Ethnobotanical study of Traditional Medicinal Plants used by Indigenous People of Ankesha District , Awi Zone, Amhara Regional State, Ethiopia

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Ethnobotanical study of Traditional Medicinal Plants used by Indigenous People of Ankesha District , Awi Zone, Amhara Regional State, Ethiopia

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GRADUATE PROGRAMES

This is to certify that the Thesis prepared by Alemitu Adane Asegu, entitled: *Ethnobotanical study of Traditional Medicinal Plants used by Indigenous People of Ankesha District, Awi Zone, Amhara Regional State, Ethiopia* and submitted in Partial Fulfillment of the Requirements for the 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 Plants used by Indigenous People of Ankesha District, Awi Zone, Amhara Regional State, Ethiopia

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Ethnobotanical study of medicinal plants was conducted to document the indigenous plant-based medicinal knowledge of people in Ankesha Wereda, Amhara Regional State Northern Ethiopia. A total of 60 informants (age beteween20-80) were selected to collect information on medicinal plant use from eight sampled kebeles. Of these, 8 key informants were selected purposively based on recommendation by local elders and authorities. A total of 62medicinal plant species distributed in 59 genera and 40 families were collected and identified. Out of these, 51 species (82.2%) were used against human ailments, 5species (8.1%) were used against livestock ailments and the remaining 6 species (9.7%) were used to treat both human and livestock ailments. From the total medicinal plant species, 22 were herbs, followed by 18 species of shrubs, 15 species of trees, and 6 species of climbers. The most frequently used plant parts were leaves (29.7%) followed by roots (24.7%)), seeds (13.8%), fruit (6.9%), stems (6.9%), sap (3.9%) latex, (2.9%), bark (1.9%), flower (1.9%), and bulb (1.9%). The most widely used method of preparation was crushing (53.5%), squeezing (12.6%), and chewing (12.6%) of the different plant parts. The common route of administration recorded was oral (62.6%) followed by dermal (21.2%) application. Agricultural expansion, firewood collection, and construction were reported as major threats to plants of the study area.

The Ankesha people possess rich ethnomedicinal knowledge. This study can be used as a basis for developing management plans for conservation, sustainable use and drug development.

Key words: Ethnobotany, Ethnomedicinal, Fidelity level, Informant consensus factor, Traditional medicinal plants

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List of Abbreviations and Acronyms

WHO	World Health Organization
AAU	Addis Abeba University
AWAO	Ankesha Woreda Agricultural Office
AWHO	Ankesha Woreda Health Office
AWCO	Ankesha Woreda Communication Office
AWAO	Ankesha Woreda Administrative Office
TMPs	Traditional Medicinal Plants
IK	Indigenous Knowledge
ICF	Informant Consensus Factor
FL	Fidelity Level

1. Introduction

Traditional medicine is an ancient medicinal practice which exists, in the communities before the advent of modern health sciences. Traditional medicine is based on indigenous theories, beliefs and experiences that are conserved down from generations. Several countries of Africa have realized the need and importance to develop improved traditional medicines from native and endemic plants that are traditionally used at various places for various ailments.

Traditional medicine still remains the main resources for a large majority (80%) of the people in Ethiopia for treating health problems. Traditional medicinal consultancy including the consumption of the medicinal plants has a much lower cost than modern attention (Mekonnen Bishaw, 1990; Tessema *et al*., 2003).

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). In general, ethnobotany is the scientific investigation of plants as used in indigenous culture for food, medicine, magic, rituals, building, household utensils and implements, musical instruments, firewood, pesticides, clothing, shelter and other purposes (Kelbessa Urga *et al.*,

2004).

Ethiopia is a country characterized by a wide range of climate and ecological conditions with enormous diversity of fauna and flora (Pankhurst, 2001). The country possesses a wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world (Dawit Abebe, 1986).

In Ethiopia little emphases has been given to traditional medicinal studies over the past decade (Debela Hunde, 2001). Therefore it can be said that ethnobotanical studies are merely at the start in Ethiopia though investigating medicinal plants uses is as yet no in depth study on the relation between medicinal plants and indigenous knowledge resources. Modern health care as never been and probably will never provide a foreseeable future and adequate health service anywhere in Africa, due to the financial limitation related to rapid population growth, political instability and poor economic performance (Ankobonggo,1992).

The majority of Ethiopian people still depend on traditional medicine .The problem of ensuring the equitable distribution of modern healthcare has become more serious, as the gap between supply and demand has continued to widen (Sebsebe Demissew and Ermias Dagne, 2001). There is a considerable global interest in tapping the accumulated knowledge of traditional medicine, and therefore researches are being carried out in many countries with the aim of increasing the use of traditional medicine to the welfare of the human population. Hence the present study was initiated to investigate the medicinal plants and traditional knowledge in Ankesha Woreda, Awi zone, Amhara region, Ethiopia.

According to Pankhurst (2001), detailed information on the medicinal plant could only be obtained when studies are taking place in the various areas where little or no botanical and ethnobotanical explorations have been made. Thus, this study was designed to carry out ethno botanical investigation on medicinal plants of Ankesha wereda, Awi regional state with the following general and specific objectives.

1.1. Statement of the problem

In Ethiopia, both human and natural factors heavily contribute to the loss of medicinal plants, which links with the gradual displacement of indigenous knowledge associated with these plants. In developing countries like Ethiopia, the indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation orally. Since, there is a gap in the documentation and records on medicinal plants in the country, indigenous knowledge on usage of medicinal plants as remedies for both human and livestock ailments will be lost. Until this moment, no research on ethnobotanical study of medicinal plants was conducted in Ankesha District. The findings of this study will help people of the study area to be aware of problems associated with medicinal plants and give attention for sustainable use and conservation of medicinal plants of their surroundings.

1.2. Objectives of the Study

1.2.1. **General objective**

The General objective of this study was to investigate and document the traditional medicinal Plants used by indigenous people in Ankesha Woreda to treat both human and livestock ailments.

1.2.2. **Specific objectives**

- To collect, identify and document traditional medicinal plants that are used by the local people for the treatment of human and livestock ailments in the study area.
- To assess current status of medicinal plants and the indigenous knowledge of the people in the study area.
- To document plant parts used, for medicinal purposes, methods of preparation and ways of administration.

- To evaluate the indigenous knowledge of the people on the use, threat and conservation measures of medicinal plants practiced in the study area.
- To provide information that will contribute to the development of strategies for conservation and sustainable utilization of traditional medicinal plants.

1.3. Basic Research Questions

The main focus of this study is to investigate the traditional uses and remedies of various plants, which are used by Ankesha Wereda people. The findings of the study will try to answer the following main research questions.

- ✓ What are the main or most common human health problems in the study area?
- ✓ What are the most important plants to treat human and livestock ailments?
- ✓ Which medically important plants species are used by local people to treat their own health problems and livestock ailments in the study area?

2. Literature review

2.1. Origin and development of ethnobotany

Ethnobotany is a broad term referring to the study of direct interrelations between humans and Plants (Martin, 1995; Balick and Cox, 1996).Ethnobotany is also defined as local people interaction with their natural environment: how they classify, manage and use plants available around them (Martin, 1995). It is also described as “a unit of ecological study specializing in the interaction of people and the plant world (Ford, 1978).

Ethnobotany is a multidisciplinary science defined as the interaction between plants and people. It is also defined as local people's interaction with their natural environment: how they classify, manage and use plants available around them (Martin, 1995). The relationship between 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, ornamentation and healthcare (Schultes, 1992).

Ethnobotanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba(Cotton,1996) and when other immigrants from the new world documented food, medicine and other useful plants of the Aztec, Maya and Inca peoples (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). This implies that humans are dependent on plants for their life. Although various animal and mineral products contribute to human welfare; the plant kingdom is most essential to human wellbeing especially in supplying his basic needs. This close interaction and dependency of humans on plants is studied under the field of ethnobotany.

John Hershberger proposed the term ethnobotany for the first time in 1895 (Balick, 1996), however this term has been given different interpretations and definitions depending on the interest of workers involved in the study (Cotton, 1996). Currently ethnobotany has become a more diversified and multidisciplinary subject which requires experts in various fields of academic study such as Botany, Anthropology, Agriculture, Linguistics, Archeology and Economics (Martin, 1995; Alexiades, 1996; Balick, 1996). Ethnobotany is also rapidly growing science, attracting people with widely varying academic backgrounds and interests (Mac Donald, 2009) and now days' ethnobotany has tended to become more analytical quantitative cross disciplinary and multi institutional (Hamilton *et al.,* 2003**).**

Martin (1995) defined ethnobotany as a study of people's classification, management and use of plants. In 1941, Shultes redefined ethnobotany as the study of the relationship, which exists between humans and their ambient vegetation (Castetter, 1944; cited in Cotton, 1996).

Ethnobotanical investigation documents the knowledge on cultural interaction of people with plants. It also tries to find out how local people have traditionally used plants for various purposes, and how they incorporated plants in to their cultural tradition and religions (Balick and Cox, 1996). Therefore, traditional local communities worldwide have a great deal of knowledge about native plants on which they intimately depend (Langeheim and Thimann, 1982). As stated by Martin (1995) to achieve more detailed and reliable information of plants and plant use, ethno botanical study needs involvement of specialists from various disciplines, such as plant taxonomists, plant ecologists, anthropologists, linguists, economic botanists, pharmacologists and others. With such interdisciplinary and multidisciplinary approaches, ethno botany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources and discovers benefits from plants.

2.2. Indigenous knowledge

Indigenous knowledge (IK) on remedies in many countries including Ethiopia, pass from one generation to the other generation verbally with great secrecy (Jansen, 1981). Such secrete and crude transfer makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer (Amare Getahun, 1976). Hence, there is a need for systematic documentation of such useful knowledge through ethnobotanical research. Indigenous knowledge is a body of knowledge built up by a group of people through generations of living in close contact with nature and it is cumulative and dynamic.

Indigenous knowledge refers to the accumulation of knowledge, rule, standards, skills, and mental sets, which are possessed by local people in a particular area (Quanash, 1998). 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 (Alcorn, 1984).

2.3. Traditional medicinal plants

Traditional medicine(TMPs) 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 physicals, mental or social imbalances and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing. (Yilma Desta *et al*., 1996; cited in Fassil Kibebew, 2001). This system of health care is also known as folk medicine, ethno medicine, or indigenous medicine.

According to FassilKibebew (2001), about 75-90 % of the rural population in the world (excluding western countries) relies on traditional medicines as their only health care system. This is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs in a way modern medicine does not. According to WHO (2001), consultation of medicinal practitioners is very helpful for the development and incorporation of useful approaches in planning and budgeting system for health care provision of most developing nations and indigenous communities. In Africa, traditional medicine plays a central role in health care needs of rural people and urban poor. Here, it is said that, this situation would remain so long as modern medicine continues to be unable to meet the health care of the people of the continent effectively (Jansen, 1981). Their value and role of this 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 (WHO, 1998). Indigenous traditional medicinal practices were carried out essentially based on private practice, i.e. private agreement between consenting parties, and the knowledge of traditional practice in most cases has descended through oral folk lore (Asfaw Debela *et al*., 1999).The secrete of information retained by traditional healers is relatively less susceptible to distortion but less accessible to the public (DawitAbebe, 1986). However, the knowledge is dynamic as the practitioners make every effort to widen their scope by reciprocal exchange of limited information with each other (DawitAbebe, 1986; Abbink, 1993).

According to konno (2004), easily accessibility efficacy on treatment and affordable cost in getting health services are also main reasons in preferring traditional medicine to modern medication. Traditional medicine has also draw backs as various authors stated (Amare Getahun,

1976; Sofowora, 1982; Dawit Abebe, 1986). Lack of precision and standardization is one drawback for the recognition of the traditional health care system. Lack of precise dosage which could lead to toxicity is also the other drawback of traditional medicine (Dawit Abebe, 1986).

2.4. Medicinal plants and ethnomedicine in Ethiopia

2.4.1. Traditional medicinal plants in public health care system

Plants in general and medicinal plants in particular are important, fundamental and most useful to almost all life on earth, one of the most significant uses of plant is the python medicinal role, i.e. the benefits of medicinal plants have contributed to modern medicine, through providing ingredients for drugs or having played central role in drug discovering, some drugs having botanical origin, extracted from plants.

Plants have been used as a source of traditional medicine in Ethiopia from the time immemorial to combat different ailments and human sufferings (Asfaw Debela *et al*., 1999). Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Pankhurst, 1965; MirgissaKeba, 1998). According to DawitAbebe (2001), there is a large magnitude of use and interest in medicinal plants in Ethiopia due to acceptability, accessibility and biomedical benefits. In this country, the long history of use of medicinal plants is reflected in various medico- religious manuscripts produced on parchments and believed to have originated several centuries ago (Fassile Kibebew, 2001). Medical textbooks written in Geez or even Arabic in Ethiopia between the mid of 17th and 18th century imply that plants have been used as a source of traditional medicine in Ethiopian health care system. Even today, it is common for people living in rural and urban areas to treat some common ailments using plants

available around them (example, *Hageniaabyssinica*to expel tapeworm, *Rutachalepensis*for various health problems) (Abbink, 1995). The continued dependency on herbal medicine along with the side of modern medicine is largely conditioned by economic and cultural factors (Aketch, 1992). In addition to these factors, the fact that modern medical services are inaccessible to the vast majority of the populations due to their costs made herbal medicines more acceptable. The problem of ensuring equitable distribution of modern health care has become more serious, as the gap between supply and demand has continued to widen. Hence, in present day Africa including Ethiopia, the majority of people lack access to health care and where available the quality is largely below standard (Abbiw, 1996). This is why Archer (1990) and Nijar (1996) stated that for most indigenous peoples and the local communities' reliance on plant resources accounts for anything up to 95% of their survival requirements. Therefore, herbal remedies are the world's therapeutic means to act against diseases for a large proportion of people both rural and urban centers in developing countries like Ethiopia (Abbiw, 1996).

