plant use trend shows that the environment is facing problems of resource depletion and loss of indigenous knowledge. Thus focused ethnobotanical research plays an important role for conservation and sustainable utilization of these medicinal plants.

Therefore, the present study focuses on gathering and documenting the knowledge and use of medicinal plant species used by the traditional healers to treat different human and livestock ailments in Dejen woreda. The research was focus in identifying the most important traditional medicinal plants, parts of plants used for medicinal purposes, and to identify and analyze indigenous management strategies of medicinal plants.

1.2 Statement of the problem

Dejen district is located in East Gojjam Amhara region Ethiopia and traditional medicine is the major part of their primary healthcare system. In this area, people treat human and livestock ailments by using their generation long knowledge of medicinal uses of plants. Forest degradation and agricultural expansion resulting in potential local loss of plants of high traditional and potential values and loss of associated knowledge in this district. A study which aims at documenting the uses of plants of this area in traditional medical practices are required to understand the threats to the survival of the plants with their means of preservation of the knowledge. The results of this study have a potential to trigger further modern scientific research and serve as a precursor for the development of plant based medicines. Therefore this study aimed to document the ethnobotanical knowledge associated with the medicinal plants used by the people in Dejen district**.**

1.3 Objectives of the study

1.3.1 General objective

To investigate and document the traditional medicinal plants used by the community in Dejen district to treat both human and livestock ailments.

1.3.2 Specific objectives

- To identify and document the most important medicinal plants used by Dejen people for the treatment of both human and livestock diseases;
- To illustrate plant parts used to treat diseases, method of preparation and route of administration as implemented by the local people of the study area;
- To find out and document the indigenous knowledge of the people on the use of medicinal plants in the study area;
- To show the distribution of traditional medicinal plants in the study area;
- To list the main threats to medicinal plants and the methods of conservation being practiced by the local people in the district;

1.3.3 Research Questions

The study was answered the following questions

- What are the important medicinal plants that are used by the local people to treat human and livestock health problem in the study area?
- Which parts of the plants are used and how the local people prepare and administer the herbal remedy?
- How do the local people treat various ailments?
- Where do the local people obtain the traditional medicinal plants?
- What are the factors to threat medicinal plants and how do the local people traditionally manage and conserve?

2. LITERATURE REVIEW

2.1 Theory and principles of Ethnobotany

Ethnobotany is defined as the study of local people's interaction with the natural environment: how they classify, manage and use plants available around them (Martin, 1995). According to the World Health Organization (WHO, 2002) about 65-80% of the world's population in developing countries depends essentially on plants for their primary healthcare due to its efficacy, ease of access, long year's utilization, low cost and lack of access to modern medicine. Ethiopia is a country characterized by a wide range of climatic and ecological conditions possessing enormous diversity of flora and fauna, including large number of potentially useful traditional medicinal plants more extensively available than many other parts of the world (Balcha Abera, 2003).

Ethnobotanical studies are based largely on qualitative methods (Gerique ,2006) however, in recent years , researchers have used a much more ecological approach introducing studies about the interaction between the natural environment and humans . Ethnobotanical data collection requires a systematic approach and information can be collected through actual field observation, interview (informal, unstructured ,semi-structured or structured), market survey, checklist interview, group and field interview etc: depending on the particular objective of the research (Martin,1995). Moreover, Ethnobotanical investigation and collection of information on indigenous knowledge is not only aimed for preservation of plant but also for understanding and documenting their relevancy to conservation and sustainable development (Gerique, 2006).

Most research designs used in Ethnobotanical studies are time consuming and expensive. Long term projects allow for working with local people to record ecological knowledge in a variety

of contexts, including ritual occasions and seasonal farming activities (Gerique,2006). The techniques are conducted in a short time without requiring expensive tools to merely sketch the local condition rather than in a depth-study (Mohammed Adefa, 2009). A small group of local people is selected and interviewed qualitatively about a wide range of topics in a semi-structured way allowing a comprehensive view on how the community acts as a whole (Martin,1995). The selection of plant samples should be based on the representativeness of the plant species. Plants should possess flowers , fruit or both in order to make their identification easier, and specimen should be pressed in the field whenever possible. Herbarium label should include the name of the institution and collectors(s), the project title, family ,genus and species of the specimen, locality, vegetation and habitat, altitude, plant description and collecting data (Mohammed Adefa, 2009).

The fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purposes, can be calculated for the most frequently reported disease or ailments as given by FL (%) = (NP/N) X 100, where NP is the number of informants that use the plants as a medicine to treat any disease (Alexiades, 1996; Cited in Mohammed Adefa, 2009).

In general, ethnobotany is the scientific investigation of plants used in indigenous cultures for food, medicine, rituals, building, household's utensils and implements, musical instrument, fire wood collection, pesticides, clothing, shelter and other purposes (Fisseha Mesfin, 2007). The science is important to define local community's plant resource needs, utilization and management strategy. As the consequence, the conservation of plant, including medicinal ones, and the associated knowledge as part of living cultural knowledge and practices between communities and the environment is essential for perpetuation of biodiversity (Martin, 1995).

2.2 Traditional Medicinal Plants

2.2.1 Definition and its historical Background

The world Health Organization defines traditional medicine as “health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies manual techniques and exercises, applied singularly or in combination to treat, diagnose or prevent illness or maintain wellbeing (WHO, 2003; WHO, 2006). This definition is incredible broad and includes a variety of different practices originating in countries all over the world. Commonly used therapeutic techniques for traditional medicine include herbal medicines, acupuncture/acupressure, manual therapies, spiritual therapies and exercises (WHO, 2002). Traditional medicine is a complex medical system that is based on a community’s culture, religion, beliefs and natural environment. To overcome the challenges of documenting and analyzing these principle and practice multidisciplinary skills are required from arange of field, for example, botany, pharmacy, linguistics, and anthropology (Viraponges and Picheansoonthon,2005).

Plants have been used by human being since the time immemorial for several purposes, including for disease control and prevention. physical evidences gathered from burial sites of Neanderthal man discovered in Iraq revealed that the use of medicinal plants in the area goes to some 6000 years back (Solace, 1975;cited in Etana Tolasa, 2007). It is believed that starting from 5000-4000 BC several drugs were in use in most parts of China. Traditional medicinal plants were also well popular as early as 1600 BC among Syrians, Babylonians and ancient Hebrews (Dery *et al.*, 1999).

It is certain that man has acquired the knowledge on the utilization of plants for disease prevention and curative purpose (Etana Tolasa, 2007). It is assumed that the early attempts were based on speculation and superstition through how the knowledge started was not clearly known, For instance,'' Evil eye'' cause individuals to be ill so that it was necessary to find out substance that can relief and make the body resistance against it Etana Tolasa,(2007).

Many of the traditionally used medicinal plants contain pharmaceutically active compounds and are used in the preparation of both traditional and modern medicines (Okigbo *et al.*, 2008). It is estimated that over 25% of the pharmaceutical preparations in the world and more than 50% in USA contain plants derived ingredient (Robert and John, 1983). The antiquity of Ethiopian traditional use of medicinal plants cannot be disregarded (Pankhurst, 1990; cited in Mirutse Giday, 1999). Medicinal text books have been written in Arabic and Geez between the 17th and 18th centuries depict that the majority of Ethiopian , with the exception of some privileged groups , have been depending on traditional medicine.

2.2.2 Traditional medicinal plants in Ethiopia

The various climatic and topographic condition of the country contributed to a rich biological diversity. Ethiopia believed to be home for about 6000 species of higher plants with approximately 10% endemism (Vivero *et al.*, 2006). Similarly as it was reported by IBC (2005), the flora of Ethiopia consists of an estimated number of 6000 species of higher plants with 10-12% endemism. Medicinal plants species are also part of those many plant species of the country. Like all other parts of the world, plants are used as a source of medicine in Ethiopia.

The introduction of modern medicine to Ethiopia date back to the 16th during the regime of emperor Libne Dingle (1508-1540) (Messeret Shiferaw,1996). The first government to run

modern health care was established in 1906 with the opening of Menelik II hospital in Addis Ababa. Since then the government has taken the formal responsibility of delivering health care to the population and health institutions were established in the different regions of the country. However, the growth and development of modern health care in Ethiopia as a whole has been very stunted and less , its coverage is less than50% of the population. The vast majority of the rural population, therefore, still depends on traditional medicine and its practitioners (Tesfaye Seifu, 2004).

Ethiopia has a long history on the use of traditional medicine to combat disease (Pankhurst, 1996). The ways are also as diverse as the different cultures existing in the country. Traditional medicine healing practice is not only concerned with curing of disease but also with the protection and promotion of human physical, spiritual, social, mental, and material wellbeing (Mekonnen Bishaw,1991). The various traditional forms of therapy had been the only health care system available before introduction of biomedical to the country in the early 1990s. The country's diverse medical traditions comprise a wide range of therapies including inoculation , thermal baths, cauterization, counter- irritation, bleeding , bone setting ,surgery, a range of spiritual and medico- religious treatment as well as the use of a wide variety of both animals and plants derived remedies (Pankhurst,2006).

2.2.3 The importance of traditional medicinal plants in human and livestock health care system

Traditional medicinal plants have played a vital role in the prevention and treatment of disease since ancient times. Medicinal plants and knowledge of their uses provide a vital contribution to human and livestock health care needs. More than 95% of traditional medicinal preparations in the country are of plants origin (Dawit Abebe, 1986). The importance of medicinal plants to

treat human and livestock ailments in most parts of Ethiopia has been stated by various studies(Dawit Abebe,1986; Mesfin Tadesse and Sebsebe Demissew, 1992; Dawit Abebe and Ahadu Ayehu, 1993; Miruste Giday *et al.*, 2007; Tilahun Tekelehaymanot and Miruste Giday, 2007; Ermias Lulekal *et al.*, 2008). Traditional medicine remains the main resource for a large majority of the people in the country for treating health problem. It also provides traditional medical consultancy including the consumption of the medicinal plants which has a much lower cost than the modern medical attention (Getachew Addis *et al*., 2001).

Traditional medicine has remained as the most affordable and easily accessible source of treatment in the primary health care system of resource poor communities. The local therapy by practitioners is used as means of medical treatment for such communities . Thus the value and role of these tradition health care system will not diminish in the future because they are both culturally viable and expected to remain affordable while the modern health care service is both limited and expensive (Dawit Abebe,2001).

Medicinal plants are important elements of indigenous medical systems in Ethiopia like other countries. They have been used as traditional medicine to treat different human aliments and livestock by the local people in different regions of the country. More than 80% of the people in the country are dependent on plants for their health service (Dawit Abebe and Ahadu Ayehu, 1993).

The wide spread use of traditional medicine among both urban and rural population in the country has attributed to cultural acceptability, efficacy against certain type of disease, physical acceptability and economic affordability as compared to modern medicine. The dependency is due to rapid increasing human population along with cultural resistances toward the use of

modern medicines (Dawit Abebe, 2001) insufficient and inaccessible modern health care service of the majority of the local communities (Haile Yineger *et al.,* 2008).

In Ethiopia majority of people lack access to health care and where available the quality is largely below standard (Endalew Amenu, 2007; Mohammed Adefa, 2009) also portrayed that modern medicine for health care has never been and probably will never provide adequate and equitable health services for the future anywhere in Africa, including Ethiopia , due to the financial limitation related to rapid population growth, political instability and poor economic performance. It is also true that Ethiopian communities rely on traditional medicinal plants rather than modern medical drugs because of medicinal plants are easily accessible in their local areas, while modern drugs are dispensed in remote health institution (EndashawBekele, 2007). Thus in- depth investigation and documentation of plants traditionally used for rational consumption and conservation of plants resources and the associated knowledge should be encouraged (Bahailu Etana, 2010).

The indigenous people of the country have also used traditional veterinary medicine to treat livestock diseases for generation. The use and application of traditional medicine to veterinary medicine is mainly concerned with folk beliefs , knowledge , skills ,methods, and practices which are used in the health care of animals . Ethnoveterinary practices comprise traditional surgical techniques, traditional immunization, magico-religious practices and the use of herbal medicine to treat livestock disease (Endalew Amenu, 2007).

The indigenous people of the country also employed plants for the largest component of the diverse healing elements of traditional livestock health care practices (Teshale Sori *et al.,* 2004). The relationship between the use of medicinal plants in animals and humans is rather complex.

However an overlap in use of plant remedies for the same indications in animals and human being may occur to a theory that humans may have tried these remedies in animals before they used them for their own medical problem. The dependency on the use of traditional medicine like the use of tradition medicine for the treatment of human ailment is due to the fact that modern veterinary medicine is not well developed in the country as well as there are no modern drugs adequately to fight livestock disease (Mirutse Giday and Gobena Ameni, 2003).

2.2.4 Medicinal plants preparation methods, dosage and administration route

The preparation and application of medicinal plants are accomplished in various formulations. Medicinal plants preparation could contain several compound like powdered plant materials , extracts and purified active ingredients isolated from plant materials. Moreover, in some case, materials derived from animals or minerals may also be added in such preparation (Etana Tolasa, 2007). Studies showed that herbalists prescribe a single or poly herbal formulation made from different parts of products of the plants. However, roots and leaves are widely used in Ethiopia (Muhammed Adefa, 2009; Getenet Chekole, 2011; Eskedar Abebe, 2011).

Ethnobotanical studies done so far showed that the most common methods of medicinal plants preparation is simple crushing and pounding a particular plants(s) and homogenizing it in water, which is used the form of herbal preparation for both human and livestock health problem (Etana Tolasa ,2007). Plant processing encompasses drying, mechanical disruption and solvent extraction and was influence the final quality of the herbal product (IUPAC, 2008).

