

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED BY
INDIGENOUS PEOPLE IN ASEKO DISTRICT, ARSI ZONE, OROMIA
REGIONAL STATE, ETHIOPIA**

M.Sc. THESIS

BY

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**Ethnobotanical study of medicinal plants used by indigenous people in
Aseko district, Arsi zone, Oromia Regional State, Ethiopia**

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**In Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE IN BIOLOGY**

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Haramaya University, Haramaya

DEDICATION

I dedicated this thesis to my lovely wife Azeb Tadesse, who were passed away, to my Family and to my lovely son Dawit Berhanu for their continues that helped me to complete this thesis work from beginning to end.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this M.Sc. Thesis is my own work. I have followed all ethical and technical principles of scholarship in conducting studies, data collection, data analysis, and compilation of this Thesis. Any scholar matter that is included in the Thesis has been given recognition through citation.

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BIOGRAPHICAL SKETCH

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ACRONYMS/ABBREVIATIONS

FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
ICF	Informant Consensus Factor
MP	Medicinal Plant
PR	Preference ranking
TMP	Traditional Medicinal Plant
WHO	World Health Organization

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Ethnobotanical study of medicinal plants used by indigenous people in Aseko district, Arsi zone, Oromia Regional State, Ethiopia

ABSTRACT

Ethiopia has rich flora with different plant species having use in health care system based on local indigenous knowledge. However, documented Ethnobotanical information was lacking in Aseko Woreda. Hence, the aim of this study was to investigate and document Ethnobotanical study of medicinal plants used by indigenous people in Aseko Woreda, Arsi Zone, Oromia Regional State, Ethiopia. A total of 116 informants aged 25 and above were selected to collect ethnobotanical data. Out of these, 16 key informants were purposively selected based on recommendations from local elders. Others were selected randomly. Data were collected using semi structured interview, group discussion, guided field walk and field observation. The data were analyzed using descriptive statistics such as percentage and frequency; preference ranking and, informant consensus factor. The results of the study showed that 74 species of medicinal plants belong to 68 genera and 40 families used to treat different health problems were gathered and documented. The plants were described with their local names and scientific names. Most of plant species were collected from wild (61%) followed by home garden (14.80%) and wild and home garden (24.32%). Out of these plants, 40 species were noted to treat only human ailments while species 15 are used to treat livestock ailments and 19 species were reported to be to treat both human and livestock ailments. The majority 39 species (52.70%) of the medicinal plants were Shrubs followed by Tree 16 species (21.62%) Herbs 12 species (16.23%) ,and 7species (9.45%) climbers. Leaves (47%), followed with roots (22%), Seed (16%), Fruit (5%), Bark (4%), Stem (3%) Bulb (3%), and Latex, (2%).The most diverse families in terms of species composition were Lamiceae represented by (6 species) followed by Fabaceae and Solanaceae each represented by equal number (5 sp),Myrtaceae and Asteraceae each represented by equal number (4 sp.) Rosaceae, Polygnonanceae, Ranunclaceae and, Verbenaceae, Cucurbitaceae and Euphorbiaceae each represented by (3 sp), Malvaceae, Oleaceae, and Rutaceae each represented by (2 species). The remaining families are each represented by 1 spp. The most common route of administrations were oral administration constituting (30%), dermal (29 %), nasal (23%), other (16%) respectively. Disease categories with relatively higher ICF values were Gastrointestinal and Parasitic related diseases (0.80); External injuries and bleeding problems (0.78). Among the five plant species, the most effective medicinal plants used to treat degree of healing several ailments were Allium sativum first ranked followed by Ocimum lamiifolium and the least was croton macrostachyus. The study area has a considerable number of traditional medicinal plants, so that conservation measures should be taken to protect these plants in their habitats.

Keywords:- Homegarden, human ailments, shrubs, Trees, wild

1. INTRODUCTION

Ethnobotany is the study of relationship between people for their use as medicine, food, shelter, clothing, fuel, fodder and other household purpose (Samar *et al.*, 2015). Over centuries indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Choudhary, 2008). In Ethiopia, utilization of medicinal plant remedies in preventing or curing various ailments still plays a significant role in most parts of the country (Birhan *et al.*, 2011; Giday and Teklehyanot, 2013). Particularly, traditional herbal healing is widely practiced throughout the rural population as their primary health care system (Seid and Tsegay, 2011). The complex knowledge, beliefs and practices generally known as indigenous knowledge or traditional knowledge develops and changes with time and space, with change of resource and culture. Indigenous people have indigenous experience in categorization, where they use their perceptions and experiences to categorize plants. From their experience, a number of categorization and classification criteria, which are important in plant diversity conservation and management have been developed. The common criteria that have been in use include plant use, habitat, life form, abundance, morphological characteristics and combinations (Martin, 1995; Cotton, 1996).

Humans started to use plants for their livelihood long ago (Martin, 1995). Over centuries, indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1996). The use of medicinal plants by indigenous people is mainly achieved through accumulation and transfer of knowledge from one generation to the next (Cunningham, 1999). Medicinal plants make important contribution in the health care system of indigenous people as the main source of medicine for the majority of the rural populations. They play a key role in the development of modern medicines too (Pramono, 2002).

Plant diversity remains crucial for human well-being and provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of various problems in Ethiopia (Fekadu, 2007). For the role to be played by plant derived products in human and livestock health care, systematic scientific investigation is vital. Due attention was not given to ethnobotanical studies in the past decades in Ethiopia (Dawit *et al.*,

2001). However, there exists an accelerated devastation of plant resources with loss of indigenous knowledge. There is a need to develop a sound research strategy and program for medicinal plant conservation, utilization and documentation including their location, existing population, place of conservation and known traditional uses. When this documentation is achieved, it would be necessary to identify priority species for further work on characterization and data sharing through national, regional and international collaboration.

The use of plants in medicinal sector by indigenous people over the past period takes a huge concern as they have long years lineage of utilization and management. This has been achieved through many generations of age old, time –tested practices, and as a consequent of accumulation of knowledge through a series of observations, interactions and innovations (Cunningham, 1996).

The majority of the developing countries depend on traditional medicinal plants for their healthcare. Maintaining health through traditional medicine in general and utilization of medicinal plants in particular is almost as old as the history of humankind. This is true in Ethiopia where nearly 80% of the population still relies on plant to prevent and cure various health problems (WHO, 2002; Awoyemi *et al.*, 2012). In developing countries leaning to and favoring medicinal plants is mainly due to inaccessibility to modern medical system, economic and cultural factors (Konno, 2004). Knowledge of medicinal plants is however, rapidly dwindling due to the influence of western lifestyle reduction in the number of healers' lack of interest of the younger generations to carry on the tradition and associated knowledge (Zewdu *et al.*, 2015).

In Ethiopia using traditional medicinal plants is common and from the backbone of traditional medicine. The loss of valuable medicinal plants due to population pressure, agricultural expansion and deforestation is widely reported by different researchers in Ethiopia (Abebe Demessie (2001); Getachew Addis (2002). Traditional knowledge of medicinal plants their use by indigenous healers and drug developments in the present are not only useful for conservation of cultural tradition and biodiversity, but also for community health care and drug development in the indigenous people.

There is limited development of therapeutic products and effects of documentation of the indigenous knowledge on usage of medicinal plants as folk remedies. In addition, there is a lack of ethnobotanical survey carried out in most parts of the country. Thus ethnobotanical studies are useful in documenting, analyzing, and disseminating indigenous knowledge related to the use and management of traditional medicinal plants (Martin, 1995; Tilahun Teklehaymanot and Mirutse Giday, 2007). Most of the reviewed literature show that medicinal plants of Ethiopia are so far concentrated in parts of the south and south west (Dula, 2013; Yibrah, 2014; *et al.*, 2014; Birhanu *et al.*, 2015). Central (Birhan *et al.*, 2011; Ermias *et al.*, 2013) north, north western and north east (Gidey, 2010dbcd; Giday and Teklehaymanot, 2013; Yigezu *et al.*, 2014) and western parts (Bussmann *et al.*, 2011; Gidey and Samuel, 2012; Megersa *et al.*, 2013) and eastern part (Jarso, 2016; Anteneh and Sebsebe, 2012, Alemayehu and Zemedu, Kebede and Ayalew, 2016; Mekonnen, 2013) of the country. However, there is no enough documented study is found in Aseko Woreda, in Oromia Regional State. This study is, therefore designed to carry out traditional medicinal plants used for human and livestock ailments in Aseko Woreda with the following objectives:

1.1. General objectives

The general objective of this study is to investigate and document medicinal plants used for human and livestock ailments in Aseko Woreda.

1.2. Specific objectives of the study are to:-

- Assess medicinal plants used to treat human ailments in the study area.
- Assess plant part(s) used as remedy, mode of preparation and application of the remedies.
- Assess medicinal plants' to treat livestock ailments.

2. LITERATURE REVIEW

2.1. Meaning and Development of Ethnobotany

John Harshberger 1895 brought up the term ethnobotany for the first time (Harshberger, 1896; cited in, Cotton, 1996). He defined ethnobotany as “the use of plants by aboriginal people”. Martin (1995) broadly defined ethnobotany as the subject dealing with the study of direct interaction between humans and plants. Black and Cox (1996) included the use of plants as food, medicinal, forage and general utility including enormous botanical expertise within field of ethnobotany. From the beginning of human civilization, many systems of remedy have been developed primarily based on plants. Peoples of all cultures depend on plants for their primary requirements and learned diverse applications of plants (Idu, 2009). According to Dery *et al.* (1991), plants have been crucial sources of preventive and healing traditional medicine preparation for human beings and livestock.

Indigenous people around the world possess unique knowledge of plants resources on which they depend for food, medicine, and general utility including tremendous botanical expertise (Martin, 1995). This implies that humans are dependent on other organism for their life. Although various animal and mineral products contribute to human welfare, the plant kingdom is most essential to human well-being especially in supplying of basic needs. This close interaction and dependency of humans on plants is studied under the field of ethnobotany. Historical accounts of indigenous people used medicinal plants were in use as early as 5000 to 4000 BC in China and 1600 BC by Syrians, Babylonians, from the earliest times, linked to the use of traditional medicine in different countries (Farnworth,1994). Evidence obtained from observation of animals shows that even chimpanzees use a number of plant species for the medicinal value (Huffmeuran and Wraghan, 1994)

According to Cotton (1996), Ethnobotany encompasses all studies that concern the mutual relationships between plants and indigenous people. Among the relationships of humans with plants, indigenous knowledge on traditional medicinal is one. Thus, people depend on plants not only for food but also for preparation of remedies. The relationship plants and human

cultures is not limited to the use of plants for food, clothing, and shelter but also includes their use for religious ceremonies decoration and health care (Khan *et al.*, 2007).

2.2. The scope of ethnobotany

The scope of ethno botany has expanded enormously encompassing botanical aspects of a number of ethno scientific fields including ethnomedicinal, ethno taxonomy and ethno ecology as well as anthropological and botanical study of material, culture and mode. Since early ethno botanical studies was only in aboriginal plant use (Cotton, 1996). In addition to its theoretical significance. Ethnobotany is emerging as a subject of great practical value. Its practical application can lead to a strengthening of cultural diversity and conservation, greater sustainability in the exploitation of plant resources and the development of new plant products (Hamilton, 2003). Many various studies focused on the descriptions and documentations of the local name and use of plants (Cunningham, 1996). As the studies progressed for many decades in particular. Ethnobotany has tended to become more analytical, quantitative, cross-disciplinary and multi- disciplinary (Phillips, 1985). Ethnobotanists are now more engaged with questions of conservation, sustainable development, cultural affirmation and the intellectual property rights of local and indigenous people.

