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Use and conservation of traditional medicinal plants by the indigenous
People of Lalo Asabi District, Western Wollega zone, South west Ethiopia.

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A research Submitted to the Department of Biology, School of Graduate Studies, Jimma University, in Partial fulfillment of the requirements of the Degree of Masters in Biology (Botanical Science).

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A research submitted to the, Department of Biology, Jimma University, School of Graduate studies, in Partial Fulfillment of the requirements for the Degree of Masters in Biology on:

Use and conservation of traditional medicinal plants by the indigenous people of the Lalo Asabi District Western Wellega Zone, Oromia regional state, Ethiopia.

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ABSTRACT

The universal use of medicinal plants could be credited to cultural acceptability, cost effectiveness and efficacy against certain type of diseases. Research on medicinal plants is increasing because its role in health care needs especially in developing countries is very crucial. This study was also conducted in Lalo Asabi District, Western Wollega Zone, Ethiopia on use and conservation of medicinal plants used to treat human and livestock ailments. The aim of the study was to identify and documenting medicinal plants used to treat human and livestock ailments, the associated knowledge to it and threats and conservation strategies. Ethnobotanical data were collected from fields and home gardens through semi structured interview, group discussion, guided field walks with respondents in which 60 purposively selected informants (48 males &12 females) from 5 Kebles had participated. The collected data were entered into Microsoft excel spread sheet and analyzed. preference ranking, paired comparison, informant consensus factor and direct matrix ranking by focusing on parts of the medicinal plants used, preparation methods, growth forms of the plants and types of diseases treated were analyzed using descriptive statistics. A total of 74 medicinal plant species distributed over 44 families were collected and identified. These medicinal plants were used for the treatment of 49 different ailments of humans and livestock. The major growth forms of these medicinal plants were shrubs and herbs followed by trees with the percentage of 36.48%, 32.43% and 27% respectively. The most commonly harvested plant parts were leaves and roots followed by bark. Remedies were prepared from single or mixture of plants which mainly involves pounding followed by homogenizing in water and powdering and dissolving in water. The widely used routes of application of the remedies were oral followed by nasal and dermal. Beside their medicinal value, plants in the study area are utilized for food, fire wood, construction, forage fencing. Preference ranking and paired comparison showed the effectiveness and the preference of people for some medicinal plant species over the other in treating ailments. Modern education, impact of religion and unwillingness of young generation had contributed a lot in the declining of medicinal plant knowledge. Agricultural expansion, deforestation, overgrazing and soil erosion are the major threats to the plants. Despite the wide expansion of destruction of plants in the area, the effort made by the people to conserve this natural resource is very less. Encouraging the local community through awareness creation by concerned bodies is recommended.

Key - words- Medicinal plants, Lalo Asabi District, traditional healers, ethnobotany, conservation.

ACRONYMS

LADARDO – Lalo Asabi District Agricultural and Rural Development Office

CSA   -   Central Statistical Agency

LADHO   -   Lalo Asabi District Health Office

IUCN   -   International Union Conservation for Nature

WHO   -   World Health Organizatio

1. INTRODUCTION

1.1 Back ground of the study

Ethnobotany is the science that studies about the past and present interrelationships between human cultures and the plants (Martin, 1995). It is the scientific investigation of plants use for different purposes, like for medicine, food, clothing, shelter, tools, and so on (Kelbessa *et al*., 2004). It is difficult to tell exactly when the term 'ethnobotany' became part of modern science. However, it can be traced back to the time when humans started making conscious interaction with plants and animals (Cotton, 1996). The use of traditional medicine is universal as it is mostly dependent on locally available plant species and plant based products and focuses on traditional wisdom-repository of knowledge (Tolesa *et al*., 2013). It's wide spread use all over the world could be credited to cultural acceptability, cost effectiveness and efficacy against certain type of diseases compared to modern medicines.

Demands for medicinal plants are increasing in both developing and developed countries (Schmincke, 2003) because its role in health care needs of people around the world especially in developing countries is very crucial. About 80 % (WHO, 2002) of the population of most developing countries still depend on the use of traditional medicine derived from plants. People living in remote areas depend more extensively on traditional medicine as the use of modern systems are out of reach (Mahonge *et al.,* 2006). The demands of the people in developing countries for medicinal plants have been met by harvesting natural flora. Because of this many medicinal plants are fast disappearing and some are endanger of extinction (Soetan, 2008). High Population in developing countries has exerted pressure on frequently used medicinal plants.

In Africa Plants are also used in the preparation of ethno-veterinary medicines (EVM). All plant parts, including leaves, bark, fruits, flowers, seeds and roots are used in EVM preparations**.** In Nigeria (Chah *et al.,* 2009) reported that farmers use traditional remedies because they are more readily available, cheaper, effective and practicable (Kaikabo *et al*., 2004). Guéye (1999) noted that ethno-veterinary knowledge (EVK) is in the custody of older people, which passes to younger generations orally, and this is still the common means of communication in Africa. According to (Wanzala *et al.,* 2005) EVK comprises all ethno practices, approaches and

raditional knowledge applied by humans with a view to solve health constraints that affect t livestock and hence, improve their productivity.

Ethiopia has a long history of traditional medicine and has developed ways to fight disease through it (Negussie, 1988). Plants have been used as a source of traditional medicine from the time immemorial to fight different ailments and human sufferings. This traditional medicine has become an important part of the culture of Ethiopian people because of its long period of practice and existence (Keba, 1998; Debela *et al*., 1999). In this country, the use of medicinal plant has long history as described in various medico- religious parchments (writing surfaces) and medical textbooks written in Geez or even Arabic. It is believed as it was originated several centuries ago (Kibebew, 2001). It was the only system available for healthcare prior to the introduction of modern medicine for prevention and treatment of various illnesses. Even today, people living in rural and urban areas of the country commonly treat some diseases using medicinal plants available around them. For example, *Hagenia abyssinica* to expel tapeworm, *Ruta chalepensis* for various health problems (Abbink, 1995).

The country is also among the centers of biodiversity in the world with several topographies, climatic conditions and various ethnic cultures (Kelbessa *et al*., 2000). Out of the 6,500 species of higher plants, 62.5% of the forest area is found in Southwest region where most of the medicinal plants are found and have been used as a source of traditional medicine to treat different human and livestock ailments (Kelbesa *et al*., 1992). In the country, traditional medicine has played a significant role in treating health problems in both livestock and humans. (Abebe, 2001). Knowledge of medicinal plants and of their uses provides vital contribution to human health care needs throughout the country (Tolessa *et al*., 2013).

Lalo Asabi District is among the rural Oromo communities of West Wollega Zone in Southwest Ethiopia. Here traditional medication is believed to be an important healthcare system which mainly involves the use of locally available medicinal plants; however there were no available document that had recorded about the use, threat and conservation of traditional medicinal plants in this area. This study was then assessed, identified and documented medicinal plants used to treat humans and livestock ailments and the associated indigenous knowledge to it by the indigenous people of the study area.

1.2 Statements of the problem

Because of human and natural influence many medicinal plants and traditional knowledge of their use is endangered today in Ethiopia in general and in the study area in particular. The Ethinomedicinal investigation conducted did not address all parts of the country and totally no reported study on use and conservation of traditional medicinal plants in treating human and livestock ailments in the study area. Therefore this study was conducted, assessed and documented medicinal plant species used to treat human and live stock ailments and the traditional knowledge of the local people focusing on the following points.

❖ What is the indigenous knowledge of people on medicinal plants in the study area?

❖ What is the growth habits of medicinal plants used in treating different diseases in the study area?

❖ What parts of the medicinal plants are used for remedy preparation and methods of preparation?

❖ What are the common diseases of humans and animals in the study area?

❖ In what conditions (treats) do these medicinal plants are found today in the study area?

❖ What are some traditional conservation strategies of the medicinal plants by the local people of the study area?

1.3 General objective

❖ To conduct study on plant species used in traditional health care practices and to document the plants and the associated indigenous knowledge and conservation methods of these plants in Lalo Asabi District, West Wollega Zone, Southwest Ethiopia.

1.3.1 Specific objectives

❖ To collect, identify and document the medicinal plants used in traditional system (focusing on growth habit, parts used and methods of preparation, dosage and modes of application).

❖ To assess and record indigenous knowledge of the people of the study area about the traditional medicinal plants in their locality and how the knowledge transfer takes place.

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❖ To assess the existing threats to medicinal plants and identify the major threats.

❖ To identify and document the traditional conservation measures practiced by the local people in the study area.

1.4 Significance of the study

The traditional use and universal belief in the efficacy of medicinal plants in health care system is generally credited to the shortage of the modern medical system. Medicinal plant knowledge varies across peoples with different religious, language and cultural backgrounds. In Ethiopia, there are many ethnic communities, therefore the study of the use and conservation of the traditional medicinal plants and the associated indigenous knowledge of the people are very significant. The destruction of vegetation and environmental degradation has become national and global issues. This is because loss of vegetation and depletion of natural resource leads to disappearance of herbal medicines. So conservation of vegetation in general and that of medicinal plants in particular is a measure concern. Therefore, the results of this research have a great importance in scientific documentation and providing detail information about the traditional medicinal plants of the study area. This is very crucial for the future to develop conservation strategies for the threatened medicinal plant species of the area. In addition, the documented information will serve as an input for other researchers who are interested to conduct studies on other aspects of ethnobotanical studies in this district.

1.5 Scope of the study

This study was conducted in Lalo Asabi District of Western Wollega Zone, Oromia, Soutwest Ethiopia by taking 60 respondents and five sample kebeles from the 27 kebeles of the district. The study was conducted from January 2016 to August 2016 thus identified and documented medicinal plants used to treat human and livestock ailments and the indigenous knowledge of the local people associated to it.

1.6 Limitations of the study

This study faced a number of challenges. The most common challenges were time and financial constraints. Because of this limitation of time and finance, the study was limited to only five kebeles and 60 respondents of the District. In addition many of the species of plants used for traditional medicinal purpose was found in wild (not cultivated) and not easily accessed. There was also challenge from traditional healers because some of them were unwilling to tell their knowledge of traditional medicine and others need large payments. These challenges were mitigated by discussing with the respondents and convincing them the aim of the study as well as by giving them some incentives as much as possible.

2. LITERATURE REVIEW

2.1 Medicinal plants used for human treatment

Eventhough using traditional medicinal plants are common in Ethiopia, research and documentation of medicinal plants has been started in recent times (Taddese and Demissew, 1992). No enough information about the quantity, quality as well as efficacy of traditional medicine to meet the standard needed to support its use.