Drugs are prepared in various dosages such as finger length, cup, can, glasses, lid spoons, pinches or handfuls and bottles (Getu Alemayehu, 2010; Nigussie Amsalu, 2010; Getenet Chekole, 2011). Some of the remedies are taken with different additives like sugar ,honey ,oil,

butter , coffee, and salt are usually used to improve the flavor of the remedy and reduce patient compliance (Muhammed Adefa, 2009). Moreover, the dose given to the patient depends on age physical and health condition (Miruste Giday, 2001). However ,the dosage or amount and unit of measurement of medicinal plants used traditional healers vary with the type of health problem which shows that the amount of the plant or plant parts used in the preparation of the remedies are rough and therefore lack precision (Miruste Giday,2001).

Herbal preparations are administered using different routes depending on the kinds of disease to be treated (Kebede Derbie *et al,* 2006; Muhammed Adefa, 2009). The main ones are oral, dermal and respiratory respectively (Mirutse Giday, 2001; Kebede Derbie *et al.,* 2006). However there are modes of application that do not fit into either of the commonly used rather like sweeping or covering flours with particular plants that are used to prevent disease rather than treatment (Mirutse Giday, 2001). When the side effects of the remedies become severe, herbalists recommend antidotes like milk, egg and roasted barley.

2. 3 Threats to and conservation of medicinal plants

According to Getachew Berhan and Shiferaw Dessie (2002) the knowledge of medicinal plants is commonly secretly passed orally from generation to generation. In this process valuable information can be lost whenever a medicinal plants is lost or when a traditional medical practitioner dies without passing his/her indigenous knowledge to other. Hence documentation of indigenous knowledge and making herbaria for future use is recommended to conservation of the declining medicinal plants (Muthswamy and Solomon Mequanente, 2009). It was pointed out that young generation has no interest to know about medicinal plants and efforts should be made to incorporate traditional medicine in school curricula so that younger people appreciate its usefulness (Mirutse Giday *et al.*,2009).

As stated by Zemede Asfaw (2001) in Ethiopia traditional medicine as elsewhere in other developing countries is faced with a problem of sustainability and continuity due to loss of taxa of medicinal plants , loss of habitats of medicinal and other categories of plants and cultures Now a day's sustained and co-ordinate efforts are needed to transform currently unsustainable practice of medicinal plants mining from wild source to more ecologically sustainable , socially acceptable and economically equitable production and utilization systems (Parrotta, 2002). Generally there are some conservation measures that have been under taken around the world aimed at protecting threatened medicinal plants species from further destruction (Cunningham, 1993). This includes in situ conservation (on their natural habitat like natural reserves parks e.g. home gardens) and ex-situ (field gene bank, seed bank and botanical garden) conservation strategies should be complimentarily implemented (Abebe Demissie, 2001).

In situ conservation is conservation of species in their natural habitat. Some plants fail to produce the desired amount and quality of active principle under cultivations out of their natural habitat (Nigussie Amsalu, 2010). Therefore in order to maintain the representative wild population of vulnerable medicinal plant species, core conservation areas or other protected habitat that will allow natural process to continue undisturbed by human activities should be designated (Endalew Amenu, 2007).

Ex –situ conservation of medicinal plants can also be made by ensuring and encouraging their growth in special places like churches, farm margins , river banks, road side , live fences of gardens and field (Behailu Etana,2010).Whatever, the case is a well organized ex-situ conservation system is indisputable for Ethiopia because of the wealth of rare plant genetic

resources and accelerated environmental and biodiversity degradation. As it is suggested, there is need to expand ex-situ conservation both in gene banks and botanical gardens (IBC, 2008).

3. MATERIALS AND METHODS

3.1 Description of the study area

3.1.1 Geographical Location of the study area.

Dejen district is one of the 20 districts in East Gojjam Zone in Amhara National Regional State (DWAO, 2016). The relative location of the Woreda is 230 km North of Addis Ababa and 330 km South of Bahir Dar. It comprises of 2 urban and 22 rural kebeles. The Woreda is bounded by Debay Tilatgen and Enemay Woreda in the North, Oromiya National Regional State in the South, Shebel berenta Woreda to the East and Awabal Woreda in the West. This woreda has an estimated total population of 128,920 of whom 62,431 are males and 66,489 are females, from these 7,582 males and 9,155 females live in the town (DFEDO, 2016). The ethnicity of the Woreda population is Amhara and Amharic is major language in the district (Figure 1).

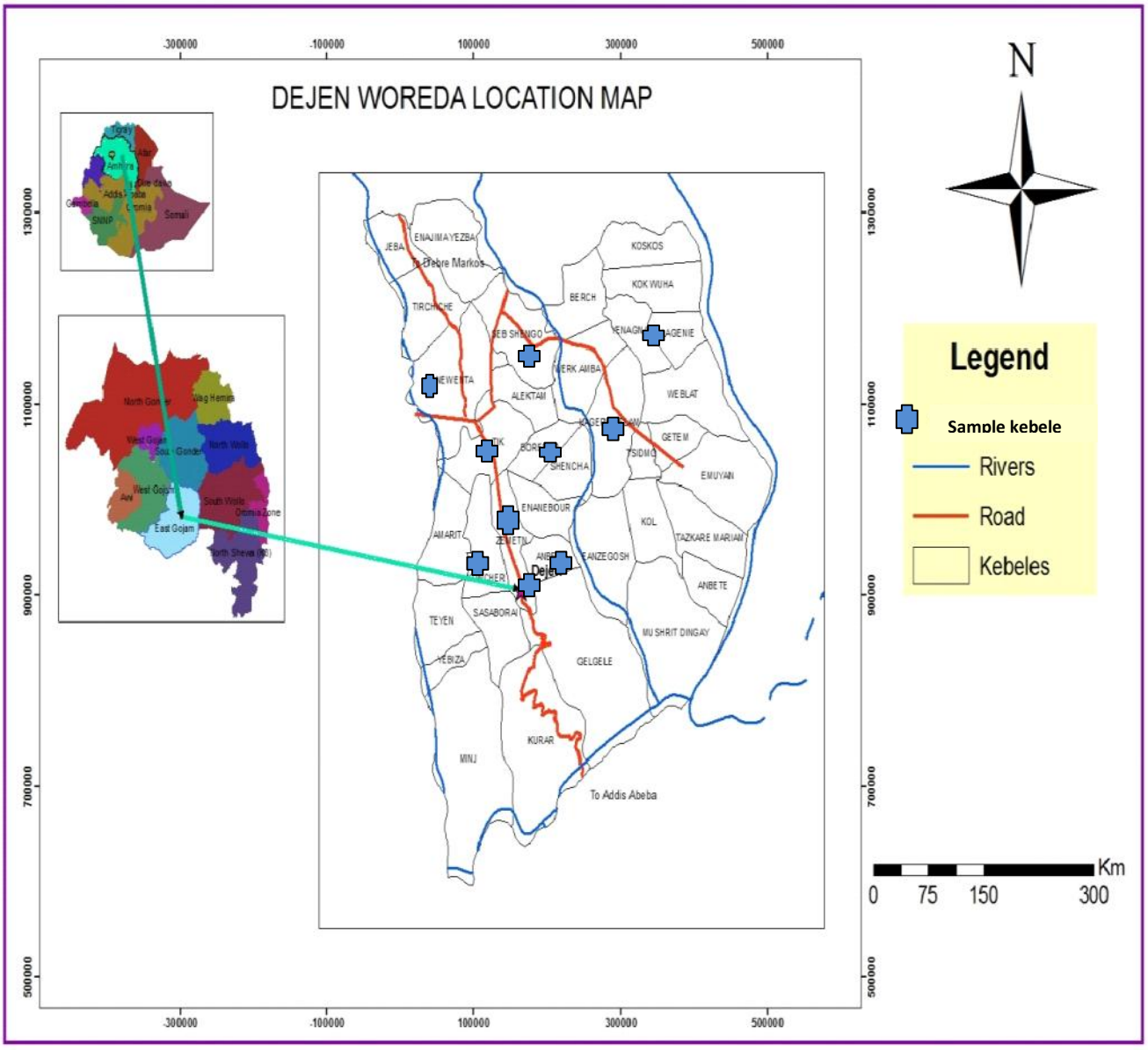

Figure 1: Map of Ethiopia show Dejen District and kebeles (source, DFEDO, 2016)

3. 1.2 Soil and Drainage

In Dejen district, there are three dominant soil types, namely: clay soil, sandy soil and silt loam soil each covering about 65%, 23% and 12%, respectively (DWAO,2016). The topography, vegetation and rainfall pattern in the district encourages the existence of many perennial rivers. These rivers (Abay, Suha, Muga, Adewadem, Bechet, Kurarwonz and Minjwodeb, Gatma) that have been providing an irrigational function under traditional and modern systems.

3.1.3 Climate and Ecology

According to Dejen wereda agricultural office (DWAO, 2016) the district characterized by three major agro- climate zone , 1.65% Dega (cold) ,75.45% Woina dega(sub-humid) and 22.9% kola (dry). Monthly mean temperature is 16.74 c^o. The mean of daily maximum and minimum temperatures are 24c^o and 11c^o respectively. The district is characterized by having unimodal rainfall where the total annual rain fall is received in the end of April to September. The annual rainfall is 800-1200mm.

3.1.4 Materials Needed for the Research

Field Materials: include hard cover note book, and permanent ink pen, collecting bags field portfolio. And moreover, plant press, including old newspaper, cardboards, number tags, were used.

3.1.5 Land use and agricultural systems

According to the information obtained from Dejen wereda agricultural and rural development office and zonal planning and economic development(2016) , the district covers a total area of 63,398 hectares of which the largest ,that is, 33,919 ha (53.5%) is agricultural

land followed by house and road covers land 8,102 ha (12.8 %). There are also other land features that share considerable area as listed in table 1, below.

Table1. Land use patterns of Dejen district

Land use	Area(ha)	% age
Agricultural land	33919	53.5
House and road coverage	8,102	12.8
Water coverage	550	0.82
Bush and shrub land	5,252.5	8.3
Forest coverage	3962	6.25
Grazing lands	3,855.5	6.1
Barren lands	6006	9.43
Plantation forest areas	1751	2.8
Total	63,398	100

Source: - (DWAO: 2016)

The main occupation of the population is agricultural and livestock production in the rural and trade in the urban kebeles. Crop production is entirely rain fed and in small-scale irrigation practice has been recently introduced by the office of agricultural and rural development (DWAO 2016). The agricultural system of the area is (both the highland and lowland) mixed farming system. Crop production under this farming system is divers and multiple cropping with limited inter-cropping is intensively employed. Traditionally , continuous cropping is exercised through crop rotation, where cereal production alternates with the production of legume crops as a means of maintaining soil fertility. The food crops growing in the district are cereals (sorghum ,maize, teff, barely ,wheat) vegetable (chili shallot, tomato, pumpkin, garlic, cabbage), pulse(chickpeas, pea ,bean), oil crops (lin seed ,kale seed , Niger seed), fruits (papaya

,lemon, orange, mango, avocado, guava), root crops (sweet potato, sugar beet, carrot) and some cash crops such as coffee and chat are grown.(DWAO, 2016).

3.1. 6 Population structure and medical service

The total population of the district is 128,920 of whom 62,431 are males and 66,489 are females. Of the total population, 112,183 are rural while 16,737 are town dweller. The largest ethnic group reported in the district was the Amhara (99%), Oromo (0.2%) and others 0.5%. Amharic is spoken as a language by 99.4% and majority of population (94%) followed orthodox Christianity, while the rest practice Islam (DFEDO, 2016).

The human health services in the district comprise of 5 health centers,24 health posts,2 town health extension work sites,1Hospital,3 private clinic and 2 private pharmacies(drug stores) (DHO,2016). This shows that the health service given is below the need of the people. Modern medical services are inaccessible to the majority of the population due to their costs made herbal medicines more efficacy, ease of access, long year's utilization**.** In the study area there is organizational structure at the district level that encourage the local herbal medicinal practitioners by certify their wisdom to enhance the use of tradition medicine and licensing the work of practitioners , according to Dejen woreda health office annual report (2016) ,the first ten top human diseases in the area are _ malaria , acute febrile illness, trauma(Dengetegna adage),common cold, dyspepsia(gastritis),helminthisis, ameobiasis, arthritis (rheumatism), typhoid fever and eye disease.

3.2 Methods of the study

3.2.1Reconnaissance survey

A reconnaissance survey of the study area was conducted from September to October 2017.During the survey, 10 representative kebeles distributed at different altitudes were selected from the 24 kebeles. These were Dejen 01,Dejen 02,Yenagnat Lagena,Berech Work Amba,Hage reselam,Alektam Sebsenshngo,Tik, Yetnora, Borebore Shencha,Zemeten and Koncher Sasaberay for ethnobotanical data collections. These kebeles were purposively selected based on the availability of traditional medicine, practitioners, traditional medicine use history, and altitudinal variation between kebeles.

3.2.2 Selection of informants

A total of 100 informants (male 80 female 20) were selected with age of above 20 -80years including 20 key informants who are healers, elders and knowledgeable persons from the total 10 sampled kebeles.Women are less in number because knowledge transfer from father to their boys and males are moving outside the house. Informants were selected based on purposive (key informants selected purposively) and other informants were randomly based on the religious leaders and researcher's observation from the community group. Furthermore, the logistic letter and list of traditional healers operating legally in the district was obtained from the Chairman of traditional healers association to interview openly with the understanding that the purpose of study is of academic value. Later, key informants were identified; interviewed and detailed information was recorded. Other 80 informants were selected randomly from the community by asking every individual in the house and working fields.

