

DILLA UNIVERSITY

**SCHOOL OF GRADUATE STUDIES DEPARTMENT
OF BIOLOGY**



ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS AND THEIR USE TO TREAT HUMAN AILMENTS IN ALETA-CHUKO DISTRICT, SIDAMA ZONE SOUTH ETHIOPIA

BY MISLE ABEBE

**A THESIS RESEARCH SUBMITTED TO SCHOOL OF GRADUATE
STUDENT DEPARTMENT OF BIOLOGY IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
BIOLOGY (BOTANICAL SCIENCE)**

ADVISOR

Dr. TALEMOS SETA (PhD)

MARCH, 2020

DILLA ETHIOPIA

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APPROVAL SHEET
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As members of the Examining Board of the Final MSc Open Defense, we declare that we have read and assessed the thesis prepared by **Misle ABEBE** entitled “**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED TO TREAT HUMAN AILMENT IN ALETA- CHUKO DISTRICT, SIDAMA, ZONE, SNNPRS, ETHIOPIA**” and recommend that it be accepted as fulfilling the thesis requirement for the degree of Master of Science in Biology (Botanical science)

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STATEMENT OF AUTHOR

The thesis is my own work and that all source of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirement for M.Sc. degree at the Dilla University and is deposited at the Aleta- Chuko woreda Administrativ offices to be made available to any other institutions for the purpose of academic degree, diploma, or certificate studies and other purposes as adocument.

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Name: Misle Abebe

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ACRONYMS AND ABBREVIATIONS

AWAO	Aleta- chuko woreda Adminstrative office
AWARDO	Aleta- chuko woreda Agricultural and rural development office
AWEO	Aleta –chuko woreda Education office
AWFEDO	Aleta- chuko woreda Finance and Economy development office
AWHO	Aleta- Chuko Woreda Health office
CSA	Central Statics Agency
FL	Fidelity Level
Ha	Hectare
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
Masl	Meter above sea level
MPs	Medicinal plants
NBSAP	National Biodiversity Strategies and Action Plan
SNNPR	Southern Nation and Nationality People Regional State
TH's	Traditional Healers
TMPs	Traditional medicinal plants
WHO	World health organization

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS	v
ACKNOWLEDGEMENT.....	vi
LIST TABLES	x
LIST OF FIGURES.....	xi
LIST OF APPENDICES	xii
ABSTRACT.....	xiii
Chapter one	1
1. INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the problem.....	2
1.3 Research Questions	3
1.4 Significance of the study	3
1.5 Limitations of the Study	4
1.6 Objectives of the Study	4
1.6.1 General objective	4
1.6.2 Specific objectives	5
Chapter two	5
2. LITRATURE REVIEW	5
2.1 Origin and Development of Ethno botanical Study	5
2.2 Indigenous knowledge and Medicinal Plants	6
2.3 Medicinal Plants and Ethno medicine in Ethiopia.....	7
2.3.1 Role of medicinal plants in Ethiopia	7
2.3.2 Traditional Medicinal plants in Human Health Care System of Ethiopia	8
2.3.3 Threats to indigenous knowledge and traditional medicinal plants in Ethiopia	8
2.3.4 Conservation of Medicinal Plants and Associated knowledge	9
Chapter three.....	10
3. MATERIALS AND METHODS.....	10
3.1. DESCRIPTION OF THE STUDY AREA.....	10
3.1.1. Location of the Study Area.....	10
3.1.2. Climate	12

3.1.3. Population and Medicinal Services	13
3.1.4. Natural Vegetation and Major Cultivated Crops	13
3.1.5. Land use and Soil types.....	13
3.1.6. Socio- economic Activity	14
3.1.7. Livestock and Wild life	14
3.2. Materials used for Data Collection.....	14
3.3. Reconnaissance survey and Selection of Study Sites.....	15
3.4. Informant Selection (Sampling)	15
3.5. Ethno botanical Data Collection.....	16
3.6. Types and ways of Data Collection.....	16
3.7. Specimen Collection and Identification.....	18
3.8. Data Analysis	19
3.8.1. The Informant Consensus Factor (ICF).....	19
3.8.2 Direct Matrix Ranking	19
3.8.3 Paired Comparison Method	19
3.8.4. Fidelity Level (FL).....	20
3.8.5. Medicinal Use Value.....	20
Chapter four	21
4. RESULTS AND DISCUSSION.....	21
4.1 Knowledge of Local Community on Traditional Medicinal Plants	21
4.1.1 Traditional Knowledge with respect to Age	21
4.2. Indigenous Knowledge of Local Community in the Study Area	24
4.2.1. Local Topographic Classification of Land.....	25
4.3. Sources of medicinal plants for human ailment treatment of the study area.....	26
4.3.1 Distribution of Medicinal Plants in the Study Area and Sites	28
4.4. Comparative Distribution of Medicinal Plants in the three.....	28
Agro-ecological Zones.....	28
4.5. Medicinal Plants Used to Treat Human Diseases.....	30
4. 6. Habits of Medicinal Plants.....	32
4.7. Parts of Medicinal Plants Used.....	33
4.8. Methods of Preparation and Forms Used	34
4.8. Routes of Administration.....	36