2.3. Indigenous Knowledge

Indigenous knowledge (IK) is the knowledge used by indigenous people to make a living in a particular environment (Warren, 1991). Terms used in the field of sustainable development to designate this concept include indigenous technical knowledge, traditional environmental knowledge, rural knowledge, local knowledge and farmers or pastoralist's knowledge. Indigenous knowledge refers to the accumulation of knowledge, rule, standards, skills, and mental sets, which are possessed by indigenous people in a particular are (Quanash, 1998). It is the result of many generations "long years" experiences, careful observations, trial and error experiments (Martin, 1995). Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine, and general utility including tremendous botanical expertise (Martin, 1995). Over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use, management and conservation (Cotton, 1996; Zemedede Asfaw, 2004).

The immediate and intimate dependency of indigenous people on natural resources resulted in the accumulation of indigenous knowledge that helped to adapt and survive in the environments in which they live. It is local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, environmental conservation and a host of other activities (Thomas, 1995). The complex knowledge, beliefs and practices generally known as indigenous knowledge develops and changes with time and space. Hence, such knowledge includes time-tested practice that developed in the process of interaction of humans with their environment (Alcom, 1984) many generations long year's experiences, careful observation and trial.

2.4. Traditional Medicinal Plants

Traditional medicine has been defined by the World Health Organization (WHO, 2008) as the sum total of all knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing. This system of health care is also known as folk medicine, ethno medicine or indigenous medicine. More than 3.5 billion people in the developing world rely on medicinal plants as components of their health care (Balick and Cox, 1996). According to Fasil Kibebew (2001), about 75-90% rural population in the world (excluding western countries) relies on traditional medicines as their only healthcare system. This is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally and meet the psychological needs in a modern medicine does not. So, medicinal plants are the main source of traditional medicine for the rural population and are of high demand in the healthcare systems of this population when compared to modern medicine, ethno medicine activities need special consideration and back-up (Abbiw, 1996). Apart from their use in the traditional system of medicinal care at the local level, medicinal plants are currently used in the production of modern drugs as a source of direct therapeutic agents, as raw materials for the manufacture of complex semi-synthetic compounds and as taxonomic markers in the search for new compounds (WHO, 1998). Medicinal plants have got special attention and regional offices were established by World Health Organization to coordinate

basic and applied research activities on medicinal plants. This was linked to the establishment to record medicinal plants to improve accessibility and dissemination of information on medicinal plants (Tsigie GebreMariham and Kaleab Asres, 2001).

2.5. Diversity and Distribution of Medicinal Plants in Ethiopia

The greater concentration of medicinal plants are found in the south and south western Ethiopia parts of the country following the concentration of biological and cultural diversity (Edwards, 2001). The various citations made from various written records of medicinal plants from central north and northwestern part of Ethiopia are thus small fractions of medicinal plants present in Ethiopia. Study on the Bale Mountains National Park in the south East Ethiopia revealed that the area, as much as it is a biodiversity hotspot, also turned out to be a medicinal plant hotspot with 337 identified medicinal species of which 24 are endemic (National Herbarium, 2004; Ermias, 200; Haile, 2005). The species comprised of 283 used as human medicine, 47 used as livestock medicine and 7 species are used for both human and livestock by the community healers, harvesters, traders and users. This work further suggested spots that could be considered medicinal plants micro hotspots within the Bale Mountain area. Different vegetation types that are found in the various agroecological zones of Ethiopia accommodate various types of medicinal plants (Edwards, 2001). Most researchers indicated that the various part of medicinal plants have been used such as leaves, roots and barks of the stem (Haile, 2005). But, leaves are regarded as the most cited plant parts used by healers for the preparation of traditional medicines (Mengistu, 2010; Mulatu, 2015; Yeshambel *et al.*; 2017).

2.6. Medicinal Plants in Human Healthcare System

Plants have been as a source of traditional medicines in Ethiopia for a long time to fight different ailments and human suffering (Asefaw Debela *et al.*, 1999). Due to its long period of practice and existence, traditional medicine has become an integral part of the people (Mirgissa Keba, 1998). According to Dawit Abebe (2001), there is a large magnitude of use and interest in medicinal plants in Ethiopia due to acceptability and biomedical benefits. In this country, the long history of use of medicinal plants is reflected in various medico-religion manuscripts produced in parchments and believed to have organized several centuries

ago (Fessile Kibebew, 2001). Medicinal text book written in geez or Arabic in Ethiopia between of 17th and 18th century imply that plant has been used as a source of traditional medicine in Ethiopia health care system.

Plants are also recycling essential nutrients, establishing soils and soil fertility, protecting areas of water catchments. They keep ecological and climatic balances and helping to control rain fall through the process of transpiration. And all these benefits of plants are directly or indirectly linked with health care Hamilton, (2004). Therefore, health care and botany have evolved as inseparable domain of human activities since various plant products are paramount important in traditional health care systems. Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Medicinal plant played a pivotal role in the treatment of various afflictions in Ethiopia (Fekadu Fullas, 2007). For the role –played by plant derived products inhuman and livestock health, systematic scientific investigation is vita (WHO, 1998). Pharmaceutical industries and western researchers on plant-based drugs have now rediscovered that plant have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents (Pistorius and Van Wiik, 1993).

2.7. Plants in Ethnoveterinary Medicine

In Ethiopia as well as in most developing countries, animal disease remains one of the principal causes of poor livestock performance, leading to an ever increasing gap between the supply of, and the demand for, livestock products (Teshale Sori *et al.*, 2004). Livestock disease has often been described as serious of constraints to both macro-level economic development in Africa and the well-being of millions of poor livestock keepers (Andy, 1999). Ethnoveterinary medicine and related study is one of the most important means of controlling livestock diseases. Ethnoveterinary medicine which refers traditional animal health care knowledge and practices comprising of traditional surgical and manipulative techniques, traditional immunization, magic religious practices and beliefs, management practices and the use of herbal remedies to prevent and treat array of diseases encountered by livestock holders (Tafesse and Mekonnen, 2001).

In Ethiopia, livestock production plays an important role in the livelihood and economy of majority of the population. Ethiopia is one of the leading countries of Africa in livestock population (Mirutse and Gobena, 2003). Although Ethiopia is rich in its livestock population, it is one of the countries in the world 18 with the lowest unit output. The poor health condition and of its livestock has partially been responsible for the low productivity (Mirutse and Gobena, 2003).

In addition, proper documentation and understanding of farmer's knowledge, attitude and practices about the occurrence, cause, treatments, prevention and control of various ailments is important in designing and implementing successful livestock production (Tafesse and Mekonnen, 2001).

2.8. Threats to Medicinal Plant Species in Ethiopia

In Ethiopia, more than 85% of the population lives in rural areas depending on natural resources for their livelihoods, economic development, and food security causing prolonged resource depletion (USAID, 2008). Abebe Demisse (2001) and IBC (2005) also indicated that the diversity of plants in Ethiopia is in the process of erosion due to anthropogenic pressure like habitat destruction and deforestation for various reasons such as timber production, agriculture, land degradation and climate change. Habitat disturbance, deforestation, selective cutting and increasing trend of using herbicides caused medicinal plants to be scarce (Mirutse Giday *et al*, 2010). Furthermore, Zemedu Asefaw (2001) also confirmed that Ethiopian medicinal plants are considered to be at conservation risk due to over use and destructive harvesting of roots and bark in addition to the other factors.

There are two sources of threats to medicinal plants, i.e. human made and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive species, commercialization, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants. Natural causes include recurrent drought, bush, fire, disease and pest outbreaks (Ensermu Kelbessa *et al.*, 1992). In addition to this, most of medicinal plants utilized by Ethiopian people are harvested from wild habitats (Mirutse Giday, 1999). Hence, this

aggravates the loss of widely occurring medicinal plant species. The consequence is also bad in such a way that, when the plant have been serving as the raw material for the preparation of different remedies are being destroyed with them would also diminish.

2.9.Importance of Conservation in Traditional Medicinal Plants

Conservation is define as the management of human use of the biosphere to yield sustainable the present generation while maintaining its potential to meet the needs of future generation (IUCN,1993). It involves a wisely preservation and protection of importance things, especially planned management of a natural resource to prevent neglect, over exploitation or even fragmentation of habitats. The vegetation of the world is being changed or destroyed at an alarming rate. Thus plant conservation should be aimed at securing strong management systems in favor of conservation or sustainable production of species of plants continues to grow and involve in the wild in their natural environment. In-situ conservation is one of the conservation strategies of species protection and conserving the remaining natural area where they grow (IUCN, 1993). According to Zemedede Asfaw (2001), Medicinal plants are considered to be at conservation of risk due to over use and destructive harvesting (roots and banks collection). Dawit Abebe and Ahadu Ayehu (1993) found that many medicinal preparation use root, stem, and bank by effective killing the plant in harvest.

Plant part used to prepare remedies are different; however, root is the most widely used part. Such wide utilization of root part for human and livestock aliments with no replacement has serve effect on the future availability of the plant. Recent work of (Haile Yineger, (2005) confirms the fact that of the total plant part to prepare remedies root is widely with 64 species (35.5%) followed by leaf 47 species (25,95%) which hence affect sustainable utilization. According to Zemedede Asfaw (2001), Medicinal plant can be conserved using appropriate conservational method in gene bank and botanical gardens. This types of conservation of medicinal plants can also possible in home garden is strategically and ideal farming system for the conservation, production and enhancement of medicinal plants. Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemedede

Asfaw,2001). This can be possible in places of worship (churches, mosques, grave yards, etc), scared grooves, farm margins, river banks, road sides, live fences of gardens and fields.

There is some conservation actions that have been undertaken around the world designed to protect threatened medicinal plants from further damage (Cunningham, 1996). This include in- situ and ex- situ conservation measures. Both in- situ and ex- situ conservation efforts are implemented to capture medicinal plant genetic resources. In-situ conservation is conservation of species in their natural habitat. Some traditional medicinal plants have to be conserved in-situ due to difficulty for domestication and management (Zemedede Asfaw, 2001).

Ethiopia has polices and strategies that support the development and utilization of plant resources in a sustainable manner. These polices reflected under various sectors including environmental protection, development of the natural resources and diversification of the domestic and export commodities (Mulugeta, 2014). The country also has developed policy and a guide line for intellectual property rights protection of traditional medicine. The policy encourages and promotes the appropriate use and protection of traditional medicine knowledge in Ethiopia taking in account the need of traditional knowledge holders and the communities who benefit from the use of the knowledge.

3. MATERIALS AND METHODS

3.1. Study Area Description

3.1.1. Location

Aseko is one of the 26 Woredas in Arsi Zone. Geographically it is located between $-8^{\circ} 15' 10''\text{N}$ to $-8^{\circ} 41' 0''\text{N}$ and $-39^{\circ} 55' 40''\text{E}$ to $40^{\circ} 16' 20''\text{E}$ latitude and longitude, respectively. It is located 218 kms from Asella. Aseko Woreda has a total of 18 kebeles; of which 17 are rural kebeles and one town (Aseko 01). It is bordered towards the south west with Chole, the northwest by Merti, the north by the west Hararghe zone, and on the east by Gololcha.