3.2.3 Ethnobotanical data collection

Ethnobotanical data collection was conducted from November 10, 2017 to January 30, 2018. Ethnobotanical data such as local name of medicinal plants, habit, habitat, disease treated, part used, route of administration, condition and methods of preparation, application and threats to medicinal plants were collected through active participation of healers and knowledgeable elders(Appendix 4,5,6).The common Ethnobotanical data collection instruments and techniques recommended by Martin (1995) were utilized.

3.2.4 Data collection instrument

Relevant data for the study was collected by Semi- structured interview; group discussion and field observation.

Semi- structured interview: -- were prepared and used (Appendix-1) as guide following Martin (1995); cotton (1996) and Cunningham (2001). Data collection was made on the basis of checklist items or questions prepared in English and later translated to Amharic. The items include information on informant's personal identity, local health problems, local names of medicinal plants, part (s) used ,methods of preparation ,disease treated ,dosage, route of administration, side effect of remedies, marketable traditional medicinal plants , source and management of medicinal plants (Appendix4,5,6) . The entire interview with informants was done through the direct contact between the researcher and informants. The willingness of informant was first being confirmed before starting data collection. This was done through awareness creation for informant by describing the future –significance of the research for the study area and for the country (Figure 2).

Figure 2. During interview (photo courtesy by Tensa Abebaw, 2018)

Group Discussion: - According to Martin (1995) intuition and experience are the best guides to informal ways of gathering information. short and precise group discussions were made once with a total of 100 (80 males and 20 females) informants group contains 8 male and 2 females in Dejen Gudignit, Yetnora(Enwenta) Gudignit &Gubeya Gudignit(Table 2) each regarding the medicinal plants in the study sites. Information on local names of the plants, medicinal uses, methods of preparation, mode of administration, disease conditions, indigenous knowledge on medicinal plants, and threats to plants, conservation and management of plants, and related data were recorded.

Field observation: - field observation was carried out with the interviewed informants and students. Habitat, habit, medicinal value, abundance and distribution of plants were recorded on field by direct observation and field walk. Moreover, 20 informants visited twice again for confirming the consistency of the information collected from them.

Visual Vegetation Description:-Two approaches were used in describing the vegetation of the study area. On one hand, information was gathered from informants following the emic categorization technique i.e. categorization by indigenous people based on their own indigenous knowledge. On the other hand, it was described and classified through repeated curious visual observation following the emic classification technique of ethnobotany as described by Martin (1995). In the latter case, morphological characteristics or general appearance of vegetation such as growth and life forms of the dominant or co-dominant plants were focused upon. And the indigenous people in the study area classified the landscape based on topography of the land and their Knowledge on the landscape classification.

3.2.5 Study kebeles with their corresponding sampling sites and number of informants participated

The purpose of this study was to investigate and document the traditional medicinal plants used by the community to treat both human and livestock ailments. The researcher investigated how the traditional medicinal plants used to treat different diseases of human and livestock. The researcher conducted a meeting with sampled informants in three different places (In Dejen 01, Guabeya and Yetnora (Enwenta)) to collect data (Table 2). The reason why the researcher conducted the meeting in these places was to minimize consumption of time for informants. Then Amharic version of the semi structure interview was interviewed one by one for informants. The researcher and the assistant researcher were reading the interview and record their response.

Though the researcher planed to administered the semi structured interview to 100 informants six of them were not found when the interview administered. But, the informants who were not found during the first meeting appointed with other day and the data was collected. So the

analysis was carried out with data found from 100 informants, and hence, the overall response rate is 100%.

Table 2. No, of informant

	Kebele	SEX					
Cluster		M	F	T	M	F	T
Dejen Gudignit	01 Kebele	13	2	15	32	8	40
	02 kebele	7	2	9			
	Zemetin	5	1	6			
	Koncher	7	3	10			
Yetnora(Enwenta) Gudignit	Yetnora(Enwenta)	10	3	13	24	6	30
	Tik	9	1	10			
	Borebor	5	2	7			
Gubeya Gudignit	Hagereselam	9	1	10	24	6	30
	Yenagnat	8	2	10			
	Sebshengo	7	3	10			
Total		80	20	100	80	20	100

3.2.6 Characteristics of informants

All informants (100) were grouped in Hundred of informants in three age groups. It included the young (20-40), the middle age (41-60) and the elders (61-80) (Appendix 9). The highest number of informants was obtained from the middle age of (32%) (Table3).Males was more in number (80%) compared to females (20%). Moreover, some of informants (35%) were illiterate (Table 4). About 75% of the total informants were married (Table 5).

Table 3. Informant general information

Age group (in yrs)	Sex & number of informants		
	Male	female	Total
20-40	16	2	18
41-60	24	8	32
61-80	40	10	50
Total	80	20	100

Table 4. Educational status of informants

Educational status	Sex of informants		
	Male	Female	Total
Illiterates	27	8	35
Only read &write	28	4	32
Modern education	20	8	28
Others(like church education)	5	-	5
Total	80	20	100

Table 5. Marital status of informants

Marital status	Sex of informants		
	Male	Female	Total
Married	65	17	82
Not married	8	2	10
Divorced	7	1	8
Total	80	20	100

3.3 Data analysis Procedures

3.3.1 Descriptive statistics

Facilities in spss statistics were utilized to determine the percentage and frequency of the data on medicinal plants draw bar graphs and pie chart. The collected Ethnobotanical data was analyzed following survey and analytical tools for Ethnobotanical method which are recommended by Martin (1995) and Alexiades (1996). Descriptive statistical methods were employed to analyze and summarize the data on medicinal plants, associated knowledge, management method, use and conservation. The most useful information gathered on medicinal plants reported by local people include medicinal value ,application, methods of preparation , route of administration, disease treated, dosage, part and habit through appropriate software and descriptive statistical analysis.

3.3.2 Reliability of information

In order to evaluate the reliably of information during the interview informants was contacted at least 2 times for the same ideas and the validity of the informants was proved and recorded. Consequently, if the idea of the informant deviates from the original information, it was rejected since it considered irrelevant information. Only the relevant once was taken into account and statistically analyzed. This method was adopted from Alexiades (1996).

3.3.3 Preference ranking

Preference ranking was performed using selected key informants for most important medicinal plants first on the basis of healing power of diseases. Accordingly, medicinal plants was chosen to be ranked preferentially by key informants on the basis of curing diseases, giving values of 1 to 5 were used in this ranking (the highest value 5 for best plant in treatment of diseases , second highest value 4 for the second best plants and least value 1 for plants with

lower healing power) as compared to other plants, while medicinal plants were ranked on the degree of healing several diseases.

3.3.4. Direct matrix Ranking

Direct matrix ranking was used following Cotton(1996)for multipurpose medicinal plants based on the relative benefits obtained from each plant, five multipurpose plant species were selected out of the total medicinal plant. And seven key informants were chosen to assign use value to each attribute(5=best, 4=very good, 3=good, 2= less used, 1= least used and 0= not used). These plant species values include medicinal, food spices, fencing, forage, fire wood, charcoal, construction and furniture making. Based on information gathered from informants, average value of each use-diversity for species was taken and the values of each species were sum up and ranked**.**

3.3.5 Fidelity Level index

The fidelity level (FL) is the percentage of informants claiming the use of a certain plant species for the same major purposes to treat ailments. Accordingly, FL was calculated for medicinal plants used to treat Dandruff and Hypertension. FL is calculated as FL(%)= (Np /N) X 100, where Np is the number of informants that claim a use of plant species to treat a particular disease and N is the number of informants that use the plants as a Medicine to treat any disease as described by Alexiades(1996). Accordingly, FL index was calculated for six medicinal plant species used for treating Dandruff (4 species) and Hypertension (4 species).

4. RESULT

4.1 Indigenous knowledge on health concept

Indigenous people of the district believed that most of health problem has traditional medicinal plants which can practice by different practitioners. Moreover, the indigenous people of the study area believed that some health problems are incurable by modern medication. But, they believe that treated by traditional medicinal plants. The practitioners' believed that some health problems such snake bite, evil eye, devil, insect allergy, dandruff and epilepsy do not treated by modern medicine and they advice for local people to get treatment with traditional way. On the other hand, the practitioners recommend the local people to go to modern health institutions for the diseases such as bleeding, vomiting, birth cases and wound.

4.1.1 Indigenous knowledge transfer on medicinal plants

The people of the study area use different medicinal plants for the treatment of different ailments. Indigenous knowledge on medical plants were reported to be accessed by various methods in the study area. According to informants response, the highest 36(36%) medicinal plant knowledge transfer in the local community was reported to be accessed by communicating with their family when healers are old enough,25% of medicinal plant knowledge transfer by observing their parents (healers) while they were practicing ,18% of medicinal plant knowledge transfer was reported to be accessed by discussing orally with family members secretly,11% of knowledge acquisition was by living very close to healers, and 10 % of them reported that they gain knowledge by following secretly when healers run treatment of patients outside the family line (figure 3).

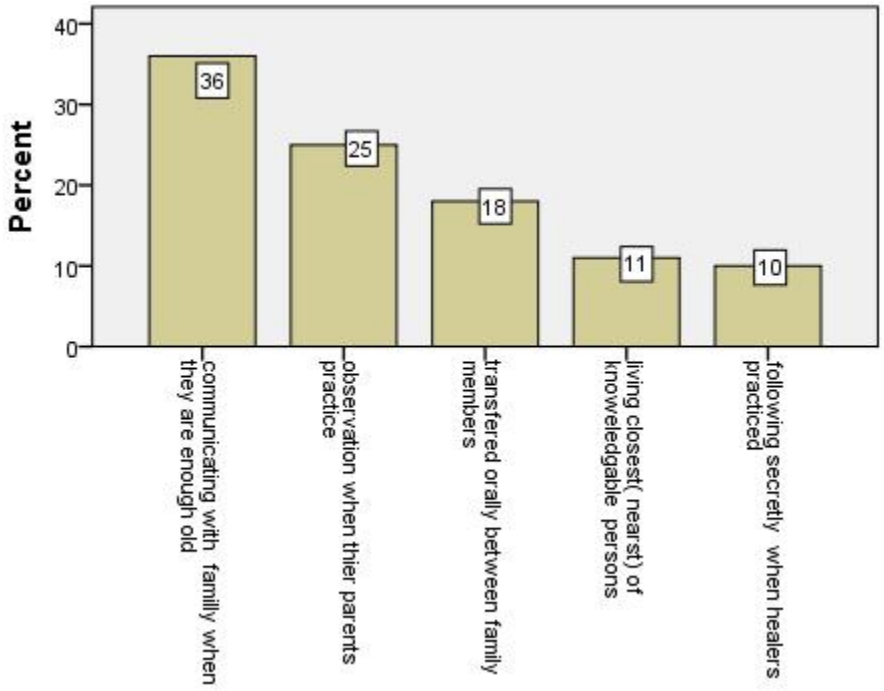

Figure 3.Types of indigenous knowledge transfer on medicinal plants

4.1.2 Indigenous knowledge on landscape classification

The indigenous people in Dejen woreda classify the landscape based on topography of the land and their knowledge on the landscape classification. The indigenous people classify the district land topographically. The following landscape was identified (figure 4).

- **Medama:** This refers to plain land on which settlement, agricultural activity as well as livestock grazing are practiced. It covers the highest land forms(28%).
- **Wetageba**: 22% of the land refers to up and down land that is not used for grazing and for agricultural activities .This land form is covered by grasses with trees and shrubs.
- **Korebta**: Covers 19% of the landscape; this refers to land forms with some elevation which is suitable for forest plantation. Sometimes agricultural and grazing activities can be performed. But the soil is washed away by wind or water (highly eroded area).

- **Shelequama**: This refers to the land forms which are found in between elevated land forms; valley mostly covered shrubs and herbs and rarely trees and climbers. It is not used for agriculture and grazing and it accounts 17% of the land
- **Terarama**: Mountain area characterized with high altitude relative to other land forms. It covers small part of the district relative to the other land forms (14%).

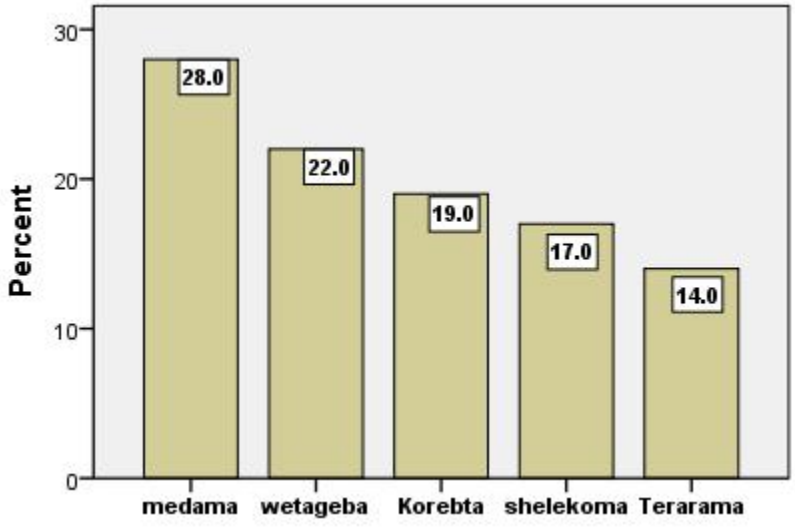

Figure 4.Indigenous knowledge of people on landscape classification in Dejen district

4.1.3 Indigenous vegetation classification

The indigenous people of the district classify the vegetations in to:

- **Chaka: -** refers to densely forested lands composed of ranges of large trees, this type of vegetation has declined in the district because of agricultural expansion and overharvesting.
- **Kutkuato: -** refers to complex plant association in the wild, road side as well as for those plants grown in garbage area. The majority of plants observed in these areas are herbs

and shrubs. According to informants the plants grown in this category have medicinal value.