4.9 Dosage of Traditional Medicine Usage	37
4.10. Applications of Medicinal Plants	38
4. 10.1 Conditions of preparations of medicinal plants	40
4.11. Importance of Medicinal Plants	40
4.11.1 Informant Consensus	40
4.11.2 Informant Consensus Factor (ICF).....	42
4.11.3 Fidelity Level.....	43
5.11.4 Paired comparison.....	44
4.11.5. Preference Ranking	45
4.12 Conservation and Threats to Medicinal Plants	49
4.12.1. Threats to Medicinal Plants and Indigenous Knowledge	49
4.12.2 Conservation of Medicinal Plants	50
Chapter five	52
5. CONCLUSION AND RECOMMENDETION	52
5.1. CONCLUSION	52
5.2 – RECOMMENDATIONS	53
REFERENCES	54
APPENDICES	i

LIST TABLES

Table 1: Specific GPS measures medicinal plants and Average Geographic location in each study sites	10
Table 2: General information about respondents compaired by age grops in the Study area	21
Table 3: Educational status of informants in the study area	23
Table 4: Specific GPS measures of minimum and maximum Altitudinal measures Of the study sites	28
Table 5: Showing types of human ailments, number of medicinal plants used and Number of informants indicated in the study area	30
Table 6: Plants parts used in preparation remedies	34
Table 7: Preparation methods of traditional medicine in the study area	35
Table 8: Routes of administration and number of application of plant medicines...	36
Table 9: Informant Consensus on mostly used Medicinal plants	41
Table 10: Informant consensus factor by categories of diseases in the study area...	42
Table 11: Fidelity Level of Medicinal Plants	43
Table 12: Paired comparison of selected five medicinal plants	45
Table 13: Preference ranking of medicinal plants used for treating diarrhea According to perceptions of informants	46
Table 14: Direct matrix ranking score of eight medicinal plant species	47
Table 15: Use value of certain medicinal plants in the study area	48

Table 16: Threatening factors of medicinal plants in the study area	49
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LIST OF FIGURES

Figure1. Adminstrative Map of the study area -----	11
Figure 2.Climadiagram of Rainfall and Temprature of Aleta- Chuko district -----	12
Figure 3.Orientations and group discussion with the selected informants In Aleta- chuko district Gellma kebele -----	17
Figure 4. Specimen collection with an informant in the study area Hallo Kebele -----	18
Figure 5. Pectures showing field observation individual and group Disscution in different kebeles of the study sites -----	22
Figure 6. Habitats of medicinal plants -----	27
Figure 7. Growth forms of medicinal plants for the treatment of human Health Problems -----	33
Figure 8. Routes of Administrations of remedies-----	37
Figure 9. Mode of Application of TM in the remedies -----	39
Figure 9. Conditions of medicinal plants used for the preparation of the Remedies -----	40

LIST OF APPENDICES

Appendix- I. List of Medicinal plants of Aleta chuko woreda used for treating

Only human ailments i

Appendix- II. Scientific names of Medicinal Plants, their Family, Local names,

Habits and their Habitat in Aleta chuko District..... xiii

Appendix-III. Types of medicinal plant Families, their numbers and

Percentage taken in the study area xvi

Appendix- IV. List of human diseases and percentages of medicinal plant

Species used by Local people xviii

Appendix- V. List of informants participated during data collection in each kebele

Of Aleta – chuko district xx

Appendix- VI. Checklist of questions used for discussion and semi-structured

Interview xxiii

ABSTRACT

Medicinal plants and knowledge of their uses provides a vital contribution to human being health care needs throughout Ethiopia. Despite the wide role of medicinal-plant use by local communities, traditional utilization and management practices are not well documented in Aleta-Chuko woreda, Southern Ethiopia. The objectives of this study were to identify wild and home garden medicinal plants and document indigenous knowledge about their utilization and practices in the study area. Ethnobotanical data were collected using semi-structured questionnaires, key informant interviews and field walk on vegetation's and fields of the study area. Ethnobotanical uses of trees, shrubs and herbs were identified and documented to treat human diseases. In this study a total of 81 medicinal plant species distributed in 75 genera and 45 families were identified. From these 42 (51.85%) species were collected from wild, 35 (43.2%) species were collected from homegardens and the rest 4 (5%) were collected from fence and road side. The 81 recorded plant species have medicinal values for 46 types of different health problems. Oral administration were widely used (68.1%), followed by dermal applications (23%). The most widely used plant parts is Leaves (38.4%) than roots (14.1%), stems (3.1%), seeds and flowers (4%) in respective order. The study's results indicated that wild medicinal plants are valuable resources to the local community. Accordingly, the majority of the population that lives in the rural and the poor people in urban areas rely mainly on traditional medicines to meet their primary health care needs. Thus, wild medicinal plants contain the highest collection (52%) than the homegarden (40.7%). In the preparation method pounding takes the highest (31.1%), chewing (20.5%) and rubbing, painting and creaming together (9.8%). In the study 80 informants and 20 key informants totally 100 local community members participated in the study area.

