Ethnobotany of Medicinal Plants and Roles of Associated Local Knowledge in Conservation in Lume District, Central Ethiopia

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ABSTRACT

Ethnobotany of medicinal plants and roles of associated local knowledge in conservation in Lume District, Central Ethiopia

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Addis Ababa University, 2023

The main objective of this study was to investigate the uses of medicinal plants and the associated local knowledge in the Lume of central Ethiopia. Ethnobotanical information was collected from a total of 49 informants with 19 females and 30 males. Of these informants, ten were local healers. The informants were selected using a purposeful sampling method. Data was collected through semi-structured interviews, guided home garden, and market surveys and analyzed using ethnobotanical tools. Eighty medicinal plants belonging to 75 genera and 43 families were documented, most (77.5%) could be used for the treatment of a wide range of human ailments. Herbs constituted the largest category (53.8%) of habits. Among the total 34 ailments, the largest number of remedies were used to treat gastrointestinal disorders and parasite infections (22.8%), followed by external injuries (22.1%). The administration routes of medicinal plants used to treat human ailments were internal (oral, 50%) and external (dermal, 32.3%). The medicinal plants that were presumed to be effective in treating a certain category of disease, such as febrile diseases (0.91) had higher ICF values. This probably indicates a high incidence of these types of diseases in the area, possibly due to the poor socio-economic and poor sanitation of these people. ***Allium sativum*** *was ranked first, followed by* ***Zingiber officinale****, both have various purposes in addition to medicinal value. Some species including* ***Nigella sativa, Piper nigrum, Zingiber officinale****, and others are supplied to the markets by the local farmers and merchants. In conclusion, there is local knowledge and habits of ethnomedicinal plant usage in the study areas of Lume, even if, the previous traditional knowledge passed method through only way of oral system, and the rare occupation of medicinal plants as their knowledge.*

Keywords/Phrases: Ailment, ethnobotanical study, lokal knowledge, Lume, medicinal plant

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LIST OF ACRONYMS

CSA	Central statics agency
AAU	Addis Ababa University
FL	Fidelity Level
GFCP	Gluten-Free Certification Program
IBC	Institute of Biodiversity Conservation
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
PGRC	Plant Genetic Resource Center
PGRI	Plant Genetic Resources Institute
WHO	World health organization

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

The promotion of traditional health practices alongside modern health services is the most promising means for ensuring affordable and sustainable healthcare for poor communities in developing countries (Cunningham, 1993). Modern healthcare had inadequate and inequitable health service anywhere in Africa, and Ethiopia in particular, due to the financial limitations related to rapid population growth and poor economic performance (Edosa Tesfaye *et al.*, (2023). Thus, medicinal plants continue to be in high demand in the healthcare system as compared to modern medicine (Cunningham *et al*., 1996). This indicates the need for in-depth investigation and documentation of plants of traditional medicinal value to rationally use and conserve plant resources and indigenous knowledge. This is an emerging truth in the developing world including Ethiopia (Nigussie Amsalu *et al.,* 2018).

The majority of the rural communities and the poor people in urban areas rely mainly on traditional medicines to meet their primary healthcare needs. However, the traditional knowledge of medicinal plants in Ethiopia is not exhaustively compiled (Teshale Sori *et al*., 2004; Mirutse Giday *et al*., 2009). Traditional medicinal knowledge of medicinal plants and their use by indigenous cultures are not only useful for the conservation of cultural traditions and biodiversity but also for healthcare and phytochemical drug development in the present and future (Pankhurst, 2001).

Indigenous people through time have developed their way of conserving nature, as the life of each community has evolved with the biota existing in their ecological setup (Cunningham, 1996). Thus, indigenous knowledge has developed because of human interaction with their ecosystem. Ethnobotanical studies are useful in documenting, analyzing, and disseminating knowledge and interaction between biodiversity and human society on how diversity in nature is used and influenced by human activities (Martin, 1995).

The ethnobotanical approach is also important as it involves local communities in the conservation of biodiversity. This is based on the idea that the healthiest ecosystems of the

world are under the control of local communities and manage many species for which sciences have little information. Therefore, the study of ethnobotany leads to the documentation of traditional medicinal plants (Pankhurst, 2001).

Medicinal plants have been used as a source of medicine to treat illness since time immemorial. For a long time, plants have provided a source of emerging modern medicine and drug compounds. Medicines that are derived from plants have made a large contribution to human health and the development of new drugs (Zewdu Birhanu *et al*., 2015).

The Ethiopian indigenous medicinal plants knowledge available in rural communities and perpetuated by word of mouth within families and the communities consists of fragile traditional skills that are likely to be lost when communities emigrate from rural areas to towns or other regions with different flora and can also be lost by life style changes due to industrialization, rapid loss of natural habitats, drastic alteration of the local ecology (Alemayehu *et al*., 2015). The current loss of medicinal plants in the country is due to natural and anthropogenic factors linked with the missing of valuable indigenous knowledge associated with the plants.

The lack of conservational activities is observed in Goam Woreda, which is similar to other areas in Ethiopia (Behailu *et al*., (2010); Mikias Teshome *et al*., 2023). Although it is known that the district has plant resources and hence, the associated traditional knowledge resource is expected to be significant. The current plant use trend shows that the environment is facing problems of depletion and loss of indigenous knowledge like other areas of the country. Thus, concerted ethnobotanical research plays a vital role in drawing information on plants and related indigenous knowledge for conservation and sustainable utilization. However, there was an enormous knowledge gap and it was from this tangible fact that the present study on the use and the conservation of traditional medicinal plants by indigenous people in the study area has been initiated as well and no study was done to include medicinal plants and indigenous knowledge of local communities of Lume District in the medicinal records of Ethiopia. Thus, the study aimed to investigate and document traditional uses of medicinal plants and related local knowledge and their conservational status in the Lume Distrareas of Central Ethiopia.

1.2 Statement of the Problem

In our country, most people do not get modern medicines to treat ailments due to a lack of sufficient modern health facilities in their vicinity because the majority of our citizens live in rural areas. In a long trend, rural communities prefer traditional medicines rather than modern ones as they think these medicines are effective, easily affordable, and fewer side effects, and are less costly (Abbiw, 1996; Asfaw Debela *et al.,* 1999).

In different parts of Ethiopia, different researchers (Kebu Balemie *et al*., 2004; Fikadu Fullas 2007; Mirutse Giday, 2009; Meragiaw *et al*., 2016) conducted ethnobotanical studies. However, such a study is lacking in Lume, Central Ethiopia. Regarding this, population pressure, accelerated urbanization, recurring drought, and deforestation, overgrazing, mining most of the traditional medicinal plants are either destroyed or are on the verge of extinction. In addition to this, fragile natural resource base, inadequate and variable rainfall, population growth, limited access to productive resources, improper farming practices, tenure insecurity, low level of community awareness, poor work and saving behavior, and its associated diminishing land holding is the other factor in the area.

The current loss of medicinal plants in the study area due to either natural or artificial factors is linked with the missing valuable indigenous knowledge associated with plant use. This strongly necessitates that there is a need to take an appropriate conservation measurement for threatened medicinal plants and associated indigenous knowledge by conducting ethnobotanical research (Ermias Liulekal *et al*., 2008).

Therefore, this ethnobotanical study intended to enrich the limited inventory of traditional medicinal plants and their way of conserving and maintaining their indigenous knowledge by studying and documenting traditionally used medicinal plants and the role of indigenous knowledge in the area. Hence, this study was initiated to fill gaps in the documentation of ethnobotanical knowledge in the study area.

1.3 Research Questions

This study was conducted to answer the following research questions:

1. Which medicinally important plant species are used by local communities to treat health problems in the study area?
2. Which part is more useful to treat disease?

3. How do the local healers prepare the traditional medicine in the study area?
4. What are the main threatening factors of medicinal plants in the area?
5. What is done by local communities and the government sector to manage and conserve locally threatened medicinal plant species?

1.4 Objectives of the Study

1.4.1 General objective

The main objective of this study was to investigate the medicinal plants used by indigenous people and to assess their conservational status in Lume, central Ethiopia.

1.4.2. Specific objectives

Following the main objective, the specific objectives were formulated as follows:

- To document traditional medicinal plants that are used by the local people for the treatment of different ailments in the study area
- To identify plant parts used for medicinal purposes, methods of preparation, and route of administration
- To examine the major threats and conservation practices of the local people to medicinal plants (MPs)
- To suggest possible strategies for the conservation and sustainable use of traditional MPs

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Ethnobotany

The term ethnobotany was coined by Harshberger, one of the fathers of economic botany of America in 1896. Ethnobotany is the study of the relationship between plants and people, which comes from "Ethno"- the study of people, and "Botany"- the study of plants. As it was reported by Cotton (1996), the term ethnobotany was defined differently depending on the interest of the workers involved in the study. The indispensable dependency of humans on plants for their livelihood was primarily started by domestication and dates back 10,000 years (Martin, 1995). Humans can gain different function like; food, medicines, pesticides, fodder, fuel, construction materials, and tools, and derives aesthetic and spiritual fulfillment. Thus, indigenous knowledge of plants appeared when humans started and learned how to use plants (Posey, 1999). Over centuries, indigenous people have developed their locality-specific knowledge of plant use, management, and conservation (Cotton, 1996).

The complex knowledge, beliefs, and practices generally known as indigenous knowledge or traditional knowledge develops and changes with time and space, with change in culture and resources. Ethnobotanical work seems to have started with Christopher Columbus in 1492 at a time when brought tobacco, maize, spices, and other useful plants to Europe from Cuba (Coton, 1996), and when other immigrants from the new world documented food, medicine, and other useful plants of the Aztec, Maya, and Inca peoples (Martin, 1995).

Ethnobotanical investigation documents knowledge of the cultural interaction of people with plants. It also tries to find out how local people have traditionally used plants for various purposes, and how they incorporated plants into their cultural traditions and religions. In Ethiopia, little emphasis has been given to traditional medicinal studies over the past decade, though traditional healers continue to practice and are the main healthcare providers for many Ethiopians (Balick and Cox, 1996).

Plants used as medicine are one of the relationships of humans with plants. Historical accounts of traditionally used medicinal plants depict that different medicinal plants were in

use as early as 5000 to 4000 BC in China and 1600 BC by Syrians, Babylonians, Hebrews, and Egyptians (Dery *et al*., 1999). Since then, the major system of traditional medicine which originated from ancient China has continued to develop not only in China but also in neighboring countries such as Japan, the republic of Korea, and Vietnam (WHO, 2007).

As stated by Martin, (1995) to achieve more detailed and reliable information on plants and plant use, ethnobotanical study needs the involvement of specialists from various disciplines, such as plant taxonomists, plant ecologists, anthropologists, linguists, economic botanists, pharmacologists and others. With such interdisciplinary and multidisciplinary approaches, ethnobotany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources, and discovering benefits from plants.

2. 2 Indigenous Knowledge

In a particular area, there is the accumulation of knowledge, rules, standards, skills, and mental sets, which are possessed by local people and are known as indigenous knowledge (Quanash, 1998). Immediate and intimate dependency of local people on natural resources resulted in the accumulation of indigenous knowledge that helped people to adapt to and survive in the environments in which they lived. It is local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation, and a host of other activities (Thomas, 1995). It is the result of many generations' long years of experience, careful observations, and trial-and-error experiments (Martin, 1995). Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine, and general utility including tremendous botanical expertise (Martin, 1995). Over centuries, indigenous people of different localities have developed their specific knowledge of plant resource use, management, and conservation (Cotton, 1996).

According to Alcorn (1984), indigenous knowledge develops and changes with time and space. Hence, such knowledge includes a time-tested practice that developed in the process of interaction of humans with their environment. One of the widely used indigenous knowledge systems in many countries is the knowledge and application of traditional medicinal plants. Such knowledge known as ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials preparation of indigenous knowledge on plant

remedies in many countries including Ethiopia, passed from one generation to the other generation verbally with great secrecy. The secret and verbal transfer makes the indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer (Amare Getahun, 1976), hence the need for systematic documentation of such useful knowledge nowadays through ethnobotanical research.

2.2.1 Threats to indigenous knowledge of medicinal plants

According to Jansen (1981), in Ethiopia, even though the traditional medicinal partitions are the best source of information about the knowledge of medicinal plants, it was found very difficult to obtain their medicinal information as they considered their indigenous knowledge as a professional secrete, only to be passed orally to their elder sons at oldest age. According to Debela Hunde *et al*. (2004), modern education has an impact on knowledge. On the other hand, the loss of knowledge is also aggravated by the expansion of modern education, making the younger generation underestimate its traditional values. He pointed out that those students who attended modern schools are showing unwillingness to learn from their parents, which is evidence of the gradually disappearing traditional knowledge. The study conducted by Tesfaye Hailemariam *et al*. (2009), showed that most of the knowledge on herbal remedies is handled by elders who are 41-50 years old. This hints at the fact that ethnomedicinal knowledge is concentrated in the elderly members of the community and the relative difficulty in its transfer from the elderly to the young generation. According to Pankhurst (1990), the knowledge of medicinal plants and methods of use circulated mainly among practitioners and the beneficiaries of such practice. Because of the impact of modern education, increase in health coverage, and urbanization, indigenous knowledge and usage of medicinal plants are being lost globally at a fast rate (WHO, 2002). This has made the knowledge and skill of traditional medicinal plants and traditional medicine more hidden and less available to the public (Abbink, 1995).

The issue is even more serious in developing countries where such important information is not recorded in writing but passed on from one generation to the next orally; few are available in written records to make matters worse, the younger generation of today unfortunately, often have different ambition and priorities. As a result, this traditional skill

is doomed to be lost even faster than the plants themselves (Sofowora, 1982., Pankhurst, and Fassil Kibebew, 2001., Miruts Giday *et al*., 2003).

2.3 Traditional Medicinal Plants

The World Health Organization (WHO, 2001), defines traditional medicine as the total combination of the knowledge and practices that can be formally explained or used in the prevention and elimination of physical, mental, or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in written (Fassil Kibebew, 2001).

According to Fassil Kibebew (2001), about 75-90% of the rural population in the world (excluding western counties) 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 accessible and meet psychological needs in a way that modern medicine dose not.

According to WHO (2001), consultation of medicinal practitioners is very helpful for the development and incorporation of useful approaches in the planning and budgeting system for health care provision of most developing nations and indigenous communities. In Africa, traditional medicines play a central role in the health care needs of rural people and the urban poor. Here, it is said that this situation will remain so long as modern medicine continues to be unable to meet the health care of the people of the continent effectively (Edosa Tesfaye, 2023). The value and role of this healthcare system will not diminish in the future, because they are both culturally viable and expected to remain affordable, while the modern healthcare service is limited and expensive (WHO, 1998).

