Ethnobotanical study of Medicinal Plants used in Indigenous People in Lemo Woreda, Hadiya Zone, SNNPR, ETHIOPIA

By: IYASU ABAYNEH


Msc Thesis Submitted to School of Graduate Studies of Addis Ababa University in partial Fulfillment of the Requirement of Degree of Master of Science in Biology.

Addis Ababa, Ethiopia

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ADDIS ABABA UNIVERSITY GRADUATE PROGRAMES

This is to certify that the Thesis prepared by Iyasu Abayneh, entitled***: Ethnobotanical study of Medicinal Plants used by Indigenous People in Lemo woreda, Hadiya Zone, SNNP Regional state, Ethiopia*** and Submitted to school of graduate studies of Addis Ababa University in partial Fulfillment of the Requirement of Degree of Master of Science in Biology complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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4._____ Chairman)	_____	_____

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Acronyms

AAU	Addis Ababa University
ETB	Ethiopian Birr
IBCR	Institute of Biodiversity Conservation and Research
IFS	International Foundation for science
UNEP-WCMC	United Nation Environment Program World Conservation Monitoring Centers
WHO	World Health Organization
IK	Indigenous Knowledge
SNNPR	South nation nationalities people region
CSA	Central statistical agency
GPS	Global position system
ICF	Informant consensus factors
FL	Fidelity level
TMs	Traditional medicines

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Abstract

Ethnobotanical study of Medicinal Plants used in Indigenous People in Lemo Woreda, Hadiya Zone, SNNPR, ETHIOPIA

IYASU ABAYNEH

Medicinal plants have not been well studied, tested or documented in the study area. Most of the information is steel in the hands of the traditional healers. This study was carried out 25 February-March 20, 2018 to explore ethnobotanical information on the use medicinal plants in lemo district people in 12 kebeles. The ethnobotanical techniques used to collect and analyze data were: semi - structured interview, guided field walk and observation, group discussion, preference raking and paired comparison, direct matrix ranking, informants' consensus factor and fidelity level combined with descriptive statistical analysis. Ninety informants (60 males and 30 females) from 12 kebeles were Included in the study. A total of 60 ethnomedicinal plant species belonging to 55genera and 34 families were collected, identified and documented in this study. Most commonly used plant families are Asteraceae followed by Lamiaceae. The highest informant consensus factor (0.83) was associated with problems caused by gastro-intestinal parasites. Dermal diseases (0.77), emergency diseases (0.70) and organ diseases (0.65) stood $1^{st}2^{nd}$, 3^{rd} and 4^{th} respectively. Preference ranking, paired comparison, direct matrix ranking and fidelity level index showed the efficacy, popularity and preference people have for some species over the other for different uses and in treating ailments. Deforestation, land degradation, overgrazing, increasing of population number and fuel wood are the main threats of medicinal plants identified by informants of the study area.

Key words: - Lemo, Hadiya, Ethnobotany traditional medicine, Indigenous knowledge, .

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Ethiopia is the origin and center of diversity for many of medicinal plant species. In the study area medicinal plants have been used traditionally to treat different human and livestock aliments. Ethnobotany encompasses all studies that concern with the mutual relationship between plants and traditional people (*Cotton,* 1996). 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 health care (Khan *et al.,* 2007). Since ancient times, plants have been vital sources of both preventive and curative traditional medicine preparations for human and livestock. Historical accounts on medicinal plants depict that different plants were in use as early as 5000 to 4000 BC in China, Syrians, Babylonians, and Hebrews and Egyptians (Dery*et al.,*1999). Considerable lore of indigenous knowledge system, from the earliest time, is linked to the use of traditional medicine for humans in different countries (Farnsworth, 1994). Evidence obtained from animals shows that even chimpanzees use a number of plants species for their medicinal value (Huffman and Wrentham, 1994).

Traditional medicine is known to rapidly spread in to the industrialize countries too. It includes holistic knowledge and practice, oral and writing functional and diagnosis, preventive and curative aspects of illness to promote total wellbeing (Babura, 2003). Indigenous knowledge refers to accumulation of knowledge's rule, standards, skills and mental sets, which are possessed by local people in a particular area (Quash 1998). One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine by local people. Such knowledge, known as Ethnomedicinal knowledge involves diagnosis, collection of raw material, preparation of remedies and its prescription to the patients (Farnsworth, 1994).

In most situations the tradition on medicinal plants of Ethiopia passes verbally from generation to generation and valuable information can be lost whenever a traditional medical practitioner passed away without conveying his traditional medicinal plants knowledge to others. In addition, the loss of valuable medicinal plants due to population pressure, agriculture expansion and

deforestation is widely reported by different works (e.g. Abebe Demissie, 2001; Tesfaye Awas and Sebsebe Demissew 2009).

These problems are also critical in developing countries like Ethiopia. The same is true in Hadiya zone SNNPR. The zone is from suffering habitat and species loss due to continued deforestation and agriculture expansion as well as loss of associated knowledge

Ethiopia is the country with many diverse cultures that reflect the presence of many diverse tribes and ethnic groups. However ethnomedicinal plants and documentations of the indigenous knowledge have been addressed only in certain locations in Ethiopia (Belachew and Tamene, 2007). There was no ethnobotanical study conducted in Lemo District of Hadiya zone. According to Pankhurst (2001) detailed information on the medicinal plant could only be obtained when studies are conducted in the various areas where little or no botanical and ethnobotanical exploration has been made. This study is therefore designed to conduct Ethnobotanical study of medicinal plants used by the people in Lemo district to fill the identified research gap.

1.2. Statement of the problem

Despite the remarkable progress in the usage of medicinal plants, human history has led to the reduction of medicinal plants due to population growth aggravated by land degradation (Ensermukelbessa et al., 1992) and (Edwards 2001). This trend has the potential to threaten wealth of indigenous knowledge on medicinal plants and even the health of people. Moreover, the consequence leads not only to the loss of medicinal plants, but also to the decline of the associated indigenous knowledge, and possibly would have negative effects on the welfare of human beings.

Indigenous knowledge (Ik) about traditional medicinal plants is transferred secretly from generation to generation orally in developing countries like Ethiopia. It is obvious that there is a gap in the documentation of medicinal plants in Ethiopia. In addition the Ik on usage of medicinal plants as remedies is being lost due to migration from rural to urban areas, industrialization, expansion of modern education and even the specialized healers do not convey their knowledge to the next generation properly. In addition in most parts of the country, the wild plants and forests are being threatened by human impact like deforestation, agricultural

expansion, over exploitation and population growth. One part of Ethiopia to face such problems is Lemo woreda of Hadiya zone SNNPR. This Region was among the areas with rich biodiversities and now it is now suffering from plant loss due to deforestation and over exploration medicinal plants without replacing. Almost nothing has been done to document ethnobotanical knowledge of the people in Lemo district which could serve as a basis for conservation and community development activities. The finding of this study will help people of the study area to be aware about problems associated with medicinal plants and give due attention for the threatening medicinal plant wealth of the area.

1.3. Objectives

1.3.1. General objectives

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

1.3.2. Specific objectives

- To collect, identify and document traditional medicinal plants used to treat human and livestock health problem.
- To identify plant parts used for medicinal purposes, their methods of preparation and the way of administration in study area.
- To identify the distribution of medicinal plants of the study area.
- To identify habitat of medicinal plants used
- To identify the specific roles of social classes of the community, especially the role of women in plant based home medicine.
- To identify the threat factors and conservation practices of medicinal plants in the study area.

Chapter Two

2. LITERATURE REVIEW

2.1. Plant –People interaction and trends of ethnobotany

The term ethnobotany was coined by an American botanist, J.W. Harshberger in 1885 to mean the study of plants used by the aboriginals (Ploktin, 1991, Balick and Cox, 1996, Sharma and kumar, 2010). During the century, which has intervened, Considerable attention has focused notonly on how plant are used, but also how they are perceived and managed, and on the reciprocal relationships between human societies and plants (Cotton,1996). As a result, ethnobotany has been repeatedly redefined (Yen, 1993; cited in (Cotton, 1996). It has now evolved into much broader meaning that covers not only a utilitarian relationships but also relationships that embrace as symbolic, ecological and cognitive, as well as the human- plant relationships in modern setting (Schultes and Von Reis, 1995; Alexiades, 1996). It is a distinct branch of ethnobotany, dealing with various aspects such as anthropology, archaeology, botany, and ecology Martin (1995) also defend it as the study of local people's interaction with the natural environment how they classify, manage and use plants that are available around them.

It is the science, which studies the relationship between a given society and its environment and in particular the plant world (Aumeerudy, 1996).It is the scientific study of complex plant-human relations in all phases and the effect of plant-environment on Human society.

The investigation of plants and their uses is one of the most primary human concerns and has been practiced by all cultures for thousands of years though it wasn't called ethnobotany (Macdonald,2009). Plants are believed to have healing powers due to their biological and physical properties and hence humans interact with plants for diverse medicinal (Cotton,1996).

2.2. Indigenous knowledge on medicinal plants

Traditional knowledge refers to innovations and practices of indigenous and local Communities around the world. According to Martin (1995) it is a result of many generationslong years Experiences, careful observation and trial and error experiments. thus, over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use management and conservation (Cotton, 1996).The development of this indigenous knowledge

system, which covers all aspects of life including management of natural environment, has been a matter of survival to the people who developed the knowledge (Fisseha Mesfin *et al*., 2009).

As described by Balick and Cox (1996)research concerned with ethnobotany involves recording the knowledge on the cultural interaction of people with plants, finding out how local people have traditionally used plants for various purpose and how they incorporate plants in to their cultural tradition and religion

Such ethnobotonical investigations also need to involve scholars from various streams such as plant taxonomy plant ecology, anthropology, linguistic, pharmacology and the like to get more detailed and reliable information (Martin, 1995). There are several techniques of inquiry tools based on the aims and objectives of the ehnobotanical study at hand (Alexiades, 1996). These inquiry techniques include participant observation, field interviews, and group discussion, check list interview and market survey. (Zemede Asfaw , 1990), (Martin, 1995) and (Grenier, 1998) have also described that useful information on ethnobotany could be obtained from collection and analysis of belief rituals, songs, sayings, verse, local names, and even dances,

2.3. Traditional medicine

Ethnobotany is abroad term referring to the study of direct interrelations between humans and plants. The world health organization (WHO, 2001) defined traditional medicines as the total combination of knowledge and practices that can be formally explained or used in prevention and elimination of physical, mental or social imbalance and raying exclusively on practical experience and observation handed down from generation, to generation, whether verbally or in writing. According to Fassil (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.

2.4. Traditional medicinal plants

2.4.1. Traditional medicinal plants used by the Local community

Today, millions of people around the world consume plant-based medicines as part of traditional medicine for a range of medical disorders. The use of traditional medicine in developing countries contributes directly to the socio- economic status and well being of the rural communities (Chiranjibi *et al*., 2006). People especially herbalists and traditional healers generate income from medicinal plant. For example in countries like Uganda about 80% of the population largely depends on herbal medicine for treating various diseases and even generating some income (WHO, 1995). The use of medicinal plants especially in the primary health care system has become prominent (WHO 1978; Shrestha and Dhillon, 2003). This has led to the increasing search for plants with medicinal uses; the search for plants with medicinal uses has led to some ethnobotanical studies that have documented traditional medicinal plant species.

Ethnobotanical studies have also showed that valuable indigenous information about the use of medicinal plants is being lost from one generation to another and due to increasing rate of habitat destruction. It is evident that plant resources including medicinal plants are getting depleted or are threatened in many countries. For instance, reports show that high population growth, habitat destruction and over exploitation have led to the loss of useful medicinal plants (Origa et al., 1997: Sheldon et al., 1997: Dhillion and Amundsen, 2000: Tabuti et al., 2003).

2.4.2. Traditional medicinal plants used in modern medicine

According to the world Health organization(WHO,) traditional medicine refers to the sum total of knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve, or treat physical and mental illnesses (WHO,2008).Traditional medical practices can include plant, animal, and mineral-based medicines, massage, spiritual therapies, and a variety of other techniques to different regions and cultures (WHO,2005). Traditional medicine is typically contrasted with conventional medicine, also referred to as allopathic, modern. Orthodox, or which is based on biochemical theories of illness

In countries with limited access to allopathic medicine, traditional medicine is often the main source of health care. In some countries in Asia and Africa, 80% of the population uses traditional medicine for primary health care needs (WHO, 2008). In many developing nations, there are more traditional healers than there are allopathic practitioners, and the population of allopathic practitioners is often concentrated in urban areas, further reducing rural access to medical care. For instance it was reported that in Uganda, the ratio of biomedical practitioners to the population is approximately 1:20, 00, while the ratio of traditional healers to the population can be as low as 1:200(WHO, 2005. In regions of Ethiopia where modern public health services are limited or not accessible, 8% of the population relies on traditional medicine for primary health care. Traditional medical services are also sought in urban areas of Ethiopia, where allopathic services are more readily available, and contribute considerably to the public health care system even in Addis Ababa, the capital city. It is estimated that at least 25% of all modern medicines are derived, either directly or indirectly from medicinal plants (WHO, 2008).

Traditional medicine is referred to us traditional for a reason: it is used by a traditional way different from the modern medicine. It is not as effective as Modern Medicine. Some traditional treatments work well but modern medicine just takes these traditional treatments and makes them more effective. Modern medicine can have side effects, but if taken with regulation and not in over dose, modern medicine attracts more people with a good preference than the traditional way (WHO, 2008).

2.4.3. The Integration of traditional and modern medicines

In Ethiopian health care Coverage, management of disease and disorders is believed to be improved by the integration of modern and traditional medicines. According to (Kebu et al., 2004), the adaptability base for the development of modern drugs is facilitated by keeping the efficacy, and quality of traditional medicines. This promotes its integration to the modern health system of the country.

Integration in this cases an increase of health coverage through collaboration, communication, harmonization of the modern system with that of the traditional one while ensuring intellectual property right and protection of traditional medicinal knowledge(Bekele Tefera,2004). Integration of two systems is believed to be crucial due to the fact that people with different

cultures, beliefs and localities have their own unique knowledge of traditional medicines and this helps for the development of modern health system (Bekele Tefera, 2004).

2.4.3.1 The global situation of traditional medicine

The practice of traditional medicine is widespread in China, India, Japan, Pakistan, Srilanka and Thailand. Up to 80% of the population in developing countries is entirely dependent on plants for its primary healthcare (Dawit Abebe and AhaduAyehu,1993; Kurt and Andrew, 2002) and the value of medicinal plants to human livelihoods is essentially infinite (Hamilton,2003).

In Africa, traditional medicines are part of the people's culture despite the fact that this form of medical is not as well organized as, for example, in India and china practitioners include herbalists, bone setters, village midwives, or traditional birth attendants, traditional psychiatrists, herb setters and other specialists (Sofowora, 1993). In Ethiopia, since early times, plants have traditionally been used as a source of medicine for the control of various ailments affecting humans and livestock and the major sources of medicine for the majority of the rural population (Tesfaye Awas *et al*., 2009). This wide usage of traditional medicine has been attributed tocultural acceptability, efficacy against certain type of diseases and economic affordability as compared to modern medicinal (Dawit Abebe *et al*., 2001).