Medicinal plants play typical role in the lives of many people in terms of health support, financial income and lively hood security (Abdul hamid *et al*., 2004; Hamilton, 2003; Hamilton, 2004). Plant has been indispensable and the most important sources of both preventive and curative traditional preparation for human beings and livestock since time immemorial. By their capacity of photosynthesis, plants form the basis of the biological food web and producing oxygen which is the key for our lives and them balancing the gases of our environment. 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; Ensermu Kelbessa *et al*., 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.

According to Mekonen (1990) and Tesema *et al*., (2003), about 80% of human population and over 90% livestock in Ethiopia rely on traditional medicine. And thus, today in Ethiopia there is a large magnitude of use and interest in medicinal plant due to socio- cultural acceptability, accessibility, affordability and biomedical benefits of the traditional medicinal plants. In other words, in all regions of the country traditional medicine has high acceptability since it is an integral part of the local culture and hence, people often rely on their efficient and less costly alternative health care (Konno, 2004; Mwambazi, 1996; WHO, 2000).

2.4.2. Plants in Ethnoveterinary medicine

In Ethiopia as well as in most developing countries animal disease remains one of the principal causes of poor livestock performances leading to an ever increasing gap between the supply of and the demand for livestock products (Teshale *et al.,* 2004). Ethnoveterinary medicine and related study is one of the most important means of controlling livestock diseases.

Ethnoveterinary medicine which refers to 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 a range of disease problems encountered by livestock holders (Tafesse Mesfin and Mekonen lemma, 2001).

Ethnoveterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. Livestock holders can prepare and use homemade remedies with minimum expense. So far, many livestock holders in rural areas where there are relatively

few veterinarians and shortages of other facilities, traditional medicinal plants are the only choice to treat many ailments (McCorkle, 1995).

In Ethiopia, as in other developing countries, livestock production plays an important role in the lively hood and economy of majority of the population. Crop production is almost entirely dependent on traction power provided by animals. Livestock offers in many harsh environments the only way of survival and constitutes a driving force for food security and sustainable development in developing countries like Ethiopia. Although, the gain from livestock production is directly related with safeguarding animal health convention, veterinary medical system is among the smallest in Ethiopia. Techniques such as those to treat the wider spread ailments are common knowledge among livestock holders (ITDG and IIRR, 1996). On the contrary, others are known only to a few indigenous professional healers who have over the year learned the practice. Stock raisers, both farmers and herders have developed their own ways of keeping their animal health and productivity (McCorkle and Mathias, 1996). They treat and prevent livestock diseases using sometimes age old homemade remedies, surgical and manipulative techniques. Taken together, these indigenous local animal health care beliefs and health care practices constitute an ethnoveterinary medicine. Like other kind of local technical knowledge, ethno veterinary medicinal practice and skills are built up on over time empirical observation, mainly through trial and error and sometimes through deliberate or even desperate experimentation and innovation (McCorkle and Mathias, 1996). Ethnoveterinary medicine can be useful when ever and where ever stock raisers have no other animal health care options, whether in rural or peri-urban areas. In spite of its paramount importance as livestock health care system, the various traditional veterinary practices remained undocumented in Africa and Ethiopia (DawitAbebe and AhaduAyehu, 1993). Thus, creation of awareness on ethno veterinary medicine emphasizing on

useful plants used for treatments of livestock has paramount importance to livestock management. In addition, proper documentation and understanding of farmers' knowledge, attitude and practices about the occurrence, cause, treatment, prevention and control of various ailments is important in designing and implementing successful livestock production (TafeseMesfine and Mekonen Lemma, 2001). In Ethiopia livestock production plays an important role in the lively hood and economy of majority of the population.

Ethiopia is one of the leading countries of Africa in livestock population (Mirutse Giday and Gobena Amini, 2003). Although Ethiopia is rich in its livestock population, it is one of the countries in the world with the lowest unit output.

The poor health condition and of its livestock has partially been responsible for the low productivity (Mirutse Giday and Gobena Amini,2003).The ever declining provision of animal health services related in the appearance of number of epizootic diseases reducing the economic efficacy of livestock production in Africa (Mirutse Giday and Gobena Amini, 2003). An ethno veterinary medicine involves the use of medicinal plants surgical techniques and livestock management practice to prevent and treat a range of animal diseases (Mathias, 1996). The study conducted by Wirtu *et al.,* (1997) revealed as animal health care were provided by the owners, traditional healers, and veterinary professionals. Besides, most modern drugs are expensive and as a result, not affordable by the majority of Ethiopian farmers and pastoralists, most of them rely on their traditional knowledge practices and locally available materials (mainly plants) in the control of diseases of their domestic animals (Mirutse Giday and Gobena Amini, 2003). In spite of its permanent importance as livestock health care systems the various traditional veterinary practices remained undocumented in Africa and Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993).

2.5 .Threats to and conservation of traditional medicinal plants (TMPs) in Ethiopia

2.5.1. **Threats to medicinal plants**

Africa's including Ethiopia's traditional medicine has faced with problems of sustainability Ensermu Kelbessa, *et al*., 1992). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge. Some studies have shown that most of the medicinal plants utilized by Ethiopian people are harvested from wild habitats (Mirutse Giday, 1999, Tesfaye Awas and Zemede Asfaw, 1999) and hence this implies the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species.

People use many wild species of plants for food, medicine, clothing, shelter, fuel, fiber, in come generation and the fulfilling of cultural and spiritual needs throughout the world (ZemedeAsfaw, 2001). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge. Some studies have shown that most of the medicinal plants utilized by Ethiopian people are harvested from wild habitats (MirutseGiday, 1999; TesfayeAwas and ZemedeAsfaw, 1999) and hence this aggravates the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species. There are two sources of threats to medicinal plants, i.e. man-made and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive species, commercialization, honey cut, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants. Likewise, natural causes include recurrent drought, bush fire, disease and pest out breaks (Ensermu Kelbessa *et al*., 1992). As elsewhere in Ethiopia, the problem is manifested in Ankesha Woreda due to the above-mentioned factors.

2.5.2. Conservation of traditional medicinal plants

Conservation is defined as the sustainable use of biological resources. The concept of sustainability is now seen as the guiding principle for economic and social development, particularly with reference to biological resources. According to ZemedeAsfaw (2001), medicinal plants are considered to be at conservation risk due to over use and destructive harvesting (roots and barks collection). Dawit Abebe and Ahadu Ayehu (1993) found that many medicinal preparations use roots, stem and bark by effectively killing the plant in harvest. Plant parts used to prepare remedies are different; however, root is the most widely used part. Such wide utilization of root part for human and livestock aliments with no replacement has severe effect on the future availability of the plant. Recent work of Haile Yineger (2005) confirms the fact that of the total plant parts to prepare remedies root is widely used with 64 species (35.5%) followed by leaf 47 species (25.97%) which hence affects sustainable utilization. In a broad sense, conservation is achieved through in-situ and ex-situ means. In-sit 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 (Zemede Asfaw, 2001). Moreover, some plants fail to produce the desired amount and quantity of the active principles under cultivation out of their natural habitats. Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemede 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. According to (Zemede Asfaw (2001), medicinal plants can be conserved using appropriate conservational methods in gene banks and botanical gardens. This type of conservation of medicinal plants can also be possible in home

gardens, as the home garden is strategic and ideal farming system for the conservation, production and enhancement of medicinal plants.

3. **Materials and methods**

3.1. Description of the study area

Ankesha is one of the 11 woredas of Awi zone Amhara Regional state. Gimjabet Mariam is the administrative capital of Ankesha. Ankesha is bounded in north by Banja woreda, in east Banja and Banjashikudad, in south Womberma, and Guangua in west. The woreda is located 135 km south from the capital of the Amhara Regional state, Bahir Dar and 18km from the administrative zone. It is 453 Km North of Addis Ababa, the capital city of Ethiopia. Its total area is about 102,924 hectares and comprises 16 Kebeles. Its elevation ranges 1500-2800 meter. Topographically, Ankesha Woreda is 70.8% plateau, 26% mountainous 2.2 % valleys, 0.1% swampy and 0.9 % others. (Fact sheet (2004) Ankesha Woreda Government Communications Affairs Bureau)

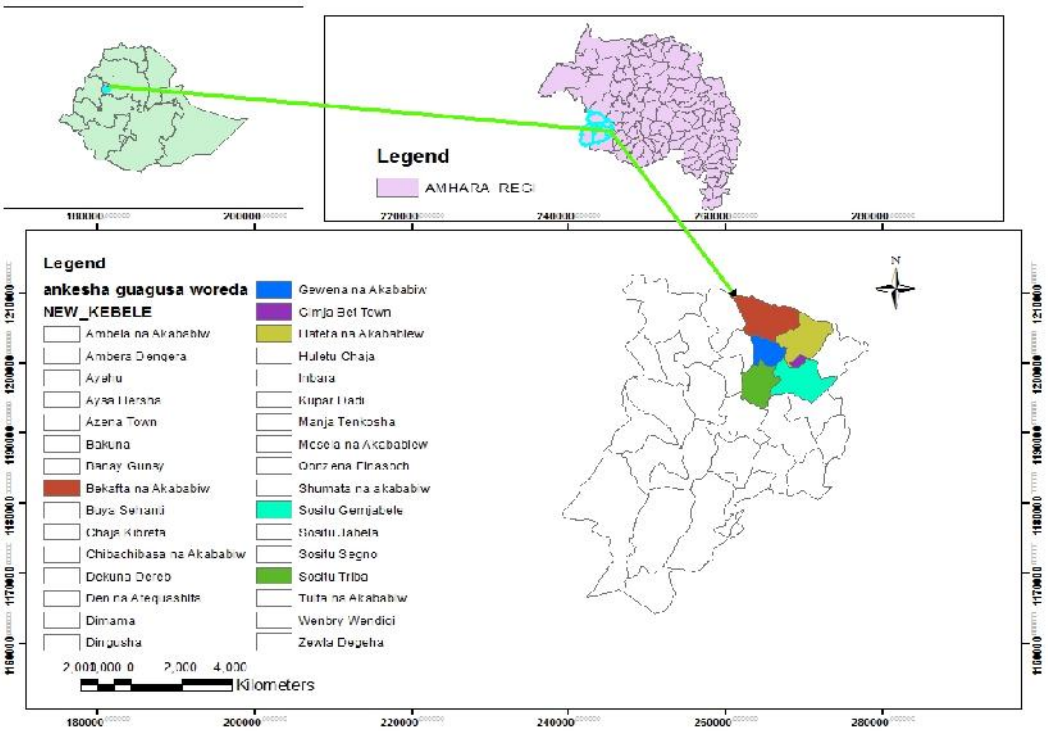

Figure 1. Map of Ethiopia showing study woreda and kebele

As the Woreda Government Communication Affairs Bureau fact sheet 2004E.C (AWCO,2012) the land utilization availability is: 72,271 hectares for farming, 8512 hectare covered by natural vegetation, 3,937 hectares for forests cultivated by community participation, 12,741 hectares for grazing, 720 hectare covered by water bodies and 360 hectares swampy. The meteorological data taken from the district Communication Office(AWCO,2017) indicates that the major rainy seasons in the district include spring(May), summer(June-August) and autumn(September-October).The average annual rainfall of the district 1600-2000 mm ,while the average annual temperature is about 15-20^{0}c.

Ankesha Woreda has three major climatic zones. These are Dega 10%, WoinaDega 80% and kola 10% (AWAO 2017). Different species of plants are grown in these three different climatic zones.

3.1.1. Population

According to (AWCO, 2017) the total population of the woreda is 235,816 of which 114,380 are males and 121,436 are females with a ratio of almost 1:1. From these 15,236 females and 13,065 males are living in the town. The remaining106, 200 females and 101,315 males are living in the rural areas.

The major ethnic compositions of the population found in the woreda are Awi 78.5%, Amhara 21% and 0.5% Gumiz. Awigna is the official language of both the District and the Administrative Zone. About 98% of the population is Orthodox Christians and the rest are Protestants and Muslims.

3.1.2. **Agriculture**

About 85% of the population is depending on agriculture. In kola climatic zones most people harvest pepper but in Dega climatic zone planting the invasive plant species such as, *Acacia decurrens*, and extracting charcoal is common (AWAO, 2017).

3.1.3. **Vegetation**

The vegetation of the study area consists of various trees, shrub and herbaceous species. Some of the common plant species include *Acacia abyssinica, Eucalyptus camaldulensis*, *Juniperus procera*, *Ficus species*, *Acacia decurrens*, *Podocarpas falcatus,* etc. The shrub layer includes *Justicia schimperiana, Olea europeae*, *Carissa spinarum*, *Calpurnia aurea*, *Vernonia sp*. etc. Most of the plants are found in and around protected areas, Church compounds and Grave yards. The other areas are highly degraded due to agricultural activities, overgrazing, and high demand of wood for construction, firewood and charcoal. Especially *Juniperus procera, Cordia africana* and *Acacia pilispina* are cut and highly used for construction and other purposes. The common crops cultivated in the study area include *Zea mays* (Maize), *Eragrostis tef* (Teff), *Hordeum vulgare* (Barley), *Triticumaestivum* (Wheat), *Pisum sativum* (Field peas), *Sorghum spp*. *Guizotia abyssinica* (Nug), *Brassica carinata (Gomenzer*), *Linum usitatissimun* (Telba) and etc(AWAO 2017).