2.1.1 Traditional medicinal plants and Indigenous knowledge

The accumulation of knowledge, rule, standards, skills, and mental sets, which are possessed by local people in a particular area, is known as indigenous knowledge (Quanah, 1998). Knowledge of plants used by humans is based on thousands of years of experience. It is the result of many generations' long year experiences, 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, clothing and different services (Martin, 1995). Over centuries, indigenous people of different localities have developed their own specific knowledge on use of plant resource, management and conservation (Cotton, 1996). So, the knowledge and application of traditional medicine is one of the widely used indigenous knowledge systems. This knowledge involves traditional analysis of ailments, collection of raw materials, preparation of remedies and its instruction to the patients (Balick and Cox, 1996).

In many parts of the Ethiopia traditional healers held their indigenous knowledge in secret (Pankhurst, 1990). Because of this it is very difficult to obtain their traditional medicinal information as they considered it as a professional secret, only passed orally to their older son at their oldest age. So the dominant ways of medicinal plant knowledge acquisition and transfer is directly from parents to children through oral means (Kidane *et al.,* 2014); (Yirga, *et al*., 2012). The report from East Showa, Bosat District by (Hunde *et al*., 2006) explained that traditional knowledge of medicinal plants is almost becoming extinct because most of the specialized healers in the area do not appropriately transfer it to the next generation. According to (Birhanu *et al*., 2015) the highest number of transfer of knowledge about the medicinal plant is to trusted eldest son orally. Because of the impact of modern education, increase in health coverage and

urbanization, medicinal plants and its indigenous knowledge are being lost globally at a fast rate (WHO, 2002). The condition is very severe in developing countries where such important information is not recorded in writing but passed on from one generation to the other generation verbally. According to (Pankhurst, 2001) since the transmission of knowledge on medicinal plants and method of use is mainly among the practitioners, the knowledge of traditional medicinal plants are hidden and less available to the public (Abbink, 1995).

2. 1.2 Growth forms of the medicinal plants

Most of the research in Ethiopia reported that traditional medicinal practitioners mostly implement herbal medicines (Amenu, 2007); (Abera, 2014); (Tolessa, 2007) and (Assefa and Abebe, 2014). But the report from Jimma Zone, Southwest Ethiopia by (Yinger and Yewhalaw, 2007) identified that more than herbs Shrubs and trees were the most represented growth forms for remedy preparations. The main reason for this is that these plants can overcome and tolerate drought conditions and have the ability to exist at all seasons. Again the report from Horo Guduru District, Western Ethiopia by (Birhanu *et al*., 2015) revealed that the growth forms of medicinal plants used by the indigenous people of this area are mostly herbs(46.4%),followed by shrubs(28.6%),and trees(25%). Similarly the report from Mecha District of Amhara region identified that the growth habit of the medicinal plants of this area is shrubs, herbs, trees and climbers where shrubs and herbs are the most widely observed growth habit respectively.

2.1.3 Parts of the plants used for remedy preparation

In Ethiopia different parts of plants were reported to be used for the preparation of remedies to treat different human and livestock ailments (Tolessa, 2007). Almost all plant parts including roots, leaves, stem, bark, fruits, young shoots and flowers, were repotted for use in preparing different remedies (Njonge *et al*., 2013). The report from Gimbi District also indicated that parts of the plants used for remedy preparation in the area were leaf, root, leafy stem, seed, bark, flower, bulb and tubers (Abera, 2014). From the listed parts of these plants leaf and roots are the most commonly used plant parts.

According to (Yinger and Yewhalaw, 2007) report, traditional healers mostly harvest leaves (64.52%) for preparation of different remedies. Preparation of remedies from the roots of some (19.35%) medicinal plant species was also reported. In addition (Kidane *et al.*, 2014) reported from Maale and Ari ethnic communities in southern Ethiopia, a total of 128 medicinal plant species were commonly used as herbal medicine. This paper also indentified that largely harvested plant parts were leaves and this has comparatively low impact on medicinal plant resources when compared with the use of roots. The use of leaves than roots, barks, stems and whole plant minimize the threat to the destruction of medicinal plants because if it is harvested in sustainable manner, it gives opportunity for long life of the plant. As different study applied in different parts of Ethiopia reported, roots and leaves are certainly the most commonly used medicinal plant parts (Geday *et al.*, 2007). The preference of leaves to other plant parts could be due to ease of preparation and the chemical constituents of leaf for the treatment of diseases.

2.1.4 Preparation methods

When traditional healers prepare traditional medicine from medicinal plants they developed several methods of preparation (Yirga, 2010). Most of the plant remedies are prepared by boiling or squeezing the plant parts either individually or the mixture. Sometimes other additives like honey, milk, butter & salts are added during preparation (Mesfin *et al.*, 2005). Crushing, concoction, pounding and mixing with cold water and chewing to swallow the juice is the modes of preparation for the majority of the remedies (Hunde *et al.*, 2006). The principal methods of remedy preparation reported by (Yineger and Yewhalaw, 2007) are through crushing (37.31%), squeezing (29.85%) and powdering (16.42%) of the various parts of medicinal plants. Concoction, filtrate, pounded and smoke bath are common modes of preparations reported from southern Ethiopia by (Tolessa *et al.*, 2013). Concoction is the most frequently practiced method of preparation. The frequent use of concoction and the mixing of two or more plants by healers could be associated with healers believes that its efficacy (healing) will increase when mixed or used together (Yirga, 2010). The remedies are prepared using water (hot or warm), local alcoholic drinks, boiled coffee or milk and taken either orally or through inhalation of the vapor after boiling (smoke bath treatment) (Tolessa *et al.*, 2013).

2.1.5 Routes of application

The most commonly reported routes of administration are oral, topical nasal and smoke bath treatment. According to (Yirga *et al.,* 2012) in Seharti-samre District of Northern Ethiopia the remedy made from medicinal plants collected from the field are applied thorough oral, dermal, ocular and anal. Among these, dermal administration is the most commonly used route of application followed by oral. (Tolesa, 2007) also reported from Gimbi district, Southwest Ethiopia that oral application is the leading route (85.55%). Similarly (Tolessa *et al.,* 2013) reported that traditional healers of Southern Ethiopia mostly practiced oral administration of plant preparations (65%), and mixing of two or more different medicinal plants. From these reports one can easily understand that oral application is the most commonly practiced route of application by local people of Ethiopia. The choice of oral administration is related to the use of some solvents or additives like milk, butter, alcoholic drinks, boiled coffee, and food. The additives are used to reduce discomfort as well as improve its taste (Flaite *et al*., 2009).

2.1.6 Dosage

Determination of dosage of medicinal plants is the big problem as many studies identified. Because there is no standardized known unit of measurements of the plant remedies as well as there is no determination of accurate dosage; it is totally based on estimation (Tolsesa, 2007). However, it is usually determined by using homemade remedies using cup, glass, half bottle, full bottle, plant parts like number of bulbs, number of seeds, leaf ties and their own hand like handful is some of the ways by which traditional healers determine the dosage of the remedies (Birhanu *et al.,* 2015). Although the full dose determination varies from healer to healer, dosage determination generally depends on the age, sex, and strength of the diseases; that is, children are given fewer doses than adults; physically strong individuals take more dose than weak individuals depending on the type of disease. According to (Amenu, 2007) local units such as finger length and number of leaves, seeds, fruits, bulbs, rhizomes, flowers and latex were used to

estimate and fix the amount of medicine. Improvements seen on the patient, disappearance of the symptoms of the diseases are some of the criteria used in determining duration of the application of the dosage.

2.1.7 Disease treated

Nowadays medicinal plants are universally recognized as the source for a number of human health, social, and economic support systems and benefits (Asfaw, 2001). Studies determined that chemical profile and composition of medicinal plants revealed the complexity and variety of compounds contributing to the various uses of plants in treating numerous ailments (Kelbessa *et al*., 2004). Through simple herbal home remedies, primary health care problems like fever, upper respiratory tract infections, gastro-intestinal problems, diarrhea, dysentery, hepatitis, anemia, arthritic conditions can be managed at home level. Additionally, it has been reported that herbal remedies are commonly used in treating human ailments like malaria, jaundice, abdominal pain, leprosy, elephantiasis, TB, trachoma, breast cancer, ascaris, stomach worms, leishmaniasis and evil eye (Limenih *et al*., 2015).

2.2 Traditional medicinal plants used for livestock treatment

Ethnoveterinary refers to people's beliefs, knowledge, skills and practices relating to care of the animals. Plant based healthcare system remains as the main alternative treatment for different ailments in different countries (Belayneh *et al*., 2012). Although Ethiopia is the country with the largest population of livestock, its productivity is very poor when compared with other developing countries (Fullas, 2010).The main reason for this is the poor health conditions of the livestock as the ethnoveterinary survey by (Geday and Ameni, 2003) in Olfa and Azebo Districts had explained. The insufficient animal health services had resulted in a number of diseases which is reducing the efficiency of livestock production. In Ethiopia, similar to most developing countries, livestock ailments remains one of the major causes of poor livestock productivity. It is possible to treat these ailments with modern treatment however; its adequacy, availability and cost of treatment are an important determinant factor for livestock owners (Sori *et al.,* 2004).

Now days the animal health service in Ethiopia is gradually improving but it is not at a stage of giving full services that can totally solve the problems of cattle owners (Mesfin and Obsa, 1994). One of the constraints on the national Veterinary Services is the shortage of required drugs due to its high price and limited supply. At present, there are many veterinarians working in Ethiopia, but they did not meet the needs of the cattle owners. This is why local people of Ethiopia use different plants as ethnoveterinary medicine (Mesfin and Obsa, 1994).

2.2.1 Growth habit of the plants

Medicinal Plants with different growth habit were used for ethnoveternery medicine preparation. Different studies carried out in different countries revealed that trees, shrubs, and climbers are the most common growth forms for remedy preparation. According to (Amenu, 2007) the dominant growth forms of medicinal plants used for the treatments of livestock ailments were shrubs (50%), trees (28.6%) and herbs (14.3%). Similarly (Etana, 2010) reported from Goma District, Jimma Zone that the growth forms of plants used for the treatments of livestock health problems were trees, herbs, climbers, and shrubs.