2.5. Traditional medicinal plants in Ethiopia.

2.5.1. Overview of medicinal plants in Ethiopia.

Several studies have been conducted in different parts of the county on traditional medicinal plants. As to the preparations and routes of Applications, a number of studies reported that relatively similar applications. Among the various methods of medicinal plants preparations, crushing, pounding and squeezing juice of particular plant parts and homogenizing it in water are the commonly used forms of preparation (Bayafers Tamene *et al*., 2000; Kebu Balemie et al.,2004; Haile Yineger and Delenassaw Yewhalaw, 2007; Ragunathan and Solomon Mequanente, 2007). All of these studies also found that leaves followed by roots were the most common plant parts used for remedy preparation though some others reported roots to be most often used plants parts followed by leaves (MirutseGiday et al., 2003; Tilahun Teklehaymanot and Mirutse Giday, 2007; Ermias Lulekal et al., 2008).

Regarding habits of medicinal plants, those studies revealed that the majority of them are found to be herbaceous followed by shrubs. Oralfollowed by dermal route of administration are the most common among the different routes of applications. Other studies also reported that majority of those plants are from the wild and only some are growing near home (Zemede, Asfaw, 1999; Tesfaye Halemariam *et al*., 2009;GetanehGebeyehu, 2011).

2.5.2. Medicinal plant diversity and distribution in Ethiopia

Ethiopia is characterized by a great range of ecological edaphic and climatic conditions (Dawit Abebe and Ahadu Ayehu, 1995; Dawit Abebe et al., 2003). The number of plant species in each corner of the country and the vegetation type is also varied ranging from arid low land to afroalpine vegetation (Dawit Abebe, 2001). Similarly it was reported that the variation in vegetation type of the country is due to the country's significant geographical diversity. It was reported by Edwards (2001), hat the wood lands, Montane, vegetation including grass land, forests and evergreen scrubs and rocky areas contain more medicinal plants indicating that traditional medicinal plants species are not equally distributed throughout the country, similar to the distribution of the total species.

(Edwards, 2001) has also reported that the vegetation types found in the wood lands of Ethiopia contain more medicinal plant species while the afroalpine vegetation consists of the least medicinal plants of all the vegetation types.

2.5.3. The use of traditional medicinal plants in Ethiopia

In Ethiopia plants have been used as a source of traditional medicine from time immemorial to combat different ailments and human sufferings (Assfaw Debela. *et al*., 1999). Due to its long period of practice and existence traditional medicine has become an integral part of culture of Ethiopia people (Pankhurs, 1990). It is common for people living in rural and urban centers used to treat some common ailments plants available around them (for example flowers of *Hageniaabysinica* used for expelling tape worm, *Rutachalepensis* leaves used to treat various health problems (Abbink, 1995). In this country,the continued dependence on herbal medicine a long side modern medicine is largely conditional by economic and cultural factors (Abbiw, 1996).

Modern health care has never been and probably never will provide foreseeable future adequate equitable health service anywhere in Africa including Ethiopia, due to the financial limitation related to rapid population, growth political instability and poor economic performance system.

2.6. Medicinal plants as the base for development of modern drugs.

Research and documentation on medicinal plants have been started only very recently even though plants have been used as a source of medicine to treat both human and livestock ailments in Ethiopia (Mesfin Tadesse and Sebsebe Demissew; 1992): the number of higher plant species on the earth is estimated to be between 250,000-500,000 (Mahesh and Satish, 2008). Of these, only about 6% have been screened for biological activity, and a reported 15% have been evaluated phytochemically (Fabricant and Farnsworth, 2001).

Ethnopharmacology is a highly diversified approach to drug discovery involving the observation, description, and experimental investigation of indigenous drugs based on botany, chemistry, biochemistry, pharmacology, and many other disciplines contribute to the discovery of natural products(Vlietink and Vanden, 1991). In addition taxonomy and the newer discipline ethnobotany has now become an integral parts of drug discovery from plants (Jachak and Sakalani, 2007); searching new drugs from traditionally used medicinal plants can be the shortest path to success (Berhanameskel Woldegirma,2009) and indigenous people remain the ultimate resources for retrieving this information for the purpose of applications, particularly in modern medicine (macdonald,2009).

Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drugs (Wright, 2005). An average of 25% modern drugs contains one or more active principle obtained from plants (Medihn Zewidu et al., 2001). and Gopalakrishnakone (2007) also described that plant based drugs provide outstanding contribution to modern therapeutics Verma and Singh (2008) also reported that various modern drugs were extracted from medicinal plants through the use of plant materials as indigenous cure in traditional system of medicine and it is believed that half of the top 25 best-selling medicines in the world originate from plant materials (Ohigashi, 2008). For example, in the United States of the top 150prescription drugs at least 118 are based on natural sources (Roberson, 2008).

Ethiopia is a rich source of medicinal plants; the knowledge and use of plant is an integral part of many ethnic rural cultures (Abbink, 1995). Perhaps the best known plants species is *phytolacca dodecandre.* Extracts of this plant are used as effective molluscicides to control Schistomiasis (Aklilu Lemma et al., 1984) and maytansine, an active principle against cancer was isolated from Maytenus species (Sebsebe Demissew and Ermias Dagne, 2001). As a result, development of new drug is important research in order to improve the health problems and even develop drugs for lethal diseases based on ethnobotanical approaches, by taking indigenous knowledge as head.

2.7. Threats to and conservation of medicinal plants

2.7.1. Threats to medicinal plants

People to use plants for food, clothing, shelter construction and means of income generation in addition to their medicinal values. Ethiopia's traditional medicine as elsewhere in Africa focused with problems of continuity and sustainability (Ensermu Kelbessa *et al*., 1992). The primary threats to medicinal plants are 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 (Zemede Asfaw, 1999; MirutseGiday *et al*., 2003).

2.7.2. Conservation of Medicinal Plants

Medicinal plants are considered to be at conservation risk due to over use and destructive harvesting of roots and barks collection (ZemedeAsfaw, 2001). Such wide utilization of root parts for human and livestock ailments with no replacements has affected the future availability of the plant. The work of Haile Yineger and Delenassaw Yewhalaw (2007) reported that, from the total plants parts used to prepare remedies, roots are widely used with 64 species (35.5%) followed by leaves 47 species (25.97%) hence affects sustainable utilization.

Chapter Three

3. Materials and Methods.

3.1. Location of the study area

The study was conducted in Lemo Woreda, SNNP Regional State, located at about 230 km south west of Addis Ababa. Lemo is the rural administrative Woreda of the 11 Woredas in Hadiya Zone (Figure 1). The woreda is sited on the main Addis Ababa-Hossana-Arbaminch road and covers about 49, 435 hectares delimited by the approximate geographical coordinates of 7°39'–59.99" N 38°00'0°.00"E (Lemo Woreda finance and economic Bureau, 2018)

Lemo Woreda is one of 11 woredas in Hadiya zone, SNNP Regional State. There were thirty five total kebeles in the woreda and among these; twelve kebeles were selected from thirty five total kebeles

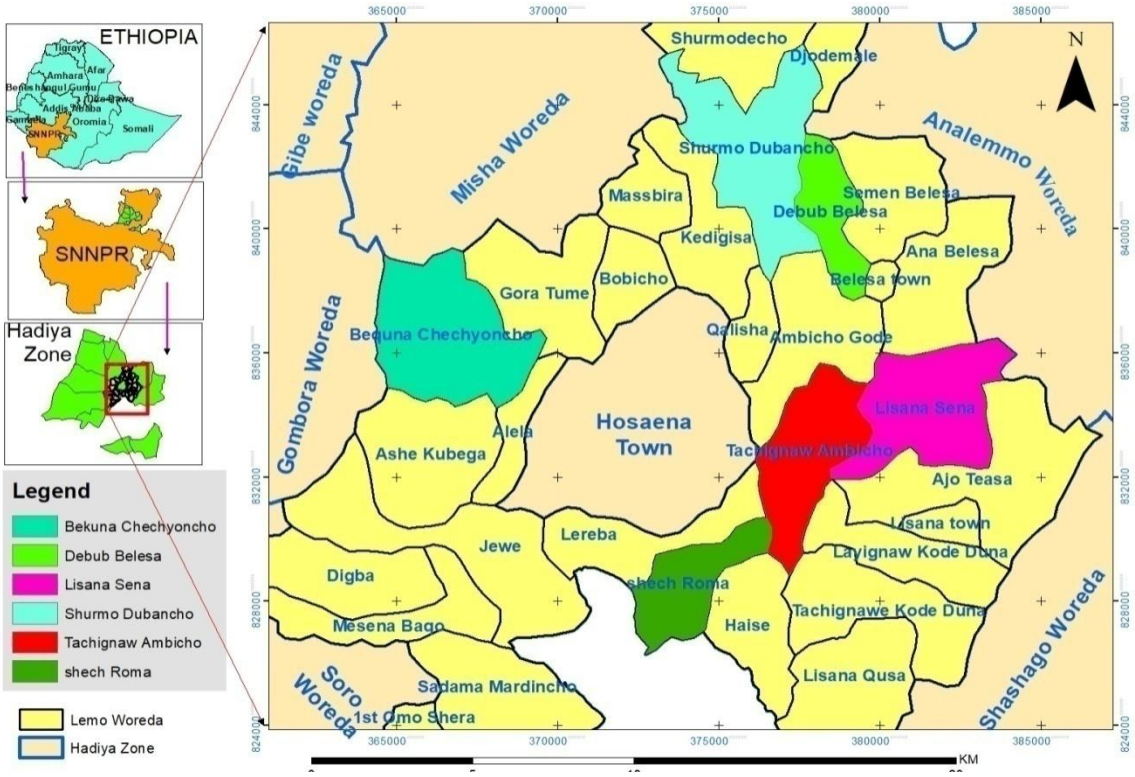


Figure1 (Map of Ethiopia showing SNNPR, the study woreda and kebeles)

3.1.1. Climate and edaphic factors

Agro-ecologically, Lemo Woreda is classified as Dega (16.7%) and Weyna dega zone (83.3%), known in the traditional agro-climatic zonation of Ethiopia, which is characterized by cool highlands and warm climatic conditions of the middle lands respectively. Woyna dega is the predominant agro-climatic zone in the area that is favoring most of the agricultural production. Annual mean minimum and maximum temperature of the woreda ranges respectively from 13°C -23°C. The mean annual rainfall of the area is 1600mm.The Woreda enjoys well distributed annual rainfall. It receives heavy rainfall during the main rainy seasons. The long rainy season in this area is between June to August. The highest rain usually occurs between July and August while lowest rainfall is mostly exhibited from January to April (Lemo Woreda finance and economic Bureau, 2018).

3.1.2. **Land use and topography**

According to the data recorded in the Woreda Land Administrative and Resource Management Office (2018), the total land area is 49, 435 hectare. The Woredas land area lies between 1900-2700m above sea level. About 65% of the study area is plain and the remaining area is plateau. The majority (61.7%) of the population in the study area is engaged in mixed agricultural activity in which crop production is integrated with livestock raising. The recorded data obtained from Lemo Worda Agricultural Development office indicated that, the major crops grown in the area are cereals, vegetables, fruits, cash crops and roots table 1.

Table 1. Major Food Crops grown in the Study Area.

Nº	**Types of Crop**	**Scientific Name**
	Vegetables	*Allium sativumLepidium sativum, Allium cepa,*
	Cereals	*Barley (Hordeum vulgare) ,Zea mays* L., *Eragrostis tef Sorghum bicolor* L. , Wheat (*Triticum aestivum)*
	Fruits	*Citrus limon (L.) , Mangifera indica* L
	Cash Crops	*Catha edulis, Coffea arabica arabica*L L.
	Root	*Ensete ventricosum* (Welw.)

Source: Lemo woreda agricultural and rural development office, 2018

3.1.3. **Vegetation**

Vegetation is an assemblage of plants growing together and covers a particular area (Jennings *et al*., 2003). Vegetation coverage in the study area is relatively very low. The major forest tree species in the area include *Juniperus procera*, *Croton macrostachyus, Acacia seyal, Podocarpus falcatus and Olea europaea subspp cuspidata, Eucalypyus globulus*. However, there is a very fast degradation of these forest areas due to deforestation, land degradation, and population pressure. As a result, it is hard to find large areas, which are covered by natural forest. Hence, what are now found there are simply small trees and some large trees as observation of the area revealed.

3.1.4. Demographic and people's livelihoods

The study area has an estimated total population of 169,764 according to the Woreda's finance and economy bureau (2018), of these inhabitants, 83,807 were males and 85,957 were females. About 98% of the population is classified as rural and close to 2% as urban dwellers. The language spoken in the woreda has been almost 75% Hadiyisa. The major livelihood system of the people is agriculture. There are also other activities like civil servants, traders.

3.1.5. Materials

Plant specimens collecting, pressing and drying pieces of equipment's were used in the field. Such materials included wooden frames, cardboards, blotters, newspapers, plasters and plastic bags that have various sizes for storage of many plant parts. Cutting tools like pair of scissors and knife, plant diggers, markers, field notebooks, printed data collection formats and checklists (semi-structured interview guides) and photographic camera were used in this study.

3.2. Sampling and Data collection

3.2.1. Reconnaissance survey

Reconnaissance survey was conducted from 25 February-March 20, 2018 in the study area in order to obtain information on identifying the sampling sites, selection of key informants, and other facilities. In this time, twelve study sites or kebeles were identified out of thirty five kebeles in the woreda. Selection of the study Kebeles was based on the number of traditional healers within Kebeles of the study Woreda and presence of some natural forest near the selected areas by using advices of knowledgeable elderly peoples and traditional.

3.2.2. Sources of data

Ethnobotanical data were gathered from both primary and secondary sources. The primary data were collected from study kebeles using direct field walk, 3 focus group discussions with 18 key informants and using semi-structured interview. On the other hand, secondary sources of data were the Woreda's administrative centers, maps obtained from Woreda's offices to describe the local area, the land situation, population status and overall description of the study area. In addition to this, data regarding types of crops growing currently in the study area were obtained from the secondary data available in the relevant offices of the woreda´s agricultural office.

3.2.3. Sampling research sites and informants

Representative Informants and knowledgeable Traditional Medicine Practitioners were selected using Systematic Random and Purposive Sampling approaches in the manner described by Martin (1995).Informants were selected from 12 Lemo woreda's sample kebeles of the 35 total kebeles in the woreda. Those 12 sample kebeles were selected from the study area using purposive sampling method and 144 general informants (12 general informants from each kebeles) and 36 key informants (3 key informants from each kebele) thus totally 180 informants were selected following the choice of informant selection as recommended by Martin (1995). That is by the recommendation of elders, local authorities, traditional healer associations, and local farmers. General informants were selected by random sampling technique by tossing a coin and when the head was raised up the resident of people in the village was interviewed wherever they were found in the home or working places depending on their free will to share indigenous knowledge but purposive sampling technique applied to select key informants as recommended by Martin (1995).