3.1.4**. Soil**

The three different dominant soil types such as red, dark brown and black were favored to grow various types of plants. The soil of the study area is dark brown soil which covers 53%, red which covers 30% and black soil covers 17%. Dark brown soil is the type of clay that has greater importance for water storage capacity (Ankesha Woreda Agricultural Office, AWAO, 2017).

Table 1. Major food crops grown in the study area (Ankesha Woreda Agricultural Office,(AWAO 2017).

Crop category	Scientific name	English name	Local name
Cereals	*Hordeum vulgare*L	Barely	Simki
	Eragrostis tef (Zucc.) Troteer	Teffe	Taffi
	Sorghum bicolor. L	Sorghum	Tsila
	Triticum aestivum L.	Wheat	shumba
	Zea mays L	Maize	Sinday
			Shumbi
Fruits	*Carica papaya* L	Papaya	Papaya
	Mangifera indica L.	Mango	Mangu
	Persea americana	Avocado	Avucadu
	Citrus limon (L.) Burm.f.	Lemon	Lumini
	Psidium guajava L.	Zeytun	Zeytun
	Musa paradisiaca L.	Banana	Muzi
Vegetables	*Brassica oleracea* L	Cabbage	Amli
	Capsicum frutescens L	Pepper	Kitu

	Lycopersicon esculentum Mill *Allium sativum* L. *Cucurbita pepo* L *Allium cepa* L	Tomato Garlic Pumpkin Shallot	Timatim Shinkurchi Patu Dimi Shinkurchi
Root crop and Stem crops	*Solanum tuberosum* *Ipomoea batatas* (L) Lam *Daucus carota*	Potato Sweet potato Carrot	Dunizi Shuqur dunizi Carut
Oil crops	*Linum usitatissimum* L Guizoia *abyssinica*(L.f.) *Ricinus communis* L	Lin seed Niger seed Gulo	Tilbi Liniguhie Chaqimi
Pulses	*Pisum sativum* L. *Vicia faba* L. *Cicer arientinum*	Pea Bean Chickpea	Huna atirie Girigi atirie Shimbrie
Cash crops	*Coffee arabica* L. *Nicotiana tabacum* L	Coffee Tobacco	Bunn Sijarie

3.1.**5. Human health**

The numbers of health stations in the woreda are; hospital 1, health centers 8, health extensions 33 and the total civil servants employed in these stations are males 139, females 196, and total 335.The health problems in Ankesha District are directly or indirectly related to the problems of sanitation, inadequate diet, lack of potable water and poor physical condition of the houses. Data obtained from Health Office of Ankesha District (2017) show the three common health problems in the District based on the number of local people who have visited health services are febrile, Acute upper respiratory and infections, Helminthiasis in 2015/16; Acute upper respiratory infections, diarrhea in 2016/17(Source; AWHO), 2017)

Table **2.** Ten top human ailments in 2015-2017 and number of patients treated in study area

2015		2016		2017	
Diseases	Total	Diseases	Total	Diseases	Total
Febrile	9703	Febrile	11,104	Febrile	4935
Acute upper respiratory infections	6422	Acute upper respiratory infections	7699	Acute upper respiratory infections	3644
Helminthiasis	5389	Diarrhea	6665	Diarrhea	2733
Diarrhea	4872	Helminthiasis	5996	Helminthiasis	2264

Diseases of musculoskeletal system & connective tissue	4026	Diseases of musculoskeletal system & connective tissue	4266	Diseases of musculoskeletal system & connective tissue	2217
Trauma	3522	Infections of skin & subcutaneous tissue	3725	Infections of skin & subcutaneous tissue	1906
Infections of skin & subcutaneous tissue	3445	Trauma	3522	Trauma	1650
Malaria	2625	Urinary tract infection	2343	Urinary tract infection	1148
Urinary tract infection	2040	Unspecific diseases	1666	Malaria	811
Unspecific diseases	1536	Malaria	1607	Asthma	632

3.2. **Reconnaissance survey and selection of the study sites**

Ankesha woreda has total of 16 kebeles. Reconnaissance survey was conducted from September to October 2017 to select 8 potential kebeles, which included; Bekafita, Hateta, SosituG/bet, Denatiquasheta, Sositu Tirba, Gewena, 01 and 02 kebeles 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.

A total of 60 informants (22 females and 38 males), out of these, 8 key informants were selected by purposive random sampling based on the recommendations of local authorities and knowledgeable elders. The other 52 informants were selected randomly from the local people of the study area. Age group of the informants consists of young (20-39), middle (40-49) and elders (50-80)

3.3. Data collection technique

3.3.1. Semi structured interview

Semi- structured interviews were prepared and used as guide following Martin (1995); Cotton (1996).

Semi structured interview allowed the investigator to provide supplementary question when needed. The items in the questionnaire were first prepared in English based on modified other related literatures (Appendix 6).Then they had been translated into local language Awigna and Amharic. Most of the questions were focused on the availability, distribution and threats of traditional medicinal plants in Ankesha wereda. From Bekafita, Hateta, Denatiquasheta, SosituTirba, Sositu G/bet, Gewena, 01and 02 kebeles 60 respondents were selected for this

interview since these could gave significant information for the investigator about the conservation, distribution threats of traditional medicinal plants and information flow from elders to youngers.

Key informants were first interviewed individually (Appendix 7) to mention about types of human and livestock ailments in the study area, the local names of the plants they use to treat diseases, diseases treated, part(s) of plants used, methods of gathering, methods of preparation of remedies, route of administration of remedies, application of the remedies, dosage, side effects of the treatment, use of the plants other than medicine, types of threat and conservation problems.

3.3.2. Group discussion

According to Martin (1995), intuition and experience are the best guides to informal ways of gathering information.

Group discussion was conducted one times with the most knowledgeable ones who were suggested by respective kebele elders and administrators about the status of the distribution, threats and conservation attempt of traditional medicinal plants. Six male respondents were participating in group discussion in Bekafita Kebele for one hour. They interacted face to face and actively discussed on the distribution, threats and conservation in order to share information about a topic. During the discussion, the informants were free to state about the traditional medicinal plants without interference (Figure 2).

Figure 2. Group discussion with informants at Bekafita Kebele [Photo courtesy by Bereket Nega 2018]

3.3.3 .Field observation

Field observation was conducted in Zehtsi Forest at Hateta kebele, Techtsi Forest at Bekafita kebele, Tirba Forest in Tirba kebele Dangula Washa in Denatiquasheta (Figure 3). Field observation was carried out with the guidance of the local people. Important points such as the plant community and the status of the medicinal plants in each visually identified plant ethno-community type and cultivation practices of medicinal plants by the local people were also be recorded. This field observation was carried with the famous traditional healer in each kebele

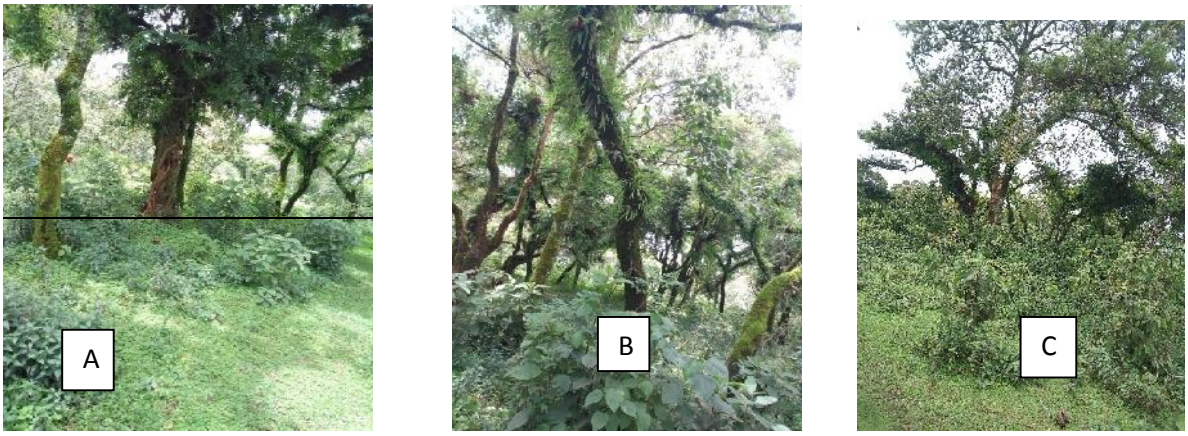

Figure 3. Forests of the study area (A-Zehtsi Forest dominated by ***Thalictrum rhynchocarpum*** , B-Techtsi Forest dominated by ***Acacia pilispina*** and C-Dangula Washa Forest dominated by ***Croton macrostachyus***) [Photo courtesy by Alemitu Adane 2018]

3.3.4. Guided field walk

Guided field walk is a combination of observation and interview methods. In this method, the researcher guided some interviewee to the most knowledgeable once who was suggested by respective kebele elders and administrators through areas where the plants of interest were expected to be found. Specimen collection and recording had done at spot while the interview is undergoing. It gave time to observe and discuss parts of plant harvesting or patterns of plant distribution (Figure 4). .


Figure 4. Guided field walk (Left Hateta Kebele While the right Tirba Kebele) [Photo courtesy by Sibihat Nega 2018]

3.3.5. Market survey

Market survey had taken in one market within Ankesha Woreda, Gimjabet Mariam market to observe and collect data on the marketability and trade of medicinal plants (Figure 5). Therefore, a market survey was conducted to gather the ethnobotanical information, to distinguish and record the type of herbal drugs sold in the market, and the multipurpose role of some medicinal plants.

Figure 5. Market survey (Gimjabet Mariam market in different position)[Photo courtesy by Alemitu Adane 2018]

3.3.6. Specimen collection and identification

Medicinal plants were collected from wild and cultivated areas. The local names, habits and associated plants were collected. The collected voucher specimens were taken to the National Herbarium of Ethiopia (Addis Ababa University). The identification was done from March to April by using various volumes of the Flora of Ethiopia and Eritrea. Finally, the identification of the voucher specimens was confirmed by my advisor Dr. Ermias Lulekal and deposited at National Herbarium of Ethiopia (Addis Ababa University).

3.4. Data analyses

3.4.1. Descriptive statistics

The ethnobotanical data was entered into microsoft Excel 2007spread sheet and organized for statistical analysis.

A descriptive statistical method was applied to compute the (percentage and/or frequency) of species,genera and families ofethnobotanical medicinal plants, their growth forms, proportion of plant parts harvested,mode of remedy preparation and routes of administration.

3.4.2. Informant Consensus Factor

Informant consensus factor (ICF) was calculated for categories of ailments to identify the agreements of the informants on the reported cures using the formula. ICF was calculated using the following formula ICF = Nur −Nt/ (Nur −1) Where Nur is the number of individual plant use reports for a particular ailment category, and Nt is the total number of species used by all informants for this aliment category (Martin, 1995). It may be used to analyze the data which will be gathered through group discussion.

3.4.3. Direct matrix ranking

The direct matrix ranking was done as group exercise in which participants reach consensus on ranking of each item or vote according to their individual assessments (Martin, 1995).

3.4.4. Preference ranking

Preferance ranking was conducted by using eight key informants to rank seven medicinal plants reported to cure abdominal pain with different parts of medicinal plant used being paper tagged then asked to assign the highest value (7) for the most preferred species against this illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining one. The value of each species was summed up and the rank for each species determined based on the total score. This helps to indicate the rank order of the most effective medicinal plants used by the community to treat the disease.

3.4.5. Fidelity level (FL)

The percentage of informants claiming the use of a certain plant for the same major purpose was also calculated for the most frequently reported diseases or ailments using the following equation (TilahunTeklehaymanot, 2007).

$$FL\ (\%) = NP/N \times 100$$

Where NP is the number of informants that claim the use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

4. Results

4.1. Ethnomedicinal Plant Species of the Study Area

A total of 62 species of medicinal plants used to treat different health problems were gathered and documented from the study area. These plants were found to belong to 59 genera and 40 families. Out of these plants, 51 species (82.2%) were noted to treat only human ailments while 5 species (8.1%) are used to treat livestock ailments and 6 species (9.7%) were reported to be to treat both human and livestock ailments. In terms of species composition, family, Asteraceae contained 5 species family because of treating different disease and their diversity in the study area; Cucurbitaceae& Rosaceae consisted 4 species each (Table 3) (Appendix3**).**

Table 3. Distribution of collected species in different families

Family	No. of genera	Percent (%)	No. of species	Percent (%)
Asteraceae	4	6.77	5	8.06
Cucurbitaceae	4	6.77	4	6.45
Rosaceae	3	5.08	4	6.45
Rutaceae	2	3.38	3	4.83
Euphorbiaceae	3	5.08	3	4.83
Solanaceae	3	5.08	3	4.83
Alliaceae	1	1.69	2	3.22
Oleaceae	2	3.38	2	3.22
Poaceae	1	1.66	2	3.22
Myrtaceae	1	1.66	2	3.22
Ranunculaceae	1	1.66	2	3.22
Fabaceae	2	3.38	2	3.22
Malvaceae	2	3.38	2	3.22
The remaining species	1	45.76	1	41.93

4.2 Medicinal plants Used to Treat Human and Livestock Diseases

The numbers of ethnomedicinally important plant species that were reported to treat human ailments in the 8 kebeles of Ankesha Woreda were 62 species which were mentioned to treat 47 different human and livestock ailments. Out of total (40) families and 59 genera, only 32 families and 49 genera are used to treat human ailments (Table 4), while the rest 8 families and 10 genera are used to treat livestock and both.