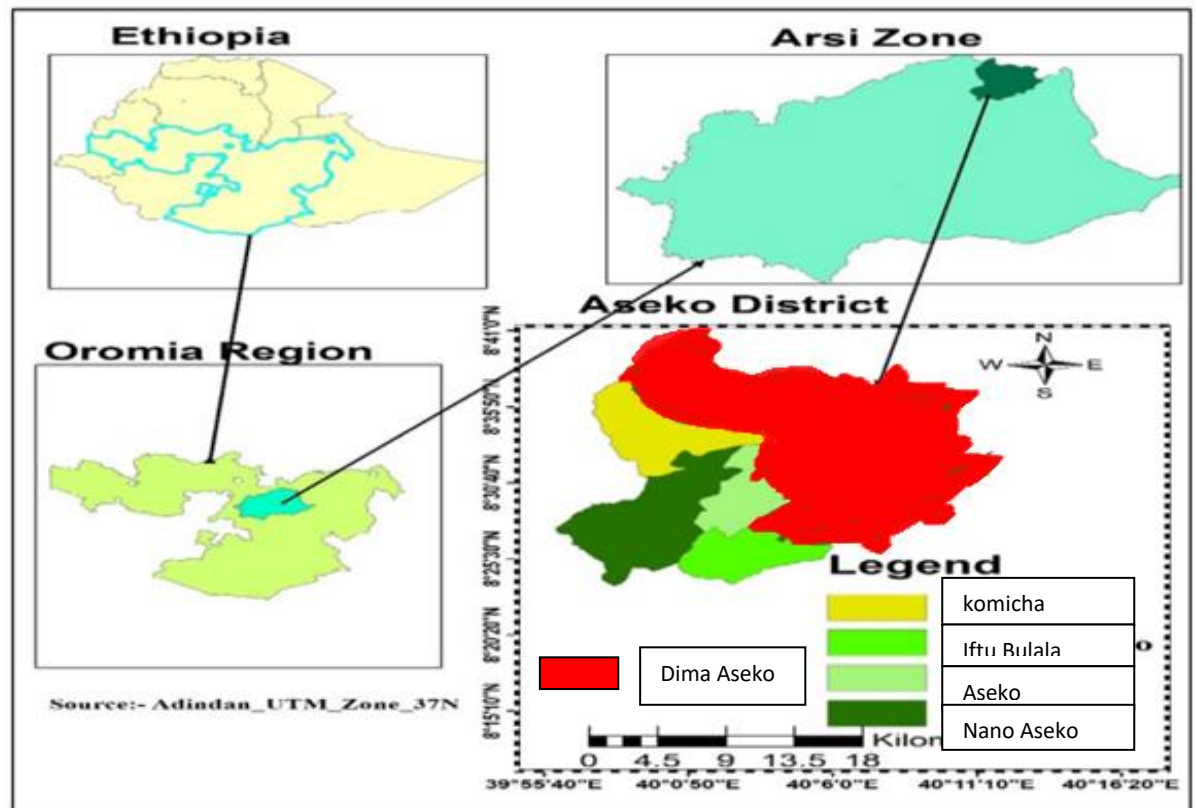


Figure 1. Map of study area

3.1.2. Agro- ecology

The woreda is commonly divided in to three major agro- ecological zones. About 48% of the Woreda is Woyena Dega agro-ecology with tempreture ranging from 15-20⁰ C. Dega Agro-ecology (with tempreture ranging from 10-15⁰ C) and kola Agro-ecology (with temperature ranging from 25-15⁰ C) covers 25and 27% respectively. The rainfall pattern is bimodal with short rainy season or “Belg” from March to April and a long rainy season “Kiremt” from June through September and sometimes up to October.(AWARDO, 2013).

3.1.3. Agriculture

Agriculture in the area is characterized by small- scale subsistence mixed farming systems, and crop production has been as integral part and mainly rain- fed. Almost all of the cropland is planted to annual food crops, including cereals (wheat, barley, sorghum, maize and teff), pluses, beans, peas, and root/tuber crops (e.g. Potatoes). A very small fraction of farmers produce vegetables and fruits. These crops are grown mainly in homestead gardens or where irrigation exists. Perennial crop such as (Coffee, khat), are also grown in considerable amounts.

3.2. Reconnaissance Survey and Selection of the study sites

A reconnaissance survey of the study area was conducted from February 10 to April 30, 2022 to get information of the general setting of the study area so as to select study site prior to actual ethnobotanical data collection. Thus study sites (kebeles) were purposively selected based on the availability of traditional medicinal plants and their use tradition and altitudinal variation to encompass different agroecologies.

3.3. Sampling of informants

For ethno botanical data collection, 100 respondents (non-traditional medicine practitioners) and 16 key informants (Healers) aged 25 and above were randomly and purposively selected from five purposively selected kebeles. These are Aseko, Nano Aseko, Iftu bulala, Komicha and Dima Aseko.

Sample size of households from the five kebeles, were determined using Yamane and Solvin's formula for calculating sample size as follows:

$$n = \frac{N}{1 + Ne^2}$$

n= sample size

N= House hold size

e=precision/error limit

According to communication office of the Woreda administrations, the total number of households including the five kebeles 122,870 (61, 926 males and 60, 944 female). Therefore, based on the above formula the samples are:

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{122,870}{1 + 122,870(0.1)^2}. \text{ Then, } n = \frac{122,870}{1 + 122,870(0.01)} n = 100$$

Other 16 key informants (healers) were purposively selected the information were gathered from local authorities, elder and knowledgeable communities.

3.4. Ethno botanical Data

For all of socio-demographic data of respondents including, age, sex, occupation, educational level, marital status, income per year, etc, were collected through interview. Then after ethnobotanical data collection were collected using semi –structured interviews, focus group discussion and guided field walks with key informants for onsite observation and plant sample collection. Focus group discussion was done based on set check list questions. Each respondent was first be interviewed separately about the local names of medicinal plants they use, ailments used for, parts of plants used, preparation methods of remedies, route of application, dosage, etc. After the interview voucher specimens were collected, numbered pressed and dried for identification at Haramaya University Herbarium. The identified specimens were kept in Haramaya University Herbarium.

3.5. Data Analysis

A descriptive statistical method such as percentage and frequency/proportion were employed to summarize ethnobotanical data. Moreover, the following quantitative methods were used to get the relative importance of medicinal plants, level of agreements between respondents on a given taxa, etc.

3.5.1. Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) was calculated for each category of ailment to identify the agreements of the informants on the reported cures for the group of ailments. The ICF was calculated as follows: number of use citations in each category (n_{ur}) minus the number of species used (n_t), divided by the number of use citations in each category minus one (Rodrigo *et al.*, 2005; Tilahun Tekelalaymanot 2007). The factor provides a range of 0 to 1, where high value acts as a good indicator for a high rate of informant consensus.

$$ICF = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Where, ICF=Informants Consensus Factor

n_{ur} = number of species in each category

n_t = number of species used

3.5.2. Direct Matrix Ranking

Direct matrix ranking was conducted following Martin (19950). This was conducted considering several attributes of medicinal plants such as their use as food, medicine, firewood, construction, cash income, charcoal, and making furniture. These are uses of medicinal plants commonly reported by key informants. Based on information gathered from informants, six multipurpose tree species were selected out of the total medicinal plants and seven use diversities of these plants were listed for selected key informants to assign use values to each species. Ten key informants were chosen to assign use values to each attribute (5=best, 4= very good, 3=good, 2=less used, 1=least used and 0=not used). The seven (7) use values include medicinal, food, income, firewood, construction, charcoal, and furniture

making. By adding the scores given, it was possible to compare use values of medicinal plants and also to identify the main cause for threats of the plants. This given values or scores will be sum up and ranked.

3.5.3. Preference Ranking

Used to compare the most effective medicinal plants used by indigenous people to treat disease was conducted following Martin (1995) and Catton (1996). For this the most reported disease of the area with medicinal plants to treat was selected. Ten informants were selected to identify the best preferred medicinal plant species for treatment of this particular illness. The medicinal plant believed to be most effective to treat the illness will have the highest value (for example, 6), and for the one with the least effective, lowest value (1) will be assigned. The values of each species were summed up and the rank for each species was determined based on the total score. This helps to indicate the rank order of the most effective medicinal plants used by indigenous people to treat the disease.

4. RESULTS AND DICUSSION

4.1. Age, Sex, Education, Religion and Marital Status of Respondents

Informants were categorized in to three age categories. Each category 20 years of age as a generation lapse to see how the knowledge varies with age. An average age of respondents were at each age category, 24.14, 50.86 and 25% were within the age range of 25 -45, 46 -65 and >66, respectively. Out of the respondents, 56.03 and 43.07 were males and females, respectively. About 91% of the respondents were married, whereas 4.31, 2.59 and 2.59 were divorce and unmarried, respectively. In terms of level of education, 82.76, 13.70 and 3.45% were illiterate, have basic knowledge read and write and completed secondary school, respectively. The majority (77.59%) of the respondents were Muslims following Islamic religion, whereas 22 .41% were followers of Christian religion.

4.2. Socio-Demographic Factors Influencing Indigenous Medicinal Knowledge.

Statistical analysis showed that age and educational level significant effect on medicinal knowledge of the indigenous where by people with less educational level and higher age group reporting more number of medicinal plants. ($p < 0.05$). The results revealed that knowledge on medicinal plant increase with age. This indicates that the elders are rich with indigenous knowledge than the young generation. This could be because of the fact that the elders have accumulated knowledge through their life-long experiences of interactions with their environments and due to the fact that the young generation under the influence of modernization and globalization. The same result was reported by different researchers (Anteneh *et al.*; 2012 and Berhane *et al.*; 2014). Traditional medicinal knowledge also varied significant ($p < 0.05$) between male and female with males reporting higher number of medicinal plants than females. The same result was reported by different investigators (Sintayehu, 2011; Anteneh *et al.*; 2012 ; Gidey and Samuel, 2012).

4.3. Medicinal plant species in the study area

A total of 74 species of medicinal plant used to treat different health problems were gathered and documented from the study area. These plants were found to belong to 68 genera and 40

families. Out of these plants, 40 species (54.05 %) were noted to treat only human ailments while 15 species (20.27%) were used to treat livestock- ailments and 19 species (25.68 %) used to treat both human and livestock ailments (Appendix table 1 and 2). The most diverse families in terms of species composition were Lamiaceae represented by (6 species) followed by Fabaceae and Solanaceae represented by (5 species each), Myrtaceae and Asteraceae each represented by (4 species), Rosaceae, Polygonaceae, Ranunculaceae, Verbenaceae, Cucurbitaceae, Euphorbiaceae each represented by (3 species), Malvaceae, Oleaceae and Rutaceae each represented by (2 species), whereas the remaining families were represented each by 1 species (Appendix Table 2).

4.4. Habitat Part(S) Used Preparation of Remedies

About 61% of the medicinal plants were collected from wild habitat, whereas 24.32 and 14.68% were collected from home gardens, and both wild and home gardens, respectively.