2.2.2 Parts of the plants used for remedy preparation

All plant parts, including leaves, bark, fruits, flowers, seeds and roots are used in Ethnoveternary medicine(EVM) preparations (Chah *et al*., 2009, Leulakal *et al*., 2014). The report from four Districts of Jimma Zone by (Yigazu *et al*., 2014) revealed that, parts of the plants used for treatments of livestock ailments were leaf, root, fruit, seeds, bark, whole plant and combination of one plant parts with another plant parts. Leaves were the major plant part used for remedy preparation because it is believed to contain more active chemicals than other parts of plants.

2.2.3 Preparation methods

Traditional healers use numerous techniques of EVM preparation. The common methods of remedy preparation from the plant parts are concoction, decoction and infusion. (Yigazu *et al*., 2014). Methods of preparation vary based on the type of disease treated and the actual site of the ailment. Additionally chopping, grinding, juicing or extracting gel and mixing with water or with

food, or making a paste of the plant parts are commonly practiced by traditional healers (Lulekal *et al*., 2014).

2.2.4 Route of administration

The commonly experienced routes of administration for various diseases are oral followed by topical and nasal (Megersa *et al*., 2013).The dominant one was oral administration. According to (Lulekal *et al*., 2014) rubbing and pasting Ethnoveterinary herbal preparations is also the commonly used treatment methods for handling dermatological diseases, whereas oral administration of homogenized herbal preparations is the main treatment method for internal ailments.

2.3 Threats to medicinal plants

Different study made at different parts of the country has revealed that most of the medicinal plants used in Ethiopia are harvested from the wild (Giday, 1999; Awas, 2003). Recent evidence from Ethiopia as well as other countries indicated that the existence of this significant resource is endangered. Research Evidence also proved that many plant species locally as well as globally threatened as a result of deforestation, urbanization and extended drought. Nowadays herbal practitioners have to walk long distances for collection of herbal medicine because of dramatic decreases of the availability of medicinal plants. The situation is even very worse in Ethiopia where there are more environmental problems (Kelbessa *et al.,* 1992). The main causes of these threats to traditional medicinal plants are loss of taxa of medicinal plants, destruction of habitats of medicinal plants and disappearances of indigenous knowledge (Kelbessa *et al*., 1992).

Survey made on herbalists in Butajira revealed that most of the herbalists do not grow medicinal plants in their garden. Because of the excessive harvesting of wild plants, the biological diversity of medicinal plants is being reduced from time to time. In addition to this, except in a few cases where a few food crops with medicinal value are cultivated, there is no organized cultivation of plants species for medicinal purposes (Tadese *et al*., 2005).Similarly the report from Endrta District Tigray region by (Yirga, 2010) stated that most of the traditional medicinal plants used by the local people are collected from the wild; a few of them were cultivated.

According to (Kelbessa *et al.,* 1992) and (Edwards, 2001), habitat and species are being lost rapidly as a result of the combined effects of environmental degradation, agricultural expansion, deforestation and over harvesting of species and this is more enhanced by human and livestock population increase. In support of this (Giday, 2003) found out that the practice of using plant remedies by Zay people to treat different ailments has been declining from time to time largely as a result of constant deforestation in the area. In addition (Asfaw, 2001) confirmed that medicinal plants are considered to be at management hazards due to over use and destructive harvesting.

2.4 Conservation strategies of medicinal plants

Different ethnobotanical literatures underline that both conserving plant species and documenting and keeping indigenous knowledge associated to them need urgent concerns (Cunningham, 1996). In order to conserve useful plants (including medicinal plants) which are threatened due to natural or manmade factors in Ethiopia, in-situ and ex-situ conservation strategies should be complimentarily implemented. The most important conservation strategies of plant species in general and medicinal plants in particular are to ensure that the populations of species of plants continue to grow and evolve in the wild in their natural habitats (Khan *et al*, .2005). This is called insitu conservation and is achieved both by creating areas as nature reserves and national parks (protected areas) and by ensuring that a number of plant species can continue to survive in managed habitats such as farms and cultivated forests (IUCN**,** 1993). In addition, exsitu conservation involves conservation outside the native habitat and used to protect populations in danger of destruction or deterioration (Mahonge *et al.,* 2006) by cultivating at home garden, along roadsides etc. According to (Kidane *et al*., 2014) Maale and Ari ethnic group of Southern Ethiopia cultivate medicinal herbs in their home gardens. They do so because they need to conserve these plants since they are scarce in their surroundings and to keep them available during the dry season and to have them at hand during urgent situations. Conservation of these medicinal plants is possible by cultivating them in places of worship (churches, mosques), farm margins, road sides, live fences and field (Asfaw, 2001). Medicinal plants that are harvested for their roots, tubers and bulbs require special consideration for conservation. Since forests and woodlands are the sources of most of the medicinal plants, such consideration should also be extended to them.

3. MATERIALS AND METHODS

3.1 Description of the Study Area

This study was conducted in Lalo Asabi District, Western Wollega Zone, Oromia region, South West Ethiopia. Lalo Asabi district is one of the 19 Districts in West Wollega zone. At present the District has 27 rural administrative sub divisions (kebeles) and three urban centers. The total area of the district is (1129.69Sq.km). It is located in the eastern part of West Wollega Administrative Zone at a distance of 464 km from Addis Ababa with an elevation range of 1670 -2060 masl and about 24 km from Gmbi which is the capital of the zone. The Addis Ababa-Dembidolo main road passes through Enango town. The district is bordered by Gimbi district in East, Boji District in West, Guliso district in South, Homa District in south east and Benishangul Gumuz Regional State in North.

3.1.1 Climate

Lalo Asabi district, like most parts of SouthWest high lands, receives its maximum rainfall during summer season (June, July and August). Its average annual rainfall is about 900mm to 1600mm. Generally, rainfall exists from March throughout October and temperature becomes severe in the months of January, February and March. Cooler condition is experienced in summer season (June, July and August). About 90% of the district is characterized by "medium land (badda-daree) which is equivalent to sub-tropical climate even though marginal areas bordering Benishangul Gumuz lie under lowland (gammoojjii) which is about 10%. (LADARDO, 2009).

MAP OF THE STUDY AREA N

Legend
- Lalo Asabi
- West Wollega
- Oromia
- Ethiopia

230,0115,0000   230,000460,000 Kilometers

Text

SOURCE;GIS LAB,2016
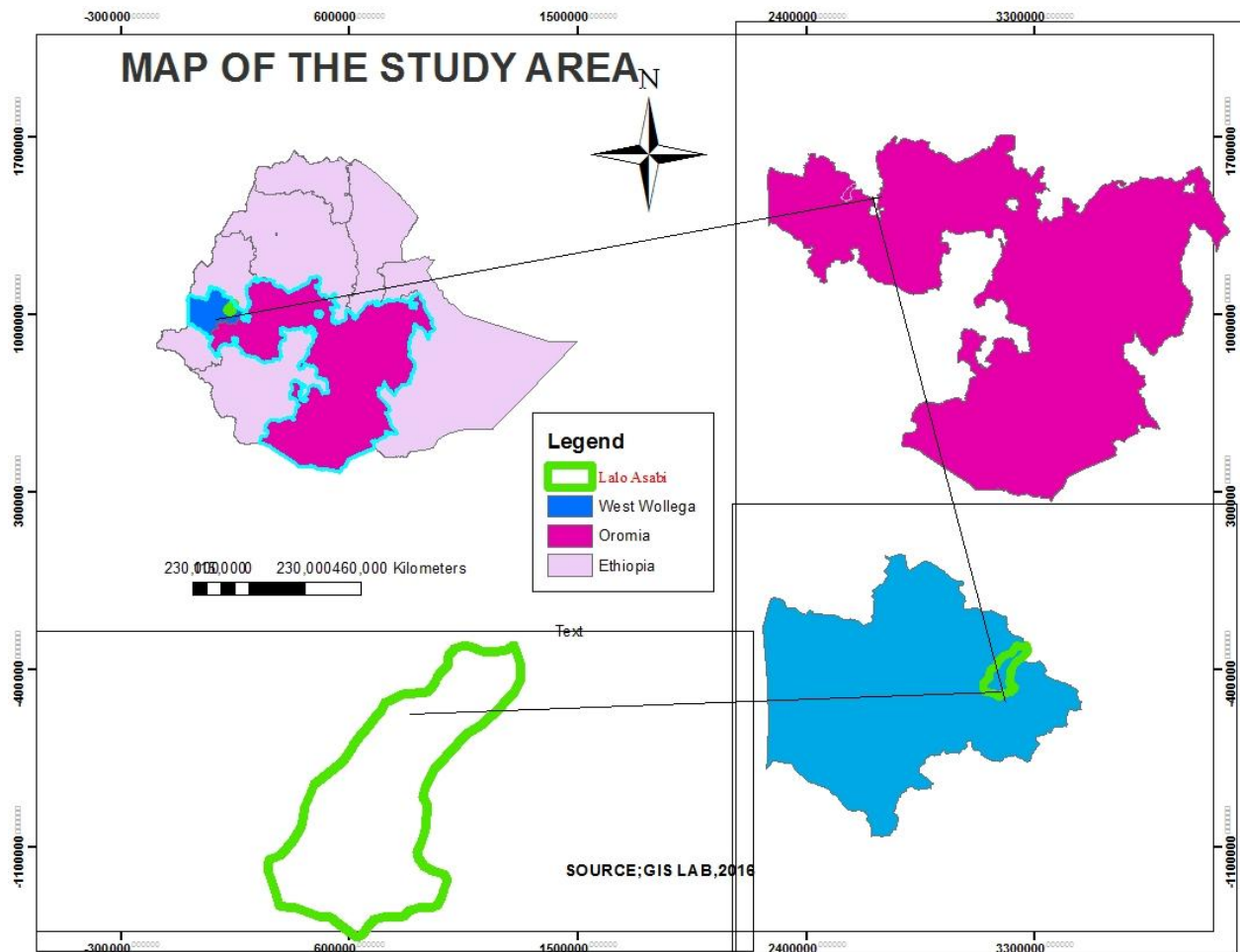
Figure 3.1 Map of the study area

3.1.2 Vegetation

As Lalo Asabi district is located in the Southwest parts of Ethiopia, it has good forest vegetation cover. Some of these forest vegetations are Janko mare forest, Mulata dalati forest, Bangi forest and others. In these forests trees like, *Acaccia abyssinica, Prunus africana, Ficus sur, Albizia schimperiana, Croton macrostachyus, Ficus vasta, Cordia africana, Ekebergia capensis, Syzygium guineense, Vernonia amygdalina, Schefflera abyssinica* are commonly found. Other vegetations such as bamboo and large grasses are also found scattered along the border of Benishangul Gumuz Regional State. The people of the District rely on fuel wood and charcoal

for domestic purposes. Similarly, construction of houses, making of farming tools, cattle houses and fencing requires cutting of trees. Because of these activities, the vegetations were destroyed by the people whose livelihood is mostly dependent upon them (LADARDO, 2009).