Table 4. Medicinal plants used to treat only human diseases

Family	No. of genera	Percent	No. of species	Percent
Rosaceae	2	5.4	4	7.8
Cucurbitaceae	1	2.7	4	7.8
Rutaceae	1	2.7	4	7.8
Euphorbiaceae	1	2.7	3	5.9
Asteraceae	1	2.7	2	3.9
Alliaceae	2	5.7	2	3.9
Oleaceae	1	2.7	2	3.9
Poaceae	1	2.7	2	3.9
Myrtaceae	1	2.7	2	3.9
Malvaceae	1	2.7	2	3.9

Table 5. Medicinal plant used to treat only livestock diseases

Family	No. of genera	Percent	No. of species	Percent
Asteraceae	1	20	1	20
Fabaceae	1	20	1	20
Solanaceae	1	20	1	20
Bignoniaceae	1	20	1	20
Scrophulariaceae	1	20	1	20

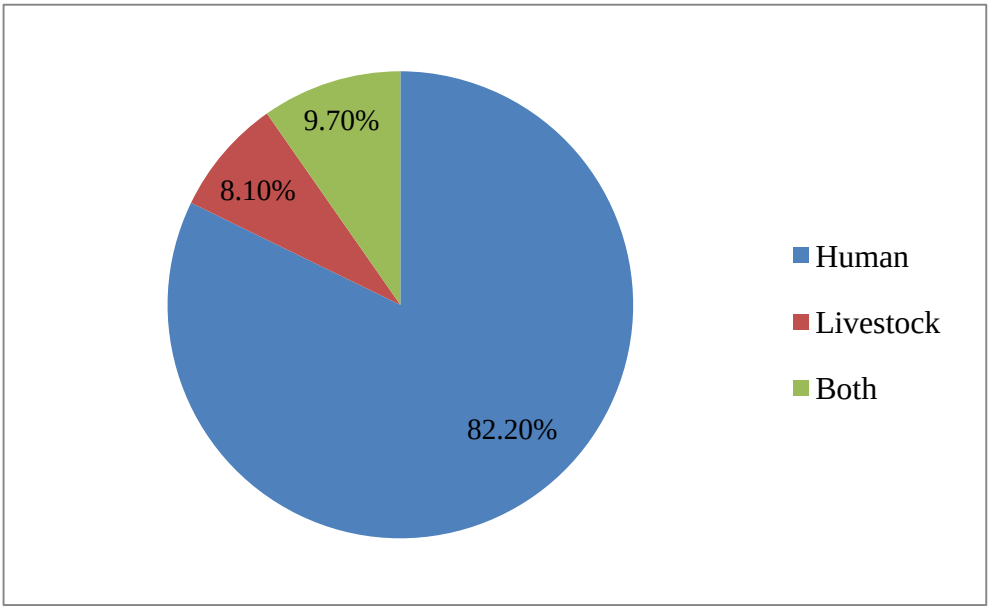

Figure 6. Medicinal Plants used to treat Human, Human & Livestock and Livestock ailments

In this study some plants were reported to have medicinal value more frequently than others to treat various ailments. For example *Euphorbia ampliphylla*, was cited by 38 informants as a source of remedy for treating Ascaris, Rabies virus, Leprosy and Wart followed by *Allium sativum* cited by 32 informants for intestinal pain, common cold, Kidney pain, Malaria and Kidney filtration; *Carica papaya* by 26 informants to treat Diabetes, Blood pressure and Wound *Lepidium sativum* by 20 informants to treat Tumor and Gonorrhea *Cucurbita pepo*; by 15

informants to treat Tape worm and Joint pain; *Zehneria scabra* by 13 informants to treat common cold; *Croton macrostachyus* by 12 informants to treat skin fungal disease; *Phytolaca dodecandra* by12(20%) informants to treat Vomiting(kuriba);*Ruta chalepensis* by 8 informants to treat Common cold; *Zingiberofficinale* by 6 to treat abdominal pain(Table 6).

Table 6 .Medicinal plants cited most by informants

Scientific name of plants	No. of informants	Percentage
Euphorbia ampliphylla	38	63.33
Allium sativum	32	53.33
Carica papaya.	26	43.33
Lepidium sativum	20	33.33
*Cucurbita pep*o	15	25
Zehneria scabra	13	21.66
Croton macrostachyus	12	20
Phytolaca dodecandra	12	20
Ruta chalepensis	8	13.33
Zingiberofficinale	6	10

4.2 1. Sources (Habitats) of medicinal plant

The majority of medicinal plant species were obtained from wild followed by home garden, road side, agricultural field and live fence (Table 7). The fact that high number of medicinal plant species was obtained from wild suggests that; the wild environment is highly exploited for its medicinal plant resources hence needs prior conservation attention.

Table 7. Distribution of medicinal plants in different habitats

Habitat type	No. of medicinal plants	Percentage
Wild	30	48.4
Home garden	18	29
Road side	6	9.6
Agricultural field	4	6.5
Live fence	4	6.5
Total	62	100

4.2.2. Plant habits (growth forms)

Analysis of growth forms of these medicinal plants (Figure 7) revealed that herbs constitute the largest category (23 species, 37.1%) of the reported human and livestock medicinal plants followed by shrubs (18 species, 29%), trees (15 species,24.2%) and climbers (6 species, 9.7%).

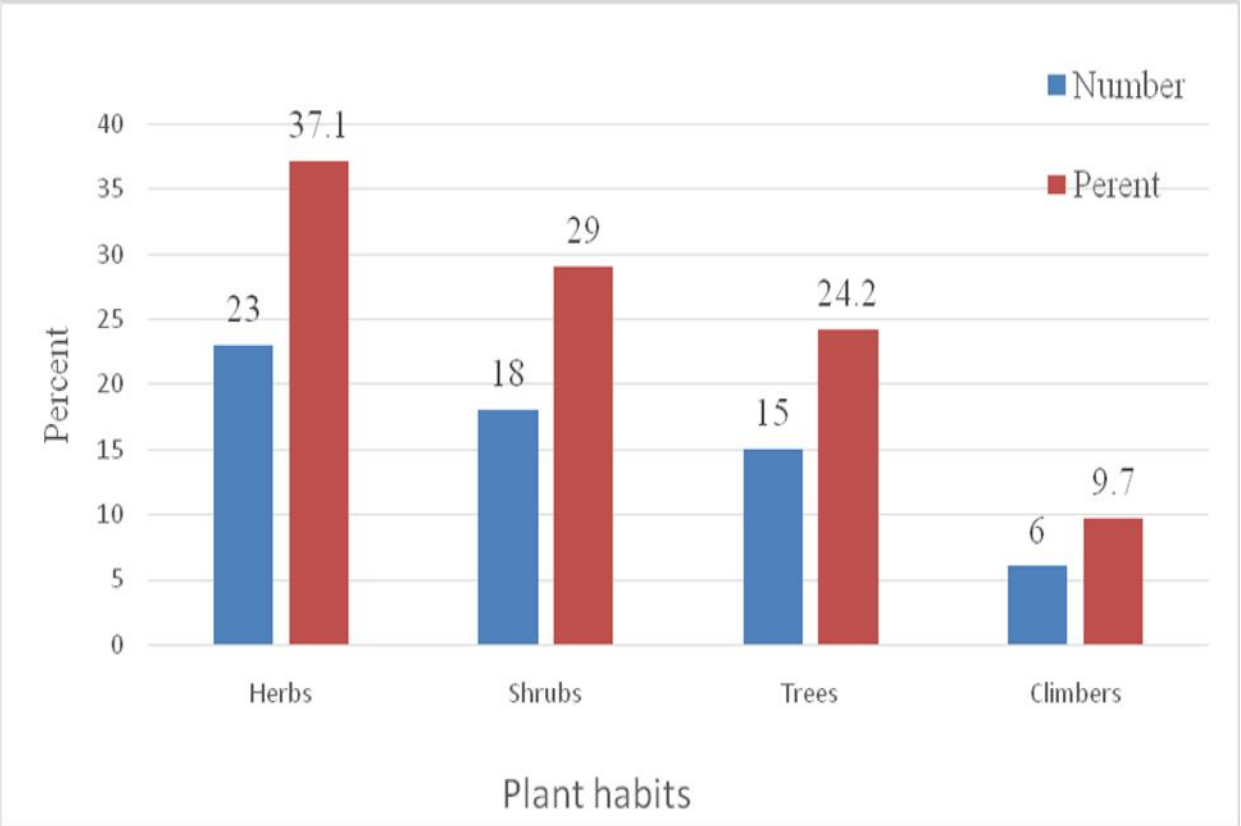

Figure 7. Habits of medicinal plants used for human and livestock

4.2.3. Plant part(s) used for medicine

During the study different parts of medicinal plants were reported by respondants to be used for medicines. The most frequently utilized plant parts were leaves followed by roots (Table 8).

Table 8. Plant parts used for traditional medicine preparations in Ankesha woreda

Plant parts	Total responses	% of total
Leaves	30	29.7
Roots	25	24.7
Seeds	14	13.8
Fruits	7	6.9
Stems	7	6.9
Bulbs	5	4.9
Sap	4	3.9
Latex	3	2.9
Bark	2	1.9
Flower	2	1.9
Bud	2	1.9

4.2.4. Preparation methods of remedies

Concerning the preparation of traditional medicine, the local people employ various methods of preparation of traditional medicines for human and livestock ailments. The method of preparation depends on the type of disease treated. The major methods of preparation of medicinal plants were crushing(53.5%),squeezing(12.6%),chewing(12.6%),boiling(9.8%),soaking(4.2%),and roasting(2.8%)(Table 9).

Table 9 .Preparation methods of herbal medicine reported by people of Ankesha woreda

Forms of preparation	Total responses	% of total
Crushing	38	53.5%
Squeezing	9	12.6%
Chewing	9	12.6%
Boiling	7	9.8%
Soaking	3	4.2%
Roasting	2	2.8%
Cooking	1	1.4%
Roasting and crushing	1	1.4%
Chopping and boiling	1	1.4%

4.2.5. Conditions of preparation of remedies

Local people of the study area prepare medicinal plants are in fresh form, dried or fresh and dried. The results showed that herbal remedies are prepared using fresh material 35 (56.5%), while 7 (11.3%) were used in the case of dried plant material and 20 (32.2%) either fresh or dried (Fig 8).

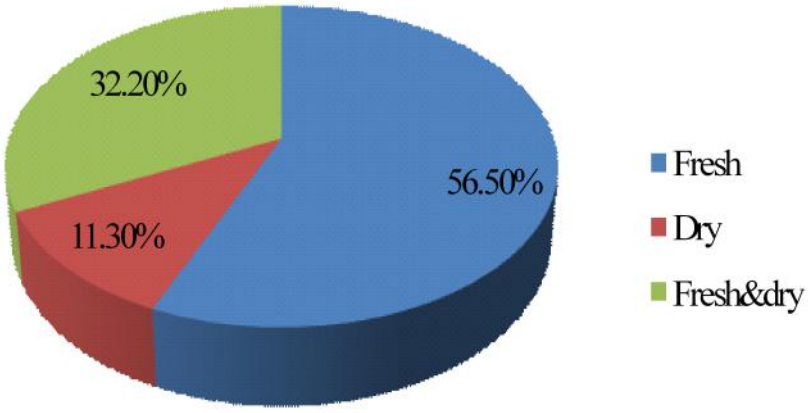

Figure 8. Conditions of preparation of plant remedies in Ankesha district

4.2.6. Dosage and route of administrations

The route of Administration includes oral, dermal, nasal, ear canal and optical. From the reported route of Administration the highest use through oral (62.6%), dermal (21.2%) ((Fig 9)

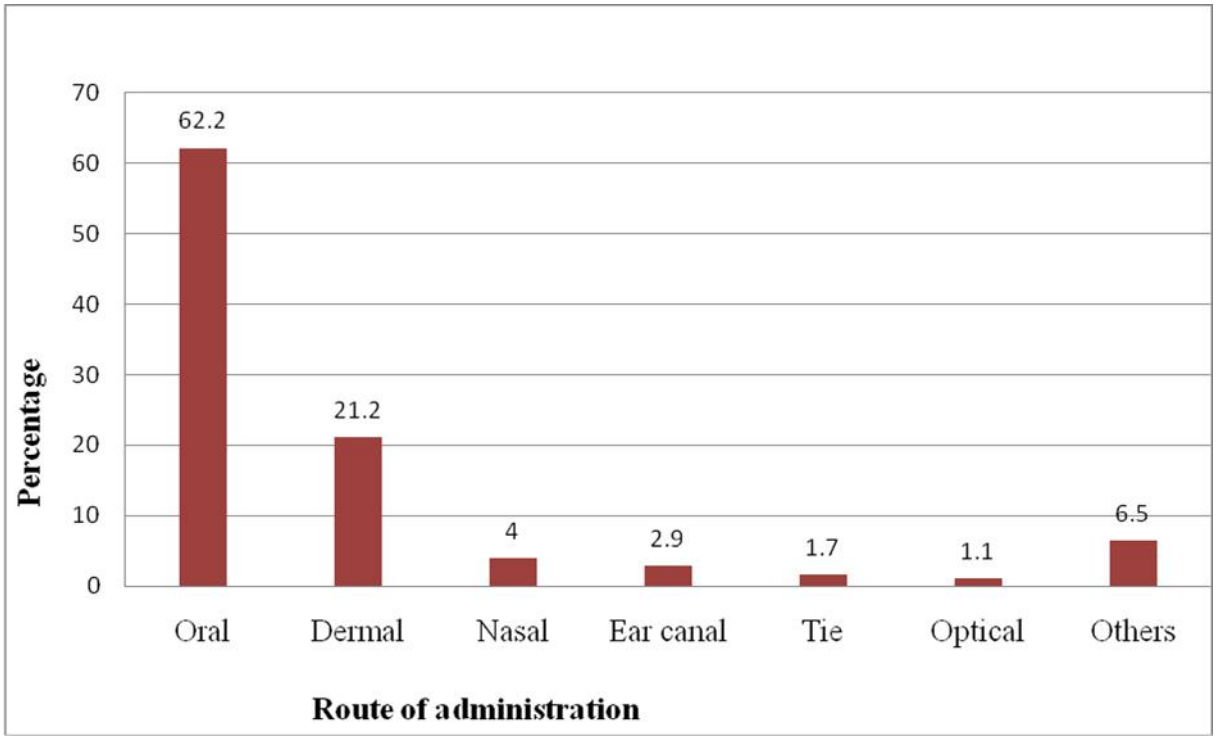

Figure 9. Route of administration of plant remedies used for human and livestock

4.2.7. Ways of applications of plant remedies

The prepared traditional medicines are applied in a number of methods, among which drinking (33%), smearing (15.5%), eating (13.7%), put on and tide (10.7%), chewing (8.8%), smoking (6.8%), dropping (5.8%) swallowing (2.9%) and others (2.9%) (Table10).