3.2.4. Ethnobotanical data collection

Before administering Ethnobotanical data collection tools (Semi-structured interviews, group discussion, guided field walk and observation), brief discussion with informants were held with the assistance of local government agents or Kebele Managers, working in the Study Kebeles/sites to elaborate the objectives of the study and to build-up trust on the purpose of filling and preserving the indigenous knowledge of people on Medicinal plants. Ethnobotanical investigation was carried out to collect data on medicinal plants used to treat human and livestock ailments in Lemo Woreda as described by Martin (1995) and Alexiades (1996)

The research methods to collect the ethnobotanical information in Lemo is mainly those that promote free sharing of information between the researchers, the herbalists and other people in the community. Therefore, informal conversations and semi-structured interviews using questionnaires prepared in local language of study area, group and individual focused group discussions and field visits were conducted to generate the ethnobotanical data.

3.2.4.1. Group discussion and semi-structured interview

Ethnobotanical data were collected through semi-structured interviews and four group discussions following Martin (1995) and Cotton (1996). Series of individual interviews were carried out to gather information regarding local names of plants used, their threats and management, part(s) used, preparationmethods, routes of remedy administration, diseases treated. The same methods used to collect data on habit, habitat and conservation status of medicinal plants. Field observations were also used to record habit and habitat of each medicinal plant with the assistance of local guides and interviewed informants. Moreover, the individual Semi-structured interview involved local names of medicinal plants, distance from the house to gathering sites, seasonality of species, degree of management (wild/cultivated), condition of plant part used (fresh/dried), other ingredients or additives (if any), methods of remedy preparation, remedy preservation (if any), dosage prescriptions, routes of remedy administration, noticeable adverse effects of remedies, source of knowledge, method of indigenous knowledge transfer, other uses of medicinal plants, existing threats and traditional conservation practices (if any).

Figure 2. Discussion and semi-structured interview with informants (photo courtesy by Reda Ertiro 2020)

3.2.4.2. Market survey

Local markets and marketing conditions of medicinal plants, fruits and spices have been visited to interview merchants in Lemo Woreda at Ashe kubega and Digeba kebeles and buyers concerning cultural, social and economic aspects of plant product selection, use and commercialization. Ethnomedicinal data collection on marketability of medicinal plants was based on oral interview with the aid of semi-structured questions. That is mainly by close observation in the market and interviews on medicinally important plants to identify the medicinal plants sold in the market. Market surveys are useful for identifying the medicinal plants at risk from commercial trade and a recommended method to conserve a given medicinal plant if it has high economic value (Omoruyi, 2012).

3.3. Data Analysis

3.3.1. Descriptive Statistics

Ethnobotanical data were analyzed after entering the data into Ms-Excel (2010) version. Descriptive statistics was also used as recommended by Martin (1995) and Cotton (1996) to identify the most common ailments in the study area, popularly used medicinal plant species and to determine proportions of different variables like plant families, growth forms, sources of indigenous knowledge, plant part used, methods of preparation. Summarized descriptive statistics was also used for various ethnobotanical ranking, scoring and percentage frequency.

3.3.2. Informant consensus factors (ICF)

For ethnobotanical data analysis informant consensus methods were employed and the relative importance of each use directly from the degree of consensus in informants' responses was calculated as recommended by Phillips (1996). In this study, in order to evaluate the reliability of the information provided by the informants, informants were contacted/met more than once for the same information and the validity of the information on ICF (informant's consensus factors)wascalculated using the formula $ICF = Nur - Nt/Nur - 1$**,** whereNur refers to the number of use-reports for a particular use category and Nt refers to the number of species used for a particular use category by all informants. ICF values are low (near 0) if plants are chosen randomly or if there is no exchange of information about their use among informants, and approach one (1) when there is a well-defined selection criterion in the community or if information is exchanged between informants (Gazzaneo *et al.,* 2005).

3.3.3. Fidelity level (FL) index

According to Friedman *et al*. (1986) cited in Alexiades (1996), the Fidelity level (FL) is used to quantify the importance of a given species for a particular purpose in a given cultural group or to determine the most preferred plants for a treatment of a particular disease. It is the percentage of informants claiming the use of a certain plant species for the same major purpose, and which would be calculated for the most frequently reported diseases or ailments as

$FL = \frac{Np}{N} * 100$:, where, Np is the number of use-reports cited for a given species for a particular ailment and N is the total number of use-reports cited for any given species for a particular ailments.Therefore, fidelity level index was calculated for most frequently reported diseases namely wound, common cold, stomach ache and toothache.

3.3.4 Ranking of Medicinally important plants

3.3.4.1 Preference ranking

According to Martin (1995), preference ranking involves asking people to think of five to seven items and request to arrange those items based on a given criterion. Such criteria may be personal preference, perceived importance in the communities, or the list of plant resources that people feel are becoming increasingly rare in their surroundings. Then, each chosen key informant was asked to assign to attributes of each species (5=most valuable, 4=very good, 3=good, 2=less used, 1=least valuable, and 0=not used). The values of each species were summed up and ranked for each informant, and then for the total informants. Therefore, in the present study the set of five plants were selected from the list of medicinal plants, which were perceived as effective and commonly reported to treat common cold by most informants in the study area. Then, these plants were presented to six randomly selected key informants to rank according to their preference. As the set of species had most important ones to treat common cold, those were given the highest value, 5; while the least important medicinal plants were given one. Then, the numbers were summed and the plants ranked.

3.3.4.2 Paired comparison ranking

Paired comparison method (Martin, 1995) was used to determine the relative importance of plant species, which are used in the treatment of wound, stomachache, toothache, common cold, eye infections, ecto-parasites and anthrax. In paired comparison ten informants were selected and

asked to choose the best item from every pair according to personal perception in treating ailments. A total rank of paired comparison was obtained by summing the number of times each item was chosen.

3.3.4.3 Direct Matrix Ranking

Direct matrix ranking was conducted for six commonly reported multipurpose medicinal plants in order to assess their relative importance to local people (Martin, 1995; Cotton, 1996).Based on their relative uses, selected informants were asked to assign use values for each plant (5 = best, 4 =very good, 3 = good, 2 = less used, 1 = least used and 0 = not used) to each use category. Use categories in the comparison include construction, medicine, furniture, fire wood, charcoal and fencing.

3.4. Ethical considerations

Before starting data collection in the study area the informants and government authorities were clearly informed about the purpose of the research. It was explained that the purpose of the present study is focused on assessing and documenting of indigenous knowledge of medicinal plants of the study area for scientific investigation rather than for commercial or illegal purpose.And the procedure involves asking permission and cooperation and the benefits they could get from the study were told. The recommendation of Cunningham (1996) which states that studies on medicinal plants must be carried out legally and ethically were strictly followed.

4 .RESULTS AND DISCUSSION

4.1. RESULTS

4.1.1. Characteristics of respondents involved in the present study

Background of the respondents has shown 66.7% of the respondents were males while 33.3% were females, from both sex 73.3% were married and the remaining 27.7%were unmarried. The educational status of the informants showed about 44.4% of respondents were learned from grade 1-8 while 22.2% respondents followed grades 9-12 and the remaining 5.6% followed college or university . About 44.4% of the respondents were with middle age (39-58) group (Appendix1)

4.1.2 Indigenous Medicinal Plant Knowledge of Local People

4.1.2.1. Traditional Medicinal Plant Use and Knowledge Transfer System

Indigenous knowledge on medicinal plants was mainly transferred orally 80 (88%) from parents to children along the family line while 10 (2%) informants reported that the knowledge was gained through learning and observation (10%) Figure-3

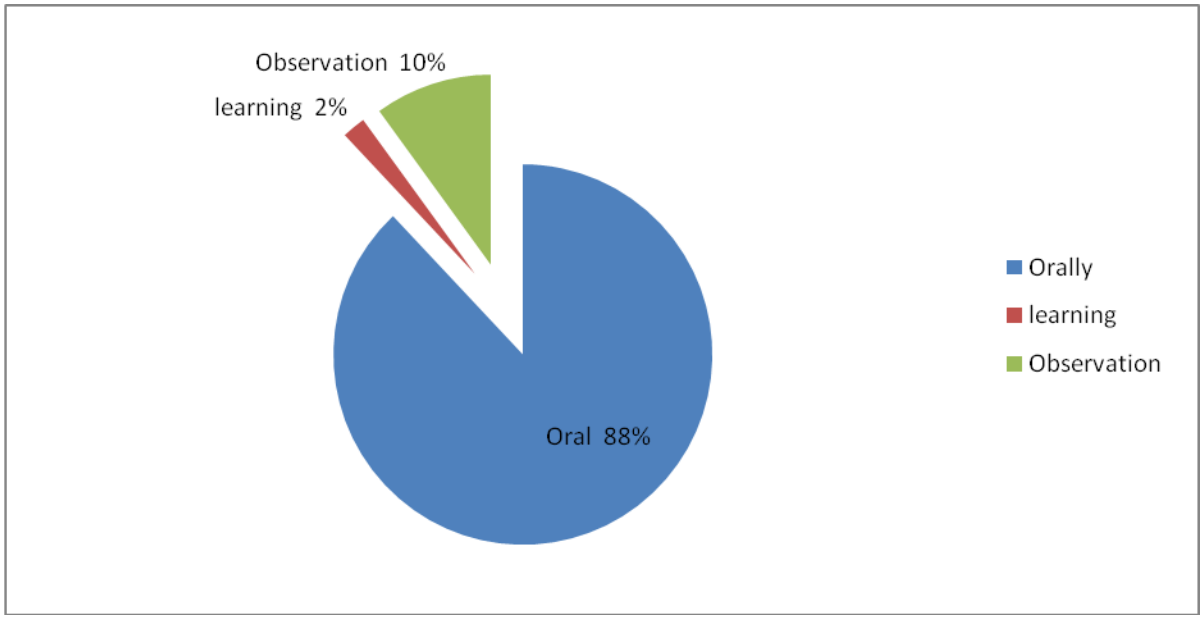


Figure- 3.Indigenous knowledge transfer on medicinal plants in Lemo woreda

4.1.3. Medicinal Plants Use Knowledge

Collected data revealed that there were Indigenous knowledge gaps among family members. The data have shown that 60% of the respondents reported that mothers are more knowledgeable on medicinal plants than any other family members.

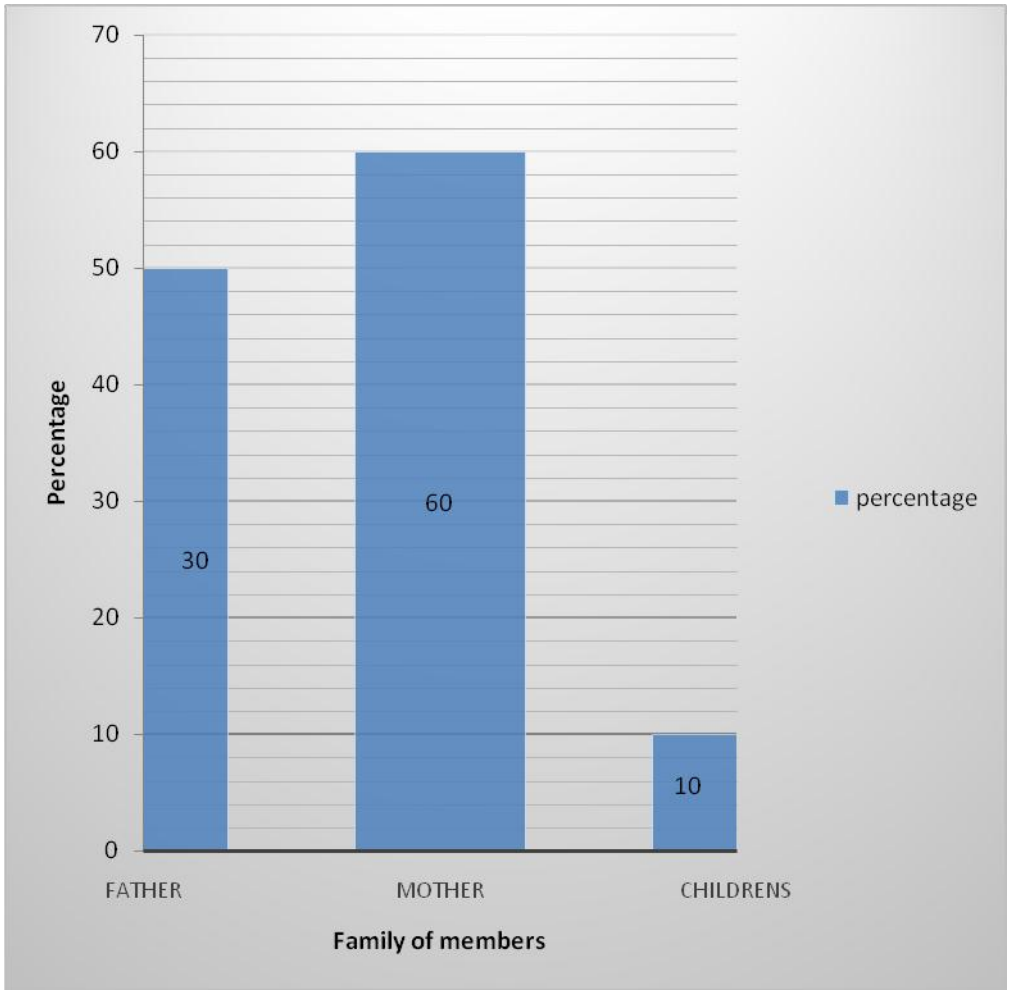


Figure-4.Medicinal plant using knowledge

4.1.4. Taxonomic Diversity and Sources of Medicinal Plants species.

A total of 60 ethnomedicinal plant species belonging to 55 genera and 34 families were collected, identified and documented in this study. Asteraceae was found the most dominant family containing 7 species (11.9%) followed by Lamiaceae having 5(8.3%) and Solanaceae 4 (6.8%) species. Zijiberaceae, Rubiaceae, Rutaceae and Rosaceae were the other dominant families having 3(5.1%) species each (Appendix 2). The results of the interview conducted indicated that most medicinal plants used by the community of the study area were collected

from the wild (50%) followed by the home garden (41%) and wild and home garden (9%) respectively (Figure-5).