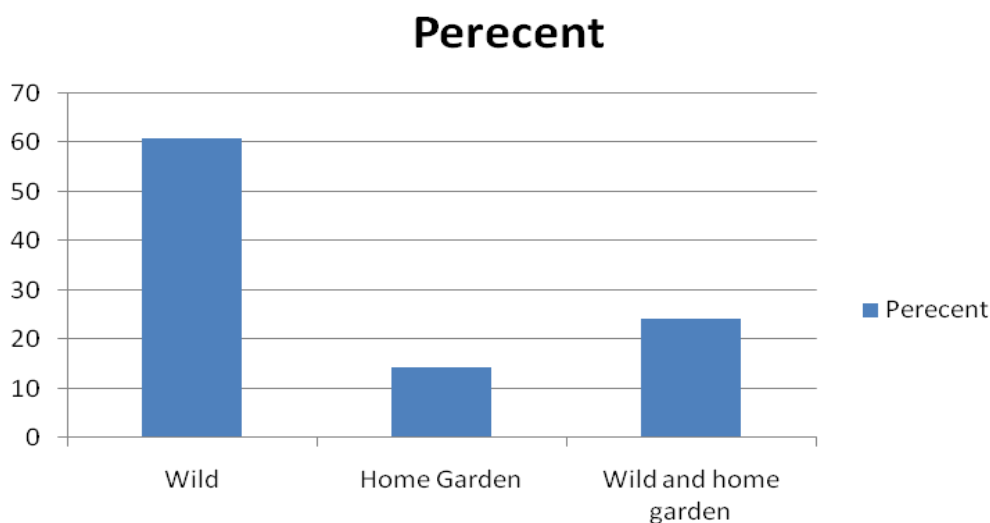


Figure 2. Plant Habitat distribution

The indigenous people of Aseko woreda use various methods of preparation of traditional medicine for different human and livestock ailments. The principal methods of remedy preparation were through crushing (pounding) which accounts for (31.6%) followed by squeezing (24%), boiling (9.30%), roasting (4.70%), fluid Juice (3.70%) and other (2.70%).

Remedies were prepared mainly from a single plant, but sometimes from more than one plant species.

In terms of life form composition most (52.7%) of the medicinal plants reported were shrubs followed by trees (21.62%), herbs (16.23%) and climbers (9.45%), respectively.

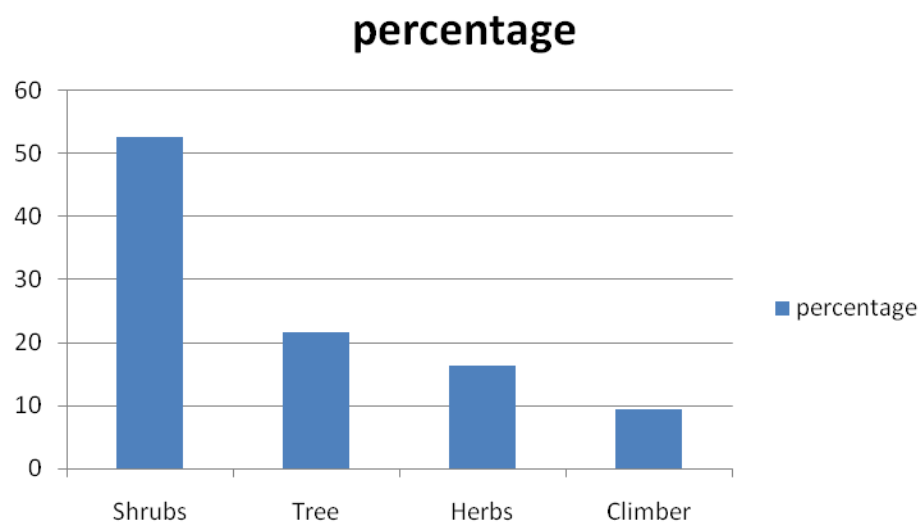


Figure 3. Growth form of medicinal plants used for human and livestock ailments

4.5. Plant part (s) used for human and livestock to ailments

From the total record of human and livestock medicinal plants the most frequently used plant part was leaves (47 %) followed by roots (22 %) are the predominant plant parts used for remedy preparation seed (16 %) fruit (4%) stem (3%) ,bulb (3%) and bark (5%) (fig 3), the finding shows that leaves were the easiest and accessible plant parts for remedy preparation. The result agrees with other ethnobotanical studies by Endalew Amenu (2007), Etana Tolesa (2007), Haile and Delenesaw, (2007). Mostly these plant parts are used fresh for remedy preparation (figure 3). Results of most other investigations (Testate *et al.*, 2004) also report the same, suggesting the fresh is the plant part used, the more would be its efficacy.

PI

Plant parts used for human and livestock ailments

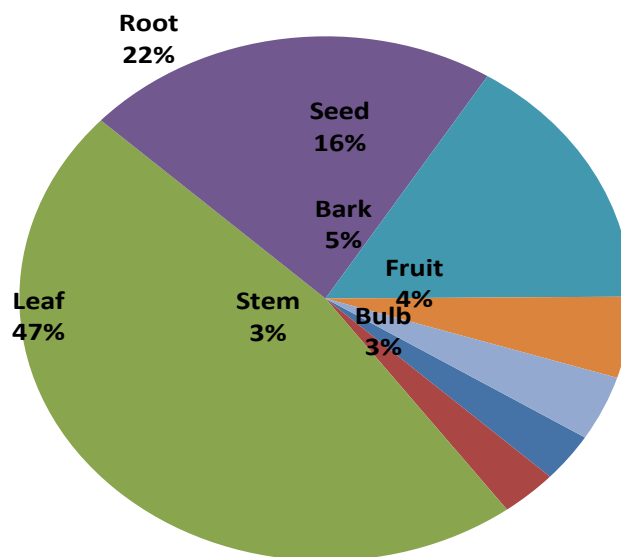


Figure 4. Plant part used for traditional medicinal preparation in Aseko woreda

4.6. Additives to the Remedies

The information to have different 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 were treat to disease in general route and from of uptake depends on the site and health of ailments honey, salt, milk, water, sugar, coffee, local alcohols such as'' tej'' tella' 'citrus juice and tea were some of the reported additives are added to improve the taste, minimize discomfort and reduce adverse effects vomiting, diarrhea and efficacy of the remedies.

Remediless were administered with no precise dispel but locals estimate the amount to be taken particular the ones to be taken internals mouth, nose, ear and eye based on the age and severity of the disease traditional measuring units such as coffee cup, count or number and glass cups for these remedies the age and health conditions that is children are given less dose

than adult physical strong individual take more dose than weak individual depending on the type of disease.

4.7. Dosage, Route and ways of Remedy Administration

The dosage of medicine to administrate was given by rough estimation of the age and physical condition of the patient. Hence there is no precision on the dosage of the remedy. Dawit and Ahadu (1993) reported that lack of precision in the dosage is one of the major drawbacks of practicing traditional remedy. As regards to route of administration, include through Oral uptake was the most (30%) cited route of remedy administration followed by dermal (29%), nasal (23%) and other routes 18%. This finding agrees with some previous reports (Kebu *et al.*; 2004 ; Mulugeta, 2014).

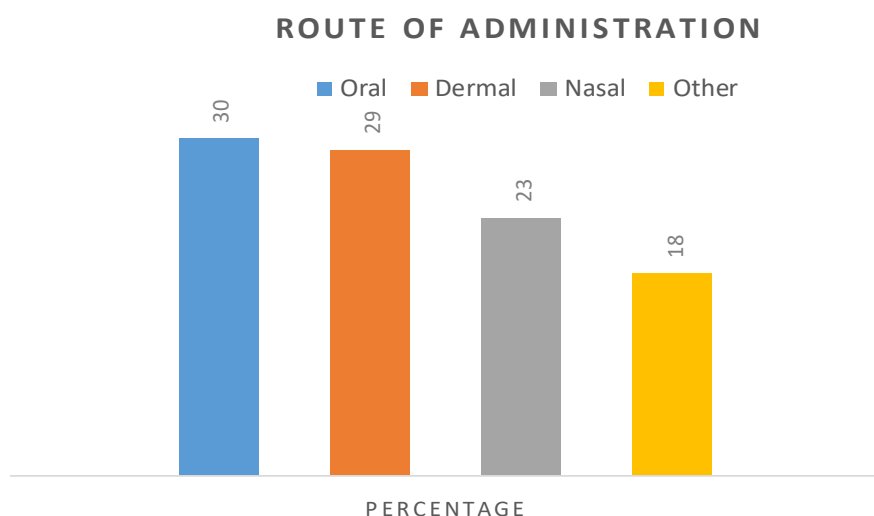


Figure 5. Route administration of plant remedies used for human and livestock

4.8. Informant Consensus Factor (ICF)

The reported human diseases were grouped in to “10” categories namely gastro- intestinal & parasitic related disease, external injuries and bleeding, oral , dental and pharyngeal disease, placental and urine rotation, evil spirit, respiratory system & throat related problem, malaria and fever, wound, body swelling, hemorrhoid and insect allergy, headache and febrile illness related diseases. These diseases are grouped based on nature of disease conditionals, place of pain, and symptoms and sign of diseases. ICF value showed that gastro- intestinal and parasitic related disease had the highest values (0.80), whereas, headache and febrile illness

related disease had the lowest ICF (0.42) value (Table. 1). Highest ICF for gastro-intestinal and parasitic related disease may indicate the common occurrence of these diseases so that more number of people exchange information and agree on plant species that can be used to treat them. The medicinal plants that are effective in treating certain ailments and will be known much by community members to have the highest ICF values Eskedar Abebe (2011).

Table 1 Informant consensus factors (ICF) on the group of human ailments.

NO	Disease Categories	No. of species	Use citation	ICF
1	Gastro-intestinal parasitic related disease	8	36	0.80
2	External injuries and bleeding	7	29	0.78
3	Oral ,dental & pharyngeal disease	5	15	0.71
4	Placental rotation and urine retention	8	20	0.63
5	Evil spit and evil eye	6	14	0.61
6	Respiratory system and throat related problem	10	21	0.57
7	Malaria and fever	4	11	0.70
8	Wound, body swelling disease	10	19	0.50
9	Hemorrhoid and oral insect allergy	6	12	0.54
10	Headache & febrile illness related diseases	9	15	0.42

4.9. Preference Ranking

Seven medicinal plants were reported to treat evil spirit. Accordingly 8 key informants were selected for exercise preference ranking by 5 for the plant they perceive as most effective to cure the ailment and 1 for the plant less effective with other values between 5 and 1 according to their perceived level of efficacy. Results showed that *Echinops kebericho* ranked first and hence the most effective medicinal plant to cure the ailments followed by *Withania somnifera* and *Ruta chalepenis* (Table 2).

Table 2. Preferences ranking of medicinal plants used to treat evil spirit

Informants	<i>Ruta chalepensis</i>	<i>Echinops kebericho</i>	<i>Artemisia afra</i>	<i>Allium sativum</i>	<i>Withania somnifera</i>	<i>Euclea racemosa</i>	<i>Cucumis ficifolius A.</i>
I1	5	4	2	3	5	2	1
I2	2	3	3	2	2	1	2
I3	3	5	4	4	4	3	3
I4	3	4	2	2	3	2	2
I5	2	4	2	3	3	2	1
I6	3	2	1	2	2	1	1
I7	1	5	1	1	4	2	2
I8	2	4	3	2	3	3	1
Total	21	31	18	19	26	16	13
Rank	3 rd	1 st	5 th	4 th	2 nd	6 th	7 th

Towards plants species having healing of different ailments preference ranking was performed by 7 selected key informants and five selected plant species (table.3) on the basis of treat in 14 different ailments showed that *Allium sativum* the most preferred one followed by *Ocimum lamiifolium* and the least was *Croton macrostachyus*. Therefore, these plant species are the most effective.