Indigenous traditional medicinal practices were carried out essentially based on private practice, i.e., private agreement between consenting parties, and the knowledge of traditional practice in most cases has descended through oral folklore (Asfaw Debela *et al*., 1999). The secret information retained by traditional healers is relatively less susceptible to distortion but less accessible to the public (Dawit Abebe, 1986). However, the knowledge is dynamic as the practitioners make every effort to widen their scope through the reciprocal exchange of limited information with each other (Dawit Abebe, 1986; Abbink, 1993).

2.4 Medicinal Plants and Ethnomedicine in the Public Healthcare System of Ethiopia

There is a large magnitude of use and interest in medicinal plants in Ethiopia due to their acceptability, accessibility, and biomedical benefits (Dawit Abebe, 2001). In this country, the long history of the use of medicinal plants is reflected in various medico-religious manuscripts produced on parchments and believed to have originated several centuries ago (Fassil Kibebew, 2001). Medical textbooks written in Geez or even Arabic in Ethiopia between the mid-7th and 8th century imply that plants have been used as a source of traditional medicine in the Ethiopian healthcare system. Even today, it is common for people living in rural and urban areas to treat some common ailments using plants available around them. For example, *Hagenia abyssinica* expels tapeworm, *Ruta chalepensis* for various health problems (Abbink, 1995).

Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of different afflictions in Ethiopia (Fikadu Fullas, 2007). For the role played by plant-derived products in human livestock health, systematic scientific investigation is vital (WHO, 1998). Pharmaceutical industries and Western researchers on plant-based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe, and profitable therapeutic agents (Pistorius and Van Wiik, 1993).

Plants play a major role in providing prototype molecules for possible development into conventional drugs for the pharmaceutical industry (Fikadu Fullas, 2007). However, a small fraction of the world's plants have been investigated scientifically so far, but, human kinds have already reaped enormous benefits from them (Farnsworth *et al*., 1985). According to Konno (2004), easy accessibility efficacy of treatment, and the affordable cost of getting health services are the main reasons for preferring traditional medicine to modern medication.

2.4.1 Ethnoveterinary medicinal plants

Ethnoveterinary medicine is a holistic interdisciplinary study of the local knowledge and the sociocultural structures and environment associated with animal health care and husbandry (Tiwari, *et al.,* 2010*)*. Hence, to keep animals healthy, traditional healing practices have been

applied for centuries and have been passed down orally from generation to generation (Toyang, *et al.,* 2007; Phondani *et al.,* 2010) Widespread interest in documenting and validating ethnoveterinary practices arose in the early 1980s. Since then, several studies have been carried out, many reports written, and numerous conferences and workshops held. These activities have saved ethnoveterinary knowledge from extinction because most knowledge resided with elderly community members and disappeared as they died (Toyang, *et al.,* 2007; Phondani, *et al*., 2010). However, the effort is still quite insignificant when compared to the undocumented global ethnoveterinary plant lore.

In Ethiopia, animal disease remains one of the principal causes of poor livestock performance, leading to an ever-increasing gap between the supply of, and the demand for livestock products (Agrawal, 1995). Conventional veterinary services, despite their paramount role, have limited coverage in developing countries (Girish, *et al.,* 2008; Devi *et al*., 2010). Due to this reasonlivestock keepers particularly in rural areas frequently visit traditional healers to get solutions for their ill-health animals; they complement modern medicine by developing a socially acceptable remedy from inexpensive resources.

The traditional knowledge of ethnoveterinary practices by local healers who are knowledgeable and experienced in traditional systems of treatment is important, but their knowledge is not documented and is dwindling fast (Endashaw Bekele *et al*., 2007). It is also indicated that the knowledge of ethnomedicinal plants is on the verge of irreversible loss and declining to deterioration due to the oral passage of herbal heritage from generation to generation rather than in writings, despite their vital role in catering to the health of human, and livestock population (Fisseha Mesfin *et al*., 2009 and Sebsebe Demissew *et al.,* 2007). Environmental degradation, agricultural expansions, cultivation of marginal lands, and urbanization are also posing a significant threat to the future well-being of human and animal populations that have relied on these resources to combat various ailments for generations (Tilahun Teklehaymanot and Giday Mirutsey *et al*., 2007) warranting the urgent need to document and preserve the indigenous knowledge. Hence, it is a timely endeavor to document, promote, and conserve the country's ethnoveterinary medicinal plant lore. Such documents are important to define and maintain the cultural identity of the people (Cetinkaya, 2009), in addition to serving as keys toward establishing people-centered natural resource management systems (Lynam and De Jong, 2007) and potentials for scientific discovery of new compounds used in the development of modern drugs (Cos *et. al.,* 2006). Although

attempts have been made to document Ethiopian ethno-veterinary medicinal plants in some cultural groups (Fisseha Mesfin and Sebsebe Demissew, 2007), it is found insignificant when compared to the multi-ethnolinguistic communities found in the country, which have remained largely unexplored. Therefore, the present study was designed to document the ethnoveterinary medicinal plants, and their preparation and application methods used by traditional healers in treating different diseases, in the Lume districts with different cultures and their languages.

2.5 Threats and Conservation of Traditional Medicinal Plants

2.5.1 Threats to medicinal plants

Ethiopia's traditional medicine as elsewhere in Africa is faced with problems of continuity and sustainability (Ensermu Kelbessa *et al*., 1992). People used many wild plant species of plants for food, medicine, clothing, shelter, fuel, income generation, and the fulfillment of cultural and spiritual needs throughout the world (Zemede Asfaw, 2001). There are two sources of threats to medicinal plants, i.e., manmade and natural causes. The rapid increase in population, the need for fuel, urbanization, timber production, over-harvesting, destructive harvesting, invasive species, commercialization, honey cut, degradation, agricultural expansion, and habitat destruction are human-caused threats to medicinal plants. Likewise, natural causes include recurrent drought, bushfires, disease, and pest outbreaks (Ensermu Kelbessa *et al*., 1992). As elsewhere in Ethiopia, the problem is manifested in Lume District due to the above-mentioned factors.

2.5.2 Conservation of traditional medicinal plants

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

In a broad sense, conservation is achieved through *in-situ* and *ex-situ* means. *In-situ* conservation is the conservation of species in their natural habitat. Some traditional medicinal plants have to be conserved in situ due to the difficulty of domestication and management (Zemede Asfaw, 2001). Moreover, some plants fail to produce the desired amount and

quantity of the active principles under cultivation out of their natural habitats. Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemede Asfaw, 2001), this can be possible in places of worship (churches, mosques, graves yards, and so on), scared grooves, farm margins, river banks, roadsides, live fences of gardens and fields.

According to Zemede Asfaw (2001); Nigussie Amsalu (2010); and Getnet Chekole (2015), medicinal plants can be conserved using appropriate conservational methods in gene banks and botanical gardens. This type of conservation of medicinal plants can also be possible in-home gardens, as the home garden is a strategic and ideal farming system for the conservation, production, and enhancement of medicinal plants.

Ethiopia has policies and strategies that support the development and utilization of plant resources in a sustainable manner. Policies are reflected in various sectors including environmental protection, development of natural resources, and diversification of the domestic and export commodities (Endashw Bekele, 2007). The country also has developed a policy and a guideline for intellectual property rights protection of traditional medicine. The policy encourages and promotes the appropriate use and protection of traditional medicinal knowledge in Ethiopia taking into account the needs of the traditional medicinal knowledge holders and the communities who benefit from the use of the knowledge.

CHAPTER THREE

3. MATERIALS AND METHODS

3.1 Description of the Study Area

3.1.1 Location of the study area

Lume District is located in the East Shoa Administrative Zone of Oromia Regional State in Centrl Ethiopia. It is located 71 km to the Southeast of Addis Ababa. Lume District is located in the Great Rift Valley with a geographical coordination of 8º35ʾ N latitude and 39º10ʾ E, longitude. It is bordered on the south by the Koka Reservoir, on the west by Ada'a Chukala, on the northwest by Gimbichu, on the north by the Amhara Regional State, and the east by Adama. Modjo is the capital of the district; other towns and towns include Ejere, Ejersa, and Koka (Figure 1).

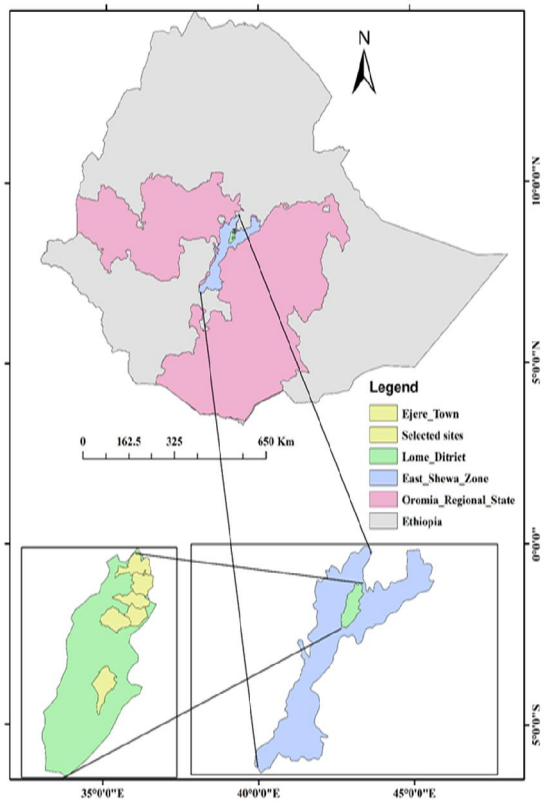

Figure 1: Map of the study area showing Lume administration and seven study sites or kebeles (the smallest administrative units)

3.1.2 Climate of the Study area

Most of Lume District ranges in altitude from 1500 to 2300 m a.s.l., except for a small portion in the northern part, which is over 2300 in altitude. The 15 years of climate data were collected from Ethiopian Meteorological services at Modjo weather station. The cliamadiagram was developed using an R-package that shows the study area had a unimodal rainfall distribution with 589 mm of mean annual rainfall from 2007 to 2022. The long rainy season stretches from March to the end of September. The mean annual temperature was 19.4°C with a minimum of 7.7°C and a maximum of 31.7°C (Figure 2).

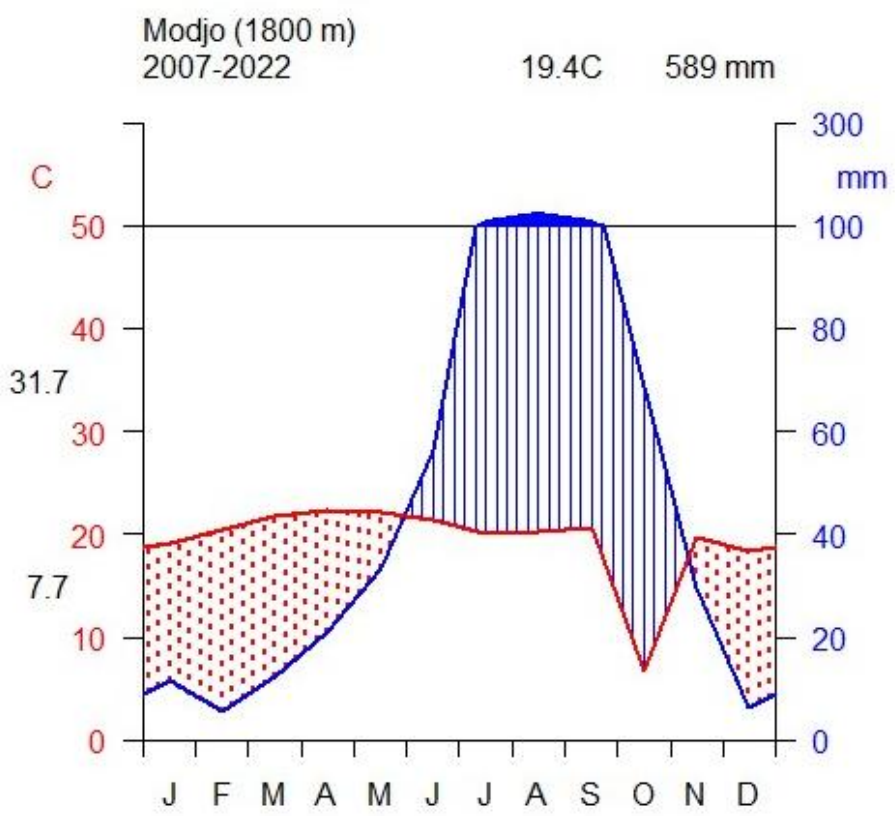

Figure 2: Cliamadiagram showing the mean annual precipitation, average minimum and maximum temperature

According to the data obtained from the Lume District administrative office, the agroecological zone of the area consists of 20% of highland (*Dega/Baddaa*), 40% of mid-land (*Woinadega/ Baddadaree*), and 40% of lowland (*Kola/Gammoojjii*). Most of the area's soil type is loam and fertile. A survey of the land in this district shows that 54.3% is arable or

cultivable, 3% pasture, 2% forest, and the remaining 20% is considered degraded or bare land including rivers in the Modjo. Although the area is known for mixed farming systems, vegetables are an important cash crop (Lume District Administrative Office, 2023, unpublished report).

3.1.3 Socio-economy of the population

Industry in the district includes four government-owned industries and 35 privately owned small businesses that employed 173 people, as well as 1278 registered business organizations which included 187 wholesalers, 495 retailers, and 298 service providers. There were 36 Farmer's Associations with 11,138 members and 12 Farmer's Service Cooperatives with 9974 members. Lume has 89 kilometers of dry-weather and 96 of all-weather road, for an average road density of 260.5 km per 1000 km^2. About 48% of the rural, 83% of the urban, and 60% of the total population have access to drinking water. Lume also has rail access provided by the Addis Ababa Djibouti railway (https://en..m.wikipedia.org/wiki/Lome-(woreda),20/01/2020).

3.1.4 Demography of the study area

According to the 2007 national census, 117,080 population were recorded in the district, of whom 60,125 were men and 56,955 were women; 38,771 (33%) of its population were urban dwellers. The majority of the inhabitants (90.1%) are followers of Ethiopian Orthodox Christianity, while 3.4% of the population practiced traditional beliefs, 3.8% of the population were Protestant, and 2.7% of the population were Muslim (CSA, 2007). With an estimated area of 709.85 km^2, Lume has an estimated population density of 197.3 people per km^2, which is greater than the Zone average of 181 (CSA, 2005). The three largest ethnic groups reported in Lume were the Oromo (66.1%), the Amhara (29.7%), and the Silte (1.2%); all other ethnic groups made up 3.1% of the population. Afan Oromo was spoken as a first language by 57.5%, followed by the Amharic language (40.5%) and the remaining 2% spoke all other primary languages (CSA, 1994).