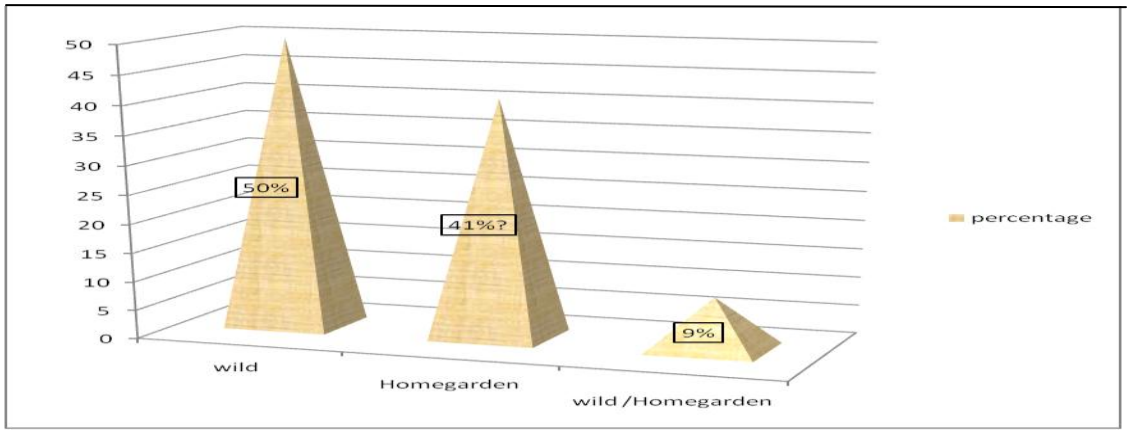


Figure 5.Habitat of medicinal plants used in Lemo Woreda

4.1.5. Ethnomedicinal Plants in the Study Area

4.1.5.1. Ethnomedicinal plants used to treat human and livestock ailments

The majority (52 species) of the recorded medicinal plants were reported to treat 32 different human ailments. Six plant species were reported for treating 6 both human and livestock ailments while rest 2 plant species were used to treat 2 different livestock ailments.

4.1.6. Habits of medicinal plants

As the collected data revealed majority (61.7%) of the medicinal plants used in Lemo woreda were herbs followed by trees (23.3%), shrubs (10%) and climbers (5%) Figure (6).

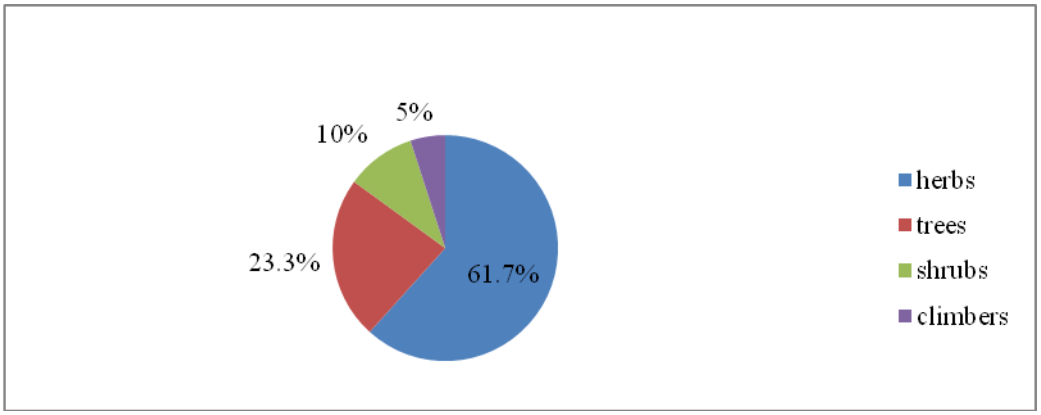


Figure-6. Habits of medicinal plants used in in Lemo Woreda

4.1.7. Medicinal plant parts used

The greater proportion of plant parts 23 (38.3%) used to treat human and livestock ailments were leaves followed by seeds 10 (16.7%). The roots and stems were represented by 11.7%and 6.7% of the species respectively (Table2).

Table 2 Proportion of plant parts used for preparation of medicines in Lemo Woreda.

Plant parts	**N^{o} of plants**	**Percentage**
Leaf(bud) only	23	38.3
Root only	7	11.7
Leaves, latex and Stems	1	1.7
Leaves and Roots	2	3.3
Stems	5	8.4
Seeds	10	16.7
Fruits	1	1.7
Leaves and seed	2	3.3
All parts	1	1.7
Latex	2	3.3
Bulbs	2	3.3
Rhizomes	1	1.7
Leaf, Fruit &Flower	1	1.7
Roots and seed	1	1.7
Leaf and flower	1	1.7
Total	**60**	**100**

4.1.8. Conditions on preparation of remedy

Among the total medicinal plants, the majority 41 (69%) cited by informants were used as fresh plant material, 14 (23%) as dried and 5 (8%) were reported to be used in either forms.

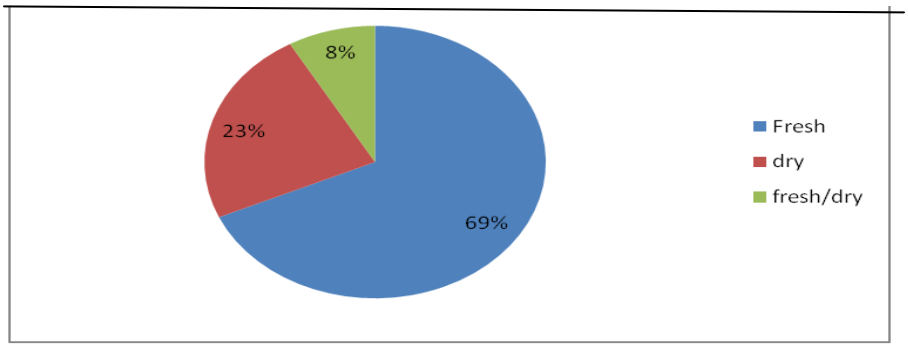
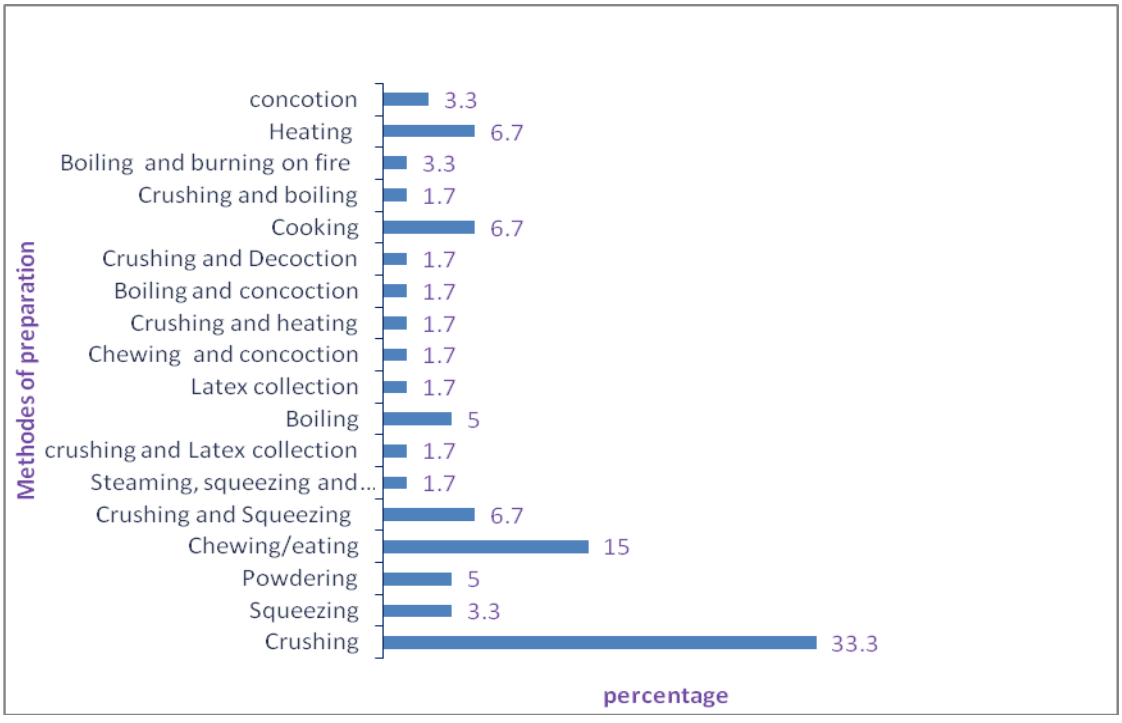


Figure 7.Conditions of medicinal plants used in Lemo woreda

4.1.9. Methods of remedy preparation

The local people of the study area used various methods of remedy preparations. A higher number of preparations 19 (33.3%) species were reported to be prepared by crushing followed by chewing/eating 9 (15%)(Figure 8).

Figure 8. Methods of preparation of remedy in Lemo Woreda



4.1.10. Materials used to prepare remedies in study area

The information gathered from informants during data collection period revealed that the community as well as traditional healers of the study area used some materials to prepare the remedy. The major material reported includes pistil, mortal, local grinding, digging, cutting and squeezing materials.

4.1.11. Additives during remedy preparation

During remedy preparation people of Lemo woreda use additives to avoid appetite problems of medicinal plant users resulted due to bitterness and unsafe flavor of medicinal plant preparations. The major additives reported in the study area include honey, water, milk, salt, coffee and tea. The informants reported that the purpose of using additives is mainly to minimize lack of appetite for taking the remedies and also to ease taking process. As well as some of them are also beside strengthening the healing potential of the remedy.

4.1.12. Dosage and routes of administration of prepared remedies

There is no standardized method of determining the dose as the study indicated but the recommended traditional dosage generally depends on the patient's age, the type of disease and the type of remedy that change over the course of treatment. After preparation, medicinal plants were administered through different routes. Most of the prepared remedies 32(53.3%) were found to be taken orally, followed by 11(18.3%) dermal application. The rest 17 species (28.3%) were given through remaining routes as Shown below (Figure 9).

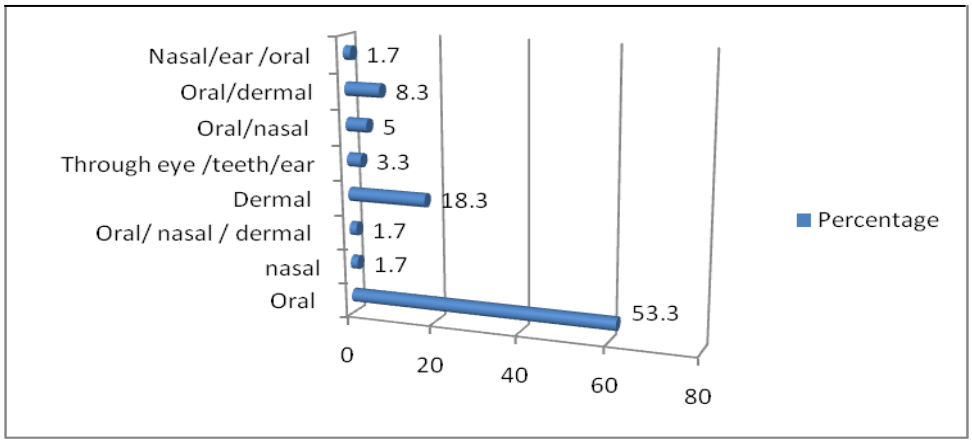


Figure 9.Route of administration of home remedy in Lemo woreda

4.1.13. Ailments Treated with Medicinal Plants

The informants reported that among 60 plant species 52 species were used to treat 32 different human ailments, two plant species were used to treat 2 livestock ailments and the remaining 6 plant species were used to treat 6 both human and livestock diseases . Respondents had good knowledge of ailments (especially human ailments) and easily identify these diseases and could readily diagnose them based on the accepted signs and symptoms. The most frequently cited health problems in the area were wound, stomach ache, tooth ache and common cold (Figure 10).

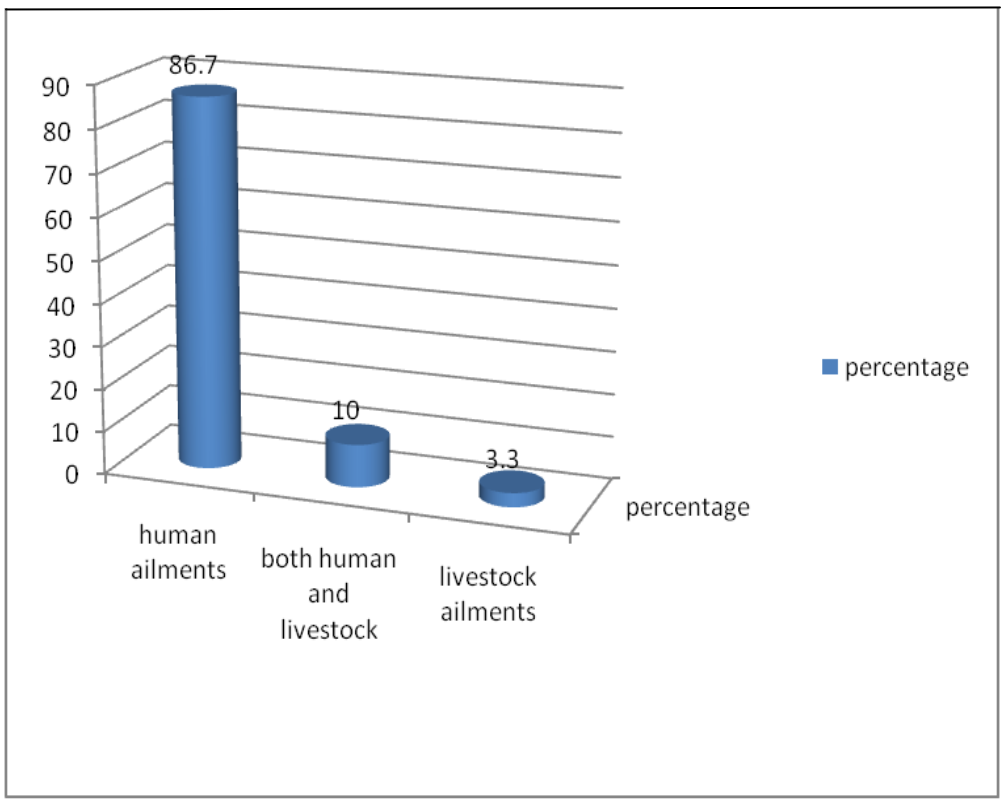


Figure 10. Ailments treated by medicinal plants in Lemo Woreda

4.1.14. Threats to Medicinal Plants

Plant resources are vital for the livelihood of the people of Lemo district. However, there is loss of plants as a result of deforestation, land degradation, overgrazing, and population number increment. So, these are contributing factors for the loss of plant species in general and medicinal plants in particular.

According to informants' response the most mentioned threats to medicinal plants of the study area were deforestation (41%), land degradation (18%), overgrazing (5%), and population number increment (36%). (Figure 11).