Table 3. preference ranking of five selected medicinal plant on the degree of healing several ailments by seven key respondents.

Medicinal plant	R1	R2	R3	R4	R5	R6	R7	Total	Rank
1. <i>Citrus aurantifolia</i>	4	3	4	2	5	2	3	23	3 rd
2. <i>Allium sativum</i>	4	5	4	3	5	5	4	30	1 st
3. <i>Hagenia abyssinica</i>	2	2	3	3	2	3	2	17	4 th
4. <i>Ocimum lamiifolium</i>	4	3	4	5	4	5	4	29	2 nd
5. <i>Croton macrostachyus</i>	1	2	2	1	2	1	2	11	5 th

4.10. Transfer of knowledge of rational medicinal plant

Assessment of source of knowledge of traditional medicinal (figure. 5) indicated that (75.56 %) of the knowledge is obtained from parent followed by (12.66 %) from religious (7 .11 %) from books and (4.67 %) through observation.

Source of Knowledge

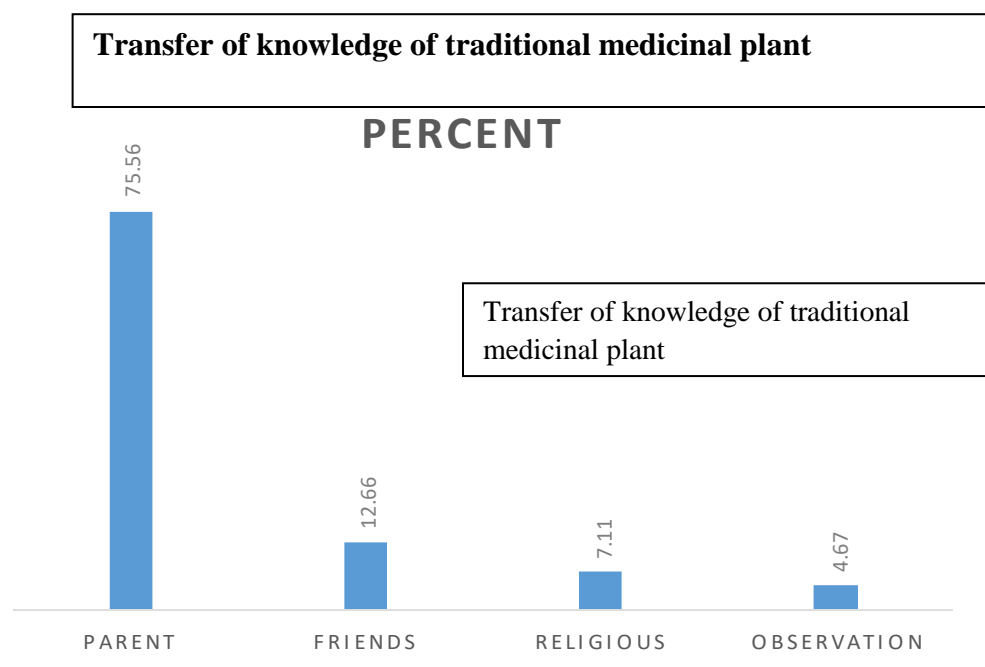


Figure. 6. Source of knowledge of traditional medicine in the study area

4.11. Direct matrix ranking (DMR)

In the study area, key informants mentioned 6 plants as most multipurpose species. The DMR was done by key informants by assigning highest value (5) for plant best suit for the purpose (use) 4= very good, 3= good= 2= less used, 1= least used and 0= not used for the purpose. The result showed that *Cordia africana* is highly demanded followed by *Hagenia abyssinica* (Table .7). Thus these species may be overexploited and dwindle from the area unless management is sought.

Table 4. direct matrix ranking use categories six medicinal plants

Plant species	Medicine	Charcoal	Firewood	Construction	Fence	Food	total	rank
<i>Hagenia</i>	4	1	5	5	3	0	18	2 nd
<i>abyssysinica</i>								
<i>Cordia Africana</i>	3	4	5	5	2	3	22	1 st
<i>Acacia</i>	2	5	4	4	2	0	17	3 rd
<i>abyssysinica</i>								
<i>Ruta Chalepensis</i>	5	0	0	0	4	0	9	5 th
<i>Carica papaya</i>	5	0	1	1	4	2	13	4 th
<i>Ricinus communis</i>	3	0	2	0	3	0	8	6 th

4.12. Threats and conservation of medicinal plants

In the study different factors both human and natural were found to contribute the threats that affect survival of medicinal plants species in the study area. The reports of seven key respondent preference ranking of six highly cited threats of medicinal plants supported that agricultural expansion were mentioned as the leading factor that threatens medicinal plants followed by fire wood and charcoal production and over grazing of animals, scarcity and pesticides are the least destruction were reported to the factors for the dwindling of natural vegetation in general and medicinal plants in particular. As a result, according to the respondents, the accessibility of medicinal plants has become less when compared to the previous times.

Traditional healers also keep their knowledge on medicinal plants for the sake of securing means of income and a cultural beliefs that telling information may make plants effective to cure the ailments. Similar findings were reported elsewhere (Abebe, 2017; Fassil, 2001; Mirutse and Gobena, 2003).

Table 5. preference ranking of threats medicinal plant

Threats	Respondents							Total	Rank
	R1	R2	R3	R4	R5	R6	R7		
Fire wood	6	5	7	2	5	2	2	29	2 nd
Agricultural expansion	5	4	4	5	3	4	5	30	1 st
Charcoal production	3	4	5	4	4	2	2	28	3 rd
Grazing animal	2	3	4	5	3	4	5	26	5 th
House Construction	3	4	3	5	4	4	4	27	4 th
Scarcity and rain (drought)	3	4	2	2	1	2	1	15	6 th
Pesticides	2	1	2	3	1	1	2	12	7 th

4.13. conservation and management of medicinal plant

In Aseko woreda evergreen forests that contain many medicinal plants are mainly around the Ethiopian orthodox tewahedo churches, mosques peoples and including elders and knowable community members meet to discuss and decide socio economic cultural and religious activities at different ceremonial and holidays, hence, someone sees a patch of indigenous old –aged trees in the study area, this shows that culture, bible and religion couture to the conservation of medicinal plants

In the study area some community members and traditional healers were found to cultivate medicinal plants some medicinal plants collected were reported as found cultivated at home gardens and these includes plants such as *Hagenia abyssinica*, *Coffea arabica*, *Ruta chalepensis* and *Echinops kebericho* they grow the desired medicinal plants species in their home garden crop fields and fences. Traditional beliefs in the study area also have their own un international role in conservation and sustainable utilization of medicinal plants giving conservation priority for identified threatened medicinal plants promoting in situ and ex –situ conservation of medicinal plants in Aseko area as well as establishing the woredas traditional healers association by creating awareness providing funds land for cultivating medicinal plants and helping their activities with professionals guidance help to conserve the fast wear away medicinal plants of the study area.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

Ethnobotanical study on medicinal plants in Aseko Woreda, Oromia Regional State, Ethiopia was conducted. The study aimed at identifying and documenting the plants used to treat human and livestock diseases. The study included 100 informants (non- healers) and 16 key informants (healers) aged 25 and above years. Ethnobotanical data were collected using semi-structured interviews, field observations, group discussion and guided field walk. Descriptive statistics was used to summarize and analyze data.

The results of the study showed that 74 medicinal plants species used to treat different health problems were gathered and documented from the study area. These plants were belong to 68 genera and 40 families. Out of these plants, 40 species were noted to treat only human ailments while 15 species are used to treat livestock ailments and 19 species were reported to treat both human and livestock ailments. The majority (52.70%) of the medicinal plants were shrubs followed by tree (21.62%) herbs (16.23%) climbers (9.45%). Leaves (47%), followed by roots (22%) are the predominant plant parts used for remedy preparation. Seed (16%), Fruit (5%), Moreover, Bark (4%), Stem (3%) and Bulb (3%), Latex (2%) were also mentioned. The top 3 diverse families in terms of species composition were Lamiceae (6 spp.) followed by Fabaceae and Solanaceae each represented by (5spp), Myrtaceae and Asteraceae with 4 spp. each.

Disease categories with top (>0.5) ICF values were Gastrointestinal and parasitic related diseases (0.80), External injuries and bleeding problems (0.78), Oral, Dental and pharyngeal disease (0.71), Placental and urine retention (0.70), Malaria and fever (0.63) and Evil spirit (0.61). In conclusion, indigenous people of the study area use traditional medicine of plant origin fighting ageist some ailments of humans and livestock, and those plant species with the highest ICF, and preference ranking should be considered for further pharmacological study.

5.2. Conclusion

In the study area 74 medicinal plants were recorded of which 40 species were noted to treat human ailments, 15 species were documented to treat livestock ailments and 19 species were used to treat both human and livestock ailments. The medicinal plant species were collected (61%) from wild vegetation (14.68%) species were from home gardens and the rest (24.32%) species were collected from both wild and home gardens. The present study revealed that people of the study area have different knowledge transfer approaches 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, food, fire wood, construction, fuel.

In the study area, shrubs (52.7%) were found to be the dominant habits used for preparation traditional remedies followed by trees (21.62%) and herbs (16.23%). Leaves were also found the most frequently used plant parts for preparation of remedies followed by roots. The major methods of traditional medicinal preparation forms were crushing (pounding) (31.6) followed by squeezing (24%). The common route of administration of herbal medicinal was oral which accounts (30%) followed by dermal (29%). The major threats to medicinal plants in the area were agriculture expansion was the leading one followed by fire wood.

5.3. Recommendations

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

- ✓ The majority of the medicinal plants were collected from wild habitat. Therefore, the locals should be awakened to grow them for better management
- ✓ Elders should be encouraged through incentives to transfer their traditional medicinal knowledge
- ✓ Traditional medicinal plants are central to the indigenous cultures and material needs. Therefore, formal and non-formal education systems should be designed to create positive attitude among the young by integrating into the curricula about the traditional use of plants general and medicinal plants particularly.

- ✓ Recognitions and intellectual property rights should be given to traditional healers, either through certification or through organizing them at community or woreda level, which popularizes their indigenous knowledge medicinal plant value.