3.1.3 Population

According to the 2009 national census the total population of Lalo Asabi district is 93508, of which 45838 are males and 47670 are females. Total household heads of the district is 13978 of which 12025 are males and 1953 are females. The average family size is 6.1(CSA, 2009). The major ethnic group of population of the district is Oromo (99.3%), Guraghe, and other ethnic groups of very few populations. Afan Oromo which is the official language of the regional state is the most (major) spoken language in the District. Religious activities practiced in the District include Christianity with different denominations, mainly Protestant and 7th day Adventist, Orthodox and Islam. Indigenous beliefs like Wakefana are also being practiced in the District (CSA, 2009).

3.1.4 Economic activities

The major economic activity of the study area like other rural areas of Ethiopia is agriculture, particularly mixed farming (rearing of animals and growing of crops) which accounts to about 96% of the economic activities of the area. About 88% of the inhabitants of the district are farmers, while about 9.83% are engaged in local and small scale economic activities such as small scale trade, wood, clay and metal work, building and construction and about 2.17% is government employee. The farming system of the District is totally rain fall dependant. The most widely cultivated crops in the District include coffee, maize, sorghum, millet, barley, oil seeds (Nug, Talba), pulses (beans, peas) (LADARDO, 2009).

According to the District agricultural and rural development office, Similar to many parts of Ethiopia, Lalo Asabi District is gifted with domestic animals such as cattle, sheep, goats, mules, donkeys and poultry. There are 34589 cattle, 18909 sheep, 4202 goats, 4115donkeys, 4115 mules, and 28449 poultry. However, the productivity of the animals is very low because of various factors such as fewer attitudes of the raisers towards animals' health, focusing only on the number of the animals as a sign of prestige and shortage of adequate feeding.

3.1.5 Medical services

According to the Lalo Asabi District health office, the modern health service coverage of the District is 63.7% and the reported ten top human diseases were acute febrile illness, Typhoid, Gastritis, Intestinal parasite, rabies, Acute respiratory tract infection, Skin infection, Urinary tract infection, malaria, Diarrhea and other helminthes (LADHO, 2009).The District has 3 health centers even though they were not well equipped with facilities and some health posts that work mainly on sanitation program but no hospital at all. In addition the number of health workers in the District is also not sufficient when compared to the total population of the District. For instance the following table shows the data of health workers in the District.

Table 3.1 health workers of the District

Health worker	Male	Female	Total
Nurses	13	10	23
Laboratory technicians	4	1	5
Pharmacy (Druggists)	2	1	3
Health officers	7	—	7
Midwifery	1	7	8
Total	27	19	46

The major reported livestock diseases were Black leg, Bloating, Trypanosomaisis, Pasturolosis, swellings, coughing, Diarrhea, Anthrax and bloody urine. These diseases have contributed a lot in minimizing animal productivity of the district (LADARDO, 2009).The District has one central veterinary clinic and 9 health posts. In addition there are only 26 veterinary health workers (25 male & 1 female) in the District. Veterinary health service coverage of the district is about 62%. As the size of the District and the available health services are not matching, people visit traditional druggists to treat their livestock.

3.2 Site selection and Sampling technique

A reconnaissance survey was made and information about the physical features of the study area was collected from March 1 - 10, 2016.Accordingly 5 kebeles (study sites) each containing 3 study areas was selected based on the researcher judgments (purposive sampling). Different criteria such as availability of forest, presence or absence of traditional healers, disease prevalence and distance from the town of the district were considered. There were totally 15 study areas (locally known as kaladi or garee misoomaa) from which data was collected. During site selection elders, knowledgeable persons, kebele administration workers and DAS (development agents) had participated. The selected five kebeles from the District for data collection were listed in the table below

Table 3.2 The study kebeles

Name of the study sites (kebeles)	Distance from the District center (Enango)	Altitude above sea level
Horda dalati	About 18 km	1860 masl
Lalo wanjo	About 9.5km	1860masl
Gombo huwa	About 14km	1840masl
Tasiho Mole	About 4.5km	1855masl
Haroji Serdo	About 21km	1870masl

3.2.1 Informant selection

During the survey 60 informants from the local inhabitants between the ages of 20 to 85 were purposively selected based on the recommendations of elders (Jaarsa biyyaa), knowledgeable persons and local authorities. Out of these 18 were key informants (1 to 2 from each study area). The method of (Martin, 1995) was used for this activity. Information concerning the knowledge of traditional practitioners was first gathered from the local people in the sites and the selection of key informants took place with local administrators and selected local elders.

3.2.2 Ethnobotanical data collection

Ethnobotanical data was collected from May to June 2016 using semi-structured interviewees, group discussions, and guided field walks with informants. Important information concerning the indigenous knowledge of the local community on health issues and on traditional medicinal plants, local vegetation classification, human and livestock ailments treated, local names of plants used for remedy preparation, parts used, methods of remedy preparation, conditions of preparation, routes of administration, indigenous knowledge transfer, often uses, existing threats to medicinal plants and traditional conservation practices were gathered during the interviews. Interviews and discussions were made based on the questionnaires prepared in English and translated to Afan Oromo. All of the interviews and discussions were held in Afan Oromo.

3.2.3 Specimen collection and identification

Voucher specimens were collected from the field and home gardens for each plant species during guided field walk with the informants. Preliminary identification of the local name of the specimen was done at the site of collection (field). Then the collected specimens were pressed in old newspaper and further identification was made using taxonomic keys, descriptions given in the Flora of Ethiopia and Eritrea and by visual comparison with real herbarium specimens.

3.2.4 Data analysis

The collected Ethnobotanical information (data) was entered into Microsoft Excel spreadsheet and was summarized qualitatively as well as quantitatively. Descriptive statistics such as

percentage, tables and graphs were employed for data analysis. Ailments treated, methods of preparation, rout of applications, parts used, growth forms of the medicinal plants and ailments treated were analyzed through descriptive statistics.

3.2.4.1 Informant consensus

Informant consensus factor (ICF) was made to make sure the agreement of informants on the reported cures of the medicinal plants. The ICF were calculated following (Heinerich *et al.,* 1998). Accordingly number of use citation in each category (nur) minus the number of species used (nt), divided by the number of use citations in each category minus one

3.2.4.2 Preference ranking

Preference ranking was made on six medicinal plants species used in treating abdominal pain to assess the degree of effectiveness (the best-preferred medicinal plant species) against the disease following Martin (1995); Cotton (1996). Those medicinal plants believed to be the most effective in treating the ailment was given the highest value (5) and those that are believed to be the least effective was given the lowest value (1). The value of each species was summed up and the rank for each species was determined.

3.2.4.3 Paired comparison

Paired comparison was used for evaluating the degree of preferences or levels of importance of certain selected medicinal plants. Accordingly seven plants were selected based on their use value as suggested by most informants and paired comparison was computed following Martin (1995). Eight key informants were randomly selected to show their responses by writing or telling 1-4 value independently for pairs of seven medicinal plants that are noted for treating wound. First list of the pairs of selected plants and the order within each pair was randomized. Then every pair was presented to selected informants. Then their responses were recorded. Finally the total value summed and their rank made based on the total score of the informants

3.2.4.4 Direct matrix ranking

The results of direct matrix ranking shows the highest values (ranks) for multipurpose medicinal plants. In the present study data on use diversity of multipurpose medicinal plants such as uses of plants for fire wood, home furniture, forage, charcoal, farming tools and others was evaluated by direct matrix ranking exercises for eight medicinal plants as described in Cotton (1996). Five highly experienced key informants were selected purposively to assign use values to each plant. The average value of each use values of the plants was taken and these values were summed up and ranked.

3.2.4.5 Ethical consideration

During data collection a special care was given to the secrets of the informants of the study area. Informants participated voluntarily without any fear and hesitation. Informants were informed that the objective of the research is not to expose the practitioners but for research and academic purpose and the research result will benefit the community in general and the practitioners in particular.

4. RESULTS AND DISCUSSION

4.1. Knowledge of informants

Almost all of the medicinal plants were identified by male respondents except two mothers were involved in identifying the plants. The rest of the females replied that, we know as plants can be

used for the treatment of different ailments but we do not have knowledge about the plant as well as its preparation methods. Most of the traditional medicine was identified by male uneducated and some with basic education informants of above sixty years of age. This means knowledge of traditional medicine is highly related to age of the people. As one goes old his/her knowledge of traditional medicine goes on increasing.

Large number of respondents participated in the survey were male elder age groups. Uneducated informants had much more knowledge of traditional medicine than educated informants. This has proved that modern education has an impact on traditional knowledge. Other findings elsewhere in Ethiopia Tolessa (2007; Amenu (2007) also reported similar result. The uneducated individuals honestly believed in and learned the knowledge from their elders. The reason why little traditional medicinal plant knowledge was observed in younger respondents is because of the fact that knowledge of traditional medicine increases with increasing age. Earlier report by (Etana, 2010) also matches with the present report. The knowledge is also highly scarce in females than in males; this is because traditionally elders ignore females and pass the knowledge only to their selected son. Different reports from different area also identified the same result Hunde *et al.* (2006); Megersa *et al.* (2013); Kelbessa *et al.* (2004).

Table 4.1 General information of respondents

General information of informants								
Age	Number of respondents	Sex			Religion	Number of respondents	Educational status	Number of respondents
		M	F					
20-35	13	9	4	13	Protestant	22	Illiterate	24
36-60	21	16	6	22	Seventh day Adventist	21	Basic education	19
Above 60	26	23	2	25	Orthodox	11	Elementary school (1-6)	11
					Muslim	2	High school	6

4. 2 Indigenous knowledge of the people of the study area

4. 2.1 Indigenous knowledge on health issues

People of the study area give enormous value for their health. They say health is a special assets provided by the God. They believed or realized that diseases are problems that damage health conditions which are either caused by darts that contains small germs or the result of sin (wrong action) locally they call it "sookkoo" that brings punishment from God. For example a child whose father, mother, grandfather or grandmother cursed him or her cannot get full health as well as cannot be rich (prosperous). These People also categorized health problems as those that can be treated and those that are impossible to treat. For example, diseases due to wrong action (sookkoo) cannot be treated either by traditional medicine or by modern medicine.   For such problems there is a traditional curse removal made by the elders to save the individual as also reported by the study made in Gimbi District, southwest Ethiopia (Tolessa, 2007).