3.2 Sampling Method

3.2.1 Selection of study area

For this study, seven kebeles (the smallest administrative unit) were selected purposively by taking into consideration the availability of remnant vegetation, distribution of traditional healers, and inclusiveness of rural and urban sites. These selected kebeles were, Tede dilemma, Nanewa, Danse shanbure, Ejere, Ejere wol-kite, Haro-yohannes, and Daka-bora kara from about 41 (35 rural and 6 towns) kebeles of Lumes District Administration. Six of the kebeles are rural while Ejere is the only rural town kebele (Figure 1).

3.2.2 Informant selection

Informant selection was done following Martin (1995). A total of 49 informants (19 females and 30 males) whose age ≥20 was selected for data collection. The informants were selected using purposeful sampling techniques from seven sites or selected kebeles after receiving their full consent based on their age, knwladge, sex, and relationship to each other in the area. From these, ten informants were specialist healers.

3.3 Ethnobotanical Data Collection

Data collection was made using semi-structured interviews, group discussions, and guided home garden with key informants for field observations. The target populations were voluntary traditional health practitioners and traditional healers. Key informants were first interviewed individually to mention the local names of the plants they used to treat diseases, diseases to be treated, part (s) of plant used, methods of preparation, route of administration, route of application, threats to, and conservation of methods. Information was carefully gathered, and interviews and discussions were based on a checklist of questions prepared in English and later translated into Afan Oromo Language.

3.3.1 Semi-structured interviews

Semi-structured interviews were prepared and done following Martin (1995) and Cotton (1996). Semi-structured interviews ensured that there was a checklist of issues and areas to be discussed. During the interview, new and more ideas were raised that were necessary for the collection of the data

3.3.2 Guided home garden walk

Based on the information guided by the people of the study area, each activities were to gain needed information about traditional medicinal plants. During the guided home garden walk, the traditional medicinal practitioners went together with the researcher to show traditional medicinal plants and explain his knowledge about traditional medicinal plants. The necessary information and plant species were gathered in the field. Hence it made a suitable condition to collect the data from the informants without any tediousness.

Figure 3: Photo showing guided home garden walk in some study sites

3.3.3 Group discussion

The local people were selected for focus group discussion when they gathered together at a small town's market (Dekebora) in different rural areas of the study areas (kebeles) for their purpose. An ethical-based agreement was made among the informants collected together before beginning the discussion. According to my review questions of the study, questions were raised for the individuals to discuss more based on their areas of indigenous knowledge of ethnomedicinal plants and the ways by which it passed from generation to generation. This group discussion aimed to strengthen the results acquired from the respondent's questionnaire survey. At the time of discussion, ethnomedicinal knowledge was gathered from the residents and knowledgeable members of the community were recorded carefully.

Figure 4: Photo showing group discussion with the local people in the study area

3.3.4 Market survey

During the study, a market survey was conducted in the open market of Ejere town which is the center town for these selected study areas. It was made to distinguish and record the type of herbal drugs sold in the market and the multipurpose role of some medicinal plants according to a checklist of questionnaires. Data were gathered through observation and interaction with sellers and buyers of traditional medicinal plant products.

Figure 5: Photo showing market survey at Ejere town

3.4. Specimen Collections and Identifications

Plant spacemen collections were performed with the help of guided field walks and the plant specimens were pressed and dried for herbarium deposition. Identification of the plant specimens was done both in the field and later at the Ethiopian National Herbarium (ETH) using taxonomic keys of different volumes of Flora of Ethiopia and Eritrea, and confirmed

with my advisor Dr. Misganaw Meragiaw and taxonomic expertise. Finally, the identified medicinal plant specimens were mounted, labeled, and stored in ETH as Vouchers.

Figure 6: Photo Showing Plant Specimen Collections & Pressing following herbarium procedure

3.5. Data Analysis

The most important data collected on traditional medicinal plants and their conservation status reported by local communities, mainly applications, method of preparation, route of application, disease treatment, part used, and habit, were analyzed through descriptive statistics. In addition, some ethnobotanical analytical tools such as fidelity level index, preference ranking, direct matrix ranking, paired comparison, and informant consensus factor were used for data analysis. The detailed information about each technique is presented as follows:

3.5.1. Preference ranking

Preference ranking was made following Martin (1995) for the five most important medicinal plants used to treat the common cold. It was to identify and rank the certain amount of traditional medicinal plants in the area that had been found to have the **highest frequencies** and **relative frequencies** of occurrence and rank them according to their perceived values or desirability. The integer values 1, 2, 3, and 4 were used whereby the most important plant was given the highest value (4), while the least important one was assigned the smallest value (1). The numbers will then become a sum for all respondents to come up with an overall ranking. Finally, rank was given to each plant species.

3.5.2. Informant consensus factor (ICF)

It was calculated for categories of ailments to identify the agreements of the informants on the reported cures using the formula used by Rodrigo *et al*., (2005) and Tilahun Teklehaimanot (2007). ICF was calculated as follows, number of use citations for each ailment (**Nur**) minus the number of taxa used (**nt**) for that ailment, divided by the number of use citations for ailments minus one.

$$ICF = (Nur-nt) / (Nue-1)$$

This means Nur is the number of use citations in each illness category, and nt is the total number of taxa used by all informants for this illness category. The ICF values range from 0 to 1, with the high values (i.e., close to 1) indicating that relatively few plants are used by a large proportion of informants, while low values (<0.5) indicate that informants' minimum agreement on the plant species to be used to treat a category of ailments.

3.5.3 Fidelity level

It was carried out to analyze plant use with the formula FL = Np/Nu*100, where NP denotes the number of informants who reported the use of the plant to treat a particular disease and N represents the number of informants who used as a medicine following Canales *et al*. (2005).

3.5.4 Paired comparison

A paired comparison was used to evaluate the degree of preference or level of importance of certain selected plants/parts of plants (Nemarundwe and Richards, 2002). A list of the pairs of selected items with all possible combinations is made and the sequence of the pairs and the order within each pair is randomized before every pair is presented to selected informants' response is recorded and the total value is summarized. The total number of possible pairs (5) is obtained by 8 respondents with formula pairwise comparison = n(n-1) /2 where n is the number of medicinal plants being compared.

3.5.5 Direct matrix ranking

The direct ranking was done following Martin (1995) and Cotton (1996) to compare the multipurpose use of a given species and to relate this to the extent of its utilization versus its dominance. Based on information gathered from informants, five multipurpose medicinal plant species (average score of 5 key informants), were ordered out of the total medicinal

plants and use diversities of these plants by saying very good, good, less used, least used, and not used (given for 4 to 1) value of each use diversity for species were ranked

3.5.6 Market survey analysis

It took place at Ejere local market to identify the traditional medicinal plants that are supplied for the market for their medicinal or other purposes by the local peoples and sellers. Some local merchants were conducted to identify the productions that they supply for the market if they would have medicinal and other purposes. Mostly it focused on these individual spices' sellers and buyers in the market.

CHAPTER FOUR

4. RESULTS

4.1 Socio-demographic Characteristics of Informants

The socio-demographic characteristics of informants of the study areas are presented in Table 1. The informants' socio-demographics showed that the ages of informants were between 20-91. Regarding their marriage status, most were married based on their status and most were educated based on education level even if they were on different levels. The farming system is the common job of most informants as are other areas in the country.

Table 1: Socio-demographic characteristics of informants

No	Characteristics of informants		Count	Percentage	Total (100%)
1	Sex	Males	30	61.2%	100%
		Females	19	38.8%	
2	Address	Tede dildima	7	14.2%	100%
		Danse shanbure	7	14.2%	
		Ejere wolkite	7	14.2%	
		Ejere	7	14.2%	
		Haro Yohannes	7	14.2%	
		Nanewa	7	14.2%	
		Daka bora	7	14.2%	
3	Age	20-45	23	46.9%	100%
		46-60	12	24.4%	
		>60	14	28.5 %	
4	Marital status	Married	45	91.9%	100%
		Unmarried	4	8.1%	
5	Religion	Orthodox Tewahido	42	85.9%	100%
		Protestant	2	4.0%	
		Muslim	1	2.0%	
		Wokefata	4	8.1%	
6	Education	Reading and certificate	43	87.7%	

	level	Diploma and above	7	14.3%	100%
7	Jobs	Farmers	35	71.5%	100%
		Merchants	8	16.3%	
		Employees	6	12.2%	

4.2 Taxonomic Diversity of Ethnomedicinal Plant Species in Lume District

In total, 80 species of medicinal plants belonging to 75 genera and 43 families were recorded in the study area. The highest number of species (7) were reported in the Fabaceae family, followed by Solanaceae and Lamiaceae with six and five species, respectively. These three families constitute more than one-fifth (22.5%) of the total species. Asteraceae, Cucurbitaceae, and Euphorbiaceae families were represented by four species each whereas the other three families, namely Myrtaceae, Rubiaceae, and Rutaceae, were represented by three species each. Fourteen families were represented by two species for each. However, the majority of the families (27) were represented by a single species (Table 2).

Table 2: List of plant families and number of genera and species of medicinal plants

No	Family	No of genera	%	No of species	%
1	Acanthaceae	1	1.33	1	1.25
2	Alliaceae	*1	1.33	2	2.5
3	Anacardiaceae	1	1.33	1	1.25
4	Apiaceae	1	1.33	1	1.25
5	Apocynaceae	2	2.66	2	2.5
6	Asclepiodaceae	1	1.33	1	1.25
7	Asparagaceae	1	1.33	1	1.25
8	Asphodelaceae	1	1.33	1	1.25
9	Asteraceae	4	5.33	4	5
10	Boraginaceae	2	2.66	2	2.5
11	Brassicaceae	2	2.66	2	2.5
12	Caricaceae	1	1.33	1	1.25
13	Cellastraceae	1	1.33	1	1.25
14	Crassulaceae	1	1.33	1	1.25
15	Cucurbitaceae	4	5.33	4	5
16	Euphorbiaceae	*3	4	4	5
17	**Fabaceae**	**7**	**9.33**	**7**	**8.75**
18	Flacourtaceae	1	1.33	1	1.25
19	**Lamiaceae**	**5**	**6.66**	**5**	**6.25**
20	Linaceae	1	1.33	1	1.25
21	Lauraceae	1	1.33	1	1.25

22	Malvaceae	2	2.66	2	2.5
23	Meliaceae	1	1.33	1	1.25
24	Molluginaceae	1	1.33	1	1.25
25	Moringiaceae	1	1.33	1	1.25
26	Myrtaceae	*2	2.66	3	3.75
27	Oleaceae	1	1.33	1	1.25
28	Papaveraceae	1	1.33	1	1.25
29	Pedaliaceae	1	1.33	1	1.25
30	Phytolaccaceae	1	1.33	1	1.25
31	Poaceae	2	2.66	2	2.5
32	Polygonaceae	1	1.33	1	1.25
33	Ranunculaceae	1	1.33	1	1.25
34	Rhamnaceae	1	1.33	1	1.25
35	Rubiaceae	*2	2.66	3	3.75
36	Rosaceae	1	1.33	1	1.25
37	Rutaceae	*2	2.66	3	3.75
38	Sapindaceae	1	1.33	1	1.25
39	Scrophulariaceae	1	1.33	1	1.25
40	**Solanaceae**	**6**	**8**	**6**	**7.5**
41	Verbanaceae	2	2.66	2	2.5
42	Virtaceae	1	1.33	1	1.25
43	Zingebraceae	1	1.33	1	1.25
	Total	75	100	80	100

Note: * Stands for the number of genera that are represented by different numbers of species

4.2.1 Habitat of medicinal plants

Plant species are located in different habitats such as the wild (shrubland, woody vegetation, and along the roads), agricultural fields or domestic crops, and homegarden. The medicinal plants collected for this study were from different habitats. Accordingly, from these eighty identified medicinal plants, the highest (37, 46.3%) numbers of species were considered as domestic crops, followed by wild habitats with (34, 42.5%) species, (7, 8.7%) of them were both wild and land domestic and the rest (2, 2.5%) were found along the roads.

4.3 Growth Habit and Part used

4.3.1 Growth habit-diversity of the medicinal plants

The habit and administration routes of medicinal plants are different as their function varies based on the diseases they treat. From the total medicinal plants' herbs counted for 43 (53.8%), followed by shrubs (22.5%) (Figure 7).

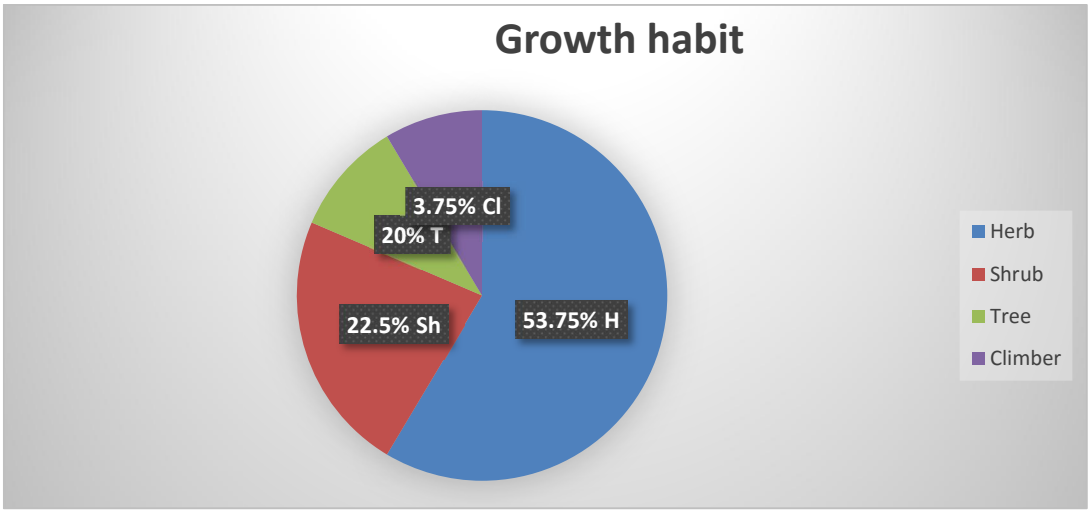

Figure 7: Diversity of growth habits of the medicinal plants (H = herbs, Cl = Climber, sh = shrubs, and T = trees)

4.3.2 Medicinal plant species used to treat human ailments

The results showed that about 77.5% (62) of plant species and 38 families were used for the treatment of human ailments. The highly used families were Euphorbiaceae, Fabaceae, Lamiaceae, and Solanaceae (4, 10.5%) each, Asteraceae, Myrtaceae, and Rutaceae (3, 7.8%) species, Alliaceae, Boraginaceae, Brassicaceae, Cucurbitaceae and Rubiaceae (2. 5.26%) species each, while all those families were represented by (1, 2.6%) species each (Appendix 2).