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7. APPENDIX

Table 1. List of medicinal plants used for the treatment of both human and livestock ailments in the study area with growth (H:herb, T: tree , shrub C:climber) Habit (W: wild; cultivated ; HG: home garden), CP: condition of preparation (F:fresh ; D:dried .and B:both)

NO	Scientific Name	Family Name	Local Name	Growth	Habit	CP	Part (s) Used	Disease Treated	Preparation & application	Route
1	<i>Grewia villosa</i> Willd	<i>Tiliaceae</i>	Jiddadhiigaa	W	S	P	Root	Headache	Pounding the roots & dry both during bed time	dermal
2	<i>Calpurnio aurea</i> (Ait) Benth	Fabaceae	Ceekata	W	S	F	Leave Root	Snake bite Amboebiasis	The decocted leaves taken with honey the dried roots are crushed & boiled with leaf of coffee then given early morning.	Oral
3	<i>Dodonaea angustifolia</i> L.f	<i>Sapindaceae</i>	Ittacha	W	S	F	L	Scabies	Crush and cream with butter.	Dermal
4	<i>Colocasia esculenta</i>	<i>Araceae</i>	Goodarree	HG	C	F	Root	wound	The root crushed and tied on The swelled wound	Dermal
5	<i>Sida cuneifolia</i>	<i>Malvaceae</i>	Cifriggii	W	S	F	Root	Wood Evilsprite Evil eye	Crush & tie brush or tie on neck	Dermal Dermal

6	<i>Prunus persica</i>	<i>Rosaceae</i>	Kookii	HG	T T	F F	L Fr	Diarrhea Tap worm	Crush immerses in water the drink the concoction	Oral oral
7	<i>Rumex abyssinicus</i>	<i>Polygona ceae</i>	Maqnaqqoo	W	S H	F.O	R	Hyperten sion	Pound power then drink with milk.	Oral
8	<i>Jasminum sp</i>	<i>Oleaceae</i>	Xanbalala	W	S	F	R	Toothach e	Take with teeth	Oral
9	<i>Urtica simensis steudh</i>	<i>Urticace ae</i>	Dobbii	W	S	F	L	Gastric wound	Roots grind& drink as juice grind& cream with butter	Oral Dermal
10	<i>Clematis simensis fresen</i>	<i>Ranuncul aceae</i>	Yazo hare g	W	S	F F F	Cl,L B,L	Hemorrh oid wound -cancer	The crushed tied crushed then tied the leaves crush & powder then cream	Dermal Dermal dermal
11	<i>Vernonia amygdalina</i>	<i>Asterace ae</i>	Eebicha	HG	S	F	Leaves	Intestinal worm	Drinking the decocted leaves with 1 cup of coffee for elders & half for children crushed leaves are put on	Oral

									head for 3 days	Dermal
12	<i>Verbascum sinaiticum</i>	<i>Scrophulariaceae</i>	Gurra harree	W	H	F	Root	Snake bite	The root crushed mixed with verbena officinalis.L then drunk	Oral
13	<i>Lippia adoensis</i>	<i>Verbenaceae</i>	Kusaayee	HG	S	F	L	Fibril illness	The leaves squeezed& the filter is giren through the nose &drink	oral
14	<i>Acacia melanoxylon</i> (R.Br.)	<i>Fabaceae</i>	Dhaddacha	W	S	F	Root	Evil eye	The root crushed&mix with water then drop in nose	Nasal
15	<i>Psidium guajava</i>	<i>Myrtaceae</i>	Zayituna	HG	H	F	Fruit	Kidney stone removal	Seven twinges of leaves will be crushed &mixed with water then drunk before breakfast until the stone is removed	oral
16	<i>Lagenaria</i>	<i>Cucurbitaceae</i>	Buqqee	HG	C	F	Leaf	Ear	Leaves are crushed and squeezed then drop in the ear	Ocular

	<i>sicerariamolina</i>				L			disease		
17	<i>Olea europaea</i>	<i>Oleaceae</i>	Ejersa	W	T	F	Root Leaf	Bone TB wound Headache	The extracted oil from roots put on the affected site the dried leaves fumigated	Dermal
18	<i>Jatropha curcas L.</i>	<i>Euphorbiaceae</i>	Abtamuiuk	W	S	F	Root Seed	Intestinal worm -Excess bile productio n	Root is crushed and drink with half cup of coffee powdered seed are eaten with honey	Oral Oral
19	<i>Premna schimperi</i>	<i>Verbenaceae</i>	Urgessaa	W	S	F	Root Leaf	Mastitis Boils	The powdered root are mixed with butter then painted on the breast of cows -Crushed & powdered leaves are tied on the infected body	Dermal Dermal
20	<i>Solanecio angulatus (vahi) C.Jeffery</i>	<i>Asteraceae</i>	Jinraas	W	H	F	Root	Evil eye	The powdered root is dry bathed at night for 3 days	Oral
21	<i>Cucurbita pepo</i>	<i>Cucurbitaceae</i>	Dabaaqula	HG	H	F	Leaves	Gastritis	The leaves cooked with Brassica oleracea 2-3 leaves then eaten	Oral
22	<i>Solanacio gigasvatke</i>	<i>Asteraceae</i>	Shikokkoo	W	S	F	Leave	Bloating	Pound and give with water	Oral

		<i>ae</i>								
23	<i>Rumex nepalensis spreng</i>	<i>Polygonaceae</i>	Shuultii	W	S	F	Root	Tonsillitis & diarrhoea	Crush mix with water then drinks a juice	Oral
24	<i>Syzigium guineense</i>	<i>Myrtaceae</i>	Baddeessa	W	S	F	Leaf	Disks	The leaves crushed and add water then drunk	Oral
25	<i>Ocimum lamifolium</i>	<i>Lamiaceae</i>	Damakase	HG	S	F	Leave leaves	Febrile illness -common cold	Boiled with tea and drink Boil and drink with coffee	Oral Oral
26	<i>Leonotis ocyimifolia (Brum.) Icuaisson</i>	<i>Lamiaceae</i>	Harmagusa	W	S	F	Leave	Stop breast Feeding of child	The leaves crush and cream	Oral
27	<i>Malva verticillata</i>	<i>Malvaceae</i>	Liitii	W	S	F	Root	Vomiting	Chewing the root	Oral
28	<i>Ruta chalepensis</i>	<i>Rutaceae</i>	Xeenaaddama	HG	H	F F	L L	Evileye Febrile Illness	Sniff, drink fumigate with Concoction -crush then fumigate whole body or drink the concoction	Oral Oral
								Epidemic common	Fumigate the house	Dermal

29	<i>Otostegia integitolia</i>	<i>Lamiaceae</i>	Xunjitii	HG	H	F	L	cold Coccolid a stomacha che	Fumigate rub squeeze the drink	Dermal Oral
30	<i>Cordia africana</i>	<i>Boragina ceae</i>	Waddeessa	w	T	F	Root	Itching	The roots are powdered then painted at bed time for 5 days	Dermal
31	<i>Rumex nervosus</i>	<i>Polygona ceae</i>	Imbuwaacco o	W	S	F	Leave, Root-L	Antra x wart	Crush & give with water – Rub, squeeze then cream	Oral Dermal
32	<i>Foeniculum vulgare L</i>	<i>Apiaceae</i>	Insilaala	W	H	F	HU Leave Stem	Cough Asme	Boil with tea then 1 cup drink -crush immerse with milk then drink	Oral Oral
33	<i>Euclea racemosa L.</i>	<i>Ebenace ae</i>	Mi'eessaa	W	S	F	Root Root	Evil sprit and Evileye -Heart burn	Drinking the crushed & decocted root 4&inhaling the smoke 1 cup of tea the root crushed & mix with water &drink 1 cup of glass	Oral Oral
34	<i>Plumbago</i>	<i>Plumbagi</i>	Marxaas	W	S H	F	Root	Anthrax	Root crushed and add water then drunk	Oral

	<i>zeylanica</i>	<i>naceae</i>								
35	<i>Allium Sativum</i> <i>Linn</i>	<i>Alliaceae</i>	Qullubbii adii	HG	H	B	Bulb	Febrile Illness	Bulb will be mixed with seed of <i>Allium</i> <i>sativum</i> then eat with food as well as given to livestock	Oral
							Bulb	Stomacha che	Bulbs are mixed with rhizome of zingiber official powered then eaten with honey	Oral
							Bulb	Bloating	Bulbs will be eating with food	Oral
36	<i>Eucalyptus</i> <i>globulus</i> <i>Labill</i>	<i>Myrtacea</i> <i>e</i>	Baargamoo adii	W	T	F	Leaf	Common cold	Crushed leaves are boiled with water then sniffed hot stem	Nasal
37	<i>Citrus aurantifolia</i> <i>Burun</i>	<i>Rutaceae</i>	Loomii	HG		F	Fruit	Wound	Cream concoction	Dermal
38	<i>Commelina SP</i>	<i>Commeli</i> <i>naceae</i>	Walgobbi S	W	T	F	Bark	Kidney	Drunk the Juice from crushed bark & residue of the bark is steam bathed 5 spoon of crushed banc	Oral
39			Mata qoma				Leaves	Boils	The leaves squeezed and tie on the swelled part	

	<i>Celtis africana</i> <i>Brum</i>	<i>Cannbaceae</i>		W	T	F				Dermal		
40	<i>Nigella sativa</i>	<i>Ranunculaceae</i>	Azmudiigur raacha	W	H	D	Seed	Head ache	Seeds are tied with clean clothes and sniffed	Nasal		
								D	Seed	Common cold	Seeds are mixed with honey then eaten for three days	oral
								D	Seed	Asthma	One drop of oil will be mixed with tea then drink for seven 5days.	Oral
41	<i>Kalanchoe sp.</i>	<i>Crassulaceae</i>	Induwoawul a	W	S	F	Leave	General medicine	Peel, tie with tiny rope then insert through skin on neck region	Dermal		
42	<i>Echinops</i> <i>Kebericho</i>	<i>Asteraceae</i>	Qabarichoo	HG	S	P	Bulb	Evil eye	The dried and fumigating	Nasal		
43	<i>Erythrina brucei</i>	<i>Fabaceae</i>	Waleensu	W	T	F	Leaves	Eye disease of lives tock	The leaves squeezed and two drop in eye cream	Dermal		
44	<i>Moringa stenoptela</i>	<i>Moringaceae</i>	Shifarraaw	H	T	F	Root	Asthma	The smoke of pounded root is inhaled at bed time for 3 days Leaf is crushed & boiled with tea drink	Oral		
							Leaf	Heartach e	leaf is crushed & add water then drink	Oral		
							Leaf			Oral		

51	<i>Ricinus communis</i>	<i>Euphorbiaceae</i>	Qobboo	HG	S	F	Root & seed	intestinal worm	Roots and seeds are crushed & drink with 1 cup of water	Oral
52	<i>Cucumis ficifolius</i> A Rich	<i>Cucurbitaceae</i>	Holotoo	W	H	F F F&D	Bark ,Root Fruit, ,	Blood4di arrhoea Wound Evileye	The bark and root crushed and mix with water and drink insert the affect in to the fruit -crush and tie on neck	Oral Dermal Dermal
53	<i>Withania somnifera</i>	<i>Solanaceae</i>	Gizaawaa	HG	H	F	Root	Evileye	Drinking the decocted root and the residue is dry bathed	Oral
54	<i>Cyphostemma SP</i>	<i>Vitaceae</i>	Laaluu	W	C L	F	Root	Wound	Root is pound dried mixed with water rubbed and applied as ointment wound	Dermal
55	<i>Verbena officinalis L</i>	<i>Verbenaceae</i>	Atucha	W	H	F	HU,R HU	Bleeding Evil spirit 4 intestinal poison	The roots crushed and tie -the whole part crush and drink with water	Dermal Oral
56	<i>Clematis simensis Fresen</i>	<i>Ranunculaceae</i>	Saritee	W	C L	F F	Leaves Root	Wound Stomach ache	The crushed leaves mixed with citrus lemon 4 then put on the wound -the root pounded then taken with coffee for 3 days	Dermal Oral
57	<i>Gladiolus schiwainfruthii (Baker)</i>	<i>Iridaceae</i>	Melasgolgule	W	H	F	Root	Injuries	The root crushed and tied on the injuries	Dermal
58	<i>Prunus Africana</i>	<i>Rosaceae</i>	Muka gurraacha	W	T	F	Bark	Wound	Crushed bark applies on the wounded area	Dermal