- **Grass land: -** refers to an area dominated by grass and other herbaceous plants.

4.2 Visual Vegetation Classification in Dejen district

In this district, categorizations of vegetations into plant community type were done with giving serious attention for the vegetation structure. To indicate the distribution of medicinal plants in the study area with respect to the dominant tree species, careful visual observation was made and vegetation of the study area was classified into Community types by taking the dominant species for naming the community. Hence, with critical observation of vegetation of the district resulted the following five plant community types.

1. Community dominated by *Eucalyptus globulus* Plantation: - This type of community is recorded in almost all study sites. It is one of the good income generating plants for the farmers in the area as a result it is widely replacing croplands. The most common community type is dominantly found in Yetnora, Koncher, Borebore, Sebshengo, and Yenagnat. However, there is no kebele where Eucalyptus Plantation is not common. The major species observed in this type of community are Eucalyptus species, and herbs and small shrubs.

2. Community dominated by *Acacia abyssinica* species

Such community type was recorded in Tike, Berch Werkamba, Geteum and Gelgele.This community type contributes 10 medicinal plants.

3. Community dominated by *Olea europaea sub sp.cuspidata* (woira)

Common plant species dominated by olea. This community type is commonly found in and around the churches of the study area. The common trees include *Juniperus procera, Acacia*

negrii and different shrub species are also common in this community. 3 of medicinal plant species were contributed by this community type.

4. Community dominated by *Pterolobium stelatum*

This type of community is dominated by *Pterolobium stelatum***.**This community type is commonly found in yenagnat, Berch Werkanba, Hagereselam and Sebshengo.

5. Community dominated by *Justica schimperiana* (sensel)

This community is predominantly observed in Dejen 02 kebele, Weblat getem and Borebore shencha. The major species obtained from this community type are *Justica schimperiana* (sensel) and Vernonia *amygdalina (girawa*).

4.3 Medicinal plants in the study area

4.3.1. Major plant use categories by the people of the study area

In the study area, a total of 72 plants having medicinal values were documented from the study area. In addition, to their medicinal values they are utilized for other uses of categories by the community. In this study 26 species (36.1%) of the plants were reported for only medicinal value, 19 species of plants (26.4 %) were used for as foods and spices, 17 species (23.6%) of the plants were used for fire wood (Figure 5).

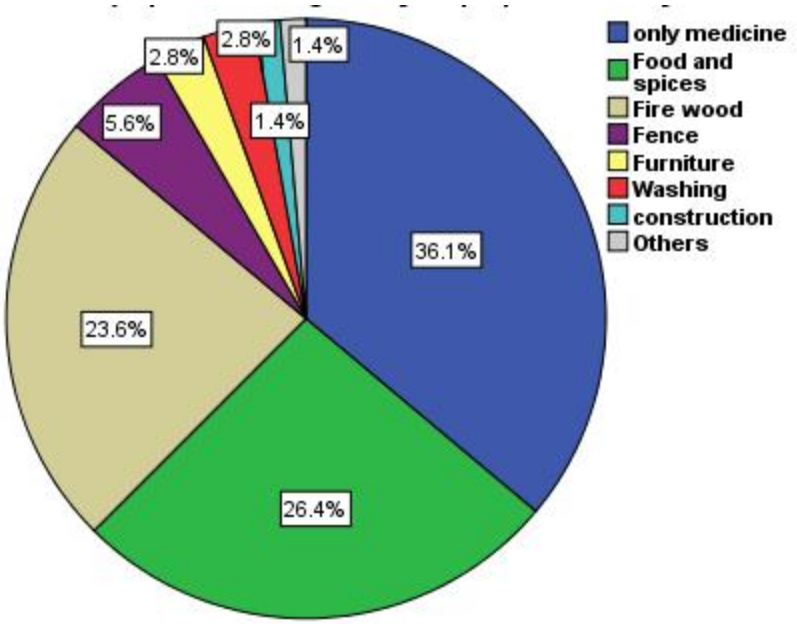

Figure 5. Major plant use categories by the people of the study area.

4.3.2 Diversity of medicinal plants in the study area

A total of 72 species, belonging to 66 genera and 45 families were collected, identified, and documented during the study to treat both human and livestock ailments (Table 6).The family As teraceae and Fabaceae had the highest number of plant species (8.33%,n=6) for each followed by Polygonaceae,Rutaceae,Myrtaceae andEuphorbiaceae(5.55%,n=4).The rest families 3,2or1 speci es each.

Table 6: Number of medicinal plant family, genera and species

Families	No. of genera	Genera in%	No. of plant species	Species in %
Asteraceae	4	6.06	6	8.33
Fabaceae	4	6.06	6	8.33
Solanaceae	3	4.54	3	4.16
Polygonaceae	3	4.54	4	5.55
Rutaceae	3	4.54	4	5.55
Myrtaceae	3	4.54	4	5.55
Verbanaceae	2	3.03	2	2.77
Lamiaceae	3	4.54	3	4.16
Cucurbitaceae	3	4.54	3	4.16
Euphorbiaceae	2	3.03	4	5.55
Brassicaceae	2	3.03	2	2.77
Others	32	48.48	31	43.05

4.3.3 Ethnomedicinal plant species used to treat human and livestock ailments by people of Dejen district

In the study area 72 medicinal plant species (Appendix 4, 5&6) were gathered and documented that were used for the treatment of human and livestock ailments. From these,48 species (66.7%) were used as human medicine, 17 species (23.6 %) for treating livestock ailments and the remaining 7 species (9.7%) were used for treating both human and livestock ailments (Figure 6).

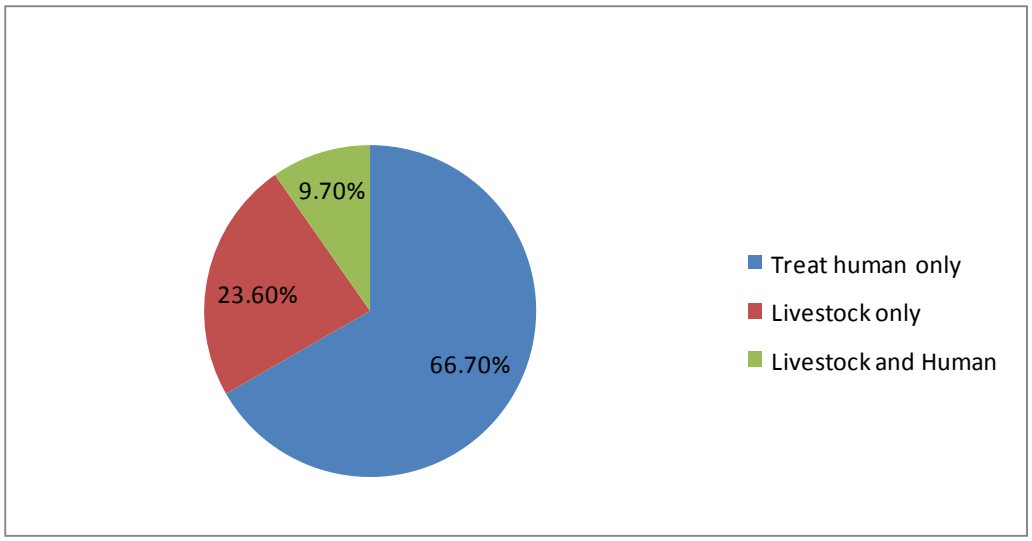

Figure 6. Ethnomedicinal plant species used to treat human and livestock ailments by people of Dejen district

4.3.4 Distributions of medicinal plants according to their habitat

Among the total of 72 species of traditional medicinal plants that are used for human ailments 35 species(49%) were collected from the wild vegetation,25 species(34%) from home gardens and the rest12 species(17%) were collected from wild &home garden (Figure 7).

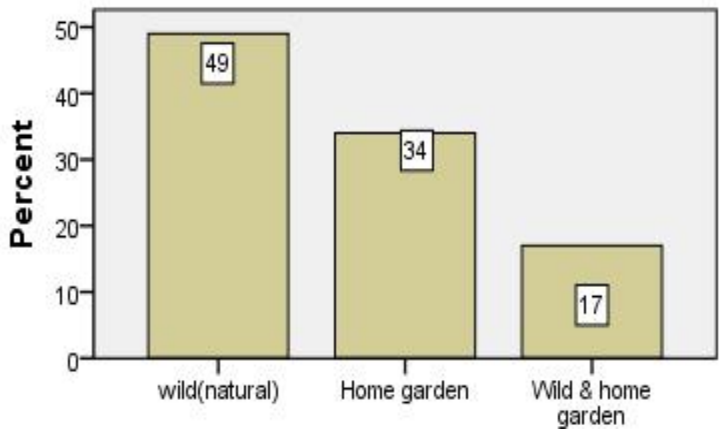

Figure 7. Distributions of medicinal plants according to their habitat

4.3.5 Diversity of habits and use categories of medical plants

Regarding the habit of plants, from the total 72 collected and recorded traditional medicinal plants(Appendix 4,5 & 6) 38 species (52.5%) were shrubs, 17 species (23.6%) were herbs, 12 (16.7%) were trees and 5 species (6.9%) were climbers (Figure 8).

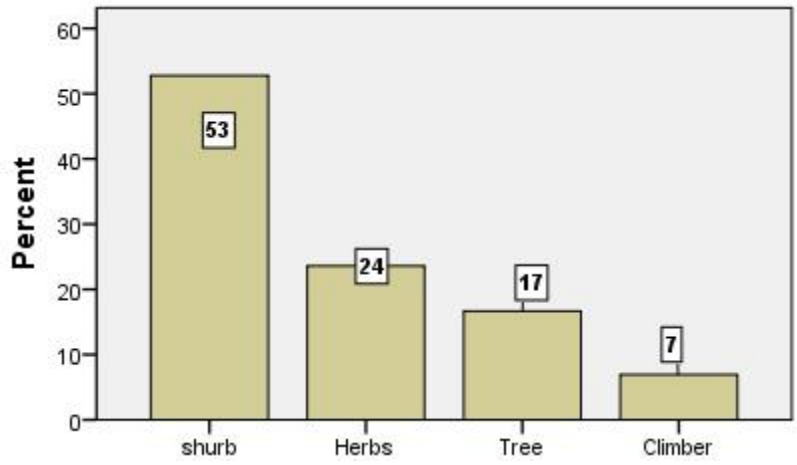

Figure 8.Diversity of habits and categories of medicinal plants

4.3.6 Plant parts used for human and livestock ailment treatment

In this research, different parts of the plants were reported to be used for medicines (Appendix 4, 5& 6). With regard to the plant parts used for medicinal purposes, of the total record of human and livestock medicinal plants, the most frequently utilized plant part was leaves (30.5%) followed by roots (22.2%) and seeds (12.5%) (Figure 9).

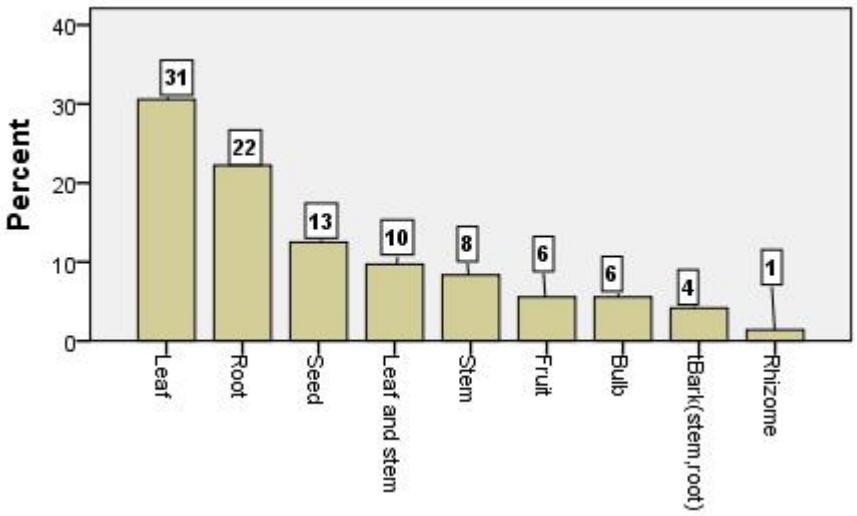

Figure 9.Plant parts used for human and 1ivestock treatment

4.3.7 Ways of preparation traditional medicines

The local community of Dejen district uses various methods of preparation of traditional medicines for different human and livestock ailments (Appendix 4, 5& 6). The principal methods of plant parts remedy preparation forms were reported to be through crushing, which accounts for (29.6%) followed by squeezing(24.1%).Others forms of preparation are also shown (Figure10). The informants have various skills associated with remedy preparation. They tend to apply mixing of different plants. The result showed that the majority of remedies were prepared from single plant species and few are prepared from different plant species, which is a combination of medicinal plants, was used to treat a disease.