The result showed that medicinal plants used to treat human ailments were harvested from various sources; domestic (32, 51.6%), wild (22, 35.5%), wild and domestic (6, 9.7%), and roadside (2, 3.2%).

4.3.3 Growth habit, preparation mode, used part, routes of administration of medicinal plants used to treat human ailments

The growth form obtained from the data about medicinal plants used for the treatment of human ailments were herbs (34, 54.8%), shrubs (15, 24.2%), and trees (13, 20.9%) (Figure 8).

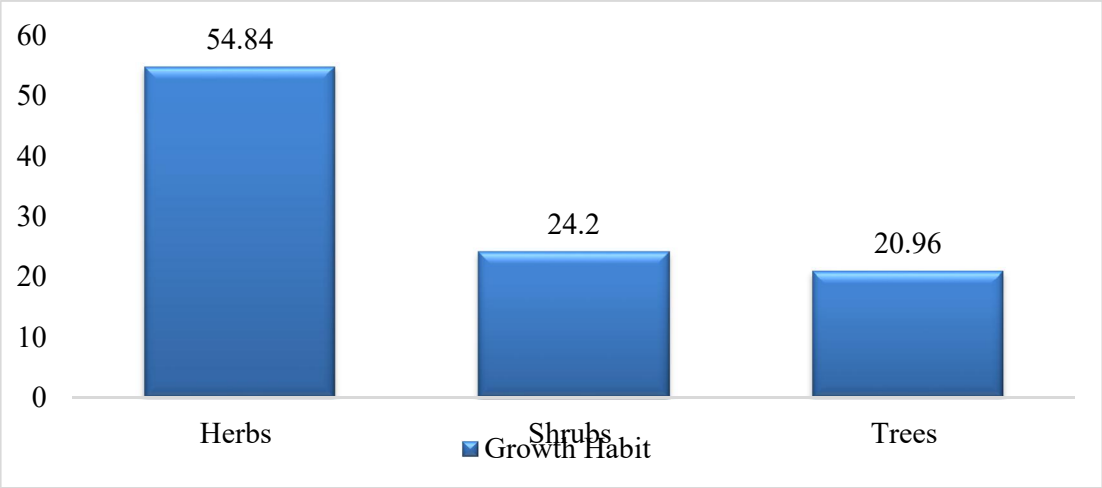

Figure 8: Growth habit of medicinal plants used to treat human ailments

Parts of medicinal plants harvested for the treatment of human ailments in the study area were leaves (25, 40.3%), seeds (10, 16.1%), fruits (9, 14.5%), roots (7, 11.3%), stem (4, 6.45%), bulb (2, 3.2%) and rhizome, leave & stem, leaves & roots, spines and tuber (1, 1.6%) for each plant species (Table 3).

Table 3: Parts of medicinal plants used for the treatment of human ailments

Part used	**No. of species**	**%**
Leaves	25	40.3
Seed	10	16.1
Fruit	9	14.5
Root	7	11.3
Stem	4	6.5
Bulb	2	3.3
Rhizome	1	1.6
Leaf and stem	1	1.6
Leaf and root	1	1.6
Spine	1	1.6

The most used modes of preparation of medicinal plants used to treat human ailments were chewing and pounding (14, 22.58%) each, squeezing (11, 17.7%), boiling (6, 9.67%), smoking (5, 8.06%), creaming (4, 6.45%), tied (3, 4.8%), crushing (2, 3.22%), while the rest soaking, mash and cooking (1, 1.6%) each (Figure 9).

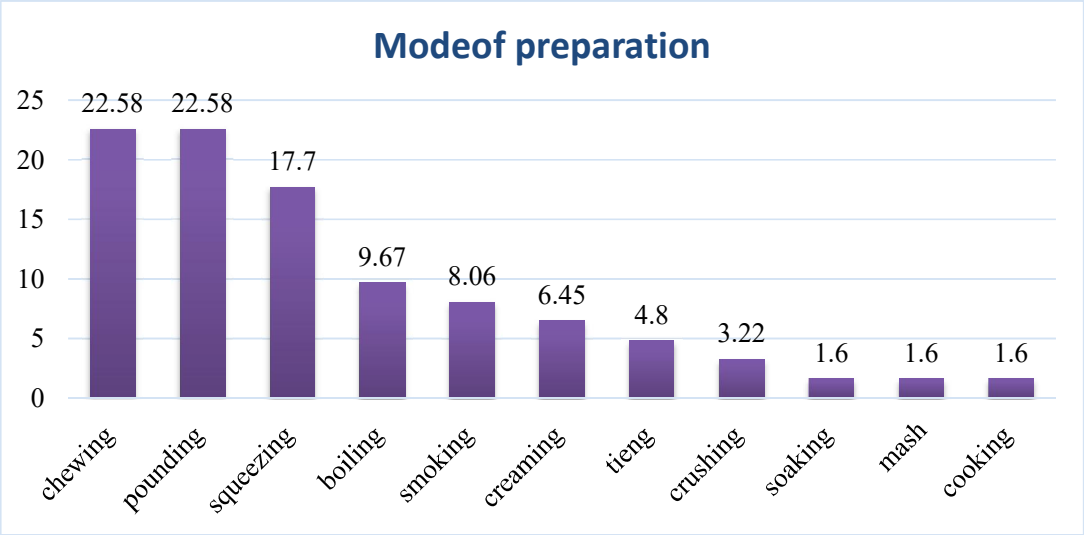

Figure 9: Mode of preparation of medicinal plants used to treat human ailments

The data showed that medicinal plants administered by using different routes of administration for the treatment of human ailments were, (31, 50%) oral, (20, 32.25%) dermal, (9, 14.5%) nasal, (1, 1.6%) both oral-nasal and oral-dermal each (Figure 10).

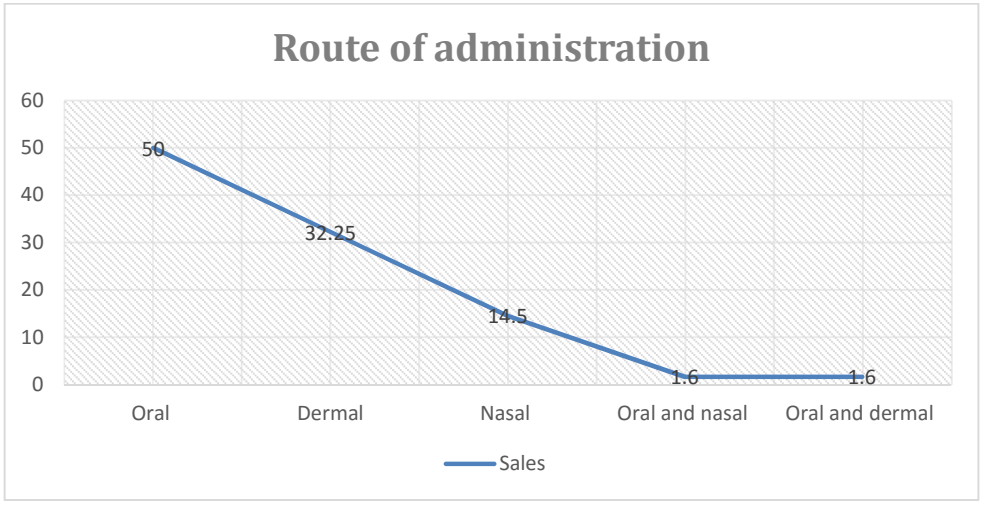

Figure 10: Administration routes of medicinal plants used to treat human ailments

4.3.4 Medicinal plants species used to treat livestock ailments

As the results of the study indicated on ethnoveterinary medicinal plants, about 16.2% (13 species) and 12 families were used for the treatment of livestock disease. Fabaceae (2, 15.

38%), Acantaceae, Apoaceae, Asteraceae, Apoacynaceae, Cucurbitaceae, Malvaceae, Oliaceae, Rubiaceae, Solanaceae, Verbenaceae, and Vitaceae contributed (1, 7.69%) species each.

4.3.5 Growth form, part used, mode of preparation, and administration routes of medicinal plants used to treat livestock ailments

According to the data obtained from the study showed that ethnoveterinary medicinal plants were harvested from the wild (10, 76.9%), and domestic (3, 23.1%). Growth forms of plants used to treat livestock ailments were herbs (5, 38.46%), followed by both shrubs and trees (3, 23.1%) each, and liana (2, 15.38%) (Figure 11).

Figure 11: Growth habit of medicinal plants used to treat livestock ailments

Parts of medicinal plants used for the treatment of livestock ailments were leaves (8, 61.5%), seeds (3, 23.1), roots and stem (1, 7.7%) each. Mode of preparation for medicinal plants used to treat livestock ailments was chewing (4, 30.7%), squeezing and pounding (3, 23.1%) each, burning (2, 15.4%), and boiling (1, 7.7%) (Table 4).

Table 4: Preparation mode of ethnoveterinary medicine

Preparation mode	T. number of plant species	%
Chewing	4	30.7
Squeezing	3	23.1

Pounding	3	23.1
Burning	2	15.4
Boiling	1	7.7

The study indicated that ethnoveterinary medicinal plants were administered along diverse routes of application; dermal (7, 53.8%), oral (5, 38.5%), and nasal (1, 7.7%) (Figure 12).

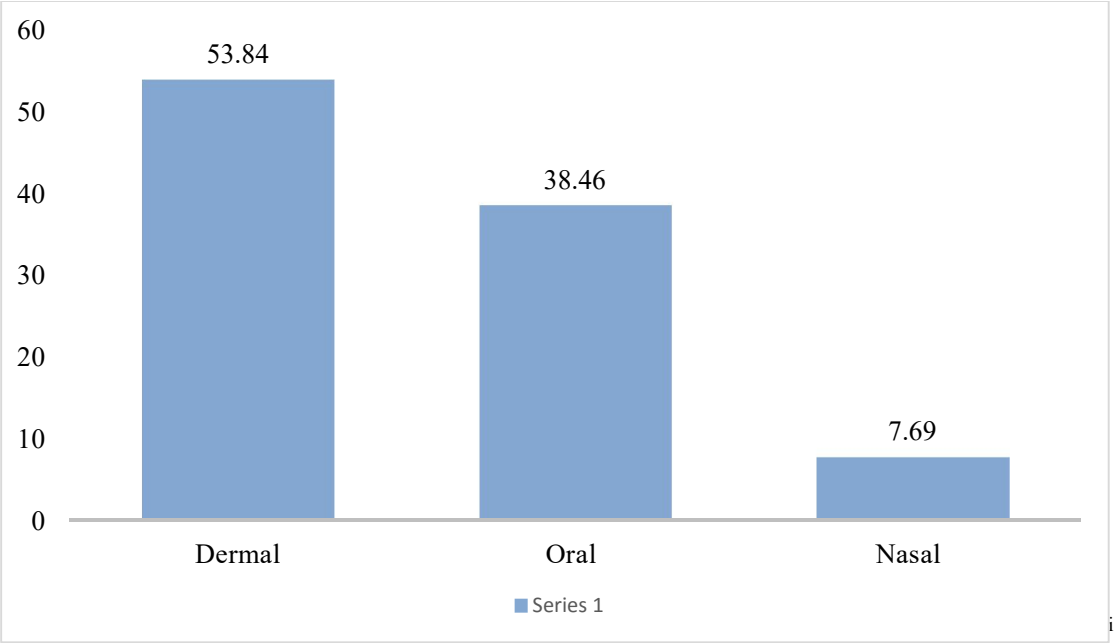

Figure 12: Application route of medicinal plants used to treat livestock ailments

4.3.6 Medicinal plants used to treat both human and livestock ailments

From 80 medicinal plant species identified in the study area, (5, 6.3%) species also categorized under five families were used to treat both human and livestock ailments. Those all families such as Asclepiadaceae, Fabaceae, Lamiaceae, Poaceae, and Solanaceae of medicinal plants contributed (1, 20%) each is used as a source of medicine for the treatment of both human and livestock ailments.

4.3.7 Growth form, part used, mode of preparation, and route of administration of medicinal plants used to treat both human and livestock ailments

The result of the study showed that medicinal plants used to treat both human and livestock ailments were harvested from wild (2, 40%), domestic (2, 40%) and both wild and domestic (1, 20%).

The study showed that the growth form of medicinal plants used to treat both human and livestock ailments were, herbs (4, 80%), and liana (1, 20%) (Figure 13).

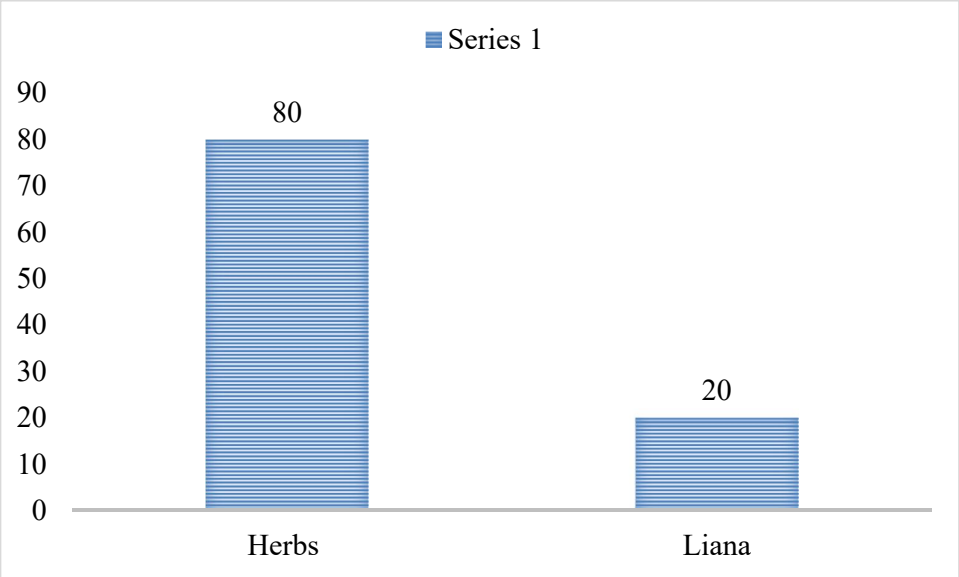

Figure 13: Growth form of medicinal plants used to treat both human and livestock ailments

Medicinal plants used to treat both human and livestock ailments in the study area were leaves (80%), and seed (20%) (Table 5).

Table 5: Medicinal plants used to treat both human and livestock ailments

Part used	**Total no. of plant species**	**%**
Leaves	4	80
Seed	1	20

According to this study mode of preparation were, grinding (1, 20%), boiling (1, 20%), and (1, 20%) chewing.