59	<i>Dovyalis abyssinica</i>	<i>Salicaceae</i>	Koshommii	W	S	F	Root	Kidney disease	The root crushed and add water then drink	Oral
60	<i>Zingiber officinale</i>	<i>Zingiberaceae</i>	Zinjabila	HG	H	F	Root	Cough common cold & tonsillitis	The roots crushed and boiled with tea & then drunk	Oral
61	<i>Melia azedarach</i>	<i>Meliaceae</i>	Nimii	HG	T	F	Hu, Leaf	Dandruff	The leaves crushed and cream	Dermal
62	<i>Nicotiana glauca</i>	<i>Solanaceae</i>	Tambo	HG	H	F	Leaf	Snakebite Leeches	The leaf is chewed and the juice swallowed the leaves crushed & with water then drink	Oral Oral
63	<i>Coffea Arabica</i>	<i>Rubiaceae</i>	Coffee	HG	S	F	Seed Seed	Scabies Head ache	The roasted seed are powdered applied on the infected area -Boil decant then drink	Dermal Oral
64	<i>Datura stramonium L.</i>	<i>Solanaceae</i>	Manjii	W	H	F	Seed	Depression	The seed is grounded and smoked or mixed with butter & put on head	Dermal
65	<i>Rhamnus Perinoides</i>	<i>Rhamnaceae</i>	Geeshoo	HG	S	F	Leaf shoot	Tonsillitis	The leaves crushed and mix with water then drink	Oral
66	<i>Thymus schimperi</i>	<i>Lamiaceae</i>	Xoosinee	W	S	F	Leaf	Hypertension	The leaves crushed boiled with tea and then drunk	Oral
67	<i>Solanum indicum</i>	<i>Solanaceae</i>	Hiddii	W	S	F	Leaf Root Root	Nose bleeding Emergency -pain during menstruation	Juice of leaf is applied to nose -chewing the root then swallowed dried roots are chewed & juice intake to stomach	Nasal Oral Oral

68	<i>Aloe vera (L) Burm</i>	<i>Alocaceae</i>	Hargessaa	W	S	F	Leaf	Gastric disease	-Heated squeezed and drink the sap is mixed with honey then eaten -leaves are crushed and mixed with honey& drunk -Leaves are crushed 4 mixed with sugar then drunk during pain	Oral
							Sap	Heart burn		Oral
							Leaf	Diabetes		Oral
							Leaf	Hypertension		Oral
69	<i>Hagenia abyssinica</i>	<i>Rosaceae</i>	Heexoo	W	T	F O	Seed	Intestinal parasite Animal skin worm	The seeds are grained add water then drunk Bark is dried and powdered then pour on wound	Oral
							Bark			Dermal
70	<i>Phytolacca dodecandra</i>	<i>Phytolaccaceae</i>	Handoodee	W	S	F	Leaf	Leeches	The leaves crushed and insert with water	Nasal
71	<i>Croton macrostachyus</i>	<i>Ephorbiaceae</i>	Bakkanisa	W	T	F	Bark	Hemorrhoids Spleenomegally	Bark is crushed and cooked with meat then soup is taken Bark is crushed and mixed with water & then drink	Oral
							Bark			
72	<i>Clerodendium ericoides (Hochst)</i>	<i>Lamiaceae</i>	Misirijjii	H	S	F	Root L	Evil eye &evil sprit	Crush powder then tied on the neck or take with tooth	Dermal Oral
73	<i>Leonotis ocymifolia (Burm.f) Warsson</i>	<i>Lamiaceae</i>	Bokkollu	W	S	F	Root	Snake bite	The root crush and tied	Dermal
74	<i>Carisaedulis</i>	<i>Apocyanaceae</i>	Hagamsa	W	S	F	Root	Evil eye	The smoke of pounded roots is in haled Root bark is pounded & applied on wound for three days	Dermal
							Root	Wound		Dermal

Appendix Table 2, Medicinal Plant Species in each Family

NO	Family	Genera	% general	Number of plant species	% species
1	<i>Tiliaceae</i>	1	1.47	1	1.35
2	<i>Fabaceae</i>	4	5.88	5	6.76
3	<i>Sapindaceae</i>	1	1.47	1	1.35
4	<i>Araceae</i>	1	1.47	1	1.35
5	<i>Malvaceae</i>	2	2.94	2	2.70
6	<i>Rosaceae</i>	3	4.41	3	4.05
7	<i>Polygonanceae</i>	3	4.41	3	4.05
8	<i>Oleaceae</i>	2	2.94	2	2.70
9	<i>Utriaceae</i>	1	1.47	1	1.35
10	<i>Ranunculaceae</i>	3	4.41	3	4.05
11	<i>Asteraceae</i>	3	4.41	4	5.41
12	<i>Scropularioceae</i>	1	1.47	1	1.35
13	<i>Verbenaceae</i>	3	4.41	3	4.05
14	<i>Myrtaceae</i>	3	4.41	4	5.41
15	<i>Cucurbitaceae</i>	3	4.41	3	4.05
16	<i>Euphorbiaceae</i>	3	4.41	3	4.05
17	<i>Solanaceae</i>	4	5.88	5	6.76
18	<i>Lamiaceae</i>	5	7.35	6	8.11

19	<i>Rutaceae</i>	2	2.94	2	2.70
20	<i>Boraginaceae</i>	1	1.47	1	1.35
21	<i>Apiaceae</i>	1	1.47	1	1.35
22	<i>Ebenaceae</i>	1	1.47	1	1.35
23	<i>Plumbaginaceae</i>	1	1.47	1	1.35
24	<i>Alliaceae</i>	1	1.47	1	1.35
25	<i>Commelinaceae</i>	1	1.47	1	1.35
26	<i>Cannabaceae</i>	1	1.47	1	1.35
27	<i>Crassulaceae</i>	1	1.47	1	1.35
28	<i>Moringaceae</i>	1	1.47	1	1.35
29	<i>Caricaceae</i>	1	1.47	1	1.35
30	<i>Acanthaceae</i>	1	1.47	1	1.35
31	<i>Rutaceae</i>	1	1.47	1	1.35
32	<i>Iridaceae</i>	1	1.47	1	1.35
33	<i>Salicaceae</i>	1	1.47	1	1.35
34	<i>Zingiberaceae</i>	1	1.47	1	1.35
35	<i>Meliaceae</i>	1	1.47	1	1.35
36	<i>Rubiaceae</i>	1	1.47	1	1.35
37	<i>Rhamnaceae</i>	1	1.47	1	1.35
38	<i>Phytolaccaeae</i>	1	1.47	1	1.35
39	<i>Apocyanaceae</i>	1	1.47	1	1.35
40	<i>Akoeaceae</i>	1	1.47	1	1.35

Appendix Table .3 List of informants in the study area with corresponding backgrounds

No	Name	Sex	Age	Religion	Marital status	Occupation	Educational status	Keble	No of plants reported	Disease reported	Part(s) mode of	Dose and additive
1	Halimaa Jamaal	F	59	Muslim	Married	Farmer	illiterate	Asakoo	1	2	Leaf	4leaves
2	Ayyalaa Abarraa	M	45	Christian	Married	Farmer	Illiterate	//	2	2	Leaf	20 leaf lates
3	Salamoon Abarraa	M	58	Christian	Married	Farmer	Illiterate	//	1	1	Leaf	3-5leaves
4	Zaaraa Aliyyii	F	59	Muslim	Married	Farmer	Illiterate	//	1	2	Root	1andhalf palm
5	Usmaan Jaarraa	M	47	Muslim	Married	Farmer	Illiterate	//	1	2	Root	Half palm
6	Saadiyyaa Abarraa	F	49	Muslim	Married	Farmer	Illiterate	//	1	2	Leaf	
7	Halimaa Jaarraa	F	59	Muslim	Married	healers	Illiterate	//	7	8	Leaf	
8	Fiqaaduu Ballaxaa	M	48	Christian	Married	Farmer	Illiterate	//	1	2	Leaf	4-8 leaves
9	Safiyyaa Huseen	F	35	Muslim	Married	Farmer	Illiterate	//	1	1	Leaf	
10	Girmaa Asaffaa	M	60	Christian	Divorced	Farmer	Illiterate	//	1	2	Seed	2 spoon
11	Abbabaa Isheetuu	M	46	Christian	Married	Farmer	Illiterate	//	1	1	Root	Half spoon
12	Sabilaa Tukee	F	33	Muslim	Married	Farmer	Writing riding	//	1	2	Leaf	4-6leaves
13	Halimaa Amaan	F	35	Muslim	Married	Farmer	Writing riding	//	1	2	Bark	6 spoon
14	Aminaa Tukee	F	64	Muslim	Married	Farmer	Illiterate	//	1	1	Leaf	
15	Innaat Dirribaa	F	53	Muslim	Married	Farmer	Literate	//	1	2	Root	Half palm
16	Tamiraat Biqilaa	M	66	Christian	Married	Farmer	Literate	//	1	2	Leaf	4-6leaves

17	Kamaal Hasan	M	28	Muslim	Single	Farmer	Writing riding	//	1	1	Leaf	
18	Asnaaqaa Djaneë	F	60	Christian	Married	Farmer	Literate	//	1	2	Seed	1-4 seeds
19	She/Nabiil Jaarraa	M	52	Muslim	Married	healers	Literate	//	18	20	Root	
20	She/Ahimad Jiloo	M	67	Muslim	Married	healers	Literate	//	16	22	Leaf	
21	Abbaamalaa kindee	M	45	Christian	Married	healers	Writing riding	//	1	2	Leaf	3-4 leaves
22	Kadijjaä Qaasim	F	49	Muslim	Married	Farmer	Literate	//	1	1	Root	
23	Zaaraa Hasan	F	64	Muslim	Married	Farmer	Literate	Asakoo	1	2	Leaf	
24	Hajjii Aliyyii	M	38	Muslim	Single	Farmer	Literate	Asakoo	1	1	Leaf	
25	Jamilaa Turee	F	68	Muslim	Divorced	Farmer	Literate	D/Asakoo	1	2	Bark	2 spoon
26	Asaffaa Rattaa	M	54	Christian	Married	Farmer	Literate	D/Asakoo	1	2	Leaf	
27	Kumsaa Lamma	M	62	Christian	Married	Farmer	Literate	D/Asakoo	1	1	Leaf	
28	Saafanoo Taajuu	M	45	Muslim	Married	Farmers	Writing reading	D/Asakoo	1	2	Leaf	
29	Nuuraa Amaan	M	72	Muslim	Married	Farmers	illiterate	//	1	1	Bulb	3-5bulbs
30	Maammoo Jaarraa	M	54	Muslim	Divorced	Farmers	illiterate	//	1	2	Leaf	
31	Jaamboo Soraa	M	80	Muslim	Married	Farmers	illiterate	//	1	2	Root	Quarter of palm
32	Saartuu Turaa	F	44	Muslim	Married	Farmers	illiterate	//	1	1	Leaf	2-4 leaves
33	Abdoo Huseen	M	70	Muslim	Married	Farmers	illiterate	//	1	2	Seed	
34	Daduu Tolaa	F	55	Muslim	Divorced	Farmers	illiterate	//	1	4	Leaf	