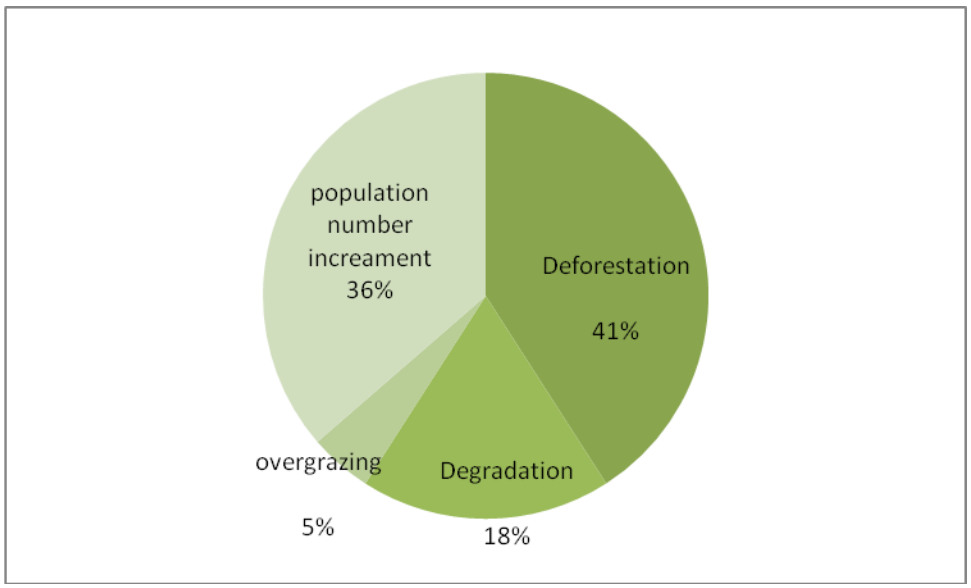


Figure 11.Threats to medicinal plants in Lemo Woreda

4.2. Informants Consensus on the Medicinal Uses of Plants

The present study has shown that, there are some medicinal plants repeatedly mentioned by many informants than others. The computed result (citation) of informants revealed that these traditional medicinal plants were well known in the study area as remedy for different diseases. For example, *Ocimum lamiifolium* was cited by (23 informants, 40%) as remedy for common cold , *Ruta chalepensis* (16,27.1%) for abdominal pain and *Catha edulis* (13, 22%) for tonsilities, *Eucalyptus globulus* (13, 22%) for sudden illness , common cold and cough and

Vernonia auriculifera(13, 22%) as remedy for wound. Among themost commonly known traditional medicinal plant species in the study area the species with least informants agreement were *Guizotia schimperi* (8,13.6)for wound and *Aframomum angustifolium*(8,13.6) for sudden illness as indicated in (Table 3).

Table 3. Most commonly known traditional medicinal plant species in Lemo Woreda.

No.	Scientific name	Informants' agreement	Percentage
1	*Ocimum lamiifolium*	23	40
2	*Ruta chalepensis*	16	27.1
3	*Catha edulis*	13	22
4	*Eucalyptus globulus*	13	22
5	*Veurnonia auriculifera*	13	22
6	*Vernonia amygidalina*	11	18.6
7	*Croton macrostachyus*	11	18.6
8	*Rumex obtusifolius*	11	18.6
9	*Guizotia schimperi*	8	13.6
10	*Aframomum angutifolium*	8	13.6

4.2.1. Preference ranking

Preference ranking on most preferred medicinal plants in the study area showed that *Ocimum lamiifolium* stood first followed by *Allium cepa and Allium sativum* respectively *t*o treat common cold .The least preferred species was *Eucalyptus globulus* as perceived by informants of community in the study area (Table 4).

Table 4. Preference ranking of five most important medicinal plants to treat common cold by six key informants based on their degree of treatment.

Lists of medicinal plants	Key Informants (R_1-R_6)						Total Score	Rank
	R_1	R_2	R_3	R_4	R_5	R_6		
Euclyptus globulus	1	2	1	2	1	1	8	5th
Allium cepa	3	3	4	4	2	3	18	2nd
Ocimum lamiifolium	5	4	5	5	4	5	28	1st
Allium sativum	2	1	3	3	3	4	16	3rd
Zinjiber officinale	4	5	2	1	5	2	15	4th

Key: R=respondents

4.2.2 Paired comparison

Output of paired comparison exercise has shown that *Vernonia auriculifera*, *Guizotia schimperi,Coffeaarabica* and *Justicia schempriana* were ranked 1st, 2nd, 3rdand 4th respectively to treat wound. *Justicia schempriana*, *Lippia abyssinica* were found less preferred and lesseffective compared to the other four species to treat wound.

Table 5. Respondents comparison on major six medicinal plants to treat wound in Lemo Woreda.

Plant species	**Respondents**										**Total**	**R**
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Vernonia auriculifera	5	5	4	5	4	5	5	5	5	5	48	1st
Justicia schempriana	3	3	1	0	1	1	1	2	3	1	16	4th
Lippia abyssinica	0	2	0	2	2	2	0	1	0	2	11	6th
Gallium aparine	2	1	3	1	3	0	2	0	1	0	13	5th
Guizotia schi mperi	4	4	5	4	5	4	4	3	4	4	41	2nd
Coffea arabica	1	0	2	3	0	3	3	4	2	3	21	3rd

Key: R=respondents

4.2.3 Direct matrix ranking

The direct matrix ranking on multipurpose use of medicinal plants revealed that *Eucalyptus globulus* tood first followed by *Juniperus procera* and *Prunus africana* respectively based on the uses that they give. Average score for direct matrix ranking of six medicinal plants with use diversity is given in Table 6.

Table6. Average rank for direct matrix ranking of six multiple use medicinal plants by seven key informants

Species	***Uses***						***Total***	***Rank***
	Furniture	Construction	Firewood	Fencing	Medicine	Agricultural tool		
Croton macrostachyus	2	2	3	1	5	1	18	5th
Eucalyptus globulus	4	5	5	4	5	2	29	1st
Cordia africana	5	4	3	2	4	2	21	4th
Olea europaea subspp cuspidata.	1	4	3	4	2	3	19	6th
Prunus africana	4	5	4	3	4	3	26	3rd
Juniperus procera	5	5	3	4	3	4	28	2nd

As the direct matrix ranking indicates people of study area were using plants for various purposes. This ranking has shown that informants rank a given species based on many criteria's.

4.2.4 Informant Consensus Factor (ICF) of medicinal plants

Based on the computed informant consensus factor values, the study revealed that the highest ICF was linked to problems associated with gastro-intestinal problems (0.83) followed by dermal diseases (0.77). The least ICF was associated with organ diseases (0.65) (Table 7).

Table7. Informant consensus factor (ICF) for five disease categories commonly occur in Lemo Woreda.

Groups of diseases	**Diseases included**	**Nt**	**Nur**	**ICF**
dermal diseases	Dandruff, ringworm, wound, allergic, haemorroide, itchy	14	52	0.77
Emergency diseases	febrile illness, common cold , cough, tonsillitis and sudden illness	19	62	0.70
Gastro-intestinal diseases	amoebiasis, taeniasis , abdominal pain, diarrhea, vomiting and loss of appetite	16	88	0.83
Livestock diseases	rabies, ecto-parasites, breathing difficulties, anthrax, wound, eye infection, stomach ache	6	16	0.67
Organ diseases	toothache, earinfection, conjunctivitis/ eye infection, sexual impotency	7	18	0.65

ICF=Nur-Nt/Nur-1, were Nur, refers to number of use reports for a particular use category

Nt, refers number of species used for particular use catagory

4.2.5 Fidelity Level (FL) of medicinal plants

The fidelity values calculated for those frequently reported diseases include Common cold, wound, toothache, stomachache. The traditional practitioners employed their indigenous knowledge to manage these frequently reported diseases and important medicinal plant species were identified for those diseases (Table 8).

Table 8. Fidelity value of traditional medicinal plants for the most frequently reported disease

Disease treated	Medicinal plants	**Np**	**N**	**Np/N**	$FL = NP/N * 100$
Wound	*Coffea Arabica*	6	12	0.5	50
	Musa paradisica	2	2	1.00	100
	Vernonia auriculifera	13	13	1.00	100
	Calipurnia aurea	2	5	0.40	40
	Lippia abyssinica	3	4	0.75	75
	Lippia abyssinica	8	8	1.00	100
Tooth ache	*Lepidium sativum*	3	4	0.75	75
	Juniperus procera	5	5	1.00	100
	Olea europaea subspp cuspidata	10	10	1.00	100
	Euclea divinorum	5	6	0.53	53
	Nigella sativa	5	8	0.04	40
	Nigella sativum				
Stomach ache	*Toddalia asiatica*	2	2	1.00	100
	Zingber officinale	4	5	0.80	80
	Foeniculum vulgare	4	4	1.00	100
	Ruta chalpensis	16	19	0.84	84
	Nigella sativum	20	34	0.36	0.59
	Nigella sativum L.				
Common cold	*Ocimum lamifollum*	23	23	1.00	100
	Allium cepa	8	28	0.29	29
	Allium sativum	28	34	0.82	82
	Eucalyptus globulus	13	22	0.59	59

Keys: Np –the no of use reports of a given species for a given ailments

N-the no of use reports of a given species for any ailments, FL-Fidelity level

5. DISCUSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1. Traditional Medicinal Plant Use and Knowledge Transfer System

During this study, knowledge difference was observed among age groups and family members. Mothers (60%) were more responsible than males (30%) and children (10%) to prepare and give home remedies for every family memberas well as for livestock ailments.

Juniprus peocera and *Asparagus caperulus*are used to treat wounds which are caused byburning. The dry leaf powder mixed with butter is applied on the wound to prevent infection. The squeeze of *Croton macrostachyus*used to treat ring worm. Traditional healers treat Ureno-genital and organ ailment using traditional medicinal plant species. *Phytolacca dedecandre* is used to treat one of the sexually transmitted diseases gonorrhea. For the treatment of gonorrhea fresh root of the plant crushed the squeeze taken orally. *Foeniculum volgare* used to treat urination and stomach ache problem of both human and livestock. It applied by taking the fresh leaf squeeze and chewing dry seed orally.

Some medicinal plants are familiar to the society in Lemo Woreda to treat many gastrointestinal aliments. Chewing the fresh root of *Rumex crispus* used to treat sudden abdominal problem.

5.1.2 Taxonomic Diversity and Sources of Medicinal Plants

This study collected and studied 60 traditionalmedicinal plant species belonging to 55 genera and 34 families for treating 32 human ailments, 2 livestock and 6 both livestock and human ailments.This diversity of traditional medicinal plants was comparable with that of Tesfaye Bekele *et al*., (2017) who reported 58 traditional medicinal plant species from Halaba area in southern Ethiopia and (Fisseha Mesfin, 2009) Who recorded 56 medicinal plant species for Korre ethnic group in Wonago woreda (cited by Fisseha Mesfin, 2009).

The most dominant family used as source of medicinal plants in Lemo Woreda was Asteraceae with 7 (11.9%) followed by Lamiaceae 5(8.3%), Solanaceae 4(6.8%) and Rubiaceae, Rosaceae, Zinjiberaceae each with 3(5.1%) species. Dominance of Asteraceae is in line with some other ethnobotanical study reports (Gebrezgabiher *et al.*, 2013; Seyoum Getaneh, 2009; Getaneh

Gebeyehu, 2011) that reported wider presence of the family Asteraceae in different study areas. Moreover, the dominance of the family Asteraceae for medicinal uses was also reported in other ethnobotanical researches conducted in Ethiopia (Eyasu Ejeta and Taddesse Brihanu,2005;Endalew Amenu, 2007;Teklehaymanot *et al*., 2009; Ermias Lulekal et al., 2014 and Getaneh Gebeyehu, 2011). Such dominance of Asterceae could relate to the wider distribution of the family in the Ethiopian floristic regions (Ermias Lulekal et al., 2014).

5.1.3 Ethnomedicinal plants used to treat human and livestock ailments

The present research revealed that there is deep indigenous knowledge on medicinal plants to treat human ailments but the community has a limited knowledge of traditional medicinal plants to treat livestock ailments. The limited knowledge on livestock ailments may relate to the fact that the community is more focused on crop production than rearing animals for their livelihood.

5.1.4 Diversity of habits and use categories of medical plants

Regarding the habit of plants, from the total 60 collected and recorded traditional medicinal plants 37 species (61.7%) were herbs, 14 species (23.3%) were trees, 6 (10%) were shrubs and 3 (5%) were climbers. In such a way that shrubs as the dominant growth form was reported and have the highest proportion of medicinal use followed by trees. This might be due to variation in the availability of vegetation type in the study areas.

5.1.5 Medicinal plant parts used

Leaves were the most reported plant parts in the preparation of remedies. The preference of leaves to other plant parts could be due to the chemical constituents of leaf for the treatment of human and livestock diseases. Such wide harvesting of leaves for traditional medicines compared to roots which are important for the survival of plants has less negative influence on the survival and ecological aspects of the plant. However, in this study area tree was the second most used part for preparation of traditional medicine; comparatively utilization of root parts highly affects sustainability of the original plant.

5.1.6 Types of preparation of remedies

The medicinal plants have various methods of preparation for different types of human and livestock ailments. The types of preparation forms were like; crushing, latex collection, squeezing, powdering, chewing, boiling, and decoction. Crushing (20, 33.3 %) constituted the highest type of preparation form, followed by chewing/eating (9, 15%) and crushing and squeezing (4, 6.7 %). Other forms of preparations are also indicated in figure 4. This finding was in line with earlier results; in which crushing was the common type of preparation (Seyoum Getaneh, 2009). In the collection of data concerning the preparation of medicine for human and livestock aliments treatment, informants have reported different skills associated with herbal preparation. Thus include plant composition (in the single form or combined form), condition of plant materials used and method of preparation. Most remedies were prepared in the single form and some of the remedies were prepared in combined forms.

5.1.7 Conditions on remedy preparation, administration and dosage

The finding in the form of medicinal plants used show that medicinal plants used in the fresh form covers (69%) of the total plants and (23%) were used in the dried forms while either forms were (8%). The results indicate that the local community used the fresh form of medicinal plants than the dried and fresh or dried forms. As the informant's agreement, the fresh forms are considered to be more powerful than the dried and the fresh one.

The common routes of administration were oral 32(53.3%), dermal10 (16.7%), oral and dermal 9 (15%), Many ethnobotanical researchers have reported similar findings in different parts of Ethiopia (Mirutse Gidey*et al*., 2011; Getachew Brehan*et a*l., 2001, 1999; Kebu Balemie*et al*., 2004; Teshale Sori*et al.*, 2004; Haile Yineger and Delenasaw Yewhalaw, 2007).The units of measurements to determine dosage were not standardized. Some of the materials that were used by the peoples of study area as cited by many informants include glasses, cups and teaspoons. There were variations in the unit of measurement according to age difference. Lack of standardization has been cited as a shortcoming of the traditional medicine system (Dawit Abebe and AhaduAyehu ,1993)

5.1.8 Informant Consensus on the Medicinal Uses of Plants

In the study area 10 medicinal plants were popular than the others, in view of that, *Ocimum lamiifolium* took the lead first were it was cited by 23 informants (40%) for its medicinal value to treat aliments and *Ruta chalepensis* was cited by 16 informants for their medicinal value. Preference ranking for 5 medicinal plants used to treat common cold show that *Ocimum lamiifolium* ranked first and hence the most effective medicinal plant to cure common cold. The second, the third and the fourth most preferred medicinal plant were *Allium cepa, Allium sativum* and *C.* Informant evaluates their relative importance to the people and the extent of the existing threats related to their use values.