Table 10. Ways of application of plant remedies in human and livestock ailment treatment

No. Ways of Applications	Total Responses	Percentage (%)
Drinking	34	33%
smearing	16	15.5%
Eating	14	13.7%
Put on and tie	11	10.7%
Chewing	9	8.8%

4.2.8. Informant consensus factor (ICF)

The diseases of the study area have been grouped into different categories based on the types of the diseases, condition of the disease as well as treatment resemblance of the disease to the local people. The results of the study showed that diseases that are frequent in the study area have higher informant consensus factor. It is further shown that medicinal plants that are effective in treating certain diseases and well known by community members also have higher ICF values (Table 11).

Table 11.Informant Consensus Factor (ICF)

Disease categories	Nt	Nur	ICF
Skin problems,dandruff,athlete'sfoot,wound	4	59	0.94
Abdominal pain ,intestinal pain, diarrhea, vomiting	4	45	0.93
Organ diseases; eye ear,teeth,head,kidney,liver	5	58	0.92
Respiratory system problems, common cold, cough	5	48	0.91
STDs menstrual problem, sexual impotency,abortion,shotel	4	32	0.9
Swelling,'mich',dehydration,	3	20	0.89
Malaria, rabies viruses	4	29	0.89
Evil eye	2	10	0.88
Joint pain, hiccup,	3	13	0.83
Diabetes ,blood pressure	3	11	0.8
Animal diseases ,leeches ,anthrax, animal bit, colic, skinny	7	30	0.79
Tonsillitis ,goiter	4	15	0.78

4.2.9. Fidelity level index (FLI)

Fidelity level (FL) values were calculated for some commonly used medicinal plants against the some commonly reported ailments: *Allium sativum* (against malaria), *Croton macrostachyus* (against skin fungal disease), *Euphorbia ampliphylla* (against Skin wart and leprosy), *Phytolacca dodecandra* (against vomiting), *Ruta chalepensis* (against common cold), *Embelia schimperi* (against tape worm) and *Vernonia amygdalina* (against abdominal pain) (Table 12).

Table 12. Fidelity level index of some medicinal plants

Botanical Name of Medicinal Plants	Examples of ailment treated	N p	N	FL	FL%
Allium sativum	Malaria	28	30	0.93	93
Croton macrostachyus	Skin fungal disease	24	26	0.92	92
Euphorbia ampliphylla	Skin wart and leprosy	19	22	0.86	86
Phytolacca dodecandra	Vomiting or" kuruba"	14	17	0.82	82
Ruta chalepensis	Common cold	12	16	0.75	75
Embelia schimperi	Tape worm	10	14	0.71	71
Vernonia amygdalina	Abdominal pain	9	13	0.69	69

4.2.10. **Preference ranking**

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of seven medicinal plants that were reported for treating abdominal pain was conducted after selecting eight key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (7) for most effective and the lowest number (1) for the least effective plant in treating abdominal pain. *Zingiber officinalea* scored 42 ranked first indicating that it is the most effective in treating abdominal pain followed by *Allium* sativum and the least effective was *coriandrum sativum* (Table13)

Table 13. Preference ranking of medicinal plants used for treating abdominal pain

List of medicinal plants	R1	R2	R3	R4	R5	R6	R7	R8	Total	Rank
Zingiber officinale	7	6	6	7	4	3	7	3	42	1st
Allium sativum	7	5	6	5	7	2	5	4	41	2nd
Vernonia amygdalina	5	4	5	6	3	2	6	5	36	3rd
Lepidium sativum	5	6	3	5	4	4	3	3	33	4th
Trigonella foenum- graecum	4	5	4	2	5	3	1	2	26	5th
Rubus steudneri	4	2	3	2	2	4	1	2	20	6th
Coriandrum sativum	3	3	2	1	4	2	2	1	18	7th

Key R-informants

4.2.11. Direct matrix ranking

Direct matrix ranking FW-fire wood, For-forage, Co-constraction, Fu-furniture, Ch-charcoal, Fe-fence, Me-medicine.

Average score for direct matrix ranking of six medicinal plant species based on their general use values (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used)(Table 14).

Table 14. Ranking of multipurpose medicinal plants

Species	Use categories								Total	Rank
	Fw	For	Co	Fu	Fo	Ch	Fe	Me		
Rubus apetalus	5	2	0	0	3	3	5	5	23	3rd
Eucalyptus globulus	4	0	5	3	0	5	4	4	25	1st
Carissa spinarum	4	0	1	1	4	4	4	3	21	4th
Rubus steudneri	2	1	1	0	4	2	5	4	19	6th
Arundinaria alpina	4	3	5	5	0	0	5	2	24	2nd
Embelia schimperi	2	2	0	2	3	2	5	5	21	5th
Total	21	8	12	11	14	16	28	23	132	
Rank	3rd	8th	6th	7th	5th	4th	1st	2nd		

4.3 .Market survey in the study area

The local market surveys were conducted with in the area of research to document the medicinal plants used in health ailments that are sold in local markets. But, there were not medicinal plants that are sold in the market legally. During the interview, the respondents explained that most healers prepared and sold TMPs in the home rather than selling in the market. Since the local people prefer either collecting these plants by themselves from the available areas in the district to prepare the medicines or they prefer to go directly to the local healers to get treatments instead of buying the medicinal plants from the market.

Some medicinal plants (*Zingiber officinale, Allium cepa, Allium sativum, Ruta chalepensis, Linum usitatissimum, Trigonella foenum-graecum, Citrus Limon, Artemisia abyssinica and Lepidium sativum)* were marketed (Appendix 5).

4.4. Threats to Medicinal Plants and Indigenous Knowledge

4.4.1. Factors Which Threatening Medicinal plants

Rural people need plants in their livelihood for different aspects. From the interview with informants various factors were recorded as the main threats to medicinal plants in Ankesha Wereda. Agricultural encroachment, firewood collection, charcoal production, plant use for house and fence construction, overgrazing, and urbanization were reported to be factors for the dwindling of natural vegetation in general and medicinal plants in particular(Table15).

Table 15. Ranking of threats to medicinal plants

Threat	R1	R2	R3	R4	R5	R6	R7	R8	Total	Rank
Agricultural expansion	6	5	3	4	5	2	6	6	37	1
Charcoal	5	2	4	5	4	3	6	2	31	4
Fire wood	3	4	5	5	2	6	4	5	34	2
Construction	4	5	3	2	5	3	5	6	33	3
Fodder	2	3	1	4	5	2	2	3	22	6
Drought	5	6	4	3	6	2	1	3	30	5

4.4.2. Threatened medicinal plants

The ranking of five medicinal plants based on the degree of threats was conducted using 8 key informants. The results indicated that *Echinops kebericho* was the most threatened medicinal

plant followed by *Aloe trigonantha* and *Kalanchoe petitiana* and the least threatened were *Phoenix reclinata* and *Embelia schimperi* respectively.

The ranking of five medicinal plants based on the degree of threats was conducted using 8 key informants (Table16).

Table 16.Ranking of threatened plants

Threatened plants	Informants									
	R1	R2	R3	R4	R5	R6	R7	R8	Total	Rank
Aloe trigonantha	3	4	5	3	5	3	4	5	32	2nd
Echinops kebericho	5	4	5	4	3	5	3	5	34	1st
Embelia schimperi	3	2	3	2	2	4	5	3	24	5th
Phoenix reclinata	4	3	4	2	3	4	3	4	27	4th
Kalanchoe petitiana	2	3	4	5	4	3	5	4	30	3rd

4.5. Management and conservation of medicinal plants

Informants reported that the healers know time and processes of gathering and storing medicinal plants. It is once a year that some medicinal plants are collected and preserved. Seed, leaf, fruit or root are harvested, dried and preserved in roof corners or outside house, and dried parts are powdered and stored in different containers like pots, bottles or tied with clothes and used when needed. Indigenous people of the area have strong and genuine belief on healing power of plants and they know their habitat, distribution, harvesting technique, time of harvest and the status of a plant in the area. For instance, 24 medicinal plants were found in majority of family gardens and farm borders in the study area, as they need these plants in their daily life as medicine or for other

values. Medicinal plants were also maintained or protected near vicinity due to their fragrance, as live fence to avoid enemies, as spices and for food. Plants are also left as remnants of forest in agricultural field due to their uses for construction, fuel wood and other values.

5. Discussion, Conclusion and Recommendation

5.1. Discussion

5.1.1. Ethnomedicinal Plant Species of the Study Area

A total of 62 species of medicinal plants used to treat different health problems were gathered and documented from the study area. These plants were grouped to 59 genera and 40 families. The presence of 62 plants used by the local people to treat 47 different types of human and livestock ailment was a good indication of the deep rooted culture of medicinal plants use in the study area. Out of these, more number of medicinal plants (51) were used for treatment of human ailments. This result shows that the local communities have more indigenous knowledge and give emphasis to the uses of medicinal plants to treat human ailments than livestock diseases. This result is similar with other results which were documented in other study sites of Ethiopia (Tesfaye Awas and Sebsebe Demissew, 2009; Mirutse Giday *et al*., 2009; Moa Megersa, 2010; Getaneh Gebeyehu, 2011).

The presence of traditional knowledge and practice on large number of medicinal plants by people of Ankesha woreda shows that the indigenous people of the area still depends on traditional medicine of plant origin. About 75-90 % of the rural population in the world (excluding western countries) relies on traditional medicines as their only health care system, because of their availability and cheap coast. Some of the medicinal plants recorded in Ankesha district are also used as remedies in other parts of Ethiopia Fisseha Mesfin (2007) documented 30 plant species. In terms of species composition, family, Asteraceae contained 5 species which may related to its abundance and distribution in the study area. But families; Cucurbitaceae& Rosaceae consisted 4 species each followed by Euphorbiaceae, Rutaceae and Solanaceae consisting of 3 species each. The remaining families contained two or one species each. Similarly the dominance of family

Asteraceae for the treatment of human diseases was reported in the work of Endalew Amenu (2007) and, Seyoum Getaneh (2009).

5.1.2. Habits and Sources of Medicinal Plants

In this study most medicinal plants were collected from the wild (48.4%).But the rest were collected from home gardens (29%), roadside (9.6%), agricultural field (6.5%) and live fence(6.5%).The finding is similar with the findings of other ethnobotanical studies elsewhere (Haile Yineger and Delenasaw Yewhalaw, 2007; Ermias Lulekal *et al.,* 2008; Tesfaye Hailemariam *et al*., 2009; Getu Alemayehu, 2010; Nigussie Amsalu, 2010; Emiru Birhane *et al.,* 2011; Gidey Yirga *et al*., 2011) in which wild areas are the most sources of medicinal plants. This indicates that the practitioners mostly exploit the wild sources or the natural environment rather than homegardens to obtain the medicinal plants in the study area.

Of the total 62 medicinal plants collected from the study area, 23 (37.1 %) were herb species followed by, 18 (29%) shrub species, 15 (24.2 %) tree species and 6 (9.7%) climbers. This shows that the most widely used medicinal plants in the study area are herbs followed by shrubs. This may be due to high level of abundance and distribution of herbs in the study area compared to trees and climber species. Relatively high number of herbs and shrubs for medicinal purpose has also been reported previously by Debela Hunde (2004) who studied medicinal plants of Boosat around Welenchiti area.