The administration routes of medicinal plants used to treat both human and livestock ailments were dermal and oral (2, 40%) each and (1, 20%) nasal (Figure 14).

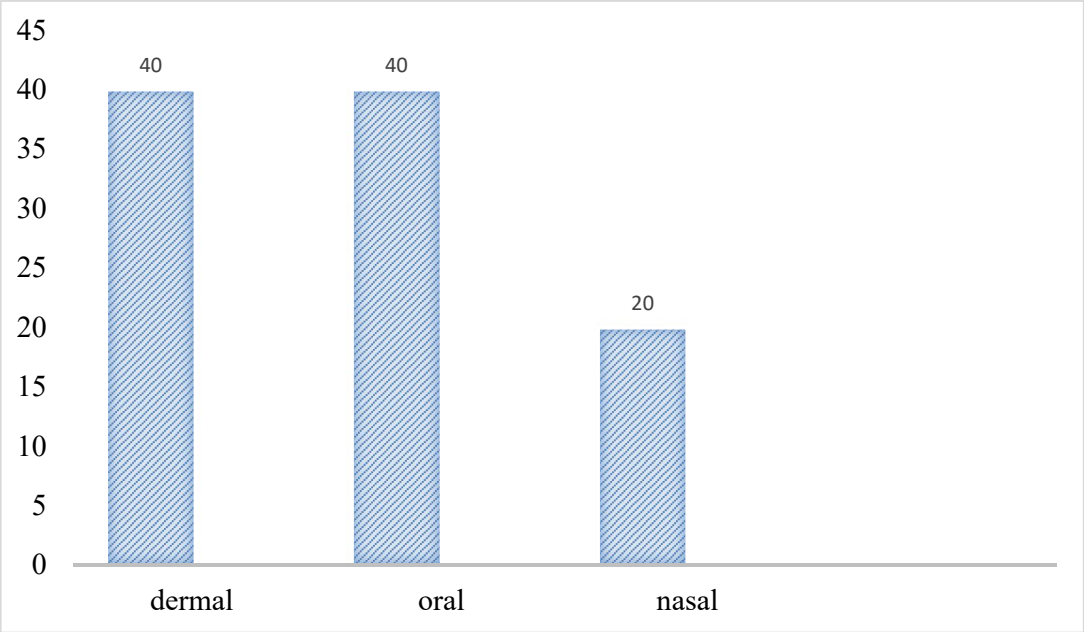

Figure 14: Administration route of traditional medicinal plants used to treat both human and livestock ailments

4.4 Dosage

The amount of traditional medicine to be taken for a certain duration is given by estimating the age, physical strength of the patients, and the severity of the disease. This indicates that there is no uniformity in the dosage of traditional medicinal plants between the traditional healers. Amounts to be administered were estimated by the use of measurements such as the length of a finger ring in a coffee cup, tea glass, or a lid of water plastic, and number count (for sap/extract drops, leaves, seeds, fruits, and bulbs) recovery from the disease, which usually is determined by the disappearance of disease symptoms, is a criterion that the local people of this study are considered to determine the duration of using the medicine.

4.5 Ranking and Scoring of Medicinal Plants

4.5.1 Preference ranking

Preference ranking was made following Martin (1995) for the five most important medicinal plants used to treat the common cold. In the study area, five medicinal plants were reported as effective in treating flu. Ten informants ranked these five plants based on their perception of the degree of effectiveness. As indicated in Table 6, *Eucalyptus globulus* was the most

effective medicinal plant used to treat a common cold followed by *Zingiber officinale*, and *Allium sativum*.

Table 6: Preference ranking of traditional medicinal plants used for treating flu

Plants used	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**T**	**R**
Allium sativum	4	3	2	2	4	3	1	3	2	4	**28**	**3rd**
Eucalyptus globulus	3	4	4	3	4	4	3	3	3	4	**35**	**1st**
Withania somnifera	2	3	4	2	3	4	3	2	3	1	**27**	**4th**
Zingiber officinale	4	4	3	4	2	4	2	3	1	4	**31**	**2nd**
Nigella sativa	2	4	4	3	2	1	1	3	1	1	**22**	**5th**

4.5.2 Informant consensus

The results indicated that the highest informant consensus went to *Ocimum lamiifolium* (81.6%), followed by *Allium sativum* (71.4%) and *Eucalyptus globulus* (61.2%) were the most important medicinal plants for treating human ailments. The popularity of medicinal plants in the area is based on the effectiveness of the species for treating febrile illness in the community and due to the abundance of the plants in the area for easy access as well as, the community having similar knowledge towards the traditional medicinal values of some plants. The result of the study from informant consensus analysis observed that some medicinal plants were in higher demand and more frequently used by the local community than others.

Table 7: The informant consensus results of the most popular medicinal plants in the study area

Scientific name of species	**No. of informants**	**%**	**Rank**
Ocimum grattissimum	40	81.6%	1st
Allium sativum	35	71.4%	2nd
Eucalyptus globulus	30	61.2%	3rd

Zingiber officinale	20	40.8%	4th
Withania somnifera	16	32.6%	5th

4.5.3 Informant consensus factor (ICF)

Based on the study ailments were grouped into various types namely, febrile illness, cough, sinus, toothache, kidney-ache, stomachache, stomach parasite, ruminant, giardia, malaria, gonorrhea, wound, snake breath, skin disease, hitching, spider poison, evil-sprit, blood pressure, weak appetite, and anemia. These diseases are categorized based on the nature of the disease, the condition that causes them, the place of attack, symptoms, and signs of diseases. Plants used against febrile illnes, cough, sinus, and toothache have high ICF scoring 91% (Table 8) followed by kidney-ache, stomach parasite, ruminant, giardia, malaria, and gonorrhea. This may indicate the common occurrence of these diseases so that more people exchange information and agree on plant species that can be used to treat these diseases than the rest. The medicinal plants that are effective in treating certain ailments and are well-known by community members have higher ICF values. On the other hand, the rest diseases suggest fewer common occurrences with less knowledge of their treatment.

Table 8: Informant consensus factor (ICF) for disease categories

Categories	**Nt**	**N_{ur}**	**ICF**	**%**
Febrile illness, cough, sinus, toothache	12	125	0.91	91%
Kidney ache, stomach ache, stomach parasite, ruminant, giardia, malaria, gonorrhea	9	89	0.90	90%
Wound, snake breath, skin disease, hitching, spider poison	11	67	0.84	84%
Evil spirit, blood pressure, weak appetite, anemia,	15	105	0.86	86%

4.5.4 Fidelity level index

The result shows that *Ocimum gratissimum* and *Allium sativum* have 100% of a high-fidelity level followed by *Zingiber officinale* (97%), *Eucalyptus globulus* (94%), *Vernonia*

amygdalina (92%), *Moringa stenopetala* (89%), *Ruta chalepensis* (87%), *Echinops hespidus* (86), *Nigella sativa* (84%), and *Withania somnifera* (74%), respectively (Table 9).

The medicinal plant that is widely used by local people to treat several ailments has fidelity level value. As was observed in the table below, Occimum *gratissimum* and *Allium sativum* are the most used to treat the disease while the *Zinger officinale* is the second most used *Eucalyptus globulus* is the third. The medicinal plants that are widely used by the local people to treat one or very few ailments will have higher FL values than those that are less popular (Mirutse Giday and Tilahun Teklehaimanot, 2007; Amare Bitew, 2022).

Table 9: Fidelity level index of most commonly used medicinal plants

No	**Medicinal plants**	**Example of ailment**	**N_P**	**N_u**	**N_p/N_u**	**%**	**R**
1	*Ocimum grattissimum*	Febrile disease (**mich**)	34	34	1	100	1
2	*Eucalyptus globulus*	Cough	32	34	0.94	94	4
3	*Moringa stenopetala*	Hypertension	26	29	0.89	89	6
4	*Zingiber officinale*	Stomach ache	35	36	0.97	97	3
5	*Nigella sativa*	Sinus	22	26	0.84	84	9
6	*Allium sativum*	Tooth ache	35	35	1	100	1
7	*Ruta chalepensis*	Stomach ache	28	32	0.87	87	7
8	*Withania somnifera*	Cough	23	31	0.74	74	10
9	*Vernonia amygdalina*	Stomach parasite	24	26	0.92	92	5
10	*Echinops hispidus/kebericho*	Evil sprit	33	38	0.86	86	8

4.5.5 *Paired comparison*

A paired comparison was made for five medicinal plans that used to treat Malaria (which frequently occurred in the study area) were employed as described by Martin (1995). For these eight key informants were requested to rank these plant species according to their effectiveness. Accordingly, *Allium sativum* stood first followed by *Ocimum grattissimum*.

Table 10: Result of paired comparison of five medicinal plants against Malaria

Medicinal plant	**Respondents (R1-R8)**									
	R1	R2	R3	R4	R5	R6	R7	R8	Total	Rank
Ocimum grattissimum	4	4	5	4	3	5	5	5	35	2nd
Carica papaya	3	3	4	4	4	3	4	4	28	3rd
Allium sativum	4	5	5	3	5	4	5	5	36	1st
Phytolacca dodecandra	3	4	2	4	4	3	3	4	27	4th
Vernonia amygdalina	2	2	1	3	1	2	2	2	15	5th

4.5.6 Direct matrix ranking

In this study, several medicinal plants were found to be multipurpose species being utilized for a variety of uses. In the study area, the common uses include various purposes such as medicinal values, spices, food, firewood, and others (firewood, shelter, garden beauty, and so on). The common uses include medicinal value, charcoal, firewood, construction, and edible purposes. Five commonly reported multipurpose species and five use categories were involved in the direct matrix ranking exercise to evaluate their relative importance by local people (Table 11). Accordingly, *Allium sativum* ranked first, while *Zingiber officinale* continued, *Nigella sativum* was third, *Citrus sinensis* ranked fourth, and lastly, Carica papaya ranked fifth respectively. This indicates *Allium sativum* and *Zingiber officinale* are the most preferred medicinal plants by local people for various uses.

Table 11: Direct matrix ranking of five medicinal plants based on their purpose

Use **Value**	***Allium sativum***	***Zingiber officinale***	***Nigella sativum***	***Citrus sinensis***	***Carica papaya***
	R1	R2	R3	R	R
Sales	4	4	4	3	3
Medicinal	4	3	3	3	3
Spices.	4	4	4	-	-
Food	3	2	1	4	4
Other purposes	1	-	-	1	-

Total score	17	13	12	11	10
Rank	1st	2nd	3rd	4th	5th

4.6 Market Survey

Ejere's town market is observed to identify the medicinal plants and the purpose of medicinal plants these are taken to the market by sellers to sell them to the users. As was observed from their display, some of the medicinal plants were sold in the market to the demands for their other purposive and medicinal uses. Most of these marketable medicinal plants are cultivated plants that are home gardens in their habitat. However, medicinal plants such as *Olea europaea* sub sp. *cuspidata*, and *Echinops hispidus* are grown naturally in wild habitats in most.

Table 12: Medicinal plants supply for Ejere local market

Scientific name	**Family name**	**Local name**	**Purpose**
Nigella sativa	Ranunculaceae	Abasuuda gurraacha	Spice
Schinus mole	Anacardiaceae	Kundobarbere	Spice
Zingiber officinale	Zingeberaceae	Jinjibila	Spice
Syzygium aromaticum	Myrtaceae	Kurunfud	Spice
Rhamnus prinoides	Rhamnaceae	Geeshoo	Local alcohol
Allium sativum	Aliaceae	Qullubbii Adii	Food spice, cough
Rubia cordifolia	Rubiaceae	Hunde dima	Food
Carica papaya	Caricaceae	Pappaayyaa	Food
Citrus aurantiifolia	Rutaceae	Loomii	Food
Echinops hispidus	Asteraceae	Qarabicho	Evil sprit
Citrus sinensis	Rutaceae	Burtukaana	Food

Persea Americana	Lauraceae	Avukaadoo	Food
Olea europaea	Oleaceae	Ejersa	Fumigation
Otostegia integrifolia	Lamiaceae	Tunjet	Mich

4.7 Indigenous Knowledge Transfer System on the MP

In this study, the most transferring way of indigenous knowledge was from elders (63.2%), followed by family (18.3%), and relatives (8.1%) (Table 13).

Table 13: The transferring system of indigenous knowledge

Medicinal knowledge transfer	**No of informants**	**%**
Indigenous elders	31	63.2
Family	9	18.3
Trusted sons	3	6.1
Relatives	4	8.1
Friends	2	4.0

4.8 Threats to Indigenous Knowledge and Medicinal Plants

The result of this study on the threatening factors of medicinal plants in the study area shows that there are four cited threats to medicinal plants suggesting that Agricultural expansion was the highest factor that threatens medicinal plants followed by Firewood (Table 14).

Table 14: Threats to medicinal plants in the study area

Threatening factors	Respondents											
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	T	R
Firewood and charcoal collection	3	5	5	4	5	4	5	3	3	4	41	2nd
Overgrazing	0	0	1	1	0	0	1	1	0	1	5	4th
Agricultural expansion	4	5	4	5	4	4	5	5	4	5	45	1st
Exploitation of materials for construction	1	2	1	2	2	1	2	2	3	2	18	3rd

4.9 Conservation of Medicinal Plants in the Study Area

As the respondent mentioned, protecting plants in their original areas, replanting at their home gardens, selecting areas, making regulations on cutting plants from the forest for various uses and community awareness were the major methods to conserve and protect in the study area. This indicated that the associated local knowledge plays a great role in the conservation of medicinal plants in the study area.

CHAPTER FIVE

5. DISCUSSION

5.1 Associated Local Knowledge of Informants in the Study Area

The total number of documented medicinal plants in the study area were eighty species, seventy five genera and 43 families used to treat both human and livestock ailments. Even though, there are no more plant species in the study area, some families like *Fabaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Cucurbitaceae,* and *Asteraceae* were highest in number and this could be indicated by the overall species richness of those families in the study area. *Fabaceae* and *Asteraceae* are included in the largest families of dicots in the flora of Ethiopia and Eritrea containing throughout the world, about eighteen and twenty-three thousand species respectively (Thulin, 1989; Ryding, 2006; Sebsebe Demissew, 2021; Balcha Abera, 2014; Friis, 2015).

There was no similarity among informants based on age and sex in having indigenous knowledge of traditional medicinal plants. There were thirty males and nineteen females in terms of their sex which indicates that there are no balanced opportunities in the family to obtain indigenous knowledge of traditional medicinal plants. In the study area, the way of transferring knowledge takes place through the men line and this indicates that it could have contributed for the women to get less knowledge than men. In addition to this, new generation and educated people exposed to modernization than older and uneducated ones could have contributed to the former having less traditional knowledge. This situation may agree with the findings of Debela Hunde (2001), Tizazu Gebre (2005), and Tilahun Teklehaimanot (2006).