The result of the direct matrix ranking shows that *Eucalyptus globules* rank first and hence it is the most preferred plant by people for different uses and the most threatened species. This scarcity is due to over harvesting of *Eucalyptus globulus for not only medicines but also for other uses*for example construction, firewood, fencing and etc

5.1.9. Direct Matrix ranking on multipurpose medicinal plants

The result of direct matrix ranking also revealed that, *Eucalyptus globulus*stood first by exhibiting high scores on construction ,firewood and medicine followed by *Juniperus procera* which exhibited high score on furniture and construction than medicine and *Prunus africana* respectively based on the uses that they gave for the people of study area. The least scored medicinal plant was *Croton macrostachus* by exhibiting high value on medicinal use than others. This was mainly important to determine its consequence on them due to continuous harvesting for different purposes and to set priority for conservation of these scarce medicinal plants. The scarcity of medicinal plants occurred due to over harvesting not only for medicine but also for other uses such as construction and firewood.

5.1.10. Highest ICF records on disease categories

The highest ICF value 0.83 (83%), was associated with problems of gastro-intestinal parasite categories followed by dermal diseases 0.77(77%) and related to emergency problems 0.70(%) respectively. This indicates a high incidence of these types of diseases in the region mainly due to the lack of pure water. On the other hand, the least ICF value was associated with organ diseases 0.65 (65%). This is result indicates that people of the the study area lack concern or

having less knowledge towards medicinal plants to treat organ ailments and also because of heterogeneousity of informants information.

5.1.11. Fidelity level values of medicinal plants

The calculated value (100%) of fidelity value (FL) showed that *Vernonia auriculifera* and *Musa X paradisica* for wound, *Juniperus procera* and *Olea europaea subspp cuspidate* for toothache, *Toddalia asiatica* and *Foeniculum vulgare* for stomachache and *Ocimum lamiifollum* for common cold.Generally, high FL indicates that, all use reports refer to the same purpose of using it, whereas low FLs are obtained for plants that are used for many different purposes.

5.1.12. Threats and conservation of medicinal plants

In this study area traditional healers used medicinal plants to treat a number of diseases using leaf which might not threatened the plant .Using root however, will lead t extinction. Indigenous people were highly dependent upon plants for multiple applications that threatened diversity of medicinal plants. In the study area deforestation, over grazing and expansion of agriculture including cultivating eucalyptus tree as cash plant affect the survival of medicinal plants. In the study area the conservation status of medicinal plant is limited. There is to need to aware the society for the proper attention to conserve the biodiversity including medicinal plants.

5.2. Conclusion

The present study showed that, there is high diversity of medicinal plants in Lemo woreda. The plant family Asteraceae was the leading family represented by 7 plant species followed by Lamiaceae and Solanaceae(3 species) from which local people of the woreda derive their traditional plant-derived medicines for treatment of various ailments of humans and livestock.

The local people are knowledgeable about medicinal plant preparation, application and distribution. But there is indigenous knowledge gap in youth than any other age groups as the study showed .Modernization and migration to urban areas were the main cause for youth to have less indigenous knowledge. This indigenous knowledge transferred from the ancestors is still maintained among the local people. Women are mostly involved in preparation of remedies and other spices for herbal preparations even though they are less involved in getting them from forests, as the forests are far away from home. The retention of this indigenous knowledge from generation to generation is mainly through family. However, most of the traditional knowledge is still in the hands of a few traditional healers. This indicates that, the transfer of indigenous knowledge between practitioners and the local community is so less. This may put the continuity of traditional medicinal knowledge under question and a decline of knowledge gradually from the healers. Peoples of Lemo woreda and its environments were found to be rich in their indigenous knowledge on medicinal plant species to manage various human and livestock ailments. The medicinal plants function was not only for medicinal purpose but also for other utilities like construction, furniture, firewood, making tools, making charcoals and medicine. Currently the availability of many medicinal plants is faced difficulties. This is due to the land degradation, overgrazing, and deforestation, and population growth. Thus, all the findings call for serious attention to the medicinal plant wealth of the area before being too late to use and save them for wider use.

5.3 Recommendations

The following recommendations are forwarded based on the findings:

- Woredas rural development bureau should encourage community based conservation.
- People of the study area should give attention on planting indigenous multipurpose plants as a replacement of lost or cleared forest
- people of the study area should focus on developing home garden medicinal plants to avoid season based and anthropological problems that cause loss of medicinal plants
- protected areas should be created by community or concerning bodies like woreda´s rural development bureau
- woredas rural development bureaushould create gene bank is too necessary to keep the gene of plant species of the study area
- Concerning bodies like woreda's rural development bureau should give attention *Eucalyptus globules* and *Juniperus procera.*
- To give more support to the finding of this research, further scientific investigations are needed for *Rumex nervosus* and *Lippia abayssinica* based on phytochemical evaluation.

6. REFERENCES

Abbink J , (1995) . medicinal and ritual plants of Ethiopian south west :An account of recent research . indigenous knowledge and development monitor.3:6-8

Aklilu Lemma ,Brody ,G; Newell ,G.W , Pankharust ,R. M and Skinner , W.A (1984) .studies on mollusicidal properties of <endod> (*phytolacca dodecandra*). Increased potency with butane extraction .in :*phytolacca dodecandra* , final report of the international scientific (Aklilu Lemma , Heynman D and silangula , S. M; eds).

Alexiades ,M.N (1996) aselected Guideline for ethno botanical research :a field manual

Asfaw Debela, DawitAbebe andKalbessa Urga ,(1999). Anover View of traditional Mediea prospective and Devlopment Effort

Aumeerudy, Y. (1996) Ethnobotany , linkages with conservation and development in << ethno botany and its Application to conservation>> , proceeding of first training workshop on NARC, Islamabad , pp 152 – 157.

Balick M.J and cox, P.A.R(1996). Plants ; people and culture . the science of ethno botany . scientific American Library , New York ,USA.

Bayafers Tamene, Ensermu Kelebessa (2000) an ethno botanical study of the semiuetl and vegetation of cheffa Hujub sacred forsts south welo , Ethiopia

Behura, N.K., 2003. Health culture ethno medicine and modern medicinal services. Journal of anthropological survey of india, 52:27-67

BekeleTefera (2004) .WHO traditional medicine strategy . essential drugs and medicines policy , in traditional medicine in Ethiopia pp.10 -16 (Urgakelbessa; AssefaAyele and GutaMergaeds) WHO country office, Addis Ababa Ethiopia . procee Ethiopia on june 30-2 july ,2003 ,Ethiopia institute , Addis Ababa, Ethiopia .

Belachew Wasihun and Tamene Yohannis., 2007. Bale goba medicinal plant field gene bank; *Lobelia rhynchopetalum (lobiliaceae*) trees less afro alpine grass land and mudland ecosystem, senatti plateau (>3400m.a.s.l) BMNP.,pp.1-5.

Berhanemeskel Weldegerma (2009). Review on important of documenting ethno pharmacological information on medicinal plants .afr.S pharmacy and pharmacol; 3:400- 403

Chiranjibi: P, sudakar.R , Dhal.N.K ; rashmita D, 2006. Somephytotherapeutic claims by tribals of rayagada district ,Orissa, india. Ethno botanical leaflets 10,189-197.

Cotton C.M. (1996) Ethno Botany :principles and Application. John Wiley and sons ltd, new York .

DawitAbebe (2001) .The role of medicinal plants health care in coverage of Ethiopia , the possible integration . in conservation and sustainable use of medicinal plants in Ethiopia proceeding of the national workshop on biodiversity conservation and sustainable use of medicinal plants in Ethiopia , (MedhineZawdu and DawitAbebe,eds)pp.6-21. IBCR, Addis Ababa.

DawitAbebe and AhaduAyehu (1993) Medicinal plants and enigmatic health practice of northern Ethiopia A:B S:P:E, ADDIS ABABA

Edwards , S. (2001). The ecology and conservation status of medicinal plants in Ethiopia.what dowe know ? in conservational and sustainable use of medicinal plants in Ethiopia . pp.46 -55 (Medhin Zewdu and Abebe Demissie .eds) .proceedings of the national workshop on biodiversity conservation and sustainable use of medicinal plants in Ethiopia . IBCRA.A

EnsermuKelebasba, Sebsebe Demissei , Zerihun Woldu and Edwards .S(1992) some threatened endemic plants of Ethiopia in sue Edwards and Zemede Asfaw (eds.) the status of some plants resources in part of tropical Africa botany 2000east central Africa NAPRECA mongraoph series no 2:35-55

Ermias Lulekal, Ensermu Kelbessa , Tamrat Bekele , and Haile Yineger (2008) an ethno botanical study of medicinal plants in Mana Angetu district , south eastern Ethiopia . J ethno boil ethnomed. 2008, 4:10. Sweden doi:10 .1186/1746 -4269.

Fabricant D.S and Farnsworth N.R (2001) the value of plant used in traditional medicinal for drug discovery. Environment health perspective,109: 69 -75.

Fassil kebebew (2001). The status and a availability of oral and written knowledge on traditional health care in Ethiopia. In conservation and sustainable use of medicinal plants in Ethiopia pp.107 – 119.

Fisseha Mesfin,Sebsebe Demissaw, and TilahunTeklehAymanot (2009). An ethno botanical study of medicinal plants in wonagowereda ,SNNPR , Ethiopia . journal of ethno biology and ethno medicine . 5:28 doi:10.1186 /1746-4269)

Fransworth, N.R., Akerel, O. And Bingel, A.S. 1985. Medicinal plants in therapy. Bulletin of the world health organization 63(6):81-965.

GetanenhGebeyehu (2001). An ethnobotanical study of traditional use of medicinal plants and their conservation status in Mecha Woreda ,west Gojjam zone of Amhara region M.sc thesis , Addis Ababa university ,Ethiopia .

Grenier, L (1998). Working with indigenow knowledge . A guide for Researchers. International development research center Dttawa , Canada

Haile Yineger and Delenasaw Yewhalaw (2007) traditional medicinal plant knowledge and use by local healers in sekoru district, Jimma zone,south western Ethiopia journal of ethno biology and ethno medicine, 3:24 .doii 10.1186/1746 -4269.

Hamilton, A.C (2003). Medicinal plants and conservation issues and approaches, medicinal plants specialists Group, UK.

Huffman, M.A. and Wrangham., R. W., (1994). Diversity of medicinal plant used by chimpanzees in the wild. In; chimpanzee culture, pp. 129-148, (Wrangham, R. W., McGrew, W.C., De wall, B.m. and poul, G.H.,eds). Harvard university press

Jackok ,s.m and saklani ,A.(2007) .challenges and opportunities in drug discovery from plants.current science,92:1251 -1257

Kebu Balemie, Ensermu Kelbessa and Zewede Asfaw (2004) .indigenous medicinal utilization, management and threats in fentale area ,eastern shewa , Ethiopia Ethi .J. Biol. Sci, 3:17.

Khan, I., Razzaq and Islam, M., 2007. Ethno botanical studies of some medicinal and aromatic plants at highest altitudes of Pakistan. Journal of agric and environ. Sci. 2(5):470-473

Mac Donald,1.(2009). Current trends in ethno botany tro p j pharm res,8: 295-297.

Mahesh, b, and satish ,S (2008). Antimicrobial ackuity of some important medicinal plants against plant and pathogens world journal of Agricultural science ,4:839 – 843

Martin, G.J (1995). Ethnobotany : a method manual. Champanand hall, London.

Martin ,G.J(1995). Ethno botany: a method manual :Chapman and hall, London

Medhin Zawdu, Tsige Gebre –Mariam and kalebAsres (2001) .Global perspective of medicinal plants .in consecrates and sustainable . use of medicinal plant in Ethiopia ,proceeding of the national work shop on Bio diversity and sustainable .use of medicinal plants in Ethiopia ,pp198 -203. (Medhin Zewdu and Abebe Demissie,eds.) IBCR, Addis Ababa.

MesfinTadess and SebesebeDemissew (1992) medicinal Ethiopian plants inventory ,identification and classification .in plant used on African Traditional medicinal as

practiced in Ethiopia and Uganda ,East Africa (Edwaras,S.S. and Zemeda Asfaw,eds.) botany 200 :NAPRECA,monggraph series 5: 1-19 Addis Ababa university,Ethiopia

Mirutse Giday, Zemade Asfaw, Thomas Elmqvist and Zerihun Woldu (2003) an ethnobotanical study of medicinal plants used by the zay people in Ethiopia journal of ethno pharmacology 85:43:-52.elsevier ltduk .

Ohigashi,H (2008) .utilization and production of medicinal plant in medicinal crops in Ethiopia current status and future potential (Makiu,ed) .JAICAF (Japan association for international collaboration of agriculture and forestry 2:29-33.

Oryem –origa, H kakudidiE.K ,katende, A.B; bukenya –ziraba ,R, (1997). Utilization of medicinal plants in bundibgyo district,Uganda. In :kinyua,am ; Kofi –Tsekpo .W.M.dangana, .L.B.(eds.) .conservation and utilization of indigenous medicinal plants and wild relatives of food crops. UNES CO, Nairobi. Pp75-80.

Pankhurs .R, (1990). An introduction to the medicinal history of Ethiopia .new jersey .USA: the red see press.

Plokin, M.I (1991) traditional knowledge of medicinal plants the search for new Jungle medicos. in: the conservation of medicinal plants pp.53-64 Akerele,o; Heywood ,V and synge ,H ; (eds.) proceedings of an international consultation. Cambridge: Cambridge university press.

Quansh, N.(1998).bicultural diversity and integrated health care in Madagascar. Nature and resource.30;18-22

Raguathan M and Solomon Mequanente bay (2007) ethnomedicinal survey of folk drugs used in bahirdarzuriadistrct ,northestern Ethiopia .Indian journal of traditional knowledge , 8: april 2009,pp.281 – 284 .

Roberson, E (2008). Medicinal plants at risk. A native plant conservation campaign report pp16

Samy, RP and Gopalakrrishnakone, P (2007). Current status of herbal, and their future perspectives nature preceding, 1176:1- 13

Schulte, R.E and Von reis, S (eds) (1995). Ethnobotany .Evolution of a discipline .Chapman and Teall , London , 414 pp

Sebsebe Demissaw andErmiasDagne (2001) . Basic and Applied Research on medicinal plants of ethiopia in conservation and sustainable use of medicinal plants in Ethiopia

proceeding of the national work shop on biodiversity and sustainable. Useof medicinal plants in Ethiopia, pp.29-33 (MedhinZewduand Sebsebe Demissi, eds.) IBCR ,AddisAbeba.

Sharma,H, and kumas, A (2010) ethno botanical studies on medicinal plant of Rajasthan (India) : Journal of medicinal plants Research 5:7 pp.1107 – 1112)

Sofowora,A(1993). Medicinal plants and traditional medicine in Africa .A Ethno botanical survey of medicinal plant in Babungo , north west Region , Cameroon .journal of Ethno bialogy and Ethno medicine , 6:8 doi: 10.1186 /1746-4269:

Tabuti, R.S, Dhilion ,S.S lye.K.A, (2003). Traditional medicine in bulamogi country, Uganda. Its practitioners,users and viability.journal of ethno pharmacology 85,119-129.

Tesfaye Awas and Sebsebe Demissew (2009) . Ethnobotanical study of medicinal plants in Kafficho people, south western Ethiopia . In proceedings of the 16th international conference of Ethiopia studies. sveinege ,Haraid Aspen, BirhanuTeferra and Shiferawbekale (eds) Trondeim .