5.1.3. Plant Parts Used, Conditions and Mode of Preparation

Results of plant parts used for medicinal purposes indicated that, the local communities mostly use leaves (29.7%) followed by roots (24.7%). Other plant parts were also used to prepare traditional medicine, i.e., seeds (13.8%), fruits (6.9%), stem (6.9%), bulbs (4.9%), sap (3.9%),

latex (2.9%), barks (1.9%), flowers (1.9%) and buds (1.9%). Analysis of the data showed that leaf was the most widely used part for preparation of remedies. Previous reports in Ethiopia have also shown that leaves were the most commonly used: followed by roots to treat various health problems (Mirutse Giday, 2001; Haile Yineger and Delenasaw Yewhalaw, 2007; Mirutse Giday *et al*., 2009; Tesfaye Hailemariam *et al.*, 2009).

Given the highest frequency of leaves used for medicinal purposes in the study area, threat to the destruction of medicinal plants was found to be minimal, as high threat to the mother plant comes with root, bark and stem harvest. According to Dawit Abebe and Ahadu Ayehu (1993) medicinal plant harvest that involves roots, rhizomes, bulbs, barks and stems have serious effect on the survival of mother plants.

There are different methods of traditional medicinal plant preparations of remedies. The most frequent and popular mode of preparation was in the form of crushed which accounts (53.5%) followed by squeezing (12.6%), chewing (12.6%), boiling (9.8%). However, Getaneh Gebeyehu (2011), in a similar study on people of Mecha District reported that most of the plant remedies are prepared by squeezing.

In this study, the local people also use some other products as additives in their preparations. For example, water, oil, butter, salt, milk, honeys are some of the additives that the local people reported to be used to improve the flavor and reduce adverse effects such as vomiting and diarrhea so that the efficacy of the traditional medicine would be maintained or increased. Such additives were also reported by some previous researchers (Dawit Abebe, 1986; Mirutse Giday, 1999).

The results showed that herbal remedies were prepared using fresh material 35 (56.5%), while 7 (11.3%) were used in the case of dried plant material and 20 (32.2%) either fresh or dried similarly, a study conducted by previous researchers Endalew Amenu (2007); Haile Yineger and Delenasaw Yewhalaw (2007); Moa Megersa (2010) and Nigussie Amsalu (2010), showed that using fresh materials for different health problems is more than dry materials because the contents are not lost before use compared to the dried forms.

5.1.4. Route of Administration, Dosage and Application of Medicinal Plants

The route of Administration includes oral, dermal, auricular, nasal, and others. Overall, oral administration was reported as a dominant route of administration (62.6%) followed by dermal route (21.2 %) and others (16.2%). Both oral and dermal routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power. This finding agrees with some previous reports (Dawit Abebe, 1986).

The dosages of medicine to be administered were reported to be given by rough estimation of the age and physical condition of the patient. Hence there was no precision on the dosage of the remedy. Dawit Abebe and Ahadu Ayehu (1993) reported that lack of precision in the dosage is one of the major drawbacks of practicing traditional remedy.

The prepared traditional medicines are applied in a number of methods, among which drinking (33%), smearing (15.5%), eating (13.7%), put on and tie (10.7%), chewing (8.8%), smoking (6.8%), dropping (5.8%) swallowing (2.9%) and others (2.9%).This finding is in agreement with other findings of ethnobotanical studies in Ethiopia (Alemayehu Kefyalew, 2010; Eskedar Abebe, 2011).

5.1.5. Top Ranking Medicinal Plants

Eight respondents were asked to compare *Zingiber officinale, Allium sativum Vernonia amygdalina, Lepidium sativum, Trigonella foenum-graecum, Rubus steudneri* and *Coriandrum sativum* medicinal plants based on their efficacy of to identify the most effective medicinal plant used for treating abdominal pain. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (7) for the medicinal plant which they thought most effective in treating abdominal pain and the lowest number (1) for the least effective plant in treating abdominal pain. *Zingiber officinale* scored 42 ranked first indicating that it is the most effective in treating abdominal pain followed by *Allium* sativum, *Vernonia amygdalina,* Lepidium *sativum* and *coriandrum sativum* was the least effective. On the other hand study by Mohammed Adafa (2009) reported that *Allium sativum* is the most preferred species in the treatment of several diseases followed by *Nigella sativa* in Tuhuledere district, Ethiopia.

The medicinal plants that are widely used by the local people to treat one or very few ailments will have higher FL values than those that are less popular (Tilahun Teklehaymanot and Mirutse Giday, 2007). For example, *Allium sativum* was reported by many informants to treat malaria and hence had 93% FL. In a similar study, Endalew Amenu (2007) has reported *Allium sativum* to be the prior plant species used for treating malaria in Ejaji area.

The results showed that some medicinal plants were popular than others. The medicinal plants were supposed to be effective in treating certain disease had higher ICF values, which indicated that these diseases were more common than those with low ICF. It is further shown that medicinal plants that are effective in treating certain diseases and well known by community members also have higher ICF values. With the ICF values ranging from 0.94 to 0.77 per illness category.

Problems of respiratory system had the highest ICF value (0.94) due to the high incidence of the disease in the area whereas; Heart problems, Diabetes, Blood pressure, had the lowest (0.77) may be due to the rare occurrence of these diseases and the fact that most are successfully treated by local healers. According to Tilahun Teklehymanot and Mirutse Giday, (2007) medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values. A high ICF value close to 1 indicates that the respondents rely most on the same taxa to manage specific disease condition, While low values of ICF close to 0 indicate that the informants disagree on the taxa to be used in the treatment of a given ailments.

In this study, a number of medicinal plants were found to be multipurpose species being utilized for a variety of uses. The common uses include medicinal, fodder, food, firewood, construction, charcoal, fencing and furniture making. Six commonly reported multipurpose species and eight use-categories were involved in direct matrix ranking exercise in order to evaluate their relative importance to the local people and the extent of the existing threats related to their use values.

Eucalyptus globulus and *Arund*inaria *alpina*, were ranked 1^{st} and 2^{nd} and hence are the most preferred medicinal plants by local people for various uses and are the most abundant species as the informants reported, which was not evidently shown by their distribution scarcity and time required for collection of these species.

Similarly, the values for use reports across the selected species were summed up and ranked. The results show that the local people harvest eight multipurpose species mainly for fencing medicine firewood, charcoal, Food, construction, furniture, forage, and with the rank of 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, $6^{th,}$ 7^{th} and 8^{th} respectively. Thus, the long-term survival of the top- ranked species is under question, as the daily demand of the local society is usual and continuous with lesser rate of re-

plantation, except for *Eucalyptus globulus.* This was evidenced by the high rate of loss of *Arundinaria alpina* in the area.

5.1.6. Marketable Medicinal Plants

The local market surveys were conducted with in the area of research to document the medicinal plants used in health ailments that are sold in local markets. But, there were not medicinal plants that are sold in the market legally. During the interview, the respondents explained that most healers prepared and sold TMPs in the home rather than selling in the market. Since the local people prefer either collecting these plants by themselves from the available areas in the district to prepare the medicines or they prefer to go directly to the local healers to get treatments instead of buying the medicinal plants from the market.

Some medicinal plants (*Zingiber officinale, Allium cepa, Allium sativum, Ruta chalepensis, Linum usitatissimum, Trigonella foenum-graecum, Citrus limon, Artemisia abyssinica*) were marketed but only for other use values like for spices, food and fumigation. This result agreed with the study reported by Eskedar Abebe (2011) in Debark Woreda, North Gonder, Etana Tolasa (2007) in Gimbi Woreda Westren Wollega and Getu Alemayehu (2010) in Minjar Shenkora district. But in other case *Lepidium sativum* was sold for the purpose of medicine and measured with a very small spoon for a price of 5 birr.

5.1.7. Threats and Conservation of Medicinal Plants in the Study Area

Results show that the accessibility of medicinal plants in the study area is less when compared with the past decade, so informants reported that they require long distance of travelling to fetch medicinal plants.

The ethnobotanical knowledge on uses of medicinal plants is secrete and transferred from one generation to the next orally. The result of the present study showed that agricultural expansion, firewood, construction, charcoal, fodder and drought were ranked as the most severe threats not only to medicinal plants but often plants of the Ankesha District as a whole. In this study information gathered from the key informants indicated that the threats agricultural expansion is the major threat to medicinal plants followed by firewood. Similarly, this finding agrees with other findings (MirutseGiday, 2001).

Indigenous people of the area have strong and genuine belief on healing power of plants and they know their habitat, distribution, harvesting technique, time of harvest and the status of a plant in the study area. For instance, 24 medicinal plants were found in majority of family gardens and farm borders in the study area, as they need these plants in their daily life as medicine or for other values. According to Zemede Asfaw (2001), cultivation for medicinal value accounted for 6% of the plants maintained in homegardens in Ethiopia.

Medicinal plants were also maintained or protected near vicinity due to their fragrance, as live fence to avoid enemies, as spices and for food. Plants are also left as remnants of forest in agricultural field due to their uses for construction, fuel wood and other values. Similarly Behailu Etana (2010) cited that agricultural expansion and fire wood are the most threatening factors.

5.2 Conclusion

Sixty-two medicinal plants were recorded in the study area of which 51 species were noted to treat human ailments while 5 species were documented to treat livestock ailments and 6 species were reported to be used to treat both livestock and human ailments. The majority of medicinal plant species were obtained from the wild (30) followed by home garden (18), road side (6), agricultural field (4) and live fence (4). In the study area, 47 ailments were reported which were being treated by traditional medicinal plants of the area. Herbal remedies were prepared from fresh materials 35 (56.5 %), dried plant materials7 (11.3 %) and fresh or dried 20 (32.2%). Herbs were highly utilized 23(37.1%) for medicinal purpose than trees, shrubs and climbers. 29 (28.7%) leaves were used for medicinal purpose more than other plant parts for preparation of human and livestock remedies. The remedies were taken with different additive and solvents and water is more frequently used for this purpose. Most of the medicinal plants were administered orally (62.6%), followed by dermal (21.2%). The major threats to medicinal plants and the associated knowledge in the study area were agricultural expansion, firewood collection, construction, charcoal production, fodder and drought in that order. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, influence of modern education and awareness factors were the major ones. Therefore, awareness creation campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness raising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use.

5.3 Recommendations

Based on the finding of the study, the following recommendations were suggested.

- The local community of the study area should be involved in conservation and management of plant resources and their indigenous knowledge in their locality.
- The Government should encourage and license the indigenous knowledge and skill of traditional medicine practitioners.
- The Woreda Agricultural Office and local elder people must be taught of growing medicinal plants in home gardens mixing with crops in the agricultural fields and live fences.
- The Woreda Administration and woreda Health Office have to encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives.
- Local government give awareness for young generation, to avoid negative impacts on the medicinal plants and associated knowledge in the area, hence, documentation of the medicinal plants of the area needs to continue.
- The Government and health office should give attention so as to standardize standardise measurements and maintain hygiene of the medicines made from plants by training both the healers and other members of the local community.
- To give more support to the finding of this research, further scientific investigations are needed for *Croton macrostachyus* and *Lepidium sativum* to extract active contents and run pharmaceutical research.

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Appendix 1. List of human and livestock diseases which are treated by medicinal plants in the study area

No.	Local Name	English Name
1	Shewu quniza	Abdominal pain
2	Gyemitsign	Abortion
3	Ameba	Amoebiosis
4	Wesfat	Ascariasis
5	Asim	Asthma
6	Bila	Athlete's foot
7	Mahuristign	Bloating
8	Anigu eniqari	Breast swelling
9	Fihutsiwu qunzi	Bronchitis
10	Glavi	Colic
11	Goni	Common cold
12	Wuri	Coughing
13	Huribi	Dandruff
14	Shiquar qunza	Diabetes
15	Enigiquwi	Diarrhea
16	Enquwahi nefsati	Ear insect
17	Enquwahi chigger	Ear problem
18	Chifa	Eczema
19	Gudali	Evil eye
20	Elu chigger	Eye problem
21	Chiguri	Gastritis
22	Garidia	Giardiasis
25	Gnari qunza	Head ache

No.	Local Name	English Name
26	Chahawu	Hepatitis
27	Seba	Stabbing pain
28	Shinki	Hypertension
29	Ahitini danti	Internal parasite
30	Kuritimi	Joint pain
31	Kulalita qunzi	Kidney pain
32	Gintsiqi	Leech
33	Hisanti qunzi	Leprosy
34	Shuta	Malaria
35	Gisiegne qunza	Rabies
36	Shotelay	RH factor
37	Wulitini	Skinny(weak body)
38	Muri egna	Snake bite
39	Kinchif	Syphilis
40	Shinchi	Tape worm
41	Tsagnaja	Tonsillitis
42	Erkuwi qunza	Tooth ache
43	Gurandi	Tumor(wart)
44	Gerkagaw Ekil	Uncontrolled menstruation
45	Kinchif	Venereal disease
46	Liqitsi	Vomiting
47	Lahane	Wound

Appendix 2. The most frequent human and livestock diseases and number of plant species used

Disease treated	Total Species	Percent
Wound	10	10.52
Common cold	6	6.31
Evil eye	5	5.26
Tape worm	5	5.26
Ear disease	5	5.26
Abdominal pain	4	4.21
Swelling	4	4.21
Malaria	3	3.15
Skin fungal disease	3	3.15
Skin wart and leprosy	3	3.15
Eye disease	3	3.15
Toothache	3	3.15
Hypertension	3	3.15
Tonsillitis	3	3.15
Stomach problem	3	3.15
Rabies	2	2.1
Ascariasis	2	2.1
Amoeba	2	2.1
Syphilis	2	2.1
Diabetes	2	2.1
Diarrhea	2	2.1
Hiccup	2	2.1
Joint pain	2	2.1
Cough	1	1.05
Kidney disease	1	1.05
Abortion	1	1.05
Intestinal parasites	1	1.05
Bronchitis	1	1.05
Headache	1	1.05
Snake bite	1	1.05
Gonorrhea	1	1.05
Hepatitis	1	1.05
Goiter	1	1.05
Colic	1	1.05
Giardiasis	1	1.05
Vomiting	1	1.05
Asthma	1	1.05
Skinny	1	1.05
Tumor	1	1.05