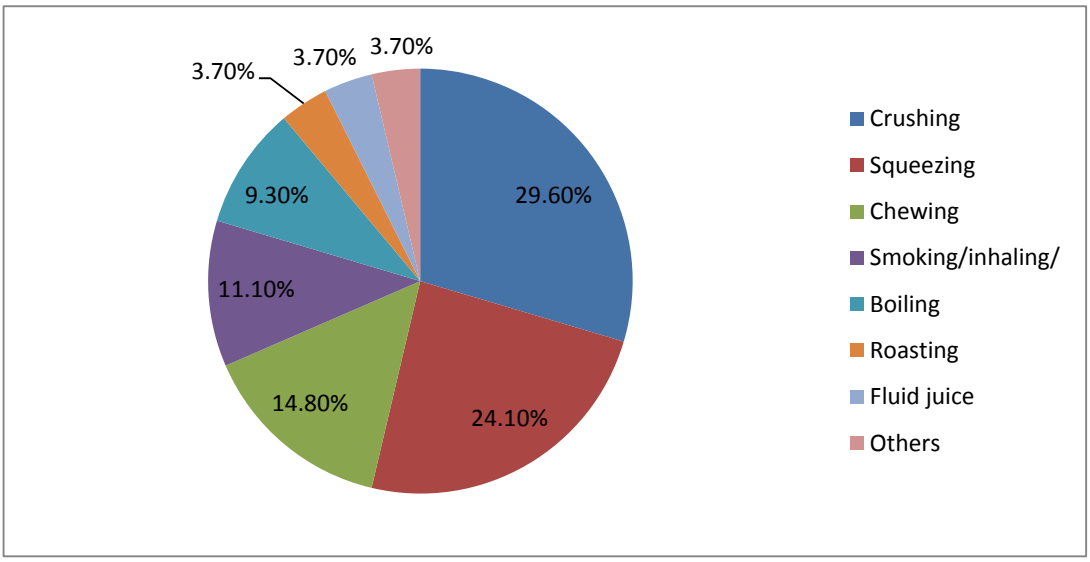

Figure 10.Ways of preparation traditional medicines in Dejen district

4.3.8 Dosage and routes of administration

The community of the study area used various local units of measurements and time of administration to determine the dosage. But, the measurement used to determine the dosages to treat various diseases was poor and are not standardized. In the study area, the traditional healers use different local measurements for dosage, mostly they use their finger lines for the measurement of the amount to be taken and different measuring materials like coffee cup, tea cup, bottle and glass cups for those remedies which are taken orally and doses given depend on the age, and health conditions; that is, children are given less dose than adults, physically strong individual take more dose than weak individual depending on the type of disease.

Medicinal plants are applied through different routes of administration (Appendix 4, 5&6). In the study area, the most common administration of herbal medicines were oral which accounts 31% followed by dermal 28%, fumigate 24 % and nasal 15 % and others accounted the remaining percent (Figure 11).

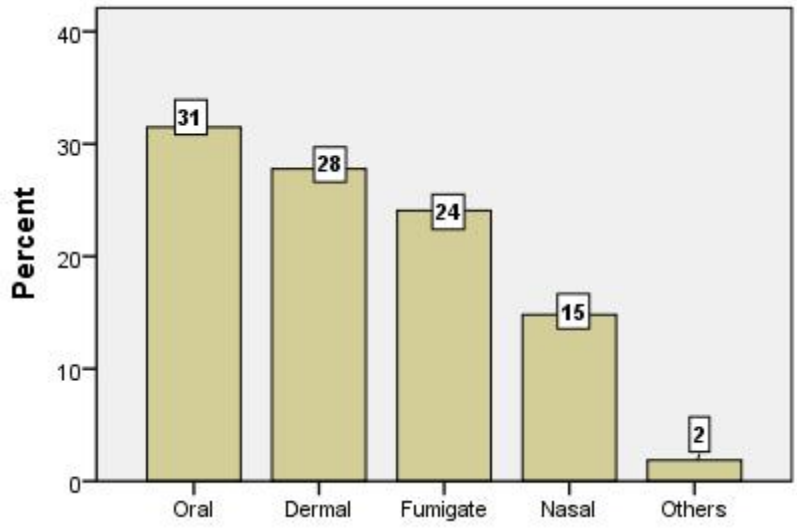

Figure 11.Route of administration medicinal plants in Dejen district

4.3.9 Reported marketable medicinal plants in the study area

In the study area, during the interview the respondents explained that most healers prepared traditional medicinal plants in home rather than selling in the market. In most case, the community prefers either collecting these plants by themselves from the available area or they prefer to go directly to local healers to get treatment instead of buying the traditional medicinal plants from market. But some traditional medicinal plants that are used for food, spices and fumigation were reported as marketable. For example *Sesamum orientale*, Tena Adam *(Ruta chalepensis*), Nech shinkurte (*Allium sativum)*, Zengeble (*Zingiber officinale)* are sold in the market.

4.3.10 The common human and livestock disease corresponding number of plant species used

In the study area, 54 ailments were reported to be treated using one or more medicinal plant species. Accordingly, General malaise was treated using large number of medicinal plants(10 species) followed by evil eye (7species),Evil spirit treated with 6 species, Stomach ache ,wound,

cough and Dandruff were reported to be treated with 5species each(Appendix7) . The rest of the main diseases were treated with more than three medicinal plants (Table 7).

Table 7. The common human and livestock disease that are treated by more than three medicinal plants and percentage of medicinal plants used.

Disease treated	Local name	No/ plant species	% of plants
Megagna	Megagna	4	3.1
Stomach ache	Hode kurtet	5	3,9
Head ache	Rass Mitat	4	3.1
General malaise	Mich	10	7.8
Devil/Evil spirit	Seitan	6	4.7
Common cold	Gunfan	4	3.1
Antrax	Abasenga	4	3.1
Wound	Kusil	5	3.9
Cough	Sale	5	3.9
Evil eye	Buda	7	5.4
Diarrhea	Tekimat	4	3.1
Dandruff	Forofor	5	3,9

4.4 Ranking of most important medicinal plants

4.4.1 Informant consensus of medicinal plant use report

One way of confirming the officious of a given plant species is using the consensus made by informants. According to this popular and healing medicinal plants are cited by the majority of the community. The results of the study showed that 10 medicinal plants are popular than the others, in view of that, *Zehneria scabra* took the lead first where it was cited by 60 informants

for its medicinal value to treating ailments. Whereas *Ocimum lamiifolium* was cited by 56 informants for their medicinal value and others (Table 8). Popularity of these medicinal plants is due to the access of occurrence of the disease is high as a result everybody should have got a chance to see the treatment and as a result the secrecy become low.

Table 8. List medicinal plant species reported by25% and more than 25% of informants

Scientific name	Local name	No of informants	% of informants
Zehneria scabra	Haregressa	60	60
Ocimum lamiifolium	Damakessie	56	56
Allium sativum	Niech (Shinkurt)	48	48
Ruta chalepensis	Tena adam	45	45
Hagenia abyssinca	Kosso	44	44
Datura stramonium	Astenagir	42	42
Eucalyptus globulus	Nech bahirzaf	40	40
Zingiber officinale	Zingbil	38	38
Rhamnus prinoides	Gesho	35	35
Vernonia amygdalina	Grawa	30	30
Citrus limon	Lemon	28	28
Linum usitatissimum	Telba	25	25

4.4.2 Preference ranking

The selected 7 key informants were asked to compare six given medicinal plants based on their efficacy which they thought most effective in treating evil eye. As indicated in (Table 9) preference ranking for six medicinal plants used to treat Evil eye shown that *Echinops kebericho* ranked first and hence the most effective medicinal plant to cure Evil eye. The second and third

most preferred medicinal plant against this disease is *Artemisia afra* and *Ruta chalepensis* respectively. While, the last preferred species compared to the three species are *Combretum collinum and Capparis tomentosa* according to informants.

Table 9. Preference ranking of medicinal plants used to treat Evil eye

Informants lebled1-7	*Echinops kebericho*	*Ruta chalepensis*	*Combretum collinum*	*Artemisia afra*	*Allium sativum*	*Capparis tomentosa*
I_1	3	5	2	2	2	1
I_2	4	2	3	5	3	2
I_3	4	3	4	3	2	2
I_4	5	3	3	4	4	3
I_5	2	3	2	2	2	1
I_6	4	2	1	3	3	2
I_7	5	1	1	3	1	3
Total	27	19	16	22	17	14
Rank	1	3	5	2	4	6

Towards plant species having healing potential of different ailments Preference ranking was performed by 7 selected key informants and five selected plant species (table10) on the basis of treat in14 different ailments showed that *Allium sativum* the most preferred one followed by *Ruta Chalepensis.*

Table10. Preference ranking of five selected medicinal plants on the degree of healing several ailments by seven key respondents

Medicinal plant	I_1	I_2	I_3	I_4	I_5	I_6	I_7	Total	Rank
Allium sativum	5	4	3	4	5	4	5	30	1
Citrus aurantifolia	3	4	2	4	5	2	3	23	3
Ruta chalepensis	5	3	4	4	3	4	4	27	2
Hagenia abyssinca	3	2	2	3	2	3	2	17	4
Croton macrostachyus	2	2	1	1	2	2	1	11	5

4.4.3 Direct matrix ranking for multiple use of medical plants

In the study area the majority of the community relies on plants for various purposes such as, medicinal, firewood, construction, fencing, food species, furniture and Washing. To assess the relative importance and to check the major impact on such plants direct matrix ranking was preformed. It was found that 46 species (64 %) of medicinal plants have values other than their medicinal role. Five commonly reported multipurpose species and seven use-categories were involved in direct matrix ranking with seven informants evaluate their relative importance to the people and the extent of the existing threats related to their use values. The values for use reports across the selected species were summed up and ranked below. As (Table 11) shows, the results of the direct matrix ranking revealed that *Eucalyptus globulus* ranked first and hence it is the most preferred plant by people for various uses and is the most threatened species. This scarcity is due to *Eucalyptus globulus* over harvesting for not only medicinal but also for other uses like construction, fire wood etc. *Carissa spinarum* ranked second, *Vernonia amygdalina* ranked as third, (Table 11). So, the top ranked species are highly threatened. That is, there is high rate of loss in the area.

Similarly, the values for use reports across the selected species were summed up and ranked. The results show that the local people harvest seven categories mainly for medicine, firewood, fencing, construction, furniture food&spice and washing with the rank of 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively. Thus, the long-term survival of the top- ranked species are under question, as the daily demand of the local society is usual and continuous with lesser rate of re-plantation.

Table11. Direct matrix ranking of five plant species by seven informants based on seven use categories (5=best, 4= very good, 3=good, 2=less used, 1= least used and 0=no used

Species	Use-categories								
	Fire wood	Construction	Furniture	Food & spice	Fencing	Medicine	Washing	Total	Rank
Eucalyptus globulus	5	5	1	0	4	5	2	22	1st
Vernonia amygdalina	4	3	3	0	2	4	2	18	3rd
Ruta chalepensis	1	0	0	5	0	5	0	11	5th
Podocarpus flactus	3	4	2	0	5	2	0	16	4th
Carissa spinarum	5	3	3	2	5	3	0	21	2nd
Total	18	15	9	7	16	19	4		
Rank	2nd	4th	5th	6th	3rd	1st	7th		

4.4.4 Fidelity level index

The fidelity level (FL) is the percentage of informants claiming the use of a certain plant species for the same major purpose to treat human and livestock diseases. Fidelity level was calculated for medicinal plants used to treat Dandruff and Hypertension. The result revealed that, *Datura stramonium* and *Moringa oleifera* have the highest medical value against Dandruff (0.70) and Hypertension (0.72) respectively (Table 12).

Table12. Fidelity level index for plant species used to treat hypertension &Dandruff in the study area

Ailments	% of informant	Species	NP	N	Fidality index NP/N
Hypertension	55	*Moringa oleifera*	40	55	0,72
	12	*Coffea arabica*	8	12	0.67
	6	*Citrus limon*	3	6	0.43
	3	*Citrus aurantifolia*	1	3	0.33
Dandruff	20	*Datura stramonium*	14	20	0.70
	5	*Plantago lanceolanta*	3	5	0.60
	8	*Acacia abyssinica*	5	8	0.63
	3	*Aloe trigonantha*	1	3	0.34

4.5 Threats and Conservation practice of Ethnomedicinal plants in the study area

Plant resources are vital for the livelihood of the people of Dejen district. However, there is loss of plants as a result of agricultural expansion, firewood, construction, fence, grazing, drought and loss of treatment. So, these are contributing factors for the loss of plant species in general and medicinal plants in particular.

According to informants' response the most mentioned threats to medicinal plants of the study area were agricultural expansion (29 %), grazing (21%), fire wood (17%), drought (10%), fence (9%), construction (8%) and celebration of ceremonies (Figure 12).

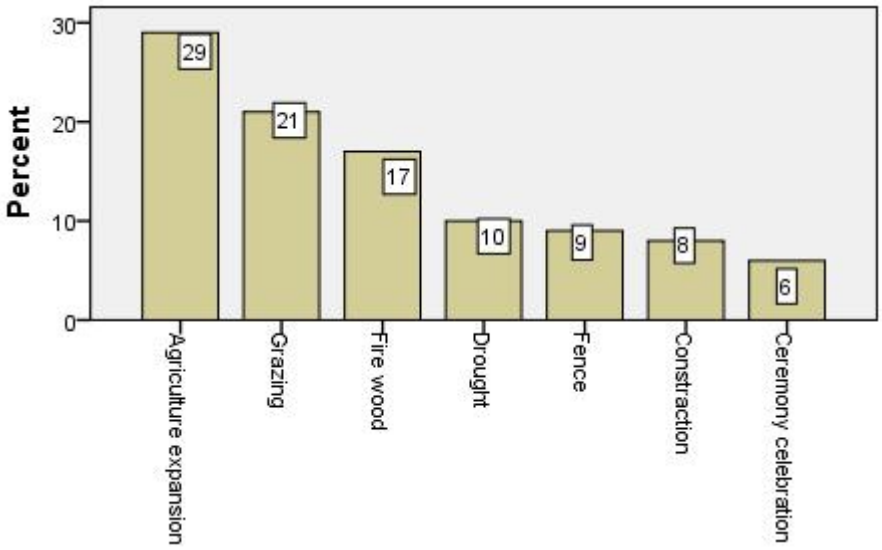

Figure 12. Percentages of reported threats for medicinal plants

Other threated factors of vegetation of the study area are animal grazing, browsing on vegetation and drought. These affect the survival of medicinal plants. Moreover, individual farmers in the study area did not give attention for plant conservation instead; they need plants for their daily life activity, as source of furniture, house hold tools, utensil making and agricultural implementation.

5. DISCUSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

5.1.1 Diversity of medicinal plants in the study area

Results show that the family Asteraceae and Fabaceae have the highest number of plant species (8.33%, n=6) for each. This reveals the presence and utilization of high diversity of Asteraceae and Fabaceae used by people of the study area due to easy availability to local people and their abundance in the area. Similarly, Behailu Etana (2010) a total of 160 species belonging to 124 genera and 58 families were in study area. Asteraceae stood first contributing 17 species (10.62%) in Goma district Jima Zone of Oromia Region. More over Demeku Wale (2014) reported a total of 118 species belonging to 107 genera and 57 families and showed that the family Asteraceae had the highest number of plant species (7.62%, n=9) in her study area.

5.1.2 Ethnomedicinal plant species used to treat human and livestock ailments by people of Dejen district

In the study area a total 72 medicinal plant species were reported to treat human and livestock ailments. From these, 48 species (66.7%) were used as human medicine, 17 species (23.6 %) as livestock medicine and the remaining7species (9.7%) were used for treating both human and livestock ailments. Most of the reported medicinal plants are used to treat human ailments. Similar results were recorded to other areas of Ethiopia. For instance, Behailu Etana (2010) in Goma district, Jima zone of Oromia Region reported a total of 160 medicinal plant species which are used for the treatment of human and livestock ailments from these, 92 species (76.03%) were used as human medicine, 12 species (9.91%) as livestock medicine and the remaining 17 species (14.04%) were used for treating both human and livestock ailments. Moreover, Mohammed Adefa (2009) recorded about 105 medicinal plants inTehuledere district South Wollo of Ethiopia and Fisseha Mesfin (2007) reported 58 medicinal plants in Wonago Woreda, SNNPR of

Ethiopia. This variation indicates the availability of medicinal plants knowledge linked with local people in different districts of the country.

5.1.3 Major plant use categories by the people of the study area

In addition, to medicinal values medicinal plants were utilized for different use categories in the community. In this study a total of 26 species (36.1%) of the plants were reported for their medicinal value only 19 species of plants (26.4 %) were reported for their use as foods and spices .The result of this study is consistent with Demeku Wale (2014) who reported that food and spices take the highest plant use followed by medicinal use categories in East Gojjam, Ethiopia. On the other hand, Endalew Amenu (2007) reported that charcoal followed by furniture take the highest plant utilization category in Chelya district, West Shewa, Ethiopia.

5.1.4 Distributions of medicinal plants according to their habitat

The local people obtain medicinal plant species from wild vegetation than home gardens. This research agrees with most investigations in Ethiopia that documented more human and live stocks medicinal plants harvested in the wild rather than home garden. For instance, Behailu Etana (2010) found that out of the 160 medicinal plants studied, 75 species were gathered from the wild and 46 species were collected from home gardens.

5.1.5 Diversity of habits and use categories of medical plants

Regarding the habit of plants, from the total 72 collected and recorded traditional medicinal plants 38 species (53%) were shrubs, 17 species (24%) were herbs, 12 (17%) were trees and 5 (7%) were climbers . This finding agrees with investigations of Etana Tolasa (2007), Fisseha Mesfin (2007), and Getu Alemayehu (2010) in such a way that shrubs were reported as dominant. In the contrary, Behailu Etana (2010); Mohammed Adefa (2009) and Demeku Wale

(2014) have found that herbs have the highest proportion of medicinal use followed by shrubs. This might be due to variation in the availability of vegetation type in the study areas.

5.1.6 Plant parts used for human and livestock ailment treatment

Leaves were the most reported plant parts in the preparation of remedies. The preference of leaves to other plant parts could be due to the chemical constituents of leaf for the treatment of human and livestock diseases Behailu Etana, (2010). Such wide harvesting of leaves for traditional medicines compared to roots which are important for the survival of plants has less negative influence on the survival and ecological aspects of the plant. However, in this study area root was the second most used part for preparation of traditional medicine; utilization of root parts highly affects sustainability of the original plant. This finding is in line with the results of other ethnomedicinal studies, Behailu Etana (2010); Demeku Wale (2014) and Etana Tolasa (2007) who reported that leaves were the most cited plant parts used in remedy preparations. In contrast, Fisseha Mesfin (2007) reported that, roots were the highest proportion in the preparation of traditional medicines**.**

The local people use different forms of medicinal plant remedy preparations and applications to treat livestock and human ailments. The preparation vary based on the type of disease treated, the medicinal plants and cites of ailment. In this research the major methods of traditional medicinal preparation forms were found to be through crushing which accounts for (29.6%) followed by squeezing (24.1%). The result is consistent with Behailu Etana (2010) in which he reported that the principal methods of remedy preparation were through crushing followed by squeezing. In addition, Emiru Brhana *et al*., (2011) reported that crushing was most frequently used method of preparation.

Medicinal plants are applied through different routes of administration. In the study area, the most common administration of herbal medicines was oral which accounts 31% followed by dermal 28%. Similar results were obtained by Nigusse Amsalu (2010) who reported that oral administration is the most reported route of administration in FartaWoreda East Welega,, Oromia Region,Ethiopia. Moreover, this result was inconsistent with Demeku Wale (2014) which reported that the most common administration of herbal medicines was oral which accounted 45% followed by dermal (30%) in East Gojjam, Amhara Region, Ethiopia.

There is great fear about the dosage taken particularly for human medicines which are taken internally**.** In addition, the local people use traditional medicines by using solvents, additives like sugar, honey, tea, coffee and local drinks in most of preparation to make them testy during applying the medicines. These additives have advantages to minimize the bitterness of the medicines. Similarly, Demeku Wale (2014) reported that additives have advantages to minimize the bitterness of the medicines in East Gojjam, Amhara Region, Ethiopia.

General malaise was found to be treated using large number of medicinal plants (10 species) followed by evil eye (7species).The fact that the above ranked diseases being treated by a number of species is coupled with the frequent occurrence of the diseases and ease of accessibility of plant species for treatment. In turn, these factors widen the popularity of these species among the informants and indigenous knowledge for treating these diseases. This indicates that given medicinal plants could be used for treatment of several human and livestock ailments and the treatment of ailments using different plant species. Similarly,(Mohammed Adefa, 2009 and Behailu Etana,2010) have reported that a single ailment is treated by two or more plant species.

5.1.7 Informant consensus of medicinal plant use report

In the study area 10 medicinal plants were found popular than the others, in view of that, *Zehneria scabra* took the lead first where it was cited by 60 informants for its medicinal value to treat ailments. Whereas *Ocimum lamiifolium* was cited by 56 informants for their medicinal value. In the contrast, Endalew Amenu (2007) *Ocimum lamiifolium* took the lead first where it was cited by 64 (88.8%) informants for its medicinal value followed by *Allium sativum* cited by 62 (86%) in Chelya Woreda, West Shewa, Ethiopia . Preference ranking for six medicinal plants used to treat Evil eye shown that *Echinops kebericho* ranked first and hence the most effective medicinal plant to cure Evil eye. The second and third most preferred medicinal plant against this disease were *Artemisia afra* and *Ruta chalepensis.* But, Endalew Amenu (2007) reported that *Pterolobium stellatum* was ranked first to cure Evil eye in Chelya Woreda, West Shewa, and Ethiopia.

Informants evaluate their relative importance to the people and the extent of the existing threats related to their use values. The results of the direct matrix ranking revealed that *Eucalyptus globulus* ranked first and hence it is the most preferred plant by people for various uses and the most threatened species. This scarcity is due to over harvesting of *Eucalyptus globulus* for not only medicinal but also for other uses like construction, fire wood etc. Even though the rank is given, all of the species particularly the top ranked ones face a question of survival in the long term because, each activities of people in the society depends on these species. Some plant species that were used for food, spices and fumigation were marketable. This result agreed with the study reported by Eskedar Abebe (2011) in Debark wereda North Gonder Ethiopia and Getu Alemayehu (2010) in Minjar Shenkora district. Fidelity level was calculated for medicinal plants used to treat Dandruff and Hypertension. The result revealed that, *Datura stramonium* and

Moringa oleifera have the highest medicinal value against Dandruff (0.70) and Hypertension (0.72) respectively. This research agrees with Demeku Wale (2014) who has reported *Moringa oleifera* was the highest plant species used for treating Hypertension in east Gojjam, Amhara region.

5.1.8 Threats and Conservation practice of Ethnomedicinal plants in the study area

The most mentioned threats to medicinal plants of the study area were agricultural expansion. Similar results were obtained in different investigations in Ethiopia. For instance, Behailu Etana (2010) showed that the need for agricultural land is the most threatened factors in Goma district. Similarly Seyani &Chikuni (1997) reported that, the world is losing plants every minute due to deforestation for agriculture, firewood, construction materials, over browsing and &drought.

According to Sofowara (1982) the loss of medicinal plants associates with the missing of advantages gained from medicinal plants and indigenous knowledge associated with plants. In general, the knowledge on medicinal plants become lesser and lesser due to its secrecy, unwillingness of young generation to gain the knowledge, oral based knowledge transfer, unavailability of the species, influence of modern education and awareness factors which all results in gradual loss of indigenous knowledge on medicinal plants in the area.

In the study area medical plants harvesting for local use does not result in their threat. Instead, most endangered medical plants of the study area were found threatened due to other modes. For commercial purpose, destructive harvesting practice, habitat loss resulting from forest degradation and agricultural encroachment have all been recognized as contributing factors for the loss of plant species. Thus, the need for agricultural land and population pressure severely threatened plant species in general and medical plants in particular. Similarly, Endalew Amenu

(2007) reported that all the above activities are recognized as contributing factor for the loss of plant species in general and medical plants in particular. Similar results obtained by Endalew Amenu (2007) reported that significant number of animals graze and browse on vegetations in their locality. They put an actual effect on vegetations there during dry season, as the availability of browsable and grazable vegetation is limited. These in turn affected the survival of medicinal plants.

5.2 Conclusion

In the study area seventy two medicinal plants were recorded of which 48 species were noted to treat human ailments, 17 species were documented to treat livestock ailments and 7 species were used to treat both livestock and human ailments. The medicinal plant species collected and identified were 35 (49%) species from wild (natural) vegetation and 25 (34%) species were from home gardens and the rest 12 (17%) species were collected from both wild and home gardens.

In the study area, 54 ailments were recorded (41 for human 13 for livestock) which are being treated by traditional medicinal plants of the area. The present study revealed that people of the area have different knowledge transfer approaches about traditional medicinal plants in which 36% of informants reported that they obtained knowledge about traditional medicinal plants by communicating their family when the healers are old enough. The medicinal plants have wide and varied uses in addition to their medicinal values thus, 26.4% were reported for food and spices, 23.6% of the plant used for fire wood.

In the study area, shrubs (52.5%) were found the dominant habits used for preparation traditional remedies followed by herbs (23.6%) and trees (16.7%). Leaves were also found the most frequently used plant parts for preparation remedies followed by roots. The major methods of traditional medicinal preparation forms were crushing (29.6%) followed by squeezing (24.1%). The common route of administration of herbal medicinal was oral which accounts (35%) the cases followed by dermal (28%).

Most healers prepared traditional medicinal plants in home rather than selling in the market. The major threats to traditional medicinal plants in the area were agriculture expansion (29%), grazing (21%), fire wood (17%), drought (10%), fence (9%), construction (8%) and ceremony

celebration (6%).Moreover; in the study area medicinal plants harvesting for local use does not result in their treat. Instead, other factors contributing for use of plant species. So, threats due to utilization for medicinal purposes are low compared to other factors.

5.3 Recommendations

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

- Some traditional healers may give attention for indigenous knowledge transfer while others have not give attention regarding the values of indigenous knowledge. So governmental and non-governmental organizations should practice awareness rising for healers to minimize the loss of indigenous knowledge.
- The district health office should contribute to identify effective medicinal plants and increasing the local people to grow medicinal plants in home gardens.
- As started in Dejen 01 kebele the district health office should support the traditional medicinal practitioners by providing land for cultivating medicinal plants.
- The local society should be create awareness through adopting multipurpose plant species giving special emphasis to medicinal plants cultivation.
- The local community of the district should be involved in conservation of plant resources and their indigenous knowledge in their locality.
- To give more support to the finding of this research, further scientific investigations are needed for *Echinops kebericho* and *Ocimium lamifolium* based on pharmacological evaluation.

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APPENDICES

Appendix-1: Format for collecting ethnobotanical information.