Tesfaye Hailemariam, SebsebeDemissew and Zewede Asfaw (2009) an ethno botanical study of medicinal plants. Used by local people in the law lands of konta special, wereda southern nation nationalities and peoples Regional state Ethiopia. Journal of ethno biology and ethno medicinal 2009.5:26 .doii10. 1186/1746 -4269.

Tilahun Teklehymanot and MirutseGiday (2007) .ethno botanical study of medicinal plants used by people in zegie peninsula ,northwestern Ethiopia. Journal of ethnobiology and ethno medicinal 3:1-12 doii 10.1186 /1746 -426.

Verma ,S and singh , S.P (2008) .current and future status of tribal medicines veterinary world .1:347-350

Vllietink ,A.J and vanden , D.A (1991).can ethno pharmacology contribute to the devlopmentof antiviral drugs? J. ethno pharmacol .32 : 141 -153.

WHO (2001) regulatory situation of herbal medicines Aworld wide Review, pp 1-9 Geneva World health organization (WHO),1978,the promotion and development of traditional medicine. Technical report series, vol. 622.WHO, Geneva. World health organization (WHO),1995. Traditional health practitioners in primary health care .WHO,Geneva.

Wright, C.W.(2005). Plant derived antimalarial agents: new leads and challenges. phytochemistry 4:55 -61

ZemadeAsfaw ,(1990) an ethno botanical study of barley in the central highlands of Ethiopia .biologischeszentrabatt 109: 51-52.

Zemede Asfaw (1999) ethnobotoany of nations nationalities and people in Gambella ,benishangulgumuz and southern region of Ethiopia AAU ,Addis Ababa ,Ethiopia .

Zemede Asfaw (2001).the role of home gardonin the production and conservation of medicinal plants in conservation and sustainable .use of medicinal plants in Ethiopia ,pp76 -91

7. APPENDICES

Appendix 1.characterstics of informants involved in this study

Background of the respondents shown that 66.7% of the respondents were males while 33.3% were females, from both sex 73.3%were married and the remaining 27.7 % were unmarried. As educational status showed about 44.4% of respondents were learned from grade 1-8 while 22.2% respondents followed grade 9-12 and the remaining 5.6% were followed college or university finally 44.4% respondents exists at middle age(39-58)age group.

Sex	No of responder	Marital status			Age group			Educational status			
		Married	unmarried	Divorced	20-38	39-58	59-90	Illiterate	1-8	9-12	College/university
M	60	41	19	-	16	25	19	21	25	10	4
F	30	25	5	-	7	15	8	9	15	5	1
T	90	66	24	-	23	40	27	30	40	20	5
%	100	73.3	26.7		25.6	44.4	30	33.3	44.4	22.2	5.6

Appendix 2: List of medicinal plants used to treat human and livestock ailments in Lemo woreda people

No	Vernacular name	Botanical name	Family Name	Diseases treated	Habitat	Condition	Plant type	Route of administration	Parts used	Remedy preparation methods
1	Geneno'o	Aloe manticola L.	Aloaceae	Giardia	W	F	Sh	O	L. lx	Leaf latex Mixed with water then given orally
2	Mesena	*Croton macrostachyus L.*	Euphorbiaceae	Anthrax Stomach Ache(liv)		D/F	T	O O	S b	Crushed dry bark mixed with water then given for livestock orally
3	Suto	*Hagenia abysinica L.*	Rosaceae	Taeniasis	Hg	D	T	O	L	dry leaves powdered then mix ed with water and given orally
4	Barawa	*Vernonia auriculifera*	Asteraceae	Wound	W	F	Sh	De	L	Fresh leaves squeezed then tied or creamed on wound
5	Heba	*Vernonia amygidalina*	Asteraceae	Allergic (H) Stomach ache(Liv)	w	F	T	De O	L	Squeezed leaves scratched on the skin Crushed leaves mixed with water and given orally for livestock
6	Kedal barzafa	*Ecalyptus globulus*	Myrtaceae	Sudden disease			T		L	Fresh Leaf bud(tip of the leaf) chewed then

				allergic Common cold	H	F		O De N		swallowed with water Fresh leaves squeezed and creamed Steaming fresh leaves in the home
7	shabe´e	*Rumex obtusifolius L.*	Polygonaceae	Diarrhoea Haemorrhoids(kintarot-in amharic)	w	F	H	O De	R L	Crushed fresh root mixed with water then given orally. Fresh leaves heated on fire then touched/applied on the area
8	shisho´o	*Rumex nervosus*	Polygonaceae	Malaria Febrile illness	W	F	H	O De	L	Crushed fresh leaves Mixed with water then given orally. Boiling of fresh leaves with water then the whole human body washed.
9	Sena	*Calpurnia*	Fabaceae	Wound						Fresh leaves squeezed

		aurea		Exo-parasite	w	F	Sh	De	L	then applied on wound of livestocks. Crushed fresh leaves mixed with cold water then the whole livestock body washed
10	Kororima	*Zingiber officinale* *Roscoe*	Zingiberaceae	tonsil&throat infection	H	D	H	O	Se	Dry seed is Chewed
11	Muza	*Musa x paradisica*	Musaceae	Wound	H	F	H	De	Lx	banana latex Creamed on wound
12	Sego	*Toddalia asiatica(*L.) Lam	Rutaceae	Stomach ache	W	D	Cl	O	Se	Chewing dry seed
13	konjoro´o	*Physalis peruviana*	Solanaceae	Breathining difficulties(liv), Tonsilities,Stomach ache	W	D /F	H	O	R Se R	Chewing fresh root Chewing dry seed Chewing fresh root for stomache ache
14	Tumunga	*Justicia schemprian a*	Acantaceae	Wound	W	F	T	De	L	The leaves heated on fire then the wound is touched

15	JInjibila	*Zingiber officinale*	Zinjiberaseae	Stomach ache Common cold	Hg	F /D	H	De	Cr	Crushed corm boiled with tea and is taken orally as" kashir"
16	Woldimama	*Foeniculum vulgare*	Apiaceae	Stomach ache	Hg	D	H	O	Se	Chewing Dry seed
17	Wokasha	*Afranomum angustifolia (*L.f)	Zingiberaceae	Sudden illness	Hg	D	H	O	Se	Dry seed chewed with salt then swallowed with water
18	Gimenja	*Ocimum basilicum*	Lamiaceae	Vomiting or loss of appetite	Hg	D		O	L	Crushed ocimum bacilicum added in "berbere" used to increase appetite
19	Koseret	*Lippia abyssinica*	Verbenaceae	Wound loss of appetite	W	F	H	De O	L	Crushed leaves mixed with crotonmacrostaychus bud sap then applied(creamed) on wound Fresh leaves added in milk to increase appetite

20	Kentelama	*Ruta chalpensis* L.	Rutaceae	stomach ache dry cough	Hg	F	H	O	L /s	Crushed leaves or seed is used with coffee or drunk by mixing with Water
21	Talba	*Linum usitatissium*	Linaceae	Amoeba Dandruf	Hg	D	H	O De	S e	Crushed dry seed mixed with water at night then teken before breakfast. Crushed dry seed is Creamed on affected area of skin
22	Hanchura	*Kalanchoe petitiana*	Crassulaceae	Swelling(wound)	W	F	H	De	L	Kalanchoe fresh leaves heated, then applied on wound area

23	Achogara	*Solanum indicum*	Solanaceae	Nasal bleeding Ear pain Gonorrhea	W	F	Sh	N ear O	L F F	Parcially crushed fresh leaves inserted in the nose. Crushed Solanum indicum fruit fluid put on affected ear Crushed flower taken orally
24	Chata	*Catha edulis*	Celastraceae	Tonsilities	Hg	F	T	O	L	Fresh Leaf bud is Chewed
25	Angambisha	*Impatiens tinctoria* A.Rich	Balsaminaceae	Gonorrea evil eye	W	F	H	O De	L	Crushed fresh leaves mixed with water then taken orally Washing the body with decocted liquor
26	Tuma	*Allium sativum L.*	Alliaceae	Artheritis Common cold	Hg	F	H	O	Bu	Allium sativum concoted with honey then it is taken each morning before breakfast. A.sativum&zinjibil

										boiled and then taken as tea.
27	Harokecheba	*Gallium aparine*	Rubiaceae	Wound due to some worm[lasame(local name)] Rabies	W/Hg	F	H	De O	L	Fresh Leaf is crushed then creamed on wound Crushed leaves mixed with water and taken orally
28	Hemachenja	*Nigella sativa* L.	Ranunculaceae	Stomach ache Tooth ache Artherities	Hg	D	H	O	Se	chewing dry seed Holding crushed seed on affected tooth/teeth Pisum sativum concocted with honey then two spoons is taken each morning.
29	Guna	*Euclea divinorum*	Ebenaceae	Anthrax Tooth ache	W	F	T	O	Sb St	Crushed fresh stem bark mixed with water then it is given until healed Heated fresh stem held on ached teeth

30	Machara	*Dutura stramomium*	Solanaceae	Tooth ache Baturine(hepatities)	w/ Hg	D /F	H	O	se l	Crushed dry seed applied on ached teeth Crushed fresh leaves mixed with water and is given orally
31	Wera	*Olea europaea subspp cuspidate*	Oleaceae	Tooth ache	W /Hg	F	T	O	St	Heated stem held on the ached teeth/ tooth
32	Lutunta	*Commelina africana* L.	Commelinaceae	Vomiting in children	W	F	H	O	L	Crushed leaf mixed with water and taken orally
33	sale´e	*Phoenix reclinata*	Arecaceae	Eye infection of livestock	w	F	T	Eye	L	Fresh leaves Crushed then liquid put in livestock eye
34	Mashisa	*Plectranthus hadiensis*	Lamiaceae	Bat urine	w		H	O	L	Crushed fresh leaves taken before breakfast for three - five days
35	Kesher shunkuruta	*Allium cepa*	Alliaceae	Dry Cough Common cold	Hg	F	H	De	L	Leaf is Heated on fire and is applied on wound(swelling)
36	Chukuna	*Artemisia*	Asteraceae	Children intestinal	W	F	H	O	L	Crushed fresh leaves mixed with water and

		abyssinica		parasite(dysentery)						a cup is given for 2-3 days
37	Hanja	*Phytolacca dodecandra*	Phytolaccaceae	Anthrax Itchy	W	F	Sh	O	R	Crushed fresh root mixed with water and taken orally Crushed fresh root creamed on the affected area.
38	Shunfa	*Lepidium sativum*	Brassicaceae	Febril illness Tooth ache	Hg	D	H	O N	St	L .sativum Seed boiled with coffee then taken orally Dry seed Burned on fire then sniffed through smoke
39	Damakase´e	*Ocinum lamifollum*	Lamiaceae	Common cold	w/ Hg	F	H	N	L	Boiled leaves taken through nose or mouth(with coffee)
40	Gora	*Rubus steudneri schweinf.*	Rosaceae	Malaria Febrile illness	W	F	H	O	L	Crushed fresh leaves mixed with water and given orally

41	Lome`e	*Citrus aurantlifolaia*	Rutaceae	Common cold tonsil hypertension	Hg	F	T	O De	F	Lemon juice concoted with tea and is taken orally for common cold. Squeezed emon juice poured on tonsilities or it is placed on center of head for very young babies Squeezed lemon juice is taken with water or lonely for hypertension
42	Hallut	*Argemone Mexicana*	Papaeraceae	Stomach ache	W	F	H	O	R	Fresh root is crushed and mixed with water then taken orally
43	Wedesha	*Cordia*	Boraginac	Sudden	Hg	F	T	O	S	Fresh stem bark Chewed then given

		africana	eae	illness					b	orally
44	Koma	*Cucurbita moschata*	Cucurbitaceae	Tape worm Ascaris	W	D	Cl	O	St	cooked dry seed is eaten at morning before breakfast
45	Buna	*Coffea arabica*	Rubiaceae	Wound Anemia	Hg	D /F	T	De O	S t L	Roasted coffee seed Crushed then put on wound Fresh leaves crushed ,boiled with water and concoted with milk(butter) then taken as coffee
46	Homa	*Juniperus procera*	Cuppressaceae	Tooth ache	W /Hg	F	T	O	St	Heated fresh stem is held on affected teeth
47	Shironta	*Brucea antidysentrica*	Simaroubaceae	Dysentery	W	F	Sh	O	R	Crushed fresh root mixed with water then given orally
48	Omoro`o	*Gardeniaternifolia (Schumach and Thonn)*	Rubiaceae	Human eye infection	W	F	H	D	L	The face is Washed by liquid of boiled fresh leaf
49	Wesa	*Enseteventricosum(*Welw.) Cheesman.	Musaceae	Fractured bone	Hg	F	H	O	R	cooked" kiniwara" is eaten with milk as much as possible
50	Dabakula	*Cucurbita pepo*	Cucurbitaceae	Delayed placenta(	Hg	D	Cl	O	St	Dried and cooked seed is given before

				for expulsion placenta)						breakfast
51	Natirala	*Artemisia absinthium*	Asteraceae	Removal of placenta(to rehabilitate placenta)	w/ Hg	F	H	O	Ap	Any fresh part concoted with butter and taken orally
52	Papaye	*Carica papaya L.*	Caricaceae	Malaria	Hg	F	T	O	L	Fresh Squeezed leaf juice is taken orally
53	Sigamatibasha	*Rosmarinus officinalis L.*	Lamiaceae	Blood pressure	Hg	F	H	O	L	Crushed leaves boiled and added in the tea then taken orally
54	Anamura	*Ajuga integrifolia* Buch-Ham ex-D.Don	Lamiaceae	Artheritis	w/ Hg	D	H	O	L	Powdered dry leaves of *Ajuga integrifolia* concocted with *Allium sativum* and honey then one tea spoon taken orally each morning.
55	Ajar gella	*Guizotia sch imperi Sch.Bip. ex Walp*	Asteraceae	Wound	W	F	H	De	L	squeezed fresh leaves tied or liquid applied on wound
56	Sodonakala	*Galinsoga quadriradia*	Asteraceae	Tonsillitis	W	F	H	De	R	Fresh root is chewed and it´s fluid

		ta								swallowed
57	Arara	*Prunus africana*	Rosaceae	Sexual impotence Cancer	W	F	H	O O	Sb Rb	crushed fresh stem bark mixed with water, filtered then taken orally Crushed fresh root bark mixed with water then taken orally
58	Girara	*Acacia abyssinica*	Fabaceae	Tonsilities	W	F	T	O	R	Fresh root bark is chewed the juice is taken
59	Gizawa	*Withania somnifera (L.)* *Dunal in DC*	Solanaceae	Stomach ache Evil sprit	Hg	D	H	De	R L	Dried root crushed and mixed with water then taken orally Crushedleaves mixed with water and the whole body washed until aperson healed
60	Kebericho	*Echinops kebericho*	Asteraceae	Evil eyes	W	D	H	N	R	Smoking of powdered dry root on burning fire and inhaled.