5.2 Indigenous Knowledge Transfer System

Indigenous and local communities rely on traditional medicines to prevent and cure different types of health problems. Traditional healers have been playing an important role in the primary healthcare system of the rural community which had less access and couldn't have modern medication. According to this study, the highest number of transfers of knowledge of medicine is from indigenous elders and families, i.e., 31 (63.2%), followed by 9(18.3%) respectively. The other challenge noted during this study was that there was no

documentation of indigenous knowledge by traditional healers as the knowledge is transferred orally to the eldest son in the family Fassil Kibebew, (2001).

5.3. Roles of Indigenous Knowledge on Traditional Medicinal Plants

The result of this study indicated that from the gathered medicinal plants the higher number was scored by herbs and shrubs, respectively. This agrees with the finding of Tilahun Teklehaymanot and Mirutse Giday, (2007) that in most of Ethiopia, herbs are the predominant plant for traditional medicines. This means that most people in the study area used herbs for the preparation of traditional medicinal value. This was because, herbs are relatively common in the study area when we compared shrubs, trees, and lianas. This finding also agrees with the finding of Etana Tolosa (2007); Gemedo Dale (2005) and Mirutse Giday *et al*., (2003) that herbs were indicated as the higher species having more medicinal values. This implies that people in the study area rely on herbs and shrubs which is greater than trees due to the expansion of agriculture.

Medicinal plants collected in the study area by local people in higher amounts were from domestic which means from home gardens and field crops; the rest were from the wild. Similarly, Zemede Asfaw (1997) reported that only plants cultivated in home gardens in Ethiopia are primarily for medicinal value. This finding did not agree with the finding of Tizazu Gebre (2005) reported remedies from the wild.

This study shows that the leaf is the most commonly used plant followed by fruits, roots, seeds, and stems respectively. This most frequent use of leaves by local people in the preparation of medicine could be related to the availability of these plants part of the year. The easy preparation mode of this plant part could be another factor to be used frequently in the study area. The frequent usage of the leaf is found in different parts of the country like Ejaji W/Shewa and Gimbi W/Wolega Oromia, Endalew Amenu and Etana Tolosa (2007). Some studies have shown that the removal of up to half of tree leaves does not affect the growth of species studied (Poffenberger *et al.,* 1992). Fruit is the second most frequently used plant part by local people in the study area and this might be due to its availability throughout the year. Also, the frequent use of fruits for the preparation of remedies in the study area could result in the availability of high concentrations of bioactive constituents (Moore, 1994; Bhattarai *et al*., 2006). In terms of medicinal value, we can understand that leaf is most

important for the local people in the area. It also may not have a negative impact as we compare it with fruits.

5.4 Method of Preparation, Dosage, and Administration Routes

From this study, we understood that the method of preparation varies based on the types of medicinal plants part and types of ailments in the area. So, the highest form of use in the preparation of remedies was chewing and few are in the form of soaking or squeezing. In the same manner, some are also pounding/grinding, powder-form, burning/smelling, boiling, creaming, crushing, food, and tied form respectively (figure 9). This implies that people in the study area depends on fresh remedies and dried form. This usage of fresh form may push medicinal plants to serious threats if there is no storage and preservation practice of plant parts for later use by local people in the area. This agrees with the findings of some researchers for example, (Tizazu Gebre, 2005; Tadesse Bayene, 2008).

On the other hand, there is no similarity between healers with regard to the dosage of traditional medicinal plants that have been taken to cure the patients. The way of taking such traditional medicines may depend on the fitness, age, and sex of the patients. Traditional healers may use different methods of measurement like fruit and leaves count, finger length for stems and roots, drops and creaming day count for the squeezed medicine. Also, it depends on the disappearance of disease symptoms to stop taking traditional medicine in the area. As indicated in this study, the most common administration routes for the medicinal plants used to treat human ailments are internal (oral and nasal) 50% and 14.5% respectively, and external (dermal) which is 32.3%. This is the reason that oral and dermal routes permit rapid physiological reactions of the prepared medicines with the pathogens and increase the curative power. This agrees with some reports in Ethiopia (Behailu Etana, 2010) (Figure 10).

5.5 Threats to Indigenous Knowledge and Medicinal Plants

In the study area, the knowledge of traditional plants was the unwillingness of the young generation to gain knowledge, the influence of modern education, and religious and awareness factors, which all resulted in the gradual disappearance of indigenous knowledge of medicinal plants. According to traditional healers, nowadays searching for medicinal plants require a long time and moving long distance even going to the neighboring area due to business gained from construction and timber production severely accelerated the high-rate

exploitation of different types of medicinal plants. In the face of these threatening factors, there has been a high need to document indigenous knowledge of local communities on the taxonomy, use, and application of medicinal plants. The most serious threats to medicinal plants in the area were deforestation, agricultural land expansion, overgrazing, over-exploitation, land degradation, and unsustainable fuel wood, and charcoal production. Similar threatening factors have been reported from different regions within Ethiopia (Lulekal *et al*., 2008; Mersha *et al*., 2016). This unregulated agricultural expansion resulted from high population growth and a lack of land use policy in the area. To increase agricultural productivity, forest lands and grasslands have been converted into farmlands causing the loss of local medicinal plants. The cause of threats to medicinal plants in the study area can be grouped into natural and anthropogenic factors.

Nowadays, the world is losing plants every minute due to deforestation, for agriculture, firewood, timber production, construction materials, and overgrazing (Seyani and Chikuni, 2013). These most anthropogenic factors besides some natural factors resulted in the loss of plants' genetic diversity and threatened the very survival of humankind with the erosion of some lifesaving medicinal plants of wild genes (Odera, 1997). Thus, the need for agricultural land and population pressure severely threatened plant species in general and medicinal plants in particular. The effect of deforestation on medicinal plants was reported by Mirutse Giday (1999), that the harvesting of medicinal plants put them also under threat.

In the study, several factors both natural and human were found to contribute to the threats that affect the survival of medicinal plant species in the study area. The reports of ten key respondent's preference ranking of four highly cited threats of medicinal plants suggested that agricultural expansion was mentioned as the leading factor that threatens medicinal plants followed by firewood & charcoal collection, exploitation of construction materials, and overgrazing respectively and this were also reported by Zemede Asfaw (2001; Tigist Wondimu *et al.* (2007). (Table 14).

5.6 Conservation of Medicinal Plants in The Study Area.

As respondents said in the study area, they used different methods to conserve their natural habitat by making different groups and social contacts like Edir and Basic Social Association in their living area. Furthermore, putting in place a functional system that would protect the intellectual property rights of the community and also ensure their benefits sharing is

important. Additionally, technical support and capacity development of the local community for the safe handling of medicinal plants and their medicine was identified as an important intervention (Fisseha Mesfin *et al.,* 2009; Ayyanar *et al*., 2010).

5.7 Conclusions and Recommendations

5.7.1 Conclusions

Although several observable anthropogenic and natural factors affected the area, considerable numbers of medicinal plant species (80) were identified in the Lume District. As a result of these factors seasonally growing herbs were the leading species, followed by shrubs and trees. Based on habitat distribution, the majority of the species were found in the home gardens, followed by farmland (seasonal), along the roads, and some were in natural vegetation. The Lume's people used traditional medicinal plants in small amounts as I understood during my field observation for this study. This is estimated as due to a lack of enough knowledge, a consequence of the reason of only orally transferring this knowledge from the respondent's family to them.

Based on the data on the habitat of the medicinal plants identified from the study area, about 46.2% of them are domestic which shows there are no more medicinal plants in the wild that are non-domestic. Hence there is no focus given to these medicinal plants in the area except, for some haw in Tede dildima kebele. In another way, this is threatening the medicinal plants in the area to be lost in a short period. Thus, special attention is needed from the local community, stakeholders, and government sectors to conserve those important medicinal plant species and associated indigenous knowledge for the next generation.

5.7.2 Recommendation

As discussed in this study, the medicinal plants in Lume were at the threat stage of loss because of less attention given from the local community, Lume's management of land and natural resources as stakeholders as the government sector, and the unsuitable climate. So, to reduce such threats, these stakeholders have played a great role in conserving and transferring the area's medicinal plants with their indigenous knowledge. It will be done by giving awareness to the local community on how they have to conserve these plants even in field areas (in-situ conservation) if wild or in the garden (ex-situ conservation). Especially, the

traditional medicinal healers need to be strengthened with the local community and government sectors to manage these medicinal plants in the area.

Based on the findings of the study, the following recommendations are forwarded for the community of Lume District:

- Furthermore, putting in place a functional system that would protect the intellectual property rights of the traditional healers and also ensure their benefit sharing is important and timely.
- Technical support and capacity development of traditional healers for the safe handling of medicinal plants and their medicine are important interventions.
- Further phytochemical investigation should be carried out on top of important traditional medicinal plants.
- Generally, I like to recommend the community of the area that, they have great attention to identifying, understanding, conserving, and using these traditional medicinal plants and they have to be aware of their children about the medicinal purpose of these plants to transfer the knowledge of the next generation.

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Appendices

Appendix 1. The human and livestock diseases identified in the study area.

No.	Local Name (Amh/O)	English name	Type of Disease
1	Mich	Febrile illness	Human
2	Ukaa	Cough	Human
3	Madaa Gogaa	Skin wound	Human
4	Ija	Evil sprit	Human
5	Abbaa seeruu	Gonorrhea	Human
6	Dhukkuba kale	Kidney-ache	Human
7	Afuura bofaa)	Snake breathe	Both
8	Koosoo	Giardia	Human
9	Garaa ciniinnaa	Stomach-ache	Both
10	Saayinasii	Sinus	Human
11	Forofor	Dandruff (hair fungus)	Human
12	Dhibee gogaa	Skin disease	Human
13	Dhibbaa Dhiigaa	Blood pressure	Human
14	Dhibee ilkaanii	Toothache	Human
15	Guba-abiddaa	Fire-burned	Human
16	Hir'ina fedhii nyaataa	Appetite reduced	Human
17	Hir'ina dhiigaa	Anemia	Human
18	Bu'a qoonqoo	Tonsillitis	Human
19	Dhukkuba busaa	Malaria	Human
20	Dhullaa	Hemorrhoids	Human
21	Funuuna	Nasal bleeding	Human
22	Summii sharariitii	Spider poison	Human
23	Bokoka garaa	Stomach swell	Cattle
24	Dhibee garaa keessaa	Ruminant illness	Cattle
25	Hiddaa bofaa	Snakebite	Both
26	Abbaagorbaa	Black leg	Cattle
27	Maxxantu/qinqin	External paracite	Cattle

28	Dhibee ijaa	Eye ache	Cattle
29	Dhibee saree	Rabies	Both
30	Dhibee morma/kulkult	Neck disease	Cattle
31	Qufaa	Influenza	Both
32	Dhibee aduu	Sun disease	Cattle
33	Dhibee haafuraawaa	Spiritual disease	Human
34	Dhibee bullaa'insaa	Ruminant illness	Cattle

Appendix 2. List of the medicinal plants and their medicinal uses

The medicinal plant used for the treatment of human disease; local name, scientific name, habit, parts used, method of preparation, administration route, and disease treatment

Key; AO = Afaan Oromoo, Am = Amharic, W = Wild, D = Domestic T = Tree, H=Herb, S= Shrub, *=medicinal plants of livestock, **= Mps of both human and livestock

Species	**Family**	**Local name A/O(Am)**	**Wild/ Dom**	**HA**	**Disease treated**	**Part(s) use, preparation method**	**Administration route**	**V.No.**
Leonotis ocymifolia (Burm.f.) Iwarsson	Lamiaceae	Bokolu	W&D	S	Mich	A leaf is squeezed and its drop is prepared to drink(oral), nasal, or skin	Orally,	GN001
Eucalyptus globulus Labill.	Myrtaceae	Bargamo adii	D	T	Cough	Boiling the fresh leaf with water and smelling its evaporation by nose during bedtime.	Nasal	GN002
Withania somnifera (L.) Dunal.	Solanaceae	Gizawa	W&D	S	Cough	Burning little parts of the dry stem and smelling its smoke in the house.	Nasal	GN003
Verbastcum sinaiccum L.	Scrophulariaceae	Gurra harree	W	H	Wound	The powder of its leaf is mixed with butter and creamed on the wound area.	Dermal	GN004
Carissa spinarum L.	Apocynaceae	Hagamsa	W	S	Evil spirit	Cutting its sharp tip(7 spines), break it into pieces, and tie it on the child's neck with cloth.	Neck	GN005
Ajuga integrifolia Ham-Buch	Lamiaceae	Harma gusa	W	H	Gonorrhea	Fresh leaf is pounded with juniper drink one teaspoon orally	Orally	GN006

Foeniculum vulgare * Mill.	Apiaceae	Inselal	D	H	Kidney -ache (reurinatio)	Boiling its leaf gives its boiled extract to cattle orally.	Orally	GN007
Otostegia integrifolia Benth.	Lamiaceae	Tunjet	D	H	Mich	The dried leaf is added to burned charcoal and its smoke is smelled	Nasal	GN008
Echinops hispidus Fresen.	Asteraceae	Kebericho	W	H	Evil sprit	Dry roots are put on fire its smoke is smelled through the nasal.	Nasal	GN009
Eleusine flaccifolia (Forssk.) Spreng. **	Poaceae	Coqorsa	W&D	H	Snake breath	The fresh leaf is chewed and pounded and creamed on the bodies of people and cattle.	Dermal	GN010
Glinus lotoides L.	Molluginaceae	Mata-harree	W	H	Kosso(stomach parasite)	The fresh leaf is chewed and swallow	Orally	GN011
*Olea europea, subse.** Caspidata	Oleaceae	Ejersa	W	T	Snake breath	A leaf is chewed and sprayed on the body of cattle	Dermal	GN012
Rumex crispus L.	Polygonaceae	Dhangaggoo/Tultii	W	H	Stomachache	The root is pounded mixed with coffee and drank (orally)	Orally	GN013
Albizia schimperiana	Fabacea	Muka arbaa	W	H	Evil sprit	The root is dried and powdered, smelling (nasal)	Nasal	GN014
Phytolocca dodecandra L. Her.	Phytolaccaceae	Andoodee	W	S	Sinus	A leaf is squeezed and its juice is taken orally	Orally	GN015
Persia americana (Mill.)	Lauraceae	Abukaadoo	D	T	Dandruff(hair fungus)	The matured fruit cream is painted on the hair until the fungus reduced	Dermal	GN016
Euphorbia tirucalli L.	Euphorbiaceae	Qincib	W	S	Skin disease	Leaf latex is creamed on the dermal part	Dermal	GN017