(Checklist of Semi-structured Interviews Question for collecting Ethnobotanical Data**)**

Date _____

I. General Information on respondents:

Area of Residence (village) _____Keble code (Name) _____Name of Respondent_____Sex_____Age.____

Marital status: single_____ married_____ Divorced_____

Religion: Orthodox_____Protestant_____Muslim_____Others_____

Source of income: Farming_____Trading local items_____Others_____

Level of education: Receive formal education_____Read and write_____Read only___Can' t read and write_____ Others_____ Ethnicity_____

For how long have you lived in the area_____

II. Ethnobotanical Data

1. What are the most common diseases of humans and livestock in your area?
2. Mention Medical plants that are used to treat for human and/or livestock diseases; local name; habit; disease treated; parts used; mode of preparation with dosage used ; route of administration; ingredients add & other uses of medicinal plants.
   Key: Habit (shrub, tree, climber); parts used (bark, leaf, root, fruit, flower, seed, stem, bulb, whole plant); Route (dermal,nasale,oral…)

Local Name of plants	Habit	Use		Parts of plants used	Disease treated	Mode of preparation	Route	Ingredients added	Other uses of medicinal plants
		Human	Livestock						

3. Does each medicinal plant have any use other than medicine?

4. How is the knowledge of medicinal plants use transferred from generation to generation in the community?

5. Where do the medicinal plants grow?

5. 1. In the wild

5.2. In the gardens

5.3. Both in the wild and home garden

6. Tell the traditional way of classifying forests and landscapes in your area:

6.1. Forest

6.2. Landscape

7. What are human and livestock diseases that are treated more than three medicinal plants?

8. Dosage: Does it vary among age groups, sex? If you say yes, why? If not, why not?

9. Are the medicinal plants marketable?

10. How the communities preserve and conserve medicinal plants in the area**?** Are there threats to those medicinal plants?

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

Amharic Name	English Name
Megagna	_
Gunfane	Common cold
Kuakucha	Tinea versicolor
Kurtmat	Arthrites
Mich	General malaise
Yebabe Mendefe	Snake bite
Yayne Hemem	Eye disease
Tekmate	Diarrhea
Forofore	Dandruff
Demegffite	Hypertension
Nesere	Nose bleeding
Yahode qurteate	Stomach ache
Yesameba Nekeresa	TB
Sale	Coughing
Yeahya kuntaret	Haemorrhoide
Yesate katelo kusel	Fire wound
Yerase metate	Head ache
Yesequare beshita	Diabetes(pancreas disease)
Yehode menfate	Bloating
Yewefite	Liver disease
Eti	Tumor
Werja	Abortion
Yeshererite shente	Spider poison
Yehode Derket	Constipation
Yechenguara Beshita	Gastric
Kurba	_
Yeterse kurtemate	Tooth ache
Wesfate	Ascaries

Yegre meshtet	Foot smell
Buda	Evil eye
Yemitel Beshita	Epilepsy
Yejero Hemem	Ear problem
Seitan(kuragna)	Devile
Amoeba	Amoebic dysentery
Chefea	Eczema
Enkerte	Goiter
Weba	Malaria
Masmeles	Vomiting
Yaguroro aneqare Mabate	Tonsillitis
Yekosotel	Tape worm
Almazbalechira	Herbuszoster

Appendix3. List of Livestock diseases which are treated by medicinal plants in the study area

Amharic Name	English Name
Yehodemenfate	Blotting
Abasenga	Antrax
Yayene Hemem	Eye disease
Meziger	Tick
Werchiga	Blackleg
Kuro	_
Kusel	Wound
Alekete	Leeches
Werwerte	Pick eye
Sale	Coughing
Yetafia chegre	Pancreatic problem
Yetute Eti	Mastits(breast tumor)
Kuntaret	Wart

Appendix 4. List of medical plants that are used for human ; local name; habit(shrub,Herb,Tree& Climber); disease treated; parts used(Root,Leave,Fruits ,seeds…); mode of preparation ; route of administration; Other uses of medicinal plants.

Scientific name	Family	Local nameof plants	Habit	for Human	Parts used	Disease treated	Mixed with plant	Mode of Preparation	Route of administration	Other Use of plants	Collection n umber
Acacia abyssinica Hochst ex.Benth	Fabaceae	Girare	Shrub	X	Leave	Dandruff & Goiter	Only	Squeezing	Dermal	Fire wood	A.B 46
Achyranthes aspera L.	Amaranthaceae	Telenj	Shrub	X	Leave	Fire wound&mich	Only	Crushing	Dermal	Only medicine	A.B 20
Artemisia abyssinica Sch.Bip.exA.Rich	Asteraceae	Arete	Shrub	X	Leave	Megagna&Bloating	Only	Chewing	Oral	Only Medicine	A.B 10
Artemisia afra Jack.exWlld	Asteraceae	Chekugn	Herb	X	Leave	Devil&common cold	With white onion	Crushing	Nasal	Livestock Food	A.B 21
Arundinaria alpina K.Schum.	Poaceae	Qurkeha	Tree	X	Stem &root	cheafe	Honey	Crushed	Dermal	Furniture	A.B 24
Calotropis procera (Ait)f.	Asclepiadaceae	Kinbo	Shrub	X	Fluid	Wound	Only	squeezing	Painted the wound	Only medicine	A.B 55
Carissa spinarum L.	Apocynaceae	Agam	Tree	X	Root	Gonorrhea	Honey	Crushed	Oral	Fire wood	A.B 28
Catha edulis (Vohl)Forssk ex Endl	Celastraceae	Chat	Shrub	X	Leave	Hypertension	Suger	Chewed	Oral	Only Medicine	A.B 47
*Citrus aurantifolia (*Christm.)Swingle	Rutaceae	Bertukan	Tree	X	Fruit	Constipation	Only	Abrade	Oral	Food	A.B 18

Citrus limon (L.)Burm.f.	Rutaceae	Lemon	Tree	X	Fruit	Dandruff&foot smell	Only	Squeezed	Dermal	Food	A.B 19
Clausena anisata (Willd.)Benth	Rutaceae	Limich	Shrub	X	Stem	Tooth ache	Only	Cutting stick	Brushing	Fire wood	A.B 26
Clerodendron myricoides(Hochst) R.B.Br.ExVatke	Lamiaceae	Misrech	Shrub	X	Root	Tooth ache&Evil eye	Only	Crushed	Fumigate	Only medicine	A.B27
Coffea arabica L.	Rubiaceae	Coffee	Tree	X	Seed	Diarrhea,TB,Spider poison&Amoeba	With honey	Powdering ,Boiling Leave for TB	Dermal&oral	Food &spice	A.B 16
Combretum collinum Fresen.	Combretaceae	Tunjet	Shrub	X	Leave	Evile eye,Devil&mich	Only	Smoke	Fumigate	Fire wood	A.B 12
Coriandrum sativum L.	Apiaceae	Denblale	Shrub	X	Seed	Stomach ache&snake bite	With water	Crushing	Oral	Food &spice	A.B 07
Cucurbita pepo L.	Cucurbitaceae	Duba	Climber	X	Fruit	Tape worm	Only	Dry&crushed	Oral	Food	A.B 30
Datura stramonium L.	Solanaceae	Astenager	Shrub	X	Leave &root	Mich,Dandruff,Almaze balechera,Headache&Nasal bleeding	With water&butter	Squeezed leave&dry root powdered for head ache	Dermal& Nasal	Only Medicine	A.B 03
Dodenaea angustifolia L.F	Sapindaceae	Kitketa	Shrub	X	Stem	Snake bite	Only	Chewing	Oral	Fire wood	A.B 52

Echinops kebericho Mesfin	Asteraceae	Kebericho	Herb	X	Root	Evile eye&Snake bite	Only	Smoking	Fumigate	Only medicine	A.B 54
Embelia schimperi Vatke	Myrsinaceae	Enkoko	Shrub	X	Fruit	Tape worm	With Barly	squeezed	Oral	Only medicine	A.B 53
Eucalyptus globulus Labill	Myrtaceae	Nech Beharzafe	Tree	X	Leave	Common cold.foot smelling&mich	With water	Boilng	Fumigate	Fire wood	A.B 31
Euphorbia ampliphylla Pax	Euphorbiaceae	Kulkual	Shrub	X	Fluid juice	Wound	Only	Squeezed	Dermal	Fire wood &fence	A.B 61
Ficus ovata Vahl	Moraceae	Shola	Tree	X	Fruit	Wound	Only	Crushed	Dermal	Food	A.B 29
Guizotia abyssinica (L.f.)Cass	Asteraceae	Noug Mech	Herb	X	Seed	Kureba&cough	With sufe	Boiled	Oral	Food	A.B 59
Guizotia scabra (Vis)Chiov.	Asteraceae		Herb	X	Root	Ear problem	Only	Crushed	By ear	Only Medicine	A.B 62
Hagenia abyssinca (Brucie.)J.F.Gmel	Rosaceae	Kosso	Herb	X	Fruit	Tape worm	Niger	Crushing	Oral	Only medicine	A.B 58
*Jasmininum abyssinicum (*Hochst)	Oleaceae	Tenbelel	Shrub	X	Leave	Tumor,Bloting&Amoeba	Only	Crushed	Dermal& Oral forbloting	Only medicine	A.B 13
Justica schimperiana (Hochst.exNees)T.Andre	Acanthaceae	Sensel	Shrub	X	Root	Yewfite	With honey	Cooked	Oral	Fire wood	A.B 05

Linum usitatissimum L.	Lineaceae	Telba	Herb	X	Seed	Constipation&cough	With water	Crushed &boiling	Oral	Food	A.B 60
Lippia adoensis Hocht.Ex.Walp.Var.adoensis	Verbanaceae	Kessie	Shrub	X	Leave	Mich	With water	Squeezed	Dermal	Only medicine	A.B 08
Lycopersicon esculentum Mill.	Solanaceae	Tomato	Herb	X	Fruit	Spider poison	Only	Squeezed	Dermal	Food	A.B 22
Malva verticillata L.	Malvaceae	Lute	Herb	X	Root	Abortion&Bloating	With water	crushing	Oral	Only medicine	A.B 15
Moringa oleifera Lam.	Moringaceae	Sheferaw	Tree	X	Leave	Hypertantion	Only	Dry&crush	Oral	Spice	A.B 38
Myrtus communis L.	Myrtaceae	Ades	Herb	X	Leave	Dandruff&mich	With butter	Crushed mixed with butter	Dermal	Only medicine	A.B 33
Phytolacca dodecandra L.Herit	Phytolaccaceae	Endode	Climber	X	Fruit	Abortion	With water	Powdering	Oral	Washing	A.B 14
Plantago lanceolanta L.	Plantaginaceae	Gortebe	Herb	X	Leave	Dandruff	With water	Squeezed	Dermal	Livestock Food	A.B 17
Podocarpus flacatus (Thumnb.)Mirb	Podocarpaceae	Zegba	Tree	X	Leave	Fire wound	Only	Crushing	Fire wood	Fire Wood	A.B 57
Rhamnus prinoides L.Herit	Rhamnaceae	Gesho	Shrub	X	Leave	Chefea,tonsillit&stomach ache	Only	Chewing	Oral&Fumigate	Food &spice	A.B 11
Rumex abyssinicus Jacq	Polygonaceae	Mekmeko	Shrub	X	Root	Vomiting&Kurtemate	Suger with water	Dry &crushed	Oral	Fire wood	A.B 48

Rumex nervosus Vahl.	Polygonaseae	Anbuacho (Enbuate)	Shrub	X	Leave	Fire wound	Only	Crushed	Dermal	Only medicine	A.B 25
Rumox nepalensis Spreng.	Polygonaceae	Tulte	Shrub	X	Root	Megagna,Ear problem,Abortion,Kuakecha&Heamoroid	Only	Chewing	Oral	Only Medicine	A.B 04
Ruta chalppensis L.	Rutaceae	TenaAdame	Herb	X	Leave	Common cold &evil eye	With tea	Boiled	Oral&Nasal	Food Spice	A.B 56
Tamarindus indica L.	Fabaceae	Roka	Shrub	X	Fruit	Stomach ach	With water	Abrade	Oral	Food	A.B 39
Trigonella foenum-graecum L.	Fabaceae	Abesh	Herb	X	Seed	Gastric	Water with suger	Powdered	Oral	Food &spice	A.B 23
Urtica simensis Steudel	Urticeaceae	Sama	Shrub	X	Leave	Heart disease	With water	Boiled	Fumigate	Only medicine	A.B 09
Vernonia amygdalina Del.	Compositeae	Grawa	Tree	X	Leave	Stomach,Gastric&Ascaries	With water	Squeezed	Oral	Washing	A.B 02
Zehneria scabra L.	Cucurbitaceae	Haregresa	Climber	X	Leave	Mich, Head ache&eye disease	Only	Squeezed &Boiled	Oral&fumigate	Only Medicine	A.B 01
Zingiber officinale Roscoe	Zingiberaceae	Zengeble	Herb	X	Rhizome	Stomach ache,cough&common cold	Only	Chewing	Oral	Food Spice	A.B 57

Appendix5 . List of medical plants that are used for livestock diseases; local name; habit(Shrub,Tree,Herb& climber); disease treated; parts used(Root,Leave,seed ,fruite); mode of preparation ; route of administration; Other uses of medicinal plants.