Keywords:T=tree,H=herbs,Cl=climbers,Sh=shrubs,W=wild,Hg=homegarden,O=oral,De=derma l,N=nasal,F=fresh,D=dry,R=root,L=leaf,Fr=flower,Ft=fruit,Rb=root bark,Sb=stem bark,Lx=latex,Ap=any part,Se=seedBu=bulb,Cr=corm,L.LX=leaf latex

Appendix 3. Frequency of species and percentage

Family name	No of species	Percentage	No of genera
1. Aloaceae	1----------	1.7	1
2. Euphorbiaceae	1----------	1.7	1
3. Myrtaceae	1----------	1.7	1
4. Polygonaceae	2----------	3.4	1
5. Fabaceae	2----------	3.4	2
6. Acantaceae	1----------	1.7	1
7. Apiaceae	1----------	1.7	1
8. Zingiberaceae	3----------	5.1	3
9. Verbenaceae	1----------	1.7	1
10. Rutaceae	3----------	5.1	3
11. Linaceae	1----------	1.7	1
12. Crassulaceae	1----------	1.7	1
13. Celastraceae	1----------	1.7	1
14. Balsaminaceae	1----------	1.7	1
15. Rubiaceae	3----------	5.1	3
16. Ranunculaceae	1----------	1.7	1
17. Ebenaceae	1----------	1.7	1
18. Solanaceae	4----------	6.8	4
19. Oleaceae	1----------	1.7	1
20. Commelinaceae	1----------	1.7	1
21. Alliaceae	2----------	3.4	1
22. Asteraceae	7----------	11.9	5
23. Phytolaccaceae	1----------	1.7	1
24. Brassicaceae	1----------	1.7	1
25. Papaveraceae	1----------	1.7	1
26. Boraginaceae	1----------	1.7	1
27. Cuppressaceae	1----------	1.7	1

28. Simaroubaceae	1----------	1.7	1
29. Musaceae	2----------	3.4	2
30. Cucurbitaceae	2----------	3.4	1
31. Caricaceae	1----------	1.7	1
32. Lamiaceae	5----------	8.5	4
33. Rosaceae	3----------	5.1	3
34. Arecaceae	1----------	1.7	1

Appendix 4. informants general information

No	Informants name	Sex	Age	Marriage	Education status	kebeles	Informants
1	ALEM BIRHANU	F	25	Unmarried	1-8	T.a	General
2	MERON SHIMELIS	F	32	Married	1-8	T.a	General
3	ABRIHAM DESTA	M	60	Married	Illiterate	T.a	General
4	NASREDIN KEDIR	M	77	Married	Illiterate	T.a	Key
5	ERMIAS GEZAHEGN	M	38	Unmarried	College	T.a	General
6	FEDILA DESTA	M	70	Unmarried	Illiterate	T.a	Key
7	HANA KEDIR	F	68	Married	Illiterate	T.a	General
8	HIPINHAS SOLOMON	M	67	Married	Illiterate	T.a	General
9	ADILA AREGA	M	35	Unmarried	University	T.a	General
10	MIHRET ABRIHAM	F	66	Married	Illiterate	T.a	General
11	MULUKEN ESHETU	M	62	Married	Illiterate	T.a	General
12	DINKINESH ALEMAYEHU	F	37	Unmarried	Illiterate	T.a	General
13	KAMIL ERSIDO	M	65	Married	Illiterate	T.a	General
14	MUBARIK EYOBE	M	36	Unmarried	1-8	T.a	General
15	SEMIRA KEBEDE	F	80	Married	Illiterate	T.a	Key
16	MESAY AREGA	M	30	Unmarried	1-8	L.s	General
17	SINTAYEHU WORKINEH	M	90	Married	Illiterate	L.s	Key
18	SISAY LIRE	M	89	Married	Illiterate	L.s	Key
19	SOFIA JEMAL	F	25	Unmarried	1-8	L.s	General
20	TEKALIGN SOLOMON	M	40	Unmarried	9-12	L.s	General
21	MULATU NASIRO	M	85	Married	Illiterate	L.s	Key
22	ABRIHAM DESTA	M	75	Married	Illiterate	L.s	General
23	RAMETO HUSSEN	M	57	Married	Illiterate	L.s	General
24	TSEGAYE HAILU	M	22	Unmarried	1-8	L.s	General
25	LIRE GICHMOLO	M	42	Unmarried	9-12	L.s	General
26	AHIMA NURIYE	F	35	Unmarried	1-8	L.s	General

27	ALAYIKA HUSSEN	F	58	Married	Illiterate	L.s	General
28	ADANE ERMIAS	M	59	Married	Illiterate	L.s	General
29	BILAL RAMETO	M	52	Married	9-12	L.s	General
30	LEMLEM BEKELE	F	45	Married	1-8	L.s	General
31	ELSABET TEKA	F	47	Married	1-8	S.r	Key
32	FEDILA LINTISO	F	33	Married	1-8	S.r	General
33	DELILA NURI NESIRO	F	49	Married	Illiterate	S.r	Key
34	BIRUK SANI	M	54	Married	College	S.r	General
35	ESEYAS DAMENE	M	58	Married	Illiterate	S.r	General
36	RAHEL WORKU	F	34	Married	1-8	S.r	General
37	ASHENAFI ADIMASU	M	56	Married	College	S.r	General
38	LAYILA RAMERO	F	41	Married	Illiterate	S.r	General
39	TSEGANESH WOGAYEHU	F	30	Unmarried	1-8	S.r	General
40	SAMIRA NURA	F	39	Married	1-8	S.r	General
41	MIHRET ESHETU	F	28	Married	1-8	S.r	General
42	MOHAMMED AYOBE	M	60	Married	Illiterate	S.r	Key
43	ZULITA ERIGO	F	27	Married	1-8	S.r	General
44	MARTA SAMUEL	F	56	Married	Illiterate	S.r	General
45	ELIFINESH TAREKEGN	F	32	Married	9-12	S.r	General
46	ABUSH YASIN	M	38	Unmarried	9-12	D.b	General
47	GENET GEZAHEGN	F	57	Married	Illiterate	D.b	Key
48	AHIMED SHEMSEDIN	M	68	Married	Illiterate	D.b	Key
49	BAREMETIKA GIRAM	F	29	Unmarried	1-8	D.b	General
50	BIRUK BEKELE	M	50	Married	College	D.b	General
51	DAWIT LIRE	M	56	Married	1-8	D .b	General
52	ELFINESH FIKADU	F	36	Married	1-8	D .b	General
53	HAYISHA ALEMU	F	53	Married	9-12	D .b	General
54	ABINET ANBIKO	M	37	Unmarried	1-8	D .b	General

55	MUDI ABIDAL	M	58	Married	1-8	D .b	General
56	ABERASH TEMESGEN	F	26	Married	1-8	D .b	General
57	MUBARIK AWOL	M	48	Unmarried	1-8	D .b	General
58	AJEBUSH DEGELE	F	50	Married	9-12	D .b	General
59	NUREDIN HUSSEN	M	29	Unmarried	1-8	D .b	General
60	MITIKU EYASU	M	88	Married	Illiterate	D .b	Key
61	FATUMA NURI	F	40	Married	9-12	S .d	General
62	REDUWAN HAMID	M	43	Unmarried	1-8	S .d	General
63	SAMUEL BIRHANU	M	82	Married	1-8	S .d	Key
64	MELESE HUSSEN	M	37	Unmarried	9-12	S .d	General
65	YOSEF TESFAYE	M	49	Unmarried	1-8	S .d	General
66	RAMETO JEMAL	M	48	Unmarried	9-12	S .d	General
67	ABDULKEDIR LOPISO	M	57	Married	1-8	S .d	General
68	ASHENAFI ADISE	M	64	Married	1-8	S .d	Key
69	BINYAM ASEFA	M	51	Unmarried	9-12	S .d	General
70	DIGAFU ARASO	M	60	Married	1-8	S .d	General
71	MESFIN LERAGO	M	52	Married	1-8	S .d	General
72	MOHAMMED FEYISA	M	79	Married	1-8	S .d	General
73	BAMRIKA TEMAM	M	53	Married	1-8	S .d	General
74	BEREKET DESALEGN	M	80	Married	Illiterate	S .d	Key
75	DEGELE GELELO	M	55	Married	1-8	S .d	General
76	BEREKET TESHOME	M	64	Married	1-8	B .c	General
77	ERSTU ENDRIAS	M	56	Married	1-8	B .c	General
78	ESHETU ERBIKO	M	72	Married	Illiterate	B .c	Key
79	MUSTEFA JABIR	M	78	Married	Illiterate	B .c	General
80	FEDILA SEID	M	81	Married	Illiterate	B .c	Key
81	ABATE MOHAMMED	M	50	Married	9-12	B .c	General
82	HAMDELA JEMAL	M	58	Married	1-8	B .c	General

83	ABDULKEDIR LOPISO	M	52	Married	9-12	B .c	General
84	LEMLEM ADANE	F	47	Married	9-12	B .c	Key
85	MUDESIR JEMAL	M	39	Unmarried	1-8	B .c	General
86	MUKEMIL MULUWORK	M	40	Married	1-8	B .c	General
87	NURAMO ABERA	M	45	Married	1-8	B .c	General
88	SAMIRA RASHID	F	56	Married	College	B .c	General
89	DEBERO TADESSE	M	58	Married	9-12	B .c	General
90	TARIKU DERILO	M	60	Unmarried	Illiterate	B .c	General

Appendix 5.Cheklist of semi-structured questions will be used for discussion and interviewee with informants to collect Ethnobotanical data

I. General Information on Respondents

1. Kebeles_____.

2. Name _____Age __ Sex _____, Marital status (single or Married)_____, Educational level _____, Occupation_____, Ethnic _____

II. Ethnobotanical Information

3. How long did you live in the area? _____.

4. What are the most common human diseases in your area? __,___,___,___.

5. What are the most common animal diseases in your area? __,__,___,__

6. How do you prevent, control and cure a given disease in your area? _____.

7. Would you list the plants species used to treat human diseases and injuries in your area?

8. Can you List the plant species used to treat human diseases in your area?

.

No.	Botanical nameofplant	Local nameofplant	Disease treated	Parts used	Habit	Route of admins	Preparation	Other ingred.	Dosage
1									
2									
3									
4									
Nth									

9. Can List the plant species used to treat the livestock diseases in your arearea?

No.	Botanical name	Local name of plant	Disease treated	Parts used	Habit	Route of admins	Preparation	Other ingred.	Dosage
1									
2									
3									
4									
Nth									

10. Would you List the plant species used to treat both human and their livestock disease in your area? .

No.	Botanical name	Local name plant	Disease treated	Parts used	Habit	Route of admins	Preparation	Other ingred.	Dosage
1									
2									
3									
4									
Nth									

11. What community members of your community frequently depend on more traditional medicine than modern? If so list them? _____

12. Are there any restrictions associated with collection of medicinal plants?

13. Are medicinal plants accessed easily in your areas ____, if not why? _____.

14. Is there any effort made on the management of medicinal plants in your area?

15. Are there plants currently cultivated in the home garden?

16. How indigenous knowledge of medicinal plants usage transferred from generation to generation in your community? _____.

17. Who is mainly responsible or knowledgeable in using, preparing, and bringing medicinal plants in your family, village and community (Father, Mother, Young males or females)?

18. What part/parts of the medicinal plant are collected for medicinal use?

19. How is the detailed preparation made? _____, its dosage and how the side effect is neutralized? Tell me briefly.

20. Are there economic groups who mostly use these medicinal plants?

21. How does modernization interfere with traditional medicinal system?

22. Are there traditional medicinal plants conserved in the area?

23. Are there limitations in utilization of some medicinal plants in the locality?

24. What are the bidirectional interaction of plant and humans?

25. What is the effect of population number increament on availability of traditional medicine?

26. What season traditional medicine less available in your area?

27. Is there any effect of using /harvesting root parts on biodiversity of medicinal plants?

28. What are sources of knowledge of medicinal plants? Family /observation/religious books/learning

29. What are causes for habitat loss? Degradation/deforestation /overgrazing/ population number increment/feulwood, land sliding, soil erosion, farming of marginal areas?

Appendix 6. RESEARCHI XA'MICHA

I.Xamama'n Informationa

1.kebele'e-_____

2. Summi _____Umuri_____Albacha _____

Mine issim Ogori_____Timirt _____Baxi_____Qaranch_____

II.Abesh qara'l informationa

3. Kabeyone hinka'n amane he'lito?

4. Ki'n ulane moamo horror manika jabuwa kutakena xantakamo?

5. Ki'n ulane moamo horror dinaxeka jabuwa kutakena xantakamo?

6. Kinu'wi ulane jabewa hinkide fayisakena te'im amadena hotakamok?

7.Jabuwina qarari ihhoo mutano chchaakisakena xantakamo?

8.Mani jabina qarari ikami mutai'n sireuwa kutakena tantakamo?

No.	Botaniq suumma	Hegeq suumma	Fayiso jabo	Awaxakam beyo	Haqich halata/habita	Masakamok orach	Gudisha	Exo'o	qaxa
1									
2									
3									
4									
Nth									

9.Dinaxi qaraluwaa kutakena xantakamon?

No.	Botaniq suumma	Hegeq suumma	Fayiso jabo	Awaxakam beyo	Haqich halata/habita	Masakamok orach	Gudisha	Exo'o	qaxa
1									
2									
3									
4									
Nth									

10.Dinatina manina laminam qarari ehena xano mutanewa kutakena xantakamon?

No.	Botaniq suumma	Hegeq suumma	Fayiso jabo	Awaxakam beyo	Haqich halata/habita	Masakamok orach	Gudisha	Exo'o	qaxa
1									
2									
3									
4									
Nth									

11.Hinka minadaph kifila kinuwi hegegone abash qarar xale'e awaxokok?

12.Abash karaluwa kahegegone hundem amanem sindena xanomon?

13.Abash qarare garo'one kasaka'a awaxitakamon?

14.Qararina awadam Mutanewa hinkide egetakena xantakamok?

15.Qara'l lachi qaranchi qaranchina hinkide higo?sumine/losani/mo'imine

16.Ki’n mi’n manise lopha qarare owokok ayete?ama/ani/osii

17.Qararina awaxakam muta’n orachuwi hinkakeno?

18.Hikidete qarare gudisakamok odim mahine uwakamo?

19.Maniki muta’ineki hinccit hinkide ?

20.Mani quxur lophim mutanone afiso hawi maricho?

21.Qararina ihoo mutano ki’nuw hegegone hundemi amanem sidima xanakamoni?

22.Hinka minadaph kifila qarare dinate sidena awaxokok?

23.Kinuw ulane qarare egerakam anani ehako beyi heohon?

24.Dolisa yakami woshi abash qararene afiso hawi he’ena xanohon?

25.Mani xigi lophim qararene afiso hawi he’ena xanohon?

26.Qarare sidima hogaam ogor teim aman he’ena xanohon?

27.Hinka amanene qarare hundam sidakena xanakamok?

28.Lugumo qararina awaxim muta’n sire’ene afiso hawi he’ohon?

29.Uli lexa’oesina isso luwuwi hinkake?

APPENDIX 7. Photographs showing some of the field activities

Photo courtesy by Rea Ertiro and Iyasu Abayneh 2020 G.C)