From the discussion made with elders, the community in the earlier period and that of today expresses the value of health by using different sayings and proverbs. The followings are some of the commonly used sayings in the community.

"**Badaan fayyaa dha**," meaning a great thing is health.

"**Dhibbi abbaan hin beekne fayyaa dha**," meaning "nobody understood that nothing is greater than health".

"Kan fayyaa qabu waa hunda qaba," meaning healthy man is rich or can do everything.

These different sayings and proverbs existing in the community proved that these people have strongly built knowledge of health and nothing has given priority more than health and considered health as a great gift given by Supreme Being.

4. 2.2 Indigenous knowledge in treating diseases

People of the study area have built an indigenous knowledge on how to treat diseases. As it was realized from group discussion and interviews made with respondents, whenever they get sick they define the disease by themselves and visit the nearby traditional healer to get treatment. If they fail to get cure, they go to clinics or health centers for modern treatment. There were two reasons why they first visit the local healers. The first reason is, they believed in that some diseases cannot totally be treated by modern medicines. For example if someone urinates early in the morning by facing to the rainbow, he/she will be caught with a disease known as "sabata waaqayyoo" (in Afan Oromo) which results in swelling of foot and face. Then, according to their belief, such types of diseases are only treated by traditional medicines. The second reason is that because traditional medicines are cheaper accessible than modern medicines, if they get cured by these medicines, no need of going to the expensive modern treatments. Similar report by (Etana, 2010); (Abebe, 2000) and (Negussie, 1988).

4.3 Distribution of medicinal plants in the vegetation types of the study area

The result obtained from the study revealed that medicinal plants used by the community were unevenly distributed among the existing vegetation (Table 4.2). Most of the medicinal plants were harvested from "bosona duudaa*" (*dense forests covered by shrubs, herbs and many species of trees) because this vegetation is rich in species diversity compared to the others. This contributed to the abundance of medicinal plants in this vegetation than other types. The second

vegetation type "Lafa bunaa" (a vegetation rich in cultivated coffee plants and scattered trees) also had many medicinal plants but the problem with this is that famers regularly remove herbs and shrubs so that the medicinal plants in these areas are endangered. In contrast a few of medicinal plants were also harvested from Citaa or lafa daggalaa (a vegetation rich in big grasses like *Hyparrhenia rufa)* and Lafa baargamoo (a vegetation rich in *Eucalyptus* trees) as well as Caffee fi qarqara bishaanii- a vegetation rich in *Cyperus digitatus,Cyperus longus* and *Phoenix reclinata.*

Table 4.2 Distribution of medicinal plants in vegetations of the study area

Vegetation type of the area.	Number of medicinal plants identified.	%
Bosona duudaa (dense forests covered by shrubs, herbs and many species of trees)	52	44.82
Lafa bunaa(a vegetation rich in cultivated coffee plants, scattered trees and dense under growth herbs)	31	26.72
Citaa(lafa daggalaa)-(a vegetation rich in big grasses like *Hyparrhenia rufa)*	11	9.4
Lafa baargamoo(a vegetation rich in *Eucalyptus* trees (*Eucalyptus tereticornis)*	9	7.75
Caffee fi qarqara bishaanii- vegetation rich in *Cyperus digitatus, Cyperus longus* and *Phoenix reclinata*	13	11.2

4. 4 Medicinal plant species used by people of the study area

A total of 74 species of medicinal plants (Appendix 2) were collected and identified from the study area. Out of these medicinal plants 47 species (63.51%) were recorded to treat only human ailments while 13 species (17.56) were recorded to treat only livestock ailments. Similarly 14 species (18.9%) of medicinal plants were identified to be used to treat both human and livestock ailments. This is an indication of the presence of good medicinal plant resource in this area similar to other parts of Ethiopia. In the same way, the study made in Horo Gduru, and Bosat District of east shoa zone also identified 81 and 52 medicinal plant species respectively (Hunde *et al*., 2006; Birhanu *et al.,* 2015).

These medicinal plants are distributed over 46 families. Family Fabaceae with 7(9.45%) species had the highest number of species. The second highest family in terms of the number of species is family Asteraceae, with 5 (6.75%) species. Rutaceae, Poaceae and Lamiaceae were the third with 3(4.05%) species; Anacardaceae, Boraginaceae, Verbenaceae, Solanaceae, Combretaceae, Euphorbiaceae, Plantaginaceae, Zingiberaceae, Myrtaceae, Polygonaceae and Tiliaceae were the fourth with 2(2.7%) species each and the rest of the families were represented by one species. The scientific name, family name, vernacular name, parts of plant used growth forms and other information of each plant is summarized in appendix 2.

4. 4.1 Knowledge of medicinal plants transfer among the community of the area

The transfer of the knowledge is mostly from parents (elders) to selected family members through oral communication by making it highly secrete and mostly to the first son. This is because it was believed that the first son is the representative of his father as well as he can keep the knowledge as secretes than other members of the family. Similar ethonbotanical reports (Geday *et al*., 2007; Kidane *et al*., 2014; Birhanu *et al*., 2015) elsewhere in Ethiopia also identified that healers keep their knowledge as the professional secrete. They keep the medicinal plant as secrete because it was believed that if everybody knows it, it becomes no more a

medicine (it's curing capacity decreases). Some knowledge transfer was also to other family members, close relatives and friends.

4. 4.2 Growth forms of the medicinal plants

The results of this study on the growth forms of the medicinal plants of the study area showed that shrubs take the highest number with 27 species (36.48%) followed by herbs with 24 species (32.43%). Trees were the third highest with 20 species (27%) and the other growth form were climbers with 3 species (4.05%) (Table 4.3). This result agrees with the one reported from Jimma zone, Sokoru District by Yinger and Yewhalaw (2007) but contradicts with the report from Horo Guduru by Birhanu *et al* (2015) in which most indicated habit of the medicinal plants in the area were herbs followed by shrubs . According to the idea obtained during the discussion with key informants, the use of shrubs and trees was important since they can exist in dry season than herbs and cannot be easily damaged like that of herbs as well as herbs only appear during rainy season.

4. 4.3 Parts of plants used for remedy preparation

People of the study area used various parts of medicinal plants for remedy preparation. From these different parts of the plants leaves are the most popularly used part (38.28%) followed by roots (16.9%), barks (14.08%) and seeds (11.26). Most ethnobotanical research reports also identified that mostly leaves are used in remedy preparation (Abera, 2014; Njonge *et al*., 2013; Yinger and Yewhalaw, 2007). According to the group discussion made with respondents, in some cases different parts of one plant were used for remedy preparation to treat a single disease. For instance, both the leaves and tuber of *Allium sativum* was used for remedy preparation to treat abdominal cramp. In the other hand one particular disease was treated by remedies prepared from different plants. For example, stomach ache was treated by remedies prepared from five medicinal plants. Since leaves were used for the preparation of most of the remedies, it can contribute to some extent for the conservation of medicinal plants in the area than using roots, because using of root results in damage to the plant permanently. This agrees with the one already reported by (Amenu, 2007).

Table 4.4 Parts of plants used for remedy preparation

Parts of plants used for remedy preparation	Total	(%)
Leaves	28	37.83
Root	13	17.56
Bark	11	14.86
Seed	10	13.5
Stem	5	6.7
Tuber	2	2.7
Rhizome	1	1.35
Sap	3	4.05
Fruit	2	2.7
Whole plant part	1	1.35

4. 4.4 Conditions and methods of remedy preparation

The result obtained from the survey revealed that most of the medicinal plants species in the study area   (53.52%) were used fresh. This may be because fresh plant parts have active ingredients than the dry parts and fresh materials are effective in treatment because the contents are not lost before use compared to the dried one. Others (26.76) were used either in fresh or dried forms and about (19.71%) were used after drying the plant parts.

The results obtained from discussion with respondents on the methods of plants remedy preparation showed that remedies were prepared largely through pounding followed by homogenizing in water (21.12%), chewing (14.08), powdering and dissolving in water (14.08%), grinding (11.26%), and smashing (9.85). The use of pounding as a major means of preparation is very important because during pounding, the juice of the plant is easily extracted and used as a medicine. A similar study made elsewhere in Ethiopia revealed that different preparation methods of medicinal plants were reported in which pounding is the most practiced method (Giday *et al.,* 2003). Other reported preparation methods also include squeezing and dropping the juice (8.43%), cooking (4.22%), crushing (4.22%), leaf infusion (4.22%), warming before fire (2.8%) and fumigation (2.8%). Earlier reports Yirga (2010); Mesfin *et al.* (2005); Hunde *et al.* (2006) also reported similar results.
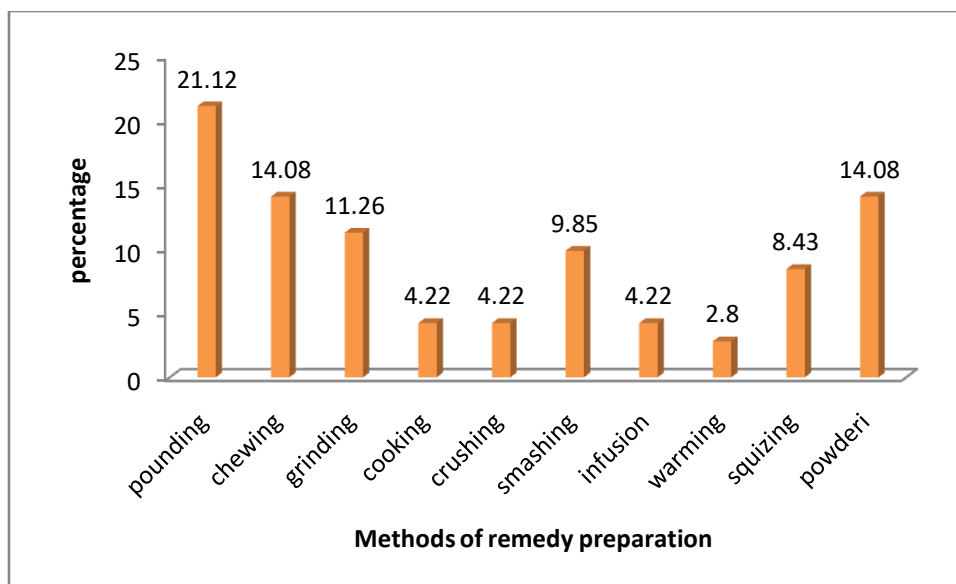
Figure 4.1 Methods of preparation of the remedies

Again according to the views of the respondents, these remedies were prepared either with additives or without them. Some additives such as coffee, milk, table salt, 'arake' and 'honey were mixed with the plant materials during preparation of some of the remedies. The aim of adding these additives during preparation of these remedies is to reduce discomforts while using the medicines. Similarly Giday (1999) also reported that remedies were prepared with additives to make it comfortable for the users. The practice of preparing remedies from the mixture of plants and the addition of some additives during preparation is a better activity because it increases the efficacy of the medicine. For example, the use of *Ruta chalepensis, Zingiber officinale,* and *Allium Sativum* together for the treatment of abdominal crump makes it stronger than using them separately.