Scientific Name	Family	Local name	Habit	Lives tock	Part used	Disease treated	With plant	Mode of preparation	Route of adminstr ation	Other use	
Aloe trigonantha Leach	Aloeaceae	Erate	Shrub	X	Leave	Stomach ach	With water	Boiling	Oral	Washing	A.B 42
Brassica carinata A.Br.	Brassicaceae	Senafech	Herb	X	Seed	Abscess(Tum or)	Feto with water	Chewed	Dermal	Food	A.B 70
Calpurnia aurea(Ait.)Benth.	Myrtaceae	Degita	Shrub	X	Fruit	Werwerte	Only	Chewed	Fumigate	Fire Wood	A.B 40
Carthamus tinctorius L.	Asteraceae	Sufe	Herb	X	Seed	Abasenga	With Niger	Boiled	Oral	Food	A.B 68
Cucumis ficifosius A.Rich	Cucurbitac eae	Enbuay	Climber	X	Fruit	Cough	Only	Squeezed	Nasal	Only medicine	A.B 63
Diplolophium africanum Turcz.	Lamiaceae	Yeferese Zenge	Climber	X	Leave and root	Pancreatic problem	With water	Crushing	Oral	Fence	A.B 45
Dracaena steudneri (Engl.)	Diracaenac eae	Merko(moata)	Shrub	X	Root	Devil	With water	Smoked	Fumigate	Fence	A.B 51
Ensete ventricosum (Welw)Cheesman	Musaceae	Koba	Shrub	X	Root	Bloating	With wate	Crushed	Oral	Fire Wood	A.B 44

Euphorbia platyphyllos L.	Euphorbiaceae	Anturfa	Shrub	X	Leave	Breast tumor of livestock	Only	Squeezed	Dermal	Only Medicine	A.B 65
Kalanchoe petitiana A.Rich	Crassulaceae	Andawela	Shrub	X	Root	Wart of livestock	Only	Crushing	Dermal	Only medicine	A.B 41
Millettia ferruginea (Hochst.)Baker	Fabaceae	Berbra	Tree	X	Fruit	Tick	With water	Squeezed	Dermal	Fire wood	A.B 06
Nicotiana tobaccum L.	Solanaceae	Tenbho	Shrub	X	Leave	Worchga&Leech	With water	Squeezed	Nasal	Only Medicine	A.B 36
Opuntia ficus-indica (L.)Miller	Cactaceae	Belese	Shrub	X	Stem	Donkey kuro	Pea bran	Smoked	Famigate	Fire wood &food	A,B 35
Piliostigma thonningii (Schumach.)Milne-Redh.	Fabaceae	Kelkelo	Herb	X	Root	Cough	Water	Cooked	Oral	Only Medicine	A.B 69
Premna schimperi (Engl)	Verbenaceae	Checho	Shrub	X	Stem	Eye disease	With water	Chewing	Put in to eye	Fire wood	A.B 43
Sesamum orientale L.	Pedaliceae	Selite	Shrub	X	Seed	Abasenga	Only	Chewing	Oral	Food	A.B 64
Securidaca longepedunculata Fresen	Polygonaceae	Themnahe	Shrub	X	Root	Devil of livestock	Only	Smoke	Fumigate	Only medicine	A.B 67

Appendix6. List of medical plants that are used for human and livestock diseases; local name; habit(Shrub,Tree,Climber&Herb); disease treated; parts used(Root,Leave,Fruite,Seed…); mode of preparation with dosage used; route of administration; Ingredients; Other uses of medicinal plants.

Scientific Name	Family	Local name	Habit	Human	Livestock	Parts used	Disease treated	Mixed with plant	Mode of preparation	Route of administration	Other use	Coll. No.
Allium sativum L.	Alliaceae	Nech shin kurte	Herb	X	X	Bulb	Abasenga,common cold,evil eye,TB,malaria,kuakucha,Diabetes&mich	With Tenadame forhuman	Crushed	Nasal&oral	Food&spice	A.B 71
Capparis tomentosa Lam.	Capparidaceae	Gumero	Shrub	X	X	Root	Devil&Evil eye	Only	Smoked	Fumigate	Fire wood	A.B 37
Croton macrostachyus Del.	Euphorbiaceae	Besana	Tree	X	X	Leave juce(ademe)	Dandruff,Devil,kuakucha	Only	Squeezed&crushed	Dermal&fumigate for evil eye	Fire wood	A.B 32
Cynoglossum coeruleum Hochst.Dc.	Boraginaceae	Shungeg	Shrub	X	X	Leave	Almaze balechira,Werchiga&mich	Aregresa for human	Squeezed	Dermal	Only medicine	A.B 72
Euphorbia tirucalli L.	Euphorbiaceae	Kinchib	Shrub	X	X	Bark	Evil eye,Wart &Epilepsy	Tenadme	Smoking	Inhaling	Only medicinal	A.B 49
Lepidium sativum L.	Brassicaceae	Feto	Shrub	X	X	Seed	Wegate,mich,Tumer,Tonsil&Malaria	Salt&water	crushing	Oral&for Tumer Dermal	Only medicine	A.B 71
Ocimum lamiifolium Hochst.exBentch	Lamiaceae	Damakesa	shrub	X	X	Leave	Mich,leech,Eyedisease &Ascaries	Only	Squeezed& Boiling	Oral&fumigate	Fence	A.B 34

Appendix 7. Major human and livestock diseases and number of plant species used by indigenous people of the study area

Human disease	No species	% species
Megagna	4	3.1
Comen cold	4	3.1
Kuakucha	2	1.5
Mich	10	7.8
Snake bit	3	2.3
Eye disease	2	1.5
Diarrhea	4	3.1
Dandruff	5	3.9
Hypertension	2	1.5
Nose bleeding	1	0.8
Stomach ache	5	3,9
TB	2	1.5
Cough	4	3.1
Heamoroide	1	0.8
Fire wound	5	3.9
Headache	4	3.1
Diabetes(pancreas disease)	1	0.8
Bloating	3	2.3
Yewefite	1	0.8
Kuragna(Devil)	2	1.5
Tumor	3	2.3
Amoeba	3	2.3
Abortion	2	1.5
Spider poison	2	1.5
Constipation	2	1.5
Gastric	2	1.5
Kurba	1	0.8
Tooth ache	2	1.5
Malaria	2	1.5
Foot smell	2	1.5
Evil eye	7	5.4
Epilepsy	1	0.8
Ear problem	2	1.5
Chife	2	1.5
Ascaries	2	1.5
Goiter	1	0.8
Vomiting	2	1.5
Tapeworm	3	2.3

Almaz balechera	2	1.5
Leech(livestock)	2	1.5
Abasenga	3	2.3
Tonsil	2	1.5
Tick	1	0.8
Werchega	1	0.8
Eye disease(livestock	1	0.8
Werwerte	1	0.8
Cough(livestock)	2	1.5
Pancreatic problem	1	0.8
Mastits(breast tumor)	2	1.5
Wart(kuntaret)	1	0.8
Blotting(livestock)	1	0.8
Kuro	1	0.8
Kusel	1	0.8

Appendex 8. List of informants participated in ethnobotanical study

No	Name of informants	Sex	Age	Keble	Occupation
1	Tegeste Merkebu	F	55	Yetnora	Office Worker
2	Mekuanent Enawegaw	M	28	Koncher	Student
3	Getachew Kebede	M	40	Dejen 01	Teacher
4	Abreham Mengeste	M	28	Yetnora	Student
5	KasaneshGelanehe	F	62	Sebshengo	Farming&Healer
6	Adugnaw Asmare	F	22	Hagereselam	Farming
7	Belay Ayahode	M	80	Hagereselam	Farming
8	Abebe Wegzaw	M	45	Yetnora	Farming
9	Werkeyantefu Enyew	F	61	Yenagnat	Farming
10	Habtamu Tamre	M	40	Yetnora	Farming&Healer
11	Adera Zewda	F	62	Yetnora	Office worker
12	Mitku Arega	M	35	Tike	Teacher
13	Demke Asefa	M	55	Dejen 01	Merchant
14	Selam Abebe	F	44	Dejen 02	Office worker
15	Dagne Gelaye	M	62	Dejen 01	Merchant&Healer
16	Manaye Derseh	M	37	Borebore	Oiffce worker
17	Eredate Merkeb	F	63	Koncher	Farming
18	Gashaye Etagode	M	75	Zemeten	Priest
19	Zeryhune Desyalew	M	58	Tike	Farming
20	Yesuefe Ahmed	M	75	Dejen 02	Weaver&Healera
21	Aragaw Abebe	M	38	Tike	Farming
22	Yesh Aweke	F	45	Dejen 01	Nerse
23	Menga Adamu	M	55	Tike	Farming
24	Shemachash Demes	F	65	Tike	Farming
25	Kefe Abrham	M	76	Dejen 02	Office worker&Healer
26	Meskerem Asegede	F	20	Yenagnat	Student

27	Abeza Lemen	F	44	Hagereselam	Farming
28	Debra Hunegnaw	F	65	Yetnora	Farming
29	Neguse Debase	M	27	Dejen 02	Merchant
30	Getu Senshaw	M	60	Yenagnat	Farming&Healer
31	Webet Fenta	F	45	Dejen 02	Office worker
32	Amare Derese	M	28	Dejen 02	Teacher
33	Kase Ayalew	M	50	Hagereselam	Priest
34	Belachew Abeneh	M	42	Hagereselam	Farming
35	Gashaw Alemu	M	48	Koncher	Healer&merchant
36	Medenekia Ayele	F	20	Koncher	Student
37	Anedargachew Addiss	M	21	Koncher	Student
38	Temsgen Alemu	M	25	Sebshengo	Office worker
39	Yeshareg Alemu	F	45	Dejen 01	Nurse
40	SHegaw Kefialew	M	50	Zemeten	Farming&Healer
41	Mulugojam Embeyale	F	61	Sebshengo	Farming
42	Demek Belay	M	35	Yenagnat	Office Worker
43	Dagne Alemu	M	55	Sebsenshngo	Priest
44	Teruye Fenta	F	41	Borebore	Farming
45	Yedenkal Seraw	M	55	Hagere selam	Farming&Healer
46	Leku Tadese	M	45	Dejen 02	Office worker
47	Adamitu Wale	F	63	Borebore	Farming
48	Berlaw Ayele	M	60	Koncher	Farming
49	Fate Oumer	F	42	Koncher	Merchant
50	Talema Guade	M	52	Tike	Farming&Healer
51	Asegde Baleh	M	64	Yetnora	Priest

52	Kuemelachew Gobeza	M	63	Yetnora	Farming
53	Muneye chane	M	63	Dejen 01	Merchant
54	Gezachew Belay	M	45	Sebshengo	Farming
55	Neguse Merzo	M	65	Hagereselam	Farming&Healer
56	Fentanesh Adamu	F	65	Zemeten	Farming
57	Yegrem Geza	M	70	Yetnora	Farming
58	Tadele Wegesh	M	48	Tike	Priest
59	Mekonen Mesfene	M	43	Hagereselam	Merchant
60	Kasyetu Mekonen	F	80	Sebsenshngo	Farming&Healer
61	Adamu Amare	M	21	Dejen o2	Student
62	Hasen Eslemane	M	65	Dejen 01	Merchant
63	Leweye Getahun	M	78	Sebsenshngo	Farming
64	Moseye Demsa	M	22	Sebsenshngo	Student
65	ThegayeAdamu	M	53	Sebsenshngo	Merchant&Healer
66	Kasa Abebe	M	68	Zemeten	Farming
67	Lewye Bitew	M	50	Tike	Farming
68	Belachew Belay	M	62	Hagereselam	Farming
69	Asefa Genberu	M	61	Borebore	Merchant
70	Abate Moseye	M	70	Borebore	Farming&Healer
71	Senshaw Alemu	M	65	Dejen 02	Farming
72	Temesgen Mosue	M	50	Dejen 01	Teacher
73	Moseye Meku	M	64	Yetnora	Farming
74	Negerew Bitew	M	45	Sebsenshngo	Farming
75	Gezachew Belay	M	61	Hagere selam	Farming&Healer
76	TemesgenAdugnaw	M	62	Dejen 01	Farming
77	Enawgaw Afewerke	M	40	Borebore	Farming

78	Yekoye Asab	M	75	Borebore	Farming
79	Kumelachew Gobeze	M	63	Yetnora	Merchant
80	Wale Getnet	M	80	Dejen 01	Farming&Healer
81	Ayele Atenafu	M	75	Zemeten	Farming
82	Deguale Gashu	M	74	Yenagnat	Farming
83	Abren Tadele	M	75	Dejen 02	Gurade
84	Debase Teruneh	M	65	Zemeten	Farming
85	Fentaneh Bitew	M	52	Tike	Farming&Healer
86	Dameta Anelay	M	62	Dejen 01	Merchant
87	Mosu Gezahagn	M	38	Yenagnat	Farmin
88	Mosu Yelefe	M	54	Tike	Farming
89	Melaku Werkneh	M	73	Yenagnat	Farming
90	Afrash Zeleke	M	68	Koncher	Farming&Healer
91	Abebe Ayele	M	68	Dejen 01	Teacher
92	Mulu Negse	M	54	Tike	Farming
93	Zeleke Derese	M	48	Dejen 01	Merchant
94	Chekole Antenhe	M	63	Yetnora	Farming
95	Habte Dersa	M	62	Yenagnat	Farming&Healer
96	Zewde Fente	M	66	Yenagnat	Merchant
97	Belete Getenet	M	70	Hagereselam	Farming
98	Baye Ayale	M	71	Yenagnat	Office Worker
99	Addiss Denku	M	72	Dejen 02	Merchant
100	Mesfen Mose	M	64	Yetnora	Farming&Healer

Declaration

I, Addissie Belay Moges confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis. The material contained in this thesis has not previously been submitted for a degree at Addis Ababa University or any other university and all the sources of materials used for thesis are acknowledged.

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Date- August 2018

Place- Addis Ababa University

This thesis has been submitted for examination with my approval as an academic advisor.

Advisor; Ermias Lulekal (PhD)

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Date_____