Appendix 3. Number of medicinal plant species in each family

No.	Family	Number of genera	Number of plant species	Percentage of plant species (%)
1	Asteraceae	4	5	8.06
2	Cucurbitaceae	4	4	6.45
3	Rosaceae	3	4	6.45
4	Rutaceae	2	3	4.83
5	Euphorbiaceae	3	3	4.83
6	Solanaceae	3	3	4.83
7	Alliaceae	1	2	3.22
8	Oleaceae	2	2	3.22
9	Poaceae	2	2	3.22
10	Ranunculaceae	2	2	3.22
11	Myrtaceae	2	2	3.22
12	Malvaceae	2	2	3.22
13	Fabaceae	2	2	3.22
14	Apocynaceae	1	1	1.61
15	Boraginaceae	1	1	1.61
16	Bignoniaceae	1	1	1.61
17	Aloaceae	1	1	1.61
18	Asclepiadaceae	1	1	1.61
19	Scrophulariaceae	1	1	1.61
20	Caryophllaceae	1	1	1.61
21	Apiaceae	1	1	1.61
22	Celastraceae	1	1	1.61
23	Rhamnaceae	1	1	1.61
24	Caricaceae	1	1	1.61
25	Linaceae	1	1	1.61
26	Chenopodiaceae	1	1	1.61
27	Rubiaceae	1	1	1.61
28	Verbenaceae	1	1	1.61
29	Capparidaceae	1	1	1.61
30	Acanthaceae	1	1	1.61
31	Phytolaccaeceae	1	1	1.61
32	Arecaceae	1	1	1.61
33	Brassicaceae	1	1	1.61
34	Moraceae	1	1	1.61
35	Myrsinaceae	1	1	1.61
36	Combertaceae	1	1	1.61
37	Amaranthaceae	1	1	1.61
38	Zingiberaceae	1	1	1.61
39	Lamiaceae	1	1	1.61
40	Crassulaceae	1	1	1.61
Total	40	59	62	100

Appendix 4. Scientific name, Family name, Local name and growth form of each medicinal plant species in study area

Scientific Name	Family name	Local name in Amharic & Awigna	Disease treated	Mode of preparation and application	Growth form	Route	Human or Livestock	Coll. No
Zingiber officinale Rose	Zingiberaceae	Zingible(Gingiblie)	Abdominal pain	**Stems**: Chewing with salt	Herb	Oral	Human	A.A 46
Allium cepa L	Alliaceae	Keye shinkurt(Gubarie)	Blood pressure	**Bulbs**: Crush the bulbs and mix with water then drink a cap of juice every morning before food	Herb	Oral	Human	A.A 47
Euphorbia ampliphylla Pax	Euphorbiaceae	Qulqual(Qulquli)	Ascariasis Rabies virus Leprosy Skin Wart	**Latex**: Prepare injera from teff powder and milky juice and eat before food **Latex**: prepare bread from teff powder and milky juice after that eat and drink whey **Flower**: The flower mix with honey and paint on wound surface **Latex**: paint the milky juice on wart surface	Tree	Oral Oral Dermal Dermal	Human	A.A 38
Zehneria scabra L	Cucurbitaceae	Haregressa(Ehuwa ahera)	Common cold	**Leaves**: The leaves are boiled with water and drink	Climber	Oral	Human	A.A 2
Coriandrum sativum L	Apiaceae	Dinbilal(Endadbie)	Diarrhea(Ascariasis)	**Seeds**: Boil the seeds with water and drink it	Herb	Oral	Human	A.A 44
Cymbopogon sp	Poaceae	Serdo(Serdu)	Breast swelling	**Stem**: Crush the stem and mix with honey and drink it	Grass	Oral	Human	A.A 15
Mentha spicata L	Lamiaceae	Nana	Syphilis	**Leaves;** the leaf is pounded, With butter and creamed on affected part.	Herb	Dermal	Human	A.A 16
Malva verticillata L	Malvaceae	Lut(Liti)	Head ache	**Root**s: Crush the root and mix with water and wash the head	Shrub	Dermal	Human	A.A 20

Achyranthes aspera L.	Amaranthaceae	Telenji	Diabetes and blood pressure	**Leaves**: Crush the dry leaves and boil with water and drink	Herb	Oral	Human	A.A 42
Allium sativum L	Alliaceae	Nech shinkurt (Fuchishinkurchi)	Intestinal pain Kidney pain Common cold Malaria Kidney filtration	**Bulbs:** Crush the bulb and swallow it before food **Bulbs**: Boil with water and drink **Bulbs:** Eating with food **Bulbs**: Eating one-two parts before food	Herb	Oral Oral Oral Oral	Human	A.A 48
Combertum terminilia Friss *etal*	Combertaceae	Abalo(Abali)	Eye pain Leprosy	**Buds:** Squeeze one-seven buds and paint on the eye **Fruit**: Crush the fruit and mix with honey and paint on wound	Shrub	Optical Dermal	Human	A.A 49
Croton macrostachyus Del	Euphorbiaceae	Bisana(Asisi)	Fungal skin disease Malaria	**Buds:** The buds are squeezed and the content is dropped on the infected site **Buds**: Eat fresh shoot tip with shiro wot	Tree	Dermal Oral	Human	A.A 18
Cucumis ficifolius A. Rich	Cucurbitaceae	Yemidir embuay (Bitlomena)	Wound Eczema(Wound) Snake bit	**Roots**: Yemidiremboay together with Yegibmrkuz (*Steganotaenia araliaceae*) root crushed and put on wound surface **Fruits**: Yemidireemboay together with Allium sativum and Chili (*Capsicum annuum)* Mix up Honey or Butter and smear on wound **Roots**: Chewing the root and swallowing the juice	Herb	Dermal Dermal Oral	Human	A.A 7
*Cucurbita pepo*L.	Cucurbitaceae	Duba(Patu)	Tape worm Joint pain	**Seeds**: Crush the seeds and eat with injera or bread **Seeds:** Crush the seeds and mix with honey and drink before food	Climber	Oral Oral	Human	A.A 12
Datura stramonium L.	Solanaceae	Astenagir (Asleflif)	Ear insect	**Leaves**: Crush the leaves and squeezed the liquid part and drop into ear **Leaves**: Crush the leaves and paint on	Herb	Earcanal	Human	A.A 1

			Dandruff Toothache	infected area or head **Seeds:** Dried seeds with *Capparis tomentosa* fresh or dried root is fumigated orally		Der mal Oral		
Embelia schimperi Vatke	Myrsinaceae	Enkoko(Enkoku)	Tape worm Hepatitis	**Seed**s: Crush the seeds and eat with porridge or drink with water **Leaves**: Crushed leaves with Niger and after drink	Herb	Oral Oral	Human	A.A 43
Ficus carica L.	Moraceae	Beles	Ear pain	**Sap**: Pour the liquid part of the leaves into ear	Shrub	Ear canal	Human	A.A 29
Hagenia abyssinica (Bruce) J. F. Gmel	Rosaceae	Kosso(Shinchi)	Tape worm	**Fruit**s: Crush the fruit and mix with water and drink it	Tree	Oral	Human	A.A 22
Lepidium sativum L.	Brassicaceae	Feto(Fitsu)	Tumor Gonorrhea Internal parasite	**Stem**: Put a hot stem on wound surface **Seeds**: Crush the seeds and mix with boiled milk and drink **Seeds**: Crushed seed mixed with water is given orally for cattle	Herb	Der mal Oral Oral	Human Livestock	A.A 50
Phytolaca dodecandra L'Herit	Phytolaccaceae	Endod(Sbiti)	Vomiting Or 'kuruba' Abortion	**Stem**: Crush the stem and mix with whey and drink **Leaves**: Squeeze the leaves and drink with honey **Roots**: Crushed root mixed with water is given orally	Shrub	Oral Oral	Human	A.A 39
Ricinus communis L.	Euphorbiaceae	Chaqma(Chaqimi)	Vomiting 'kuruba'	**Roots**: Chewing the roots by adding ginger and swallow	Shrub	Oral	Human	A.A 27
Ruta chalepensis L	Rutaceae	Tenadam(Naruqi)	Common cold Malaria	**Leaves**: Boil the leaves with tea or milk and then drink **Stem:** Dried or fresh shoot boiled with ginger and drink	Herb	Oral Oral	Human	A.A 13

Sida schimperiana Hochst. ex A. Rich	Malvaceae	Chifrig	Syphilis	**Roots**: Crush the roots and mix with honey and swallow	Shrub	Oral	Human	A.A 8
Vernonia amygdalina Del.	Asteraceae	Girawa(Quqitsi)	Abdominal pain Amoebiosis, Giardiasis Stomach pain	**Leaves**: Crush the leaves into powder and mix with water then drink **Leave**s: Dried or fresh leaf is soaked with honey and drink **Leaves**: Fresh leaf soaked with water is given orally for cattle	Tree	Oral Oral Oral	Human Livestock	A.A 25
Verbena officinalis L	Verbenaceae	Atuch	Stabbing pain	**Roots, Leaves** and **Fruits:** are crushed with cardamom and mix with Honey and swallow	Herb	Oral	Human	A.A 9
Carica papaya L	Caricaceae	Papaya(papayi)	Diabetes and blood pressure Wound	**Leaves**: Boil the dry leaves with water and drink **Sap**: The leaves or stem juice paint on wound surface	Tree	Oral Dermal	Human	A.A36
Linum usitatissimum L	Linaceae	Telba(Tilbi)	Wound Intestinal wound	**Seeds**: Crush the seeds and mix with honey and tie on wound surface **Seed**s: Crush the seeds mixed with water is given orally before food	Herb	Dermal Oral	Human	A.A 51
Aloe trigonantha Leach	Aloaceae	Riet(Embirkaki)	Wound Continuouslyweightloss Insectcide (weevil)	**Sap:** Cut the leaves and take a jelly juice and paint on infected site **Leaves**: Fresh or dried leaf is given orally for continuously loss cattle **Leaves**: put the leaves where the cereal stored.	Shrub	Dermal Oral	Human Livestock	A.A 52
Erythrina brucei L	Fabaceae	Korch(Buri)	Infected wound Abdominal pain	**Leaves**: Dry leaves are crushed and spread the powder on wound place **Leaves**: Squeezed leaves with *Cucumis ficifolius* is given orally	Tree	Dermal Oral	Livestock	A.A 30

Solanum anguivi Lam	Solanaceae	Zerichenboay (Empampy)	Joint ache Rabies vires Sexual impotency	**Fruits**: Crush and drink one cup **Fruits**: Crush Zerichenboay and Beles (*Ficus carica*) fruit and eat with meat **Roots**: Chewing the root during sexual intercourse	Herb	Oral Oral Oral	Human Livestock	A.A 5
Echinops kebericho Mesfin	Asteraceae	Kebercho(Kober)	Cough	**Stem** or **roots**: Smoke the nasal cavity of the patient with dried stem or root	Shrub	Nasal	Livestock	A.A 17
Trigonella foenum-graecum. L	Fabaceae	Abish(Kochi)	Swelling Abdominal pain	**Seeds**: Crush both Abish and Bean, then mix with water and tie on the swell part **Seeds**: Crushed seeds mixed with water and honey and then drink	Herb	Dermal Oral	Human	A.A 53
Olea europaea subsp. cuspidata (Wall.ex G. Don) Cif	Oleaceae	Woira(Awer i)	Wound Eye or ear pain Evil eye	**Leaves:** Leaves together with Enboacho, burn with fire and crush it and then wash the wound with lemon and spread it **Sap:** Remove the bark and take juice and paint on ear or eye **Leave**s: Fresh or dried leaves are fumigated nasally	Tree	Dermal Ear or Optical Nasal	Human	A.A 21
Acmella caulirhiza Del	Asteraceae	Yemdir Berberie(Bitberbera)	Tonsillitis	**Flowe**r: Chewing the flower and swallow	Herb	Oral	Human	A.A 23
Carissa spinarum L.	Apocynaceae	Agam(Atsiri)	Evil eye	**Roots**: Crush the roots and smoke or tie on the neck	Shrub	Nasal(tie on Neck)	Human	A.A 35
Phoenix reclinata Jacq	Arecaceae	Selen(Ankuty)	Goiter	**Leaves**: The leaves will be squeeze and paint on goiter	Tree	Dermal	Human	A.A 31
Silene macrosolen A. Rich	Caryophllaceae	Wugirt(Wugrty)	Tape worm	**Fruit:** The fruit will be crushed together with Niger seeds and eat it	Herb	Oral	Human	A.A 37