35	Misraa Kadiir	F	67	Muslim	Married	Farmers	Illiterate	//	1	2	Leaf	
36	Margistuu Dajanee	M	45	Muslim	Married	Farmers	illiterate	//	1	2	Root	3 spoon
37	Amanee Huseen	F	68	Muslim	Married	Healers	illiterate	//	2	3	Leaf	5-6leaves
38	Arabaa Gadaa	M	54	Muslim	Divorced	Farmers	illiterate	//	1	1	Leaf	
39	Girmaa Baqqalee	M	70	christen	Married	Farmer	illiterate	//	1	2	Leaf	
40	Obsee Turaa	F	26	Muslim	Single	Farmer	Writing reading	//	1	2	Root	
41	Zarfee Amaaraa	F	66	Christia n	Married	Farmer	illiterate	//	1	2	Barck	2 spoon
42	She/Jamaal Kadiir	M	52	Muslim	Married	Healers	illiterate	//	12	14	Leaf	
43	Birqee Lammaa	F		Christia n	Married	Farmer	illiterate	//	1	2	Leaf	3-4 leaves
44	Qes/Yonaas Alamuu	M	70	Christia n	Married	healers	illiterate	//	10	12	Fruit	
45	Gaadisaa Kabbdaa	F	68	Christia n	Married	Farmer	illiterate	//	1	2	Leaf	
46	Shabbaa Guyyoo	M	47	Muslim	Married	Farmer	illiterate	D/Asako o	1	2	Seed	
47	Hajjoo Kaliiloo	F	77	Muslim	Married	Farmer	illiterate	D/Asako o	1	2	Leaf	

48	She/ Qaasim Turaa	M	43	Muslim	Married	healers	Writing reading	I/bulaalla	12	12	Root	Size of 1 sicken
49	Hajjii Kamaal	M	80	Muslim	Married	Farmer	illiterate	I/bulaalla	1	10	Leaf	
50	Urgoo Aliyyii	F	48	Muslim	Married	Farmer	illiterate	//	1	2	Root	
51	She/ Muktaar Jamal	M	53	Muslim	Married	healers	illiterate	//	10	12	Leaf	
54	Ayyaantuu Tolaa	F	42	Muslim	Married	Farmer	illiterate	//	1	2	Leaf	2 leaves
54	Qabattoo Jaarraa	M	64	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
55	Waaqoo Gadaa	M	65	Muslim	Married	Farmer	illiterate	//	1	2	Root	
56	Zayitunaa Kamaal	F	44	Muslim	Married	Farmer	illiterate	I/bulaalla	1	1	Leaf	
57	Kataboo Galmaa	M	77	Muslim	Married	Farmer	illiterate	I/bulaalla	1	1	Leaf	
58	Hikmaa Kadiir	F	69	Muslim	Married	Farmer	illiterate	//	1	1	Root	2 sicken
59	Azeebaa Umar	F	51	Muslim	Married	Farmer	illiterate	//	2	2	Leaf	
60	Ebbaa Turaa	M	68	Muslim	Married	Farmer	illiterate	//	2	1	Leaf	
61	Shubbee Amaan	F	44	Muslim	Married	Farmer	illiterate	//	1	2	Root	
62	Moomee Jaarraa	F	72	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
63	Hasan Kamaal	M	47	Muslim	Married	Farmer		//	1	1	Seed	
64	Abbaat Araarsoo	M	52	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
65	She / Habib Imaam	M	68	Muslim	Married	healers	illiterate	//	12	6	Bark	

66	Karimaa Jundii	F	32	Muslim	Married	healers	illiterate	//	1	1	Root	
67	Shaafii Aliyyoo	M	68	Muslim	Married	Farmer	illiterate	//	2	1	Leaf	
68	Zeeyinii Amaan	F	69	Muslim	Married	Farmer	illiterate	//	4	2	Leaf	
69	Shubbaa Umar	F	52	Muslim	Married	Farmer	illiterate	I/bulaalla	1	1	Seed	
70	Tulluu Kabbadee	M	70	Christia n	Married	Farmer	illiterate	I/bulaalla	2	2	Root	
71	Shifarraa Tafarii	M	48	Muslim	Married	Farmer	illiterate	N/Asako o	3	2	Bulb	2-4 bulb
72	Maaruu Asaffaa	M	42	Christia n	Married	Farmer	illiterate	N/Asako o	2	1	Leaf	
73	Dajanee Getuu	M	69	Christia n	Married	Farmer	illiterate	//	3	2	Leaf	
74	CaaltuuAmaan	F	48	Muslim	Married	Farmer	illiterate	//	1	1	Root	1 slicken
75	Badriyyaa Hajjii	F	70	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	10-14 leaves
76	Araggaa Tashooma	M	67	Christia n	Married	Farmer	illiterate	//	2	2	Leaf	
77	Saadiya Jamaal	F	45	Muslim	Married	Farmer	illiterate		1	2	Leaf	
78	She/Abduu Qaasim	M	66	Muslim	Married	Healers	illiterate	//	12	6	Fruit	1-3 fruit
79	Shek/Jarraa Hasanoo	M	68	Muslim	Married	Healers	Writing reading	//	14		Leaf	

80	Getaahun Jamaanah	M	40	Christian	Married	Farmer	Writing reading	//	1	2	Leaf	
81	Shukaree Amaan	F	69	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
82	Jamaal Kadiir	M	58	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
83	She /JawaarAliyyii	M	44	Muslim	Married	Farmer	illiterate	//	1	2	Leaf	
84	Arabee Jaarraa	F	62	Muslim	Married	Farmer	illiterate	//	2	2	Root	
85	Abbuu Hajjii	M	63	Muslim	Married	Farmer	illiterate	//	3	2	Leaf	
86	Saartuu Jundii	F	60	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	
87	Jundii Waaqoo	M	42	Muslim	Married	Farmer	illiterate	//	2	2	Root	
88	Maashoo Muhaammad	M	59	Muslim	Widow	Farmers	illiterate	//	3	3	Leaf	
89	Riyaad Muktaar	M	63	Muslim	Married	Farmer	illiterate	//	2	1	Leaf	
90	Kamaal Muhaammed	M	58	Muslim	Married	Farmer	illiterate	//	3	2	Root	
91	Urgee Robaa	F	64	Muslim	Married	halers	illiterate	//	12	8	Leaf	
92	Kaasuu Tufaa	M	34	Christian	Married	Farmer	Writing reading	N/Asako	1	1	Leaf	
93	Zubee Usmaan	F	62	Muslim	Married	Farmer	illiterate	N/Asako	1	1	Seed	

94	Maakidaa Tukee	F	65	Muslim	Married	Farmer	illiterate	Qomicha a	2	2	Leaf	
95	Abbaay Aliyyii	M	64	Muslim	Married	Farmer	illiterate	Qomicha a	1	1	Stem	1 sticken
96	Qufaa Hirphoo	M	40	Muslim	Married	Farmer	Writing reading	Qomicha a	2	2	Root	
97	Gutoo Amaan	M	65	Muslim	Married	Farmer	illiterate	//	3	2	Leaf	
98	Galatoo Tolaa	M	48	Muslim	Married	Farmer	illiterate	//	1	1	Stem	
99	Abbaayyee Tolaa	M	55	Muslim	Married	Farmer	illiterate	//	13	8	Leaf	
100	Fatiyaa Kadiir	F	38	Muslim	Married	Farmer	illiterate	//	4	4	Root	
101	Wandimmuu Tulluu	M	58	Christia n	Married	halers	illiterate	//	11	10	Leaf, Root	
102	Salamoon Asaffaa	M	60	Christia n	Married	Farmer	illiterate	//	2	2	Leaf	
103	Caaltuu Umar	F	48	Muslim	Married	Farmer	illiterate	//	1	2	Root	
104	Kitaabee Amaan	F	62	Muslim	Married	Farmer	illiterate	//	1	1	Leaf	4-6 leave shoot
105	Fiqree Lammaa	M	61	Christia n	Married	Farmer	illiterate	//	1	1	Leaf	
106	Shek/Tukee Robaa	M	45	Muslim	Married	Farmers	Writing	//	1	2	Root	
107	Sulxaan Jaarraa	M	65	Muslim	Married	Farmers		//	1	1	Leaf	
108	Moomee Usmaan	F	62	Muslim	Widow	Healers	Illiterate	Qomichaa	2	3	Leaf	

109	Habibaa Kadiir	F	38	Muslim	Married	Farmers	Writing reading	//	1	1	Seed	8-12 seed
110	Kumee Jaarsoo	F	60	Muslim	Married	Farmers	Illiterate	//	1	2	Root	
111	Imaanaa Kadiir	M	55	Muslim	Married	Farmers	Illiterate	//	2	4	Leaf	
112	Jamilaa Jiloo	F	65	Muslim	Married	Farmers	Illiterate	//	3	1	Fruit	
113	Imma Kamaal	F	30	Muslim	Married	Farmers	Writing reading	//	2	4	Seed	
114	Maakidaa Jeyiluu	F	65	Muslim	Widow	Farmers	Illiterate	//	1	1	Leaf	
115	Tamaam Huseen	M	37	Muslim	Married	Farmers	Writing reading	//	1	1	Root	3-6 medium root
116	AbbabuuTolasaa	F	65	Muslim	Married	Farmers	Illiterate	//	1	3	Leaf	

Appendix 2

Checklist of Semi-structured Interview Question for Collecting Ethnobotanical data

I. General information

1. Personal information

Name of respondent _____

2. Sex: - 1) male 2) female

3. Age: - a) 25-45 b) 46-65 d) above 66

5. Residence area (village) _____ Keble code _____

6. Marital status: a) single b) married c) divorced

7. Occupation (main job):- a) farmer b) government worker c) merchant d) other 8. 8. Religion: a) Muslim
b) Christian c) Others

9. Educational background: a. 1-4 b. 5-8 c. above 8 e. >8 & religious education
e) illiterate

II. Ethnobotanical data for medicinal plants

1. What are the most common diseases of humans, livestock's and both of them in your area?

Human diseases. -----

Livestock diseases. -----

Both human and animal diseases. -----

2. Are there members of the community who frequently use the traditional medicinal plant as compared to modern medicine? Why?

3. How is the knowledge of traditional medicine passed to a family member/younger generation?

4. Mention medicinal plants used to treat human, livestock and both human and livestock diseases in your area?

5. Where do these plants grow / cultivate (the most common habitats of medicinal plants)?

A) Wild /forest B) Home garden C) Other

6. What is the habit (life forms) of the plant? Tree (T) shrub(s) herbs (h) Climber (CL) Others (O)

7. What part/s of the medicinal plant(s) is/are used? Leaf (L) Roots (R) Tuber (T) Rhizome (R) Bark (B) Stem (St) Fruit (Fr) Seed (Sd) Whole plant (Wp) Bulb (B) Others (O)

8. What is the method of preparation of the medicinal plants?

a. squeezing and filtering, b. crushing, c. Powdering d. fumigating e. boiling

9. How are the prepared remedies taken by the patient(s) (route of administration)? Internal: Dermal (D) Oral (O) Nasal (N) Ear (E) Eye (E) Tooth (T) Anal (A) Others (O)

External: Fumigation (F) Washing (W) Putting on (P) Smoking (S) Rubbing (R) Brushing (B) Others (O)

10. a. What are threatening factors of medicinal plants in your area? For medicinal _____,
Food_____, Firewood_____, Charcoal_____, Fence_____,
Construction_____, Furniture_____, Edible fruit_____ Drought_____

b. How do the local people manage and conserve these medicinal plant species through their traditional indigenous knowledge?