4. 4.5 Routs of administration of the remedies

This study also identified that there were various administration route of remedies by the indigenous community where the main routes of administration were oral, topical, dermal and nasal. Ocular and anal administrations of some remedies were also reported. Among these routes of administration, oral administration is the leading route (57.97%) followed by topical (20.6%), dermal (12.3%) and nasal route (8.4%). Similar results were reported by many other researchers (Flaite, 2009; Tolessa *et al.,* 2013; Yirga *et al.,* 2012; Tolessa, 2007) indicating that the main

route of remedy administration was oral route. The use of oral administration as the main route is advantageous because most of the remedies applied through oral are prepared with additives and these additives reduce the discomfort associated with it; so that patients use the remedies easily.
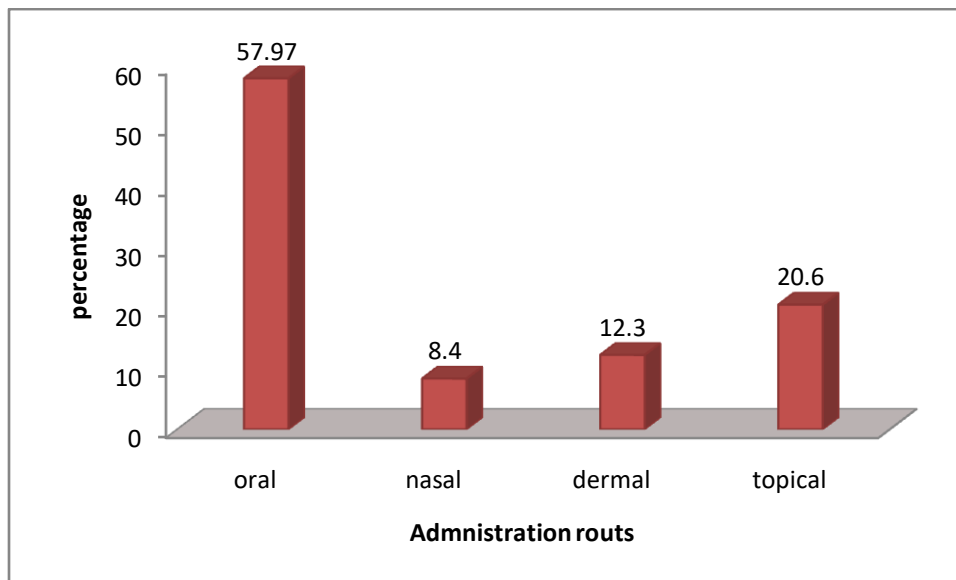
Figure 4.2 Administration routes of the remedies

4. 4.6 Dosage of medicinal plants used

People of the study area used different means of measurement to determine the dosage of the traditional medicine such as counting the number of leaf, number of fruits, bulbs, rhizomes, cup of tea, cup of water, half bottle, full bottle, drop/s etc. People of Horo Guduru, Western Ethiopia also use similar methods of plant remedy preparation Birhanu *et al.* (2015). However, according to the discussion made with traditional healers, the dosage of traditional medicines prescribed by different healers was not the same; it varies from healer to healer. Other healers also revealed that they never measure the dosage; they apply it by diagnosing condition of the patient. This is the main problem associated with traditional medicine Abebe and Ayehu (1993). Although determination of the dosage varies from healer to healer, most of the time the dosage given depends on some factors like age, strength of patients and types of disease and special care is given for pregnant women. For example, Healers never order treatments that were taken orally to

pregnant women because it is believed that it can damage the embryo. This result agrees with the findings of Tolessa *et al. (*2013) where dosages of the remedies vary from one or two spoons full to half or full glass and mostly depend on age and type of illness. According to some informants these drugs had some negative side effects on some people like vomiting, diarrhea, burning sensation of abdomen, slight head ache and others.

4. 4.7 Human ailments commonly treated in the study area

According to the results of the survey the followings were diseases occurring and treated by using medicinal plants in the study area. Abdominal cramp, evil eye, external parasite, eye infection, allergies, hook worm, nasal bleeding, tuberculosis (TB), fibril illness ,fire burn, gonorrhea, head ache, hepatitis (sabbata waaqayyoo), ascaries, back pain (dudda kutaa) chest pain (waraansa laphee),cough, diarrhea, internal parasites, malaria, rabies, ring worm, skin infection (hooqsisaa),fungal infection, snake bite, bone fracture stomachache, wounds, bat poison (simbira halkanii), ear problem, tooth ache, tonsillitis, lymphatic swelling (mudaamuddi), Spider poison, rheumatic, tapeworm.

Large numbers of plants were identified to treat human ailments than livestock ailments. This might be because of people had developed the knowledge of using plants to treat human ailments than livestock ailments. Many human ailments were treated at home level, using medicinal plants. This strengthens the idea that poor families in the rural and remote areas use traditionally made plant remedies because of its availability and cost effectiveness as reported by Kelbessa *et al*. (2004); Street and Prinshoo (2012). Among the medicinal plants species used to treat human ailments, many of them were used to treat wounds (11%), stomach ache (8.3%), abdominal cramp (6.9%), common cold (6.9%), and head ache (5.5%) (Table, 4 .6).

Table 4.6 Human ailments commonly treated in the study area and plant species used for the treatment

Human ailments	Plant species used to treat the ailments	(%)
Tonsillitis	3	4.16

Swelling gland	2	2.77
Common cold	5	6.9
Abdominal cramp	5	6.9
internal parasite	2	2.77
Stomach ache	6	8.33
Rheumatic	1	1.3
Chest pain	1	1.3
Headache	4	5.5
Hepatitis	2	2.77
Tooth ache	3	4.16
Skin infection	2	2.77
Diarrhea	2	2.77
Eye infection	1	1.3
Ring worm	1	1.3
Wound	8	11.1
Febrile illness	3	4.16
Fungal infection	3	4.16
Evil eye	2	2.77
Swelling	2	2.77
Malaria	2	2.77
Allergies	1	1.3
Hook worm	2	2.77
Fire burn	1	1.3
Gonorrhea	1	1.3
Snake bite	2	2.77
Bone fracture	3	4.16
Chest pain	1	1.3
Nasal bleeding	1	1.3
Tuberculosis	1	1.3
Spider poison	1	1.3
Tape worm	1	1.3

4.5 Medicinal plants used for livestock treatment

Thirteen medicinal plant species treating only livestock ailments were collected and identified from the study area. These plants are distributed over eleven families. Family Asteraceae and Fabaceae comprise two species each and Dracaenaceae, Anacardaceae, Poaceae, Rosaceae, Solanaceae, Moraceae, Loganiaceae, Araceae, and Piperaceae comprise one species each. Most of these species were obtained from the wild; only three species *Calpurnia aurea, Dracaena steudneri* and *Nicotiana tabacum* were collected from home gardens. Similarly, 27 and 8 species of plants treating livestock ailments were reported from West Showa, Ejaji area and Dega Damot, Amhara region by Amenu (2007) and Limenih *et al.* (2015) respectively. Cultivating livestock remedies in home gardens is not common in the study area. This could be because of most of the medicinal plants used for the treatments of livestock ailments were not edible by humans. In the study area it was observed that what people mostly cultivated around their home garden were edible plants. This is similar to the finding of Kidane *et al.* (2014) that people mostly cultivate edible plants around their home.

4. 5.1 Growth habit and parts used for remedy preparation

The growth habits of medicinal plants used for live stock health problems in the study area were shrubs which consist of 6 species (46.15%), trees 5 species (38.46%) and herbs 2 species (15.3%). This finding contradicts with the finding of (Amenu, 2007) and (Etana, 2010) in which trees were the dominant growth habits for the treatment of livestock ailments but agrees with the work of (Tolessa, 2007) in which Shrubs were the most represented growth forms for remedy preparations.
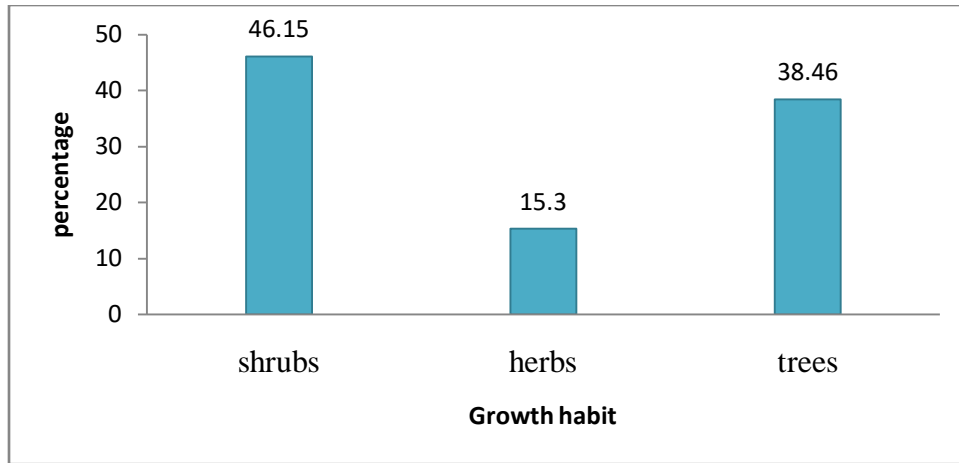
Figure 4.3 growth habits of plants used for livestock remedy preparation