Vernonia amygdalina * Del.	Asteraceae	Hibicha	W	S	Ruminant illness(cattle)	A leaf is eaten by cattle as food	Orally	GN018
Croton macrostachyus Del.	Euphorbiaceae	Bekenisa	W	T	Blood pressure	Powdered leafy-stem and mixed with water and butter used orally after filtered	Orally	GN019
Aloe camperi Schweinf.	Asphodelaceae	Ret	W	S	For reducing hair fungus	Extract its leaf juice and drop it on the hair	Dermal	GN020
Euphorbia abyssinica Gmelin.	Euphorbiaceae	Qulqual	W	S	Dandruff (hair fungus)	Leaf juice is extracted and creamed with hair	Dermal	GN021
Azadirachta indica A. Juss.	Meliaceae	Nim	W	T	Blood pressuse, Teethache	Chewing leaf and drinking its extract to reduce blood pressure, Chewing stem on part of illness teeth until the feeling reduced	Orally , Mouth	GN022
Ocimum grattissimum L.	Lamiaceae	Damakase	D	S	Allergic (mich), Malaria	A leaf is squeezed and its drop is prepared to drink(oral), nasal, or skin Crushed the root & mix with water for three (3) days	Orally, Nasal and Dermal, Orally	GN023
Ricinus communis L.	Euphorbiaceae	Qobboo	W	S	Stomach-ache, Wound	The root is pounded and drunk the watery part Warm the leaf and put it on the wound	Orally, Dermal	GN024
Moringa stenopetala (Back.f) Cuf	Moringaceae	Moringa	D	T	Blood pressure	Leaf is squeezed its juice is taken orally with tea.	Orally	GN025
Linum usitatissimum L.	Linaceae	Telba	D	H	Fire burned	The seed is pounded and creamed with butter on the burned part	Dermal/wound	GN026

Asparagus africanus L.	Asparagaceae	Saritii	W	S	Evil sprit	The Stem part is cut and placed on the door out of place	Somewhere	GN027
Artemisia afra (NQ Liu)	Asteraceae	Arittaa	D	H	Evil sprit	Crushed fresh root and mixed with water to drink or smell it.	Orally and nasal	GN028
Brasica nigra	Brasssicaceae	Ija raafuu	D	H	Reduced Apetite(hum)	Seed is pounded mix with oil eaten by food	Orally	GN029
Eucalyptus camaldulensis Dehnh.	Myrtaceae	Bargamo dima	W	T	Stomach ache	Fresh leaf is chewed its extracts are swallowed	Orally	GN030
J*usticia schimperiana* * (Hochst. Ex Nees) T. Anders.	Acanthaceae	Sansel	W	H	ruminant illness (cattle	Leaf and root are given with another food	Orally	GN031
Allium sativum L.	Alliaceae	Qullubbii adii	D	H	Cough, toothache,evil-sprit	Bulb is boild with milk or tea and drunk, Bulb is squeezed and mixed with salt and put on part feeling illness, Bulb is tied on hand for baby	Orally , Dermal, Hand	GN032
Rubia cordifolia L.	Rubiaceae	Hunde dima	D	H	Anemia	Tuber is cooked as wat and eaten as food	Orally	GN033
Lepidium sativum L.	Brassicaceae	Feexoo	D	H	Stomachache	Seed is pound it is taken with tea or coffee orally	Orally	GN034
Schinus molle L.	Anacardiaceae	Qundobarbare/Tikurberbere	D	T	Tonsil	Seed is chewed stayed on part of the tonsillitis	Orally on wound	GN035
Citrus aurantiifolia html. (Christm.) Swingle.	Rutaceae	Loomii	D	T	Tonsil	Fruit juice is dropped on the child's skull ash is added to it, and creamed.	Dermal	GN036

Citrus sinensis (L.) Obs.	Rutaceae	Burtukaana	D	T	Appetites, Cough	Fruit juice is taken orally, Fruit Juice is hot on fire and drink	Orally , Orally	GN037
R*uta chalepensis* L.	Rutaceae	Tenadam	D	H	Stomach ache	Fresh leaves are chewed and their extract is swallowed	Orally	GN038
Coffee arabica L.	Rubiaceae	Buna	D	T	Wound, Stimulant	Roasted and powdered coffee seed is put on the recently injured bleeding part and also on the burned part	Dermal	GN039
Carica papaya L.	Caricaceae	Papaya	D	S	Amoeba, Giardia, Malaria	Dried fruit juice is taken orally, fresh leaf is boiled and drink, extract	Orally , Orally	GN040
Cardia africana Lam.	Boraginaeae	Waddeessa	W	T	Toothache	The stem is chewing on part of the sickness	Dermal	GN041
Kalanchoe petitiana A. Rich.	Crassulaceae	Bosoqqee	W	H	Wound	Fresh Leaf is directly gotten near the fire and put on part of the wound repeat	Dermal	GN042
Cucumis ficifolius A. Rich.	Cucurbitaceae	Hoolotoo	R	H	Hemorrhoids(dhullaa)	Small-sized fruit entered into the swell part	Wound	GN043
Solanum incanum L.	Solanaceae	Hiddii	R	S	Nasal bleeding	The fresh leaf is squeezed enter in the nose until the bleeding is stopped	Nasal	GN044
Catha edulis (Vahl.) Forssk. ex Endl.	Celastraceae	Caatii	D	S	Gonorrhea	A leaf is chewed and swallowed	Orally	GN045
Nigella sativa L.	Ranunculaceae	Abasuuda gurraacha	D	H	Cough	Seed is pound boiled with zinger and bulb, then filtered sugar is added and one cup of tea.	Orally	GN046
Syzygium aromaticum	Myrtaceae	Qurunfudi	D	T	Tonsil	Seed is chewed and moved on ill part	Dermal	GN047

(L.) Merr &Perry								
Rhamnus prinoides L' Herit.	Rhamnaceae	Geeshoo	D	S	Tonsilities	7 fresh tip leaves are chewed and swallowed	Orally	GN048
Nicotiana tabacum L. **	Solanaceae	Tambo	D	H	stomach parasites(cattle) spiritual disease	Fresh and dry pounded leaf dissolved in water and drunk orally and also taken nasal, Put in around or in the house near to human beings	Orally and nasal	GN049
Lantana camara L.*	Verbenaceae	Wof kolo	W	S	Swell (cattle)	A leaf is squeezed and given orally	Orally	GN050
Lycopersicon esculentum Mill.	Solanaceae	Timatimii	D	H	Spider poison	A leaf is chewed and put on the poisoned part	Dermal	GN051
Zingiber officinale Roscoe	Zingeberaceae	Zinjibila	D	H	Cough, stomach ache	Rhizome pounded with Allium sativum, boiled, filtered drunk with sugar	Orally	GN052
Verbena officinalis L.	verbanoceae	Atuch	W&D	H	Stomach ache/cininnaa garaatif	The root is chewed and swallowed its liquid orally	Orally	GN053
Calpurinia aurea (Alt.) * Benth	Febaceae	Ceekaa/digita	W	S	External body ache /cattle/	Fresh leaf squeezed mixed with water and washed on the outer body parts of the cow/ox/	Dermal	GN054
Taverniera abyssinica A.Rich.	Febaceae	Dingetegna	W	H	Spiritual disease, internal parasite	The root is chewed and taken orally	Orally	GN055
Argemone Mexicana L.	Papaveraceae	Koshoshilla	W	H	Wound	Leaf's tear/milk put on the infected parts of the wound.	Dermal	GN056
Datura strmonium	Solanaceae	Menjii/Atefaris/Asangira	W	H	Sinus , Dandruff	A leaf is dried and taken as cigarettes, fresh leaf is squeezed and put on the head of the infected.	Nasal , Dermal	GN057

Acokanthera schimperi (A.DC.) Schweinf.*	Apocynaceae	Qaraaroo/Kererro	W	T	Hen's external parasite	Fresh leaf is put on the fire in hen class treated its smoke	Nasal	GN058
Vicia faba L.	Fabaceae	Beeqala	D	H	Wound , Swellen	Three beans are chewed and put on the wound ache, Seven(7)seeds are tied to the neck	Dermal	GN059
Cymbopogon citratus (DC.) Stapf	Poaceae	Tejisar/ lemon grass	D	H	Evil spirit, stomach ache	The leaf is put on fire and smoked it is also chewed and taken orally	Nasal , Orally	GN060
Guizotia abyssinica (L.f)	Asteraceae	Nugi	D	H	Cough	Fruit is boiled with water and honey and then taken orally	Orally	GN061
Trigonella foenum graecum L. **	Febaceae	Shuqoo	D	H	Stomach ache, Broken wound	Powder is mixed with water and then taken orally and Put(tied) on the broken body parts, for both	Orally, Dermal	GN062
Sida schimperiana Hochst. A.Rich	Malvaceae	Chifrig	W	H	Bleeding	Fresh leaf powder on external injury for blood clotting.	Dermal /wound	GN063
Dovyalis abyssinica (A.Rich) Warb	Flacourtaceae	Koshimmo	W&D	S	Stomach parasite	Fruits are squeezed and taken orally	Orally	GN064
Gossypium hirsutum L. *	Malvaceae	Jirbii	D	H	Eye ache	Seed is chewed and dropped in the eyes of cattle.	Dermal /wound	GN065
Thymus Schimper Ronnigeri **	Lamiaceae	Xosiinyii	W	H	Influenza , blood pressure	A leaf is boiled with sugar and salt taken orally for both	Orally	GN066
Gongronema angolense (N. E. Br.)	Asclepiadace`ae	Hiddii Hantutaa	W	L(liana)	Rabies	A leaf is ground and dried mixed with honey and taken by teaspoon orally. And for animals	Orally	GN067

Bulock. **						within milk		
Hagenia abyssinica (bruce.) J.F Gmel	Rosaceae	Hexoo	W&D	H	Internal parasites	The dried and crushed leaf is drunk with water or with the local drink 'Tella'	Orally	GN068
Heliotropium aegyptiacum Lehm.	Boraginaceae	Bega nebse	W&D	H	Nose bleeding	Fresh leaves powder is taken at night during sleeping time.	Nasal	GN069
Lens culinairis Medikus	Fabaceae	Missira	D	H	Wound /chife	Fruits are chewed and put on a wound or the infected part.	Dermal	GN070
Allium cepa L.	Alliaceae	Qullubbi dima	D	H	Blood pressure	It is boiled with water and boiled orally.	Orally	GN071
Zahneria scarva (Linn.f) Sond. *	Cucurbitaceae	Hareg resa	W	L	Sun disease	Fresh leave is squeezed and mixed with water then the infected animal is washed by it.	Dermal	GN072
Acacia albida Del. *	Fabaceae	Gerbi /yekola girar	W	T	Eye disease	Its external epidermis is chewed and put into the infected eyes of animals.	Wound	GN073
Capsicum annum L. *	Solanaceae	Berbere	D	H	Neck disease/ kulkult	The powder is mixed with sodium chloride and water and put on the aching part of the neck.	Dermal/Wound	GN074
Sesamum orientale L.	Pedaliaceae	Selixa	D	H	Cough	Its powder is boiled with water and taken orally.	Orally	GN075
Rubia cordifolia L. *	Rubiaceae	Maxxanne/ chogogit	W	H	Animals leg disease	Its fruit is put on the fire and the animal's infected leg is put on the burned fire.	Wound	GN076
Lagenaria siceraria (Molina) Standl.	Cucurbitaceae	Buqqee /kil	D	H	Rabies disease	The new fruit is opened and its seed is mixed with the squeezed Calpurinia aureas leaf and stey for one night then taken in the morning	Orally	GN077

						orally.		
Dodonaea angustifolia L.f	Sapindacieae	Kitkita	D	T	Wound	Leaf powder is mixed with butter and put on the wound.	Dermal /wound	GN078
Cucurbita pepo L.	Cucurbitaceae	Dabaaqula	D	H	Hook worm	Seeds are soaked in water overnight chewed and swallowed.	Orally	GN079
Cyphostemma adenocaule (Steud. ex A. Rich.) Discoings ex Wild & Drummond *	Vitaceae	Hunde bale buco(mochmuache) or Aserkush	W	L	Black leg /abagorba	The finger-like root is crushed, mixed with water, and given to animals orally.	Orally	GN080

Appendix 3: Information about informants

Key; M = Male, F = Female * = key informants(local healers)

No.	Name of informant	Age	Sex	Marital status	Religious	Education level	Address of informant
1	*Gifti Melka	76	F	Married	Orthodox	Reading	Ejere Wolkite
2	Cheru Teshome	54	M	>>	Wokefata	Reading	Dakabora
3	Tirunesh Ambesie	28	F	>>	Orthodox	Diploma	Nenewa
4	*Girma Welde	73	M	>>	Orthodox	Reading	Tede
5	Teshome Tilahun	50	M	>>	Orthodox	Reading	Danse shanbure
6	Sisay Bekele	40	F	>>	Orthodox	Reading	Ejere Wolkite
7	Ashetu Dechasa	58	M	>>	>>	Reading	Haro Yohannes
8	Zewudinesh Yirga	30	F	Unmarried	>>	Reading	Danse shanbure
9	Dereje Mengistu	48	M	Married	>>	Reading	Tede
10	*Shimels Gashaw	65	M	Married	>>	Reading	Ejere
11	Tasew Huluka	67	M	>>	>>	>>	Nanewa
12	*Genemu Haro	79	M	>>	>>	Reading	Danse shanbure
13	*Kume Awel	50	F	>>	Muslim	Reading	Ejere
14	SintayewTeshome	40	F	>>	>>	Reading	Haro Yohannes
15	Taye Girma	35	M	>>	>>	Reading	Tede
16	Tegene Jirru	60	M	>>	>>	Reading	Haro Yohannes
17	Kebede Melka	91	M	>>	Orthodox	Reading	Ejere Wolkite
18	Zinu Eshetu	20	F	Unmarried	Orthodox	Reading	Ejere Wolkite
19	Shifera Dinku	35	M	Married	Orthodox	Reading	Danse Shanbure
20	Girma Tegene	45	M	Unmarried	Orthodox	Reading	Haro Yohannes
21	*Tamire Gurja	40	M	>>	>>	>>	Nanewa
22	*Tariku Girma	35	M	Married	Ortho.	Degree	Ejere
23	Yismashewa Yeshigeta	42	F	Unmarried	Ortho.	Reading	Dakabora
24	Fanta Hailu	91	M	Married	Ortho	Reading	Tede