Verbascum sinaiticum Benth	Scrophulariaceae	Ketetina	Skinny(weak body)	**Root**s and **Leaves:** Crush together with salt and eat	Shrub	Oral	Livestock	A.A 54
Lagenaria siceraria(Molina) Standl	Cucurbitaceae	Qil(Kib)	Ear pain	**Leaves**: Squeeze the leaves and pour the liquid part in to ears	Climber	Ear canal	Human	
Stephania abyssinica DilloEn and A.Rich) Walp	Menispermaceae	Yeait hareg (Yintsi ahera)	Wound	**Root**: Crush the roots and paint on wound surface	Climber	Dermal	Human	A.A 55
*Cynoglossum coeruleum*Steud.ex DC.	Boraginaceae	Shimgigit(Shibtbiti)	Fibril illness Uncontrolled menstruation	**Leaves**: Squeeze the leaves and drink and paint on the whole body **Root**: Fresh root is given orally	Herb	Oral and Dermal Oral	Human	A.A 19
Nicotiana tabacum L	Solanaceae	Timbaho (Sijari)	Leech infection, Bloating Common cold	**Leaves:** Fresh leaf juice with water is given orally or nasally for cattle **Leave**s: Fresh leaf juice with water is given orally	Shrub	Orally or nasally Oral	Livestock	A.A 45
Stereospermum kunthianum Cham	Bignoniaceae	Washinte(Zany)	Wound	**Bark**: The barks will be crushed together with red soil and after drink	Tree	Oral	Hyena bitten livestock	A.A 32
Echinops longisetus A.Rich	Asteraceae	Kosheshile(Danduri)	Stabbing pain Colic	**Stems:** The stems will be tied on pain surface **Root**: Fresh root boiled with water is applied on the horse skin	Herb	Dermal	Human Livestock	A.A 56
Jasminum grandiflorum L	Oleaceae	Tembelel	Eye pain Common cold	**Leaves:** The leaves will be crushed and drip on eye **Roots:** Dried root boiled vapor is inhaled orally or nasally	Climber	Optical Oral or Nasal	Human	A.A 57

Clematis simensis Fresen.,	Ranunculaceae	Yeazohareg(Azuahara)	Swelling	**Leaves**: Fresh leaf juice with water is applied topically	Climber	Dermal	Human	A.A 4
Thalictrum rhynchocarpum Dill &A. Rich.	Ranunculaceae	Sirebizu(Siramencha)	Evil eye Animal bit	**Roots:** Crushed root is tied on neck **Roots**: Crushed root with water is given orally for Cattle	Herb	Tied on neck Oral	Human Livestock	A.A 6
Citrus limon L	Rutaceae	Lomi(Lumini)	Athletes foot Asthma	**Fruit**: The fruit of Citrus lemon is squeezed and creamed on affected for continuous days **Leaves**: Boil the leaves with stem of sugar cane and drink hot decoction	Shrub	Dermal Oral	Human	A.A 58
Rubus apetalus Poir	Rosaceae	Enjory(Tsarky enjory)	Gastritis	**Leaves and fruits:** Dried leaf and fruit soaked with water is given orally	Shrub	Oral	Human	A.A 59
Prunus persica (L.) Batsch	Rosaceae	Kok(Kok)	Swelling	**Leaves:** Dried leaf powder mixed with food is given orally	Tree	Oral	Human	A.A 40
Rhamnus prinoides L'Herit	Rhamnaceae	Gesho(Geshu)	Tonsillitis	**Leaves:** one-seven leaf buds are chewing and swallowing	Shrub	Oral	Human	A.A 11
Rubus steudneri Schweinf.	Rosaceae	Kega(Gimsy)	Tape worm	**Fruits:** Fresh fruit is given for eating	Shrub	Oral	Human	A.A 3
Maytenus albutifolia (Lam.) Exell	Celastraceae	Koba(Koky)	Venereal diseases	**Bark**: Dried, roasted stem bark powder with butter is applied on infected place	Tree	Dermal	Human	A.A 28
Beta vulgaris L.	Chenopodiaceae	Qosta(Kosta)	dehydration	**Leaves** :the fresh leaves will be cooked with oil & added salt, then after will be eaten	Herb	Oral	Human	A.A 60
Arundinaria alpina K.Schum	Poaceae	Qerikha (Shembeku)	Shotelay	**Roots**: the root of *Arundinaria alpina* is tie on neck part of the body	Herb	Tie on neck	Human	A.A 61
Clausena anisata (Willd.) Benth	Rutaceae	Lemeche(Luntsy)	Evil eye	**Roots**: The fresh roots are crushed and mixed with water and drunk	Tree	Oral	Human	A.A 41
Coffea arabica L.	Rubiaceae	Buna(Kankupa)	Diarrhea	**Seeds**: The seeds of Coffee are roasted, crushed, powdered, boiled and the filtrate one cup of tea, mixed with few drop of oil then drunk	Shrub	Oral	Human	A.A 10
Psidium guajava L	Myrtaceae	Zeytune(Zeytona)	Amoeba	**Seeds:** The seeds are eaten together with its fruits	Tree	Oral	Human	A.A 24

Eucalyptus globulus Labill	Myrtaceae	Nech bahirzaf (Fuchibarzaf)	Bronchitis	**Leaves:** The leaves of *Eucalyptus globulus* are chopped and boil with water and inhale repeatedly the vapor	Tree	Nasal	Human	A.A 26
Artemisia abyssinica Sch.Bip.exA.rich	Asteraceae	Arite(serent)	Stomachache	**Leaves** Chewing the leaves	Shrub	Oral	Human	A.A 62
Kalanchoe petitiana A. Rich	Crassulaceae	Andawula(Andiqui)	Ear pain Evil eye Common cold Tonsillitis Tooth ache	**Roots:** The roots of *Kalanchoe petitiana* are squeezed and added few drops through ear **Roots**: Fresh root is inhaled nasally **Roots**: Fresh root is fumigated nasally **Roots**: Fresh root crushed with water is given **Roots:** Chewing fresh root	Herb	Ear canal Nasal Nasal Oral Oral	Human	A.A 14
Capparis tomentosa Lam	Capparidaceae	Gumero(khanguri)	Tooth ache	**Root:** Crush the roots of *Capparis* tomentosa and *Datura stramonium* Stem together and fumigated	Shrub	Oral inhale	Human	A.A 34

Appendix 5.Gimjabet Mariam market survey medicinal plants sold in the market

Local name	Scientific name	Family name	Their uses
Naruqi	*Ruta chalepensis*	Rutaceae	Common cold, Malaria
Serent	*Artemisia abyssinica*	Asteraceae	Abdominal pain
Kosta	*Beta vulgaris*	Chenopodiaceae	Dehydration
Tilbi	*Linum usitatissimum*	Linaceae	Wound
Lumini	*Citrus limon*	Rutaceae	Athletes foot,Asthma
Gingiblie	*Zingiber officinale*	Zingiberaceae	Abdominal pain
Gubarie	*Allium cepa*	Allaceae	Blood pressure
Fuchishinkurchi	*Allium sativum*	Allaceae	Itestinal pain ,Kidney pain,common cold,malaria
Kochi	*Trigonella foenum-graecum*	Fabaceae	Swelling,Abdominal pain
Fitu	*Lepidium sativum*	Brassicaceae	Tumor,Gonorrhea,Intestinal parasite

Appendix 6.Checklist of semi-structured interview questions for collecting ethnobotanical data

Semi structured interview and questionnaires

Date_____Kebele_____

Name of informant_____Sex; Male_____Female_____Age_____

Occupation _____Religion_____Level of education_____

1) What are the main or most common human health problems in your locality?

2) What are the main or most common livestock health problems in your locality?

3) What are the most important medicinal plants used to treat human and livestock ailments?

List of medicinal plants used for both human and livestock, scientific name; family; local name; habit; parts used; disease treated; methods of preparation with dosage used and route of application

Scientific name	Family name	Local name	Disease treatment	Mode of preparation	Route

4) Which plant do you use to treat the particular health problem (disease)?

5) For what other purpose do you use the medicinal plants? Beside, its medicinal value?

6) What part of medicinal plant is used?

7) How is the parts gathered? (Including the collected time)

8) Does the dose differ among sex and age?

9) Any restrictions in taking remedies (pregnancy, age, etc.)?

10) Are medicinal plants easily accessible?

11) Do you store the medicine? If yes. How and for how long? _____

_____

12) Are the medicinal plants marketable? If Yes;

A) What is their availability?

B) What is their measurement?

C) How much its price?

13) What are the major threats to medicinal plants?

14) How do you conserve the medicinal plants?

Thank you very much

Appendix 7.List of informants in the study area

No.	Name	Sex	Age	Marital status	Education Status	Residence kebeles	Occupation
1	Amsalu Alemayehu	M	55	Married	Read &write	01	Merchant **Key Informants**
2	Ayalew Kassahun	M	48	Married	G->12	01	Teacher
3	Habitamu Amsalu	M	20	Single	G-10	01	Student
4	Beyen Haile	M	56	Married	Illiterate	01	Farmer
5	Birtukan Adugnaw	F	23	Married	Read& write	01	House wife
6	Emye Muloye	F	39	Married	G->12	01	Teacher
7	Aster Moges	F	38	Married	G->12	01	Teacher
8	Adanech Enidalew	F	33	Married	Illiterate	01	House wife
9	Marugojjam Fentahun	M	35	Married	G-10	02	Student **Key Informant**
10	Asaye Alene	M	40	Married	Read &write	02	Merchant
11	Abiyot Dagmiyaw	M	38	Married	Read & write	02	Merchant
`12	Tibebu Desaiew	M	24	Single	G-10 complete	02	Merchant
13	Dagmiyaw Belay	M	56	Married	Read &write	02	Farmer
14	Rahel W/Giworgis	F	20	Single	G-10	02	Student
15	Shashitu Engida	F	40	Married	G->12	02	Teacher
16	Belaynesh Tibebu	F	48	Divorced	Illiterate	02	Merchant
17	Melese Yibelu	M	47	Married	Illiterate	Ateta	Farmer **Key Informant**
18	Kindie Yenesew	M	45	Married	G->12	Ateta	Teacher
19	Tiruneh Yihun	M	55	Married	Read & write	Ateta	Farmer
20	Aderaw Menigie	M	42	Married	Read & write	Ateta	Farmer
21	Alemneh Mihiret	M	36	Married	Read & write	Ateta	Merchant
22	Teweda Ayenew	F	43	Married	G->12	Ateta	Teacher
23	Mesel Hunegnaw	F	32	Married	Illiterate	Ateta	House wife
24	Enatfanta Amare	F	29	Married	Illiterate	Ateta	House wife
25	Tilahun Kebede	M	48	Married	Illiterate	Bekafita	Farmer **Key Informant**s
26	Abriham Abate	M	39	Married	Illiterate	Bekafita	Farmer
27	Hiruyi Alemayehu	M	57	Married	G->12	Bekafita	Teacher
28	Muluneh Yirdaw	M	48	Divorced	Illiterate	Bekafita	Farmer
29	Birhan Zeru	M	60	Married	Read & write	Bekafita	Merchant
30	Meri Tebeje	M	51	Married	Read & write	Bekafita	Merchant
31	Mulu Tesera	F	31	Married	Illiterate	Bekafita	House wife
32	Hiwot Anagaw	F	31	Married	G_>12	Bekafita	Teacher
33	Fekadu Bogale	M	50	Married	Read & write	Denatiqus hita	Farmer **Key Informants**
34	Alemu Yihun	M	42	Married	G->12	Denatiqus hita	Teacher
35	Molla Bekele	M	55	Married	G->12	Denatiqus hita	Teacher
36	Ayenew Yenew	M	27	Divorced	G-5	Denatiqus hita	Merchant
37	Yenew Yihun	M	48	Married	Illiterate	Denatiqus hita	Farmer
38	Abeba Bantigegne	F	30	Single	G-10	Denatiqus hita	Merchant

39	Zewuditu Meseret	F	32	Married	Read & write	Denatiqushita	House wife
40	Worku Kelemu	M	50	Married	Illiterate	S/Gimjabet	Farmer **Key Informants**
41	Alemayehu Ayen	M	44	Married	G->12	S/Gimjabet	Teacher
42	Adimas Shiu	M	41	Married	Illiterate	S/Gimjabet	Farmer
43	Tiruneh wondim	M	35	Married	Illiterate	S/Gimjabet	Farmer
44	Alemitu Worku	F	33	Married	Illiterate	S/Gimjabet	House wife
45	Teje Mihiret	F	37	Married	Illiterate	S/Gimjabet	House wife
46	Worknesh Belew	F	43	Married	Read &write	S/Gimjabet	House wife
47	Mergata Birhanu	M	30	Married	Read &write	S/Tirba	Merchant **Key Informants**
48	Gitachew Agi	M	50	divorced	Illiterate	S/ Tirba	Farmer
49	Worikayehu Manamino	M	41	Married	G->12	S/ Tirba	Teacher
50	Abiyot Shitu	M	32	Divorced	Read &write	S /Tirba	Merchant
51	Biritukan Zerihun	F	34	Married	Read &write	S/ Tirba	House wife
52	Beza Worku	F	56	Married	Illiterate	S/Tirba	House wife
53	Mulu Gashaw	F	28	Married	Read &write	S/Tirba	House wife
54	Nigatu Alemu	M	52	Married	Illiterate	Gewena	Farmer **Key Informants**
55	Getenet Yetwale	M	40	Married	Read& write	Gewena	Farmer
56	Belay Zeru	M	43	Married	Illiterate	Gewena	Farmer
57	Getachew Genet	M	39	Married	Illiterate	Gewena	Farmer
58	Yeshumie Nigat	F	49	Married	Illiterate	Gewena	House wife
59	Demekech Aniley	F	45	Married	Illiterate	Gewena	House wife
60	Teje baynes	F	38	Married	Illiterate	Gewena	House wife

Declaration

I, Alemitu Adane Asegu 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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Signature_____

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)

Signature _____

Date_____