Medicinal plant parts used for treatment of live stock health problems in the study area were leaves, bark, and sap. Like that of plants used for human treatment leaves are again the most widely used plant part for remedy preparation to treat livestock ailments.
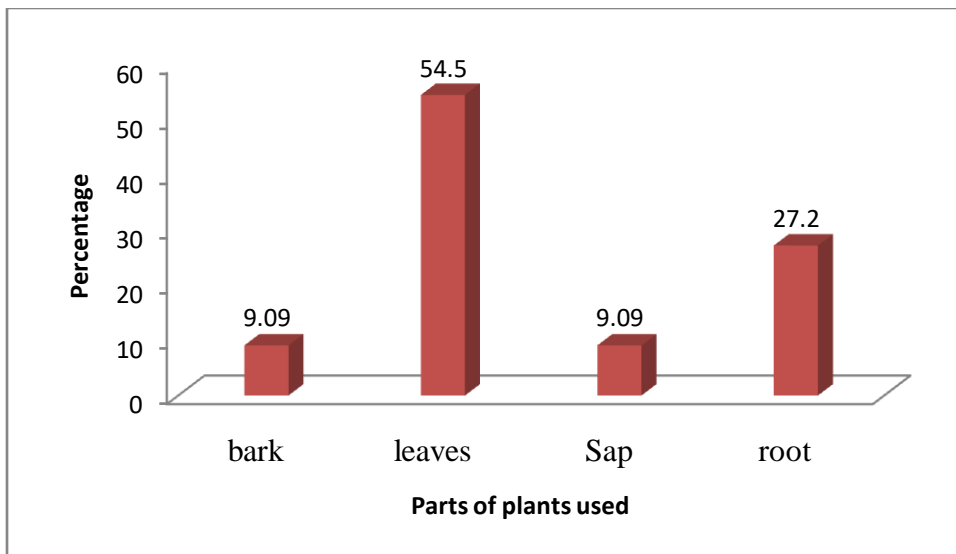
Figure 4.4 parts of plants used for livestock remedy preparation

4. 5.2 Method of preparations and routes of administration

People of the study area developed various methods of remedy preparation and administration to treat different livestock ailments. The common methods of preparation practiced in the area were

pounding followed by filtering, pounding followed by homogenizing in water, powdering followed by dissolving in water, crushing, dropping, smashing and grounding. Pounding is the most commonly practiced method of remedy preparation followed by crushing and powdering. For instance, *Dracaena steudneri* root and bark pounded, salt was added, homogenized in water and given orally for few weeks at intervals of two or three days by observing the progression made at each intervals of the days. Etana (2010) also reported similar result from Goma District, Jimma Zone. The most common route of administration practiced in the area was oral application. Other methods like dermal, topical, ocular and nasal administrations were also applied. Similar routes of administration were also reported by Amenu (2007) and Limenih *et al.* (2015).

4. 5.3 Dosage

In preparing remedies for livestock there were no accurate measurements similar to that of humans. Traditional practitioners used different tools like half bottle, full bottle, tie of leaf, hand full of bark, bunch of root and estimate the amount depending on the severity of the disease and age of the cattle.

4. 6 Livestock ailments commonly treated in the study area

The result of the survey revealed that the followings were livestock ailments occurring and treated by using medicinal plants. Retained placenta, external parasite, cough, physical weakness, rabies, hyena bite, black leg, leech, trypsis (Gandii), snake bite, bloat, swelling (dhitoo horii), scabies, eye infection, bloody urine and diarrhea.

Table 4.7 Livestock ailments commonly treated in the study area

Livestock ailments	Number of Plant species used	%
Retained placenta	4	30
External parasite	4	30
Cough	3	23

Physical weakness	1	7.6
Rabies	1	7.6
Hyena bite	1	7.6
Black leg	2	15.3
Leech	2	15.3
Trypsis (Gandii)	2	15.3
Snake bite	1	7.6
Bloat	2	15.3
Swelling (dhitoohoii)	1	7.6
Scabies	1	7.6
Infection of eyes	2	15.3
Bloody urine	1	7.6

4. 7 Informant consensus (agreement) on the medicinal plants

The study revealed that the medicinal value of some medicinal plants is very well known and had high acceptance than other medicinal plants in the study area. The local community proved their medicinal value through time because they were cited by a number of respondents (more informant consensus) than the others. Those medicinal plants cited by several respondents and believed to have more respondent agreements were listed in the table below.

Table 4.8 Informant consensus score

Scientific name	Number of respondents	(%)
Solanum giganteum	24	40
Piper capense	34	56.6
Brassica nigra	28	46.6
Nicotiana tabacum	36	60
Warburgia ugandensis	34	56.6
Ocimum gratissimum	31	43.6

Flacourtia indica	31	43.6
Allium Sativum	38	63.3
Echinops kebericho	32	53.3
Croton macrostachyus	38	63.3
Calpurnia aurea	23	38.3
Buddleja polystachya	27	45
Brucea antidysenterica	26	43.3
Zingiber officinale	38	63.3
Ruta chalepensis	35	58.3

Accordingly *Allium Sativum, Zingiber officinale and Croton macrostachyus* are indicated by the highest number of informants 38 (63.3%) followed by *Nicotiana tabacum* 36 (60% informants and *Ruta chalepensis* 35(58.3%) informants respectively.

4. 8 Ranking of medicinal plants depending on their medicinal effectiveness

4. 8.1 Preference ranking

As shown in (table 4.8) the preference ranking made on six medicinal plants used by the indigenous community of the study area in treating abdominal pain showed that *Zingiber officinale* stood first among the six plant species followed by *Allium Sativum, Brassica nigra, Ximenia americana*, *Caylusea abyssinica and Ruta chalepensis* respectively. People showed preference to certain plants among the many plants used to treat one particular ailment. Similarly Berhanu (2002) reported, pair wise ranking of medicinal plants to reveal the most preferred medicinal plants used by the local people of Gojjam is showing that *Allium sativum* was the most preferred anti malarial plant.

Table 4.9 Preference ranking of medicinal plants treating abdominal cramp

Medicinal plants	Respondents A__I										Total	Rank
	A	B	C	D	E	F	G	H	I	J		
Brassica nigra L.Koch	2	3	3	2	2	3	2	3	4	3	28	3rd
Ximenia americana L.	1	2	2	2	2	2	2	2	3	2	20	4th
Allium Sativum L	2	3	3	4	4	4	3	5	4	5	37	2nd
Ruta chalepensis	1	1	2	2	2	1	2	1	2	2	16	6th
Zingiber officinale	4	5	3	5	4	5	4	6	5	5	46	1st
Caylusea abyssinica	1	2	2	1	2	2	2	1	2	3	18	5th

4. 8.2 Paired comparison

Paired comparison was done among seven medicinal plants that were proved by the informants

for their use in treating wounds by taking eight respondents and their rank was identified.

Accordingly, *Solanum giganteum* ranked first followed by *Croton macrostachyus* and *Citrus*

limon, respectively (Table 4.9). This result indicated that these medicinal plants were stronger

than other plants in treating wound in the study area. This result of paired comparison may

possibly indicate that people usually use plants with strong curing capacity for a given ailment as

also indicated by other researchers (Kaba, 1998); (Yirga, 2010).

Table 4.10 Paired comparison of medicinal plants used to treat wounds

Medicinal Plants species	Respondents(R$_1$_____R$_8$)								Total	Rank
	R$_1$	R$_2$	R$_3$	R$_4$	R$_5$	R$_6$	R$_7$	R$_8$		
Croton macrostachyus	3	2	3	2	4	3	2	4	23	2nd
Ficus vasta	2	1	2	1	2	1	2	1	12	6th
Plantago lanceolata	2	1	2	3	1	3	2	3	19	4th
Citrus limon	3	2	3	2	3	2	4	2	21	3rd
Stephania abyssinica	2	1	2	1	2	3	2	3	16	5th
Solanum giganteum	4	3	4	2	4	3	4	4	28	1st
Datura stramonium	2	3	2	1	3	2	2	1	16	5th

Key- R, respondents, 1= the least; 2 = Good; 3 = Very good, 4 = Excellent

4.8.3 Informant consensus factor (ICF)

The results of the study revealed that ailments that are commonly appearing in the study area have higher informant consensus factor with ICF values ranging from 0.6 to 0.86. Stomach ache has the highest ICF value (0.86) followed by wounds and fire burn (0.84).

Table 4.11   Informant consensus factor (ICF)

Ailment categories	Number of Species	Use citation	ICF
Fire burn, Wound	8	44	0.84
Ring worm, Fungal infection	4	9	0.62
Snake bite, rabies	5	14	0.69
Skin infection, external parasite	3	6	0.6
Headache, Tooth ache, Nasal bleeding	8	40	0.82
Hepatitis, Hook worm	4	17	0.81
Eye infection, ear problem	3	7	0.66
Common cold, Tuberculosis, cough	6	18	0.70

Abdominal cramp, Ascariasis, Tape worm, Diarrhea	9	45	0.81
Stomach ache	6	38	0.86
Chest pain, back pain,	3	8	0.71
Febrile illness, Malaria	5	19	0.77
Tonsillitis, Swellings, lymphatic swelling	7	27	0.76
Evil eye	3	9	0.75
Bone fracture	3	6	0.6
Spider poison, allergies	2	6	0.8

4.9 Plants with multipurpose roles in the study area

Among the seventy four medicinal plants identified from the study area most of them have multipurpose activities besides being used as medicinal. The data obtained from the respondents revealed that seventeen species (22.97%) were reported to have only medicinal value. The rest fifty seven species (77.02%) were reported to have different uses, for instance they were used as edible, forage, cash crop, fencing, spices, washing (as soap), preparation of traditional alcoholic drinks, construction, fire wood, charcoal, farming tools and home furniture. This different use values of medicinal plants indicated that they were playing significant role for the people besides being used as medicine (Table 4.2).

Table 4.12 use diversity of medicinal plants

Uses of the plants	Number of species	%
Only for medicinal use	17	23.94
Other uses beside medicinal	Number of species	%
Edible	15	21.12
Forage	7	9.8
Cash	4	5.63
Fencing	9	12.6
Spices	4	5.6

Washing (as soap),	2	2.8
For traditional alcohols	2	2.8
Construction	7	9.8
Fire wood and charcoal	26	36.6
Farming tools	18	25.35
Home Furniture	3	4.22
Bee hive tying	4	5.63

In the study area some plants were used for different purposes, such as *Syzygium guineense* is edible, used for construction, farming tools, firewood and bee hive tying. Similarly *Albizia schimperiana* is used for construction, farming tools, beehive tying, forage and fire wood.