25	Bultume Dinegde	50	M	Married	Ortho.	Reading	Haro Yohannis
26	Andualem Dasaye	30	M	Married	Ortho	Reading	Ejere
27	Getachew Yilma	45	M	Married	Protestant	Reading	Nanewa
28	Tsegaye Kifle	70	M	Married	Ortho.	Reading	Danse shanbure
29	Fanaye Erko	57	F	Married	Ortho	Reading	Haro Yohannis
30	*Dinke jire	65	F	Married	Ortho	Reading	Dakabora
31	Selemon Zenebe	37	M	Married	Ortho	Degree	Ejere
32	Zewde Negash	47	M	Married	Ortho	Reading	Nanewa
33	Werkinesh Dugo	52	F	Married	Orthodox	Reading	Tede
34	Asnaku Alemu	52	F	Married	Protestant	Diploma	Nanewa
35	Dinku Sisay	32	M	Married	Wokefata	Reading	Nanewa
36	Fikirte Tasew	47	F	Married	Orthodox	Reading	Ejere
37	Woynshet Tadese	56	F	Married	Ortho.	Reading	Ejere Wolkite
38	Girma Tolesa	62	M	Married	Wokefata	Reading	Ejere Wolkite
39	Gizaw Ketema	55	M	Married	Ortho.	Diploma	Dakabora
40	Buziye Belay	67	F	Married	Wokefata	Reading	Ejere
41	Dibabe Rorrisa	53	F	Married	Ortho.	Reading	H . yohannis
42	Dinkitu Yirga	45	F	Married	Ortho.	Reading	Danse shambur
43	Welde Geletu	70	M	Married	Orthodox	Reading	Tede
44	*Mitiku Alemu	58	M	Married	Ortho	Reading	Dakabora
45	Eshetu Wendimu	51	M	Married	Ortho	Reading	Ejere Wolkite
46	*Befikadu Habte	67	M	Married	Ortho	Reading	Dakabora
47	Yeshi Birhanu	27	F	Married	Ortho	Diploma	Danse shambur
48	Etetu Degife	57	F	Married	Orthodox	Reading	Tede
49	Tekle Negash	62	M	Married	Orthodox	Reading	Dekebora
	Total		M= 30, F = 19		49		

Appendix 4: Information on plant's purpose as local rather than medicinal

Key; Am = Amharic, A/O =Afaan Oromoo , D = Domestic ,W = Wild

Vouch No.	Scientific and family name and plant type(If wild or domestic)	Local name Amh/Or	Other use/s of the medicinal plant
GN001	*Leonotis ocymifolia (Burm. f.) Iwarsson Lamiaceae*	Bokolu	Shelter, firewood
GN002	*Eucalyptus globulus, Labill. Myrtaceae*	Bargamo adii	Timber, shelter
GN003	*Withania somnifera, (L.) Dunal.* Solanaceae	Gizawa	-
GN004	*Verbatcum sinaiccum L. Scrophulariaceae*	Gurra harree	-
GN005	*Carissa spinarum L* Apocynaceae	Hagamsa	Shelter, firewood
GN006	*Ajuga integrifolia* Ham-Buch Lamiaceae	Harma gusa	To stop breastfeeding children.
GN007	*Foeniculum vulgare,* Mill. Apiaceae	Inselal	*For washing home equipment*
GN008	*Otostegia integrifolia, Benth.* Lamiaceae	Tunjet	Mich
GN009	*Echinops hispidus Fresen. ,* Asteraceae	Kebaricho	-
GN010	*Eleusine flaccifolia (Forssk.) Spreng.* Poaceae	**Coqorsa**	Cattle feed
GN011	*Glinus lotoides L. Molluginaceae*	Mata-harree	*Some animal feed*
GN012	*Olea europea, subse. Caspidata* Oleaceae	Ejersa	*Equipment sterilization*
GN013	*Rumex crispus L.* Polygonaceae	Tulti	Animal feeding
GN014	*Albizia schimperiana ,* Fabaceae L.	Imalaa	*Animal feeding*
GN015	*Phytolocca dodecandra L. Her.* Phytolaccaceae	Andoodee	Detergent, animal shelter

GN016	*Persia americana (Mill.),* Lauraceae	Abukaadoo	Food
GN017	*Euphorbia tirucalli L.*, Euphorbiaceae	Qincib	*Shelter, Firewood*
GN018	*Vernonia amygdalina Del.* Asteraceae	Hibicha	*Wash for alcohol equipment, animal feed, firewood*
GN019	*Croton macrostachyus Del.* Euphorbiaceae	Bekenisa	*Shelter, animal feed, firewood*
GN020	*Aloe camperi Schweinf.* Asphodelaceae	Argisa	*Garden recreation, oxen shoulder wound treatment*
GN021	*Opuntiaficus indica ,* Cactaceae*(D)*	Qulqual	Food, Sometimes as garden recreation
GN022	*Azadirachta indica A. Juss* Meliaceae	Nim	*Shelter, garden beauty, firewood*
GN023	*Ocimum grattissimum,* L. Laminaceae	Damakase	*Firewood*
GN024	*Ricinus communis, L.* Euphorbiaceae	Qobboo	Seed oil as paint for equipment
GN025	*Moringa stenopetala*,(Back.f) Cuf Moringaceae(Baker f.*)*	Moringa/shiferaw	*Shelter, drink with tea*
GN026	*Linum usitatissimum,* L. Linaceae	Telba	Food
GN027	*Asparagus africanus, L.* Asparagaceae	Saritii	-
GN028	*Artemisia afra,* Asteraceae (NQ.Liu)	Arittaa	*Garden beauty, recreation*
GN029	*Brasica nigra,* Brassicaceae L.	Ija raafuu	*For 'siljo'*
GN030	*Eucalyptus camaldulensis, Dehnh* Myrtaceae	Bargamo dima	Timber, shelter
GN031	*Justicia schimperiana,* (Hochst. Ex Nees) T. Anders. , Acanthaceae	Sansel	*Shelter, animal food, firewood*
GN032	*Allium sativum*, L. Amaryllidaceae	Qullubbii adii	Food as spice,sell

GN033	*Rubia cordifolia L.* Rubiaceae	Hunde dima	Food
GN034	*Lepidium sativum L.* Brassicaceae	Feexoo	-
GN035	*Schinus mollem, L. Anacardiaceae*	Qundabarbare	Sell for Spice,
GN036	*Citrus aurantiifolia* html. (Christm.) Swingle. Rutaceae	Loomii	Food,
GN037	*Citrus sinensis (L.) Obs,* Rutaceae	Burtukaana	Food
GN038	*Ruta chalepensis, L.* Rutaceae	Xenadam	Flavor for coffee
GN039	*Coffee Arabica , L.* Rubiaceae	Buna	*Drink*
GN040	*Carica papaya L. Caricaceae*	Papaya	*Food*
GN041	*Cardia africana, Lam.* Baraginaceae	Waddeessa	*Firewood, construction*
GN042	*Kalanchoe petitiana ,* A, Rich Crassulaceae	Bosoqqee	-
GN043	*Cucumis ficifolius, A, Rich.* Cucurbitaceae	Hoolotoo	-
GN044	*Solanum incanum,* L. Solonaceae	Hiddii warabeessa	-
GN045	*Catha edulis, (Vahl.) Forssk. ex Endl.* Celastraceae	Caatii	*Chewing for addiction*
GN046	*Nigella sativa, L. Ranunculaceae*	Abasuuda	Spice
GN047	*Syzygium aromaticum* (L.) Merr.& Perry *Myrtaceae*	Qurunfudii	*Spice*
GN048	*Rhamnus prinoides,* L Herit Rhamnaceae	Geeshoo	*Making local beer*
GN049	*Nicotiana tabacum* L. *Solanaceae*	Tambo	*Chewed and smoked for addiction*
GN050	*Lantana camara,* L. Verbenaceae	Wof kolo	*Shelter, wash equipment*
GN051	*Lytopersicon esculentum, Mill Solanaceae*	Timatimii	*Food,sell*
GN052	*Zingiber officinale,* Roscoe	Zinjibila	*Spice*

	Zingiberaceae		
GN053	*Verbena officinalis L. Verbanoceae*	Atuch	
GN054	*Calpurinia aurea* (Alt.) Benth *Febaceae*	Cekaa/ Digita	*Shelter, fuel*
GN055	*Taverniera abyssinica* A.Rich *Febaceae*	Dingetegna	-
GN056	*Argemone mexcana* L. *Papaveraceae*	Koosheshila	-
GN057	*Datura strmonium* L. *Solanaceae*	Menji/Atefaris /Asangira	-
GN058	*Acokanthera schimperi(A.DC.)Schweinf Apocynaceae*	Qaraaroo/ keraro	*Shelte , fuel*
GN059	*Vicia faba L. Febaceae*	Baqela (bean)	*Food,*
GN060	*Cymbopogon citratus* (DC.) Stapf *Poaceae*	Xajji sar/ lemongrass	
GN061	*Guizotia abyssinica* (L.f) *Asteraceae*	Nugii	*Food*
GN062	*Trigonella foenum-graenum L. Febaceae*	Shuqoo	*Spices, food*
GN063	*Sida schimperiana* Hochst.A.Rich *Malvaceae*	Cifriggii	-
GN064	*Dovyalis abyssinica(A.Rich) Warb Flacourtaceae*	Koshimmoo	*Fuel, shelter*
GN065	*Gossypium hirsutum* L. *Malvaceae*	Jiirbii	*Shelter*
GN066	*Thymus schimper* Ronniger*i Lamiaceae*	Xosiignii	-
GN067	*Gongronema angolense* (N. E. Br.) Bulock. Asclepiadaceae	Hidda Hantuutaa	*Shelter*
GN068	*Hagenia abyssinica (bruce.)J.F Gmel Rosaceae*	Heexoo	*Shelter, Fuel*

GN069	*Heliotropium aegyptiacum Lehm.* Boraginaceae	Beganebse	Shelter
GN070	*Lens culinairis Medikus* Fabaceae	Missir	Food
GN071	*Allium cepa L. Alliaceae*	Qullubbi dima	Spice, food
GN072	*Zahneria scarva (Linn.f) Sond. Cucurbitaceae*	Hareg resa	-
GN073	*Acacia albida Del. Fabaceae*	Gerbi/ yekola girar	*Shelter, fuel*
GN074	*Capsicum annum L.* Solanaceae	Berbere	*Spice, food*
GN075	*Sesamum orientale L. pedaliaceae*	Salixa	*Spice, food*
GN076	*Rubia cordifolia L. Rubiaceae*	Maxxannee	-
GN077	*Lagenaria siceraria (Molina) Standl. Cucurbitaceae*	Buqqee	*Used as hause material*
GN078	*Dodonaea angustifolia L. f* Sapindaceae	Kitkita	*Shelter, fuel*
GN079	*Cucurbita pepo L.* Cucurbitaceae	Dabaaqula	*Food*
GN080	*Cyphostemma adenocaule (Steud. ex A. Rich.) Discoings ex Wild & Drummond Vitaceae*	Hundebaalabuco	*Shelter*

Appendix 5**: Sample semi-structured interview questions**

Date……..

Name of respondants …… Age……Sex……

Occupations……..

Marital statuses …….....

Religion: Orthodox, …….Protestant …….Muslim…… others……..

Level of education: ……

1. What are traditional medicinal plants in your area used to treat disease?
    - Name the plants…….
    - Habitat of the plant……
    - Part of the plant used……..
    - Preparation methods ……
    - Dose (amount used)…….
    - Administrative method……
2. What types of human and livestock diseases that are treated by traditional medicinal plant in your area?

    ……

    ……

    ……

    ……

    ……
3. What is the most common habitat of medicinal plants?

    ……

    ……

    ……

    ……
4. Which plant species are the most preferred in their uses as medicinal?

    Whay?.....

    .....

    .....

    .....
5. When is preferred for collection of medicinal plants in your

area?.....
.....
.....

6. How are the prepared remedies taken by the patient (s) (route of administration)?.....
.....
.....
7. How do you know someone's disease and type of disease attack?.....
.....
.....
8. Dose the medicine has any specific measurement (dosage) and vary among age groups and sex?.....
……
……
…….
9. Where do you get such experience in medicinal plant practice?.....
……
……
……
10. How is the knowledge of medicinal plant use transferred from elders to the young generation?.....
.....
.....
.....
11. What are the threatening factors of traditional medicinal plants in your area?.....
.....
.....
.....
12. What is the status of traditional medicinal plants in this area?.....

.....

.....

.....

13. What is the awareness of the society to conserve these plants?.....

    ……

    ……

    ……..

Afaan Oromoon

Gaaffiilen gaafannoo qorannichaaf qopha'an

Guyyaa ……

Maqaa …….. Umrii……Saala……

Haala gaa'elaa……..

Amantaa : Ortoodoksii……Pirotestaantii…...Musliima…….kanbiro…..

Sad. Barnootaa,…….. …….

1. Gosoota biqilootaa naannoo keeti dhibeewwan fayyiisan tarreessi
    - Maqaa biqiiltuu…….
    - Eddo itti argamu…….
    - Qaama biqiltuu qorichuummaf oolu…….
    - Akkaataa ittiin qopha'uu…….
    - Hanga fayyadama isaa……
    - Haala ittii fayyadama isaa (fudhatamuu)……..
2. Goosonnii dhibee namaatii fi kan loonii oricha adaatin fayyan kan naanno keti enyuu

    fa'a?.....

    .....

    .....
3. Eddoon biqiloonni qoricha adaa ittii argaman essaa?

……
……
……..

4. Sanyiin biqiloota adaa naannoo sanatti qorichuummaaf filatamu kami? Maalif?
……
……
……
…….

5. Qorichoota gurudhaaf yeroon filatamaa ta'ee kami?.....
……
……

6. Qorichii qopha'ee dhukkubsataadhan haala kamin fudhatamaa?
……
……
…….

7. Dhukkuubsataan tokkoo dhibee maaliitin akka qabamee maalin adda baasta?
……
……
…….

8. Haangii qoorichii ittn safaramee keenannamu murta'aa ta'ee qabaa? Moo saala fi uumrii irratti hunda'ee garagarummaa qabaa?.....
……
…….

9. Muxannoo qoricha adaa keennuu kana esaa argachuu dandeessee?.....
……
……
……

10. Beekkuunmsii qoriicha adaa keennuun kun namoota gurguddoo irraa gara dhalootaattii haala kamiin daddarbuu danda'aa?.....
……
……..

11. Naannoo keetittii biqiloonnii qoricha addaf olan kun sababoota akkamiin mancaa'uu danda'an?.....
    ……
    ……
    ……..
12. Haallii qoriichoota adaa naannoo kanaa maal fakkaata?.....
    ……
    ……
    …….
13. Hubannoon ummannii naannoo kanaa kunuunsa biqilootaa irrattii qabu maal fakkaata?.....
    .....
    .....
    .....

i