4. 9.1 Direct matrix ranking

In this study, many medicinal plants were identified to have multipurpose use besides being utilized as medicine. The additional uses include, Fire wood, Home furniture, Forage, Charcoal, Farming tools, bee hive tying and others. Eight commonly reported multipurpose medicinal plants species and seven use-categories were included in direct matrix ranking exercise and their relative use was evaluated in the table. Accordingly *Syzygium guineense, Eucalyptus tereticorni* and *Albizia schimperiana* were ranked 1st, 2nd and 3rd respectively. Except *Eucalyptus tereticorni* the other two species *(Syzygium guineense* and *Albizia schimperiana)* were scarce in their distribution in the wild even though they were cultivated to some extent in the coffee farm land. This could be because of their wide consumption by the community. Even though *Eucalyptus tereticorni* was also highly used by the people, they cultivated it more than any plant species in the community next to coffee plant. The higher the direct matrix ranking, the most that plant is assumed to have multiple purpose.

Table 4.13 Direct matrix ranking of medicinal plant species on their use values

uses	*Syzygium guineens*	*Albizia schimper*	*Ficus vasta*	*Ehretia cymosa*	*Buddleja polystach*	*Eucalypt us*	*Premna resinosa*	*Vernonia amygdali*	Total	Rank
Fire wood	5	5	3	5	3	5	4	5	35	1st
medicinal	3	3	2	3	3	3	3	3	23	4th
Edible	5	0	1	0	0	0	0	0	6	7th
Home furniture	3	3	3	3	2	4	3	0	21	5th
Forage	2	2	5	1	2	0	2	4	18	6th
Charcoal	5	4	3	2	2	5	2	3	25	3rd
Farming tools	5	3	2	5	2	5	2	3	27	2nd
Rank	1st	3rd	4th	4th	7th	2nd	6th	5th		

Key: 5 = the best, 4 = very good, 3 = good, 2 = less, 1 = the least, 0 = not at all

4. 10. Threats to medicinal plants

Like other parts of Ethiopia, in Lalo Asabi District medicinal plants were threatened by different factors. Agricultural expansion, specially the wide expansion of the cultivation of coffee plants, habitat destruction due to deforestation, over grazing mainly in the grasses, herbs and tree seedlings by livestock and soil erosion by running water had been identified as the factors to the loss of medicinal plant species. Similar study elsewhere in Ethiopia by Asfaw (2001) also confirmed these conditions. Again Similar results were also reported from other parts of Ethiopia by Kelbessa *et al.* (1992); Tadese *et al*. (2005). About 85% of the people of the study area are farmers. They use plants for different purposes like construction of their own houses and that of their cattle, for different farming materials and home furniture as well as making and selling of charcoals by those with farmland less and poor farmers. In addition to over harvesting, overgrazing of herbal medicine by livestock was also affecting the medicinal plants of the area. In the area there were no extra fields to graze livestock so that continuously overgrazing by

livestock in the same area resulted in damage and disappearance of the herbal medicine. Similar reports by Giday (2003); Asfaw (2010) and Edwards (2001) confirmed that medicinal plants are considered to be at management hazards due to over use and destructive harvesting.
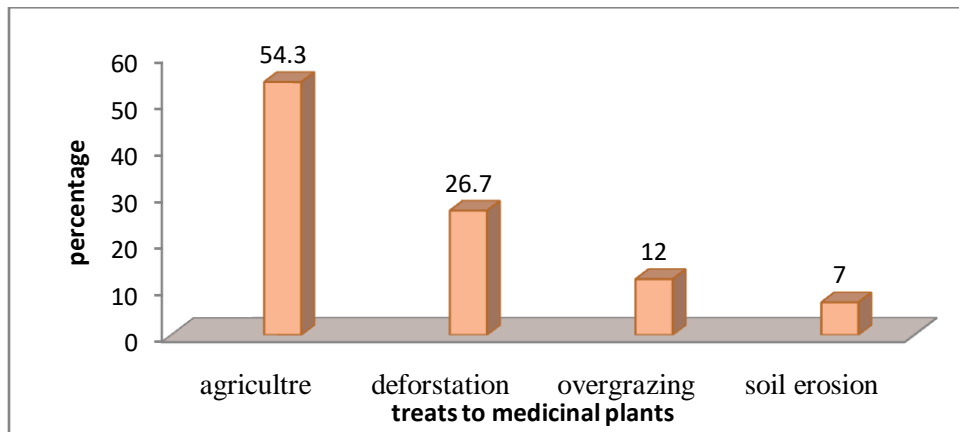

Fig. 4.5 treats to medicinal plants

4. 11 Threats to the indigenous knowledge

Factors like, inappropriate transfer of the knowledge from elders to the youngsters; low interest of youngsters and religious factors were identified treating medicinal plants knowledge.   This means there is no programmed transfer of the knowledge, simply elders tell to the younger orally when they become too old. Since there is no any documentation of the knowledge, it can be easily forgotten and results in erosion of the knowledge. In addition youngsters showed very low interest to learn such knowledge from elders, most of the time they consider learning the knowledge as backwardness and as it is only for those who do not have modern education. Other studies WHO (2002); Pankhurst (2001) and Abbink (1995) revealed similar results.

In the other hand some religions do not accept the knowledge; they assume it as something which has relation with bad spiritual action and working with the power of evil spirits. These conditions contributed a lot for the threatening of the indigenous knowledge of the ethnomedicinal plants in the study area.

4. 12 Conservation of medicinal Plants in the study area

According to the study revealed, people of the study area were poor in conserving the medicinal plants. As the discussion made with key informants realized, they search for the plants only when they need them, at other time no one pays attention about it, they focus only on their immediate benefit. Since most of the medicinal plants in the study area were harvested from the wild, they were exposed to different manmade and natural destruction activities. Eventhough they have knowledge about the effect of destruction of plants, the effort they made in conserving medicinal plants was very law as also reported by Balemie *et al.* (2004) from the study made around Rift valley. Again Cunningham (1996) also reported that conservation of medicinal plants need urgent response from the concerned bodies. Traditional healers search for medicinal plants in the forest whenever patients visit them. The belief behind this is to make the plants not to be known by the patients. This is why they never cultivate medicinal plants specially those that are believed as strong medicine around their home. Because of this conservation status of medicinal plants in the study area were highly limited and required proper considerations.

However, in some places a few medicinal plants were observed cultivated around home gardens and in coffee farm lands. For instance, *Rhamnusprinoides, Rutachalepensis*, *Calpurnia aurea*, *Lippia javanica*, *Ocimum basilicum, Zingiber officinale*, *Allium Sativum, Catha edulis, Ricinus communis* and *Dracaena steudneri* were cultivated around home. *Croton macrostachyus, Cordia africana,Albizia schimperiana, Syzygium guineense* and *Vernonia amygdalina,* were medicinal plants cultivated in the coffee farm lands. These activities were good for the conservation of the medicinal plants since these areas are protected by the people. Kidane *et al.* (2014) and Asfaw (2001) also reported that conservation of medicinal plants is possible by cultivating them in places of worship (churches, mosques), farm margins, road sides and live fences.

5. CONCLUSION

The present study revealed that local people of the study area had deep knowledge of their own in classifying plant resources in their area. There were multiple customs, traditions and norms that enable them to do so. In the study 74 medicinal plants were used to treat human and livestock ailments. Among these medicinal plants 47 species (66.19%) were noted to treat 34 human ailments whereas 11 species (15.49%) were used to treat 15 livestock ailments and 13 (18.3%) medicinal plants were used to treat both human and livestock ailments. The reported medicinal plants were used for various purposes, for instance, food, forage, construction, firewood, home furniture and for different cultural values. However compared to its consumption, conservation of these resources is not significantly worked on by the people. Medicinal plants in the area and associated indigenous knowledge are almost disappearing.

The growth habit of the plants is mostly shrubs and herbs. Leaves are the widely used plant part for remedy preparation in which fresh plant parts are widely used. Most of the plants were collected from the wild except a few edible plants from home garden and around farm lands. Methods of preparation of remedies mostly involve pounding followed by filtering, pounding followed by homogenizing in water and crushing in which single or mixture of plants are used. The mode of administration of remedies is mainly internal in which oral administration is the main route of administration. There is no accurate dosage of these medicines; traditional healers use different tools to estimate the dosage. For instance, handful, half bottle, full bottle, one cup of tea or coffee, number of leaf ties and the like.

In the study area 49 ailments, 34 for human and 15 for livestock were identified to be treated by traditional medicinal plants of the area. As pointed out by informants, abdominal pain, wound and stomach ache were the common ailments of humans reported and similarly retained placenta, cough and external parasites were the commonly reported livestock ailments. People usually use plants with strong curing capacity for a given ailment as well as show preference to certain plants among the many plants used to treat one particular ailment.

Threat to plants in general and to medicinal plants in particular were mostly due to expansion of agricultural activities, deforestation of vegetations by different agents, over grazing and using

plants for different constructions. These are the causes for reduction in quantity of medicinal plants than utilization for medicinal purpose. Impact of modern education, unwillingness of the young generation, religious factors as well as oral based knowledge transfer was the main factors negatively affecting traditional medicinal plants knowledge.

6. RECOMMENDATIONS

Based on the results of the survey, the following ideas are recommended:

❖ Natural resources such as plants are vital for the survival of all life forms; therefore, indigenous people of the study area should conserve and manage plant resources of their area as well as indigenous knowledge associated to them.

❖ Awareness creation on young generation should be given due attention to raise their attitude towards learning of traditional medicinal plant knowledge and using of them from their elders.

❖ Traditional practitioners should be encouraged and their knowledge should be protected. Any impact from modern knowledge and religion should be managed positively.

❖ Because the local people harvest vegetations for different uses without thinking of its sustainability due to lack of proper awareness, awareness should be created by concerning bodies like development agents, agricultural and rural development workers and others through which the idea of sustainable utilization will be practiced.

❖ Training program to the local people, on how to use plant resources and its ways of conservation at kebele or District level by skilled agricultural workers, NGOS or any concerned body should be practiced regularly.

❖ Both in-situ and ex-situ conservation strategies should be practiced in the area through training farmers to ensure the recovery of threatened medicinal plants species by initiating the local people to cultivate medicinal plants around their home gardens, in the farm lands like mixing with coffee plants and around spiritual areas.

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