Key word: *Ethnobotany, Medicinal plant, indigenous knowledge, Aleta- Chuko District.*

Chapter one

1. INTRODUCTION

1.1 Background of the Study

People around the world have unique knowledge of plant resources on which they depend for food, medicine and other uses. Plants have been vital sources of both preventive and curative traditional medicine for man. It was estimated that 25 000 to 75 000 species of higher plants have been used in traditional medicine worldwide (Farnsworth NR., 1985). About 80% of the population in Africa primarily depends on traditional medicinal plants for their health-care (WHO, 2002).

The use of traditional medicinal plants (MPs) has been widely practiced in Ethiopia. Indigenous peoples of different localities in the country have developed their own specific knowledge to use, manage and conserve plant resources, which gave traditional medicine its diverse nature. Extensive use of traditional medicine in Ethiopia could be accredited to efficacy against certain type of ailments, economic affordability, physical accessibility, and cultural acceptability as compared to modern medicine. Medicinal plants contain drugs used for suppressing, preventing or curing many forms of diseases and more than 95% of traditional medical preparations are of plant origin in Ethiopia. Modern studies on traditional MPs in Ethiopia started in 1973. Ever since this time, researchers have been doing investigations on MPs, especially on local knowledge of traditional MPs (Megersa Mesfin *et al.*, 2013). Medicinal plants still play considerable role in the health care system of the developing world. As a result of its wide range of altitude and great geographical diversity, Ethiopia is an important regional centre for biological diversity. There are about 6500-7000 vascular plants in Ethiopia, nearly 12% of which are endemic (Teweldebirhan Gebere Egziabher, 1991). In Ethiopia, plants are used as a source of traditional medicine from antiquity to solve different health problems and human ailments. Nearly 80% of the population in Ethiopia use plant-based traditional medicine as their primary health care system. Studies indicated that habitat and species are being lost as a result of combined effects of environmental degradation, agricultural expansion, deforestation

and over harvesting of species. Poor resource administration, lack of awareness on medicinal plants, oral transmission of MP are also influencing MP resources. Hence, detailed information on MPs is significant especially for rural and poor societies, still relying on traditional MPs to fight a number of diseases. This fact holds true for indigenous peoples of Sidama who depend on plant resources for various purposes. Accordingly, the study aims to identify and document the traditional MP knowledge of Sidama people in Aleta- Chuko district.

1.2 Statement of the problem

Ethiopia has diverse climate and soil types that enable growth of several indigenous medicinal essential plants. These plants have enormous economic, social and medicinal benefits. However, despite the existing enormous potentials of production and subsequent benefits from these commodities, no strong attention has been given to improve their cultivation, production and processing technologies. Most parts of Ethiopia the rich biological diversity and indigenous knowledge of this diversity was not sufficiently documented, and many of the studies made up to now do not target on a specific agro ecological zones of the country. For instance the greater concentrations of medicinal plants are found in the south and south western parts of the country following the concentration of biological and cultural diversity. Despite the use of traditional medicine over many centuries, relatively small numbers of MP's species have been studied for possible medical applications, and the spread of this knowledge is mostly limited to indigenous societies.

Thus, the need to perform ethno botanical research to document the medicinal plants and the associated indigenous knowledge (IK) is a valuable task. Moreover SNNPRS specially the Sidama Zone particularly Aleta-chuko district which is showing that many plant species were threatened with extinction if deforestation, urbanization and drought are to continue due to the following problems :-

- Loss of indigenous knowledge and Loss of cultural assets
- Danger on medicinal plant through smuggling and misuse of resources
- Ecological degradation
- Traditional healers may not participate and fully collaborate etc.

The indigenous knowledge about traditional MPs was transferred secretly from generation to generation orally which makes the knowledge more difficult in the transfer process.

From the woreda Agricultural office, guide expert information and informant group discussion, there was no previous report indicating conduct of ethno botanical study on human ailments in selected study district, since the woreda formed recently departing from other wordas of the the zone (ACWAO).

1.3 Research Questions

The focus of the study is to assess the indigenous traditional use and remedies of various plants which were used by the people of Aleta- Chuko woreda. The finding of the study finally will try to answer the following main research questions:-

- What are the main or most common human health problems or disease in the area?
- List plant species used to treat human disease in the area?
- What are the methods of preparation of human medicinal plants?
- Which medicinal plants/parts are commonly used for treatment of human disease?
- What are the major threats to medicinal plants, as a group or individual species?
- For what other purposes the medicinal plants used? Beside its medicinal value
- What are the crucial problems facing medicinal plants?

1.4 Significance of the study

Traditional medicine is an integral part of the healthcare system. Due to very scarce modern healthcare facilities around rural area of the country as well as the study district and the economic insufficiency of the community to meet the prices of available modern healthcare services, THs are the most reliable providers of Health care services to the community. It will be important for the sustainable management and conservation of medicinal plants providing the valuable information to the local people in different aspects of traditional practices associated with plant based health care systems which are in use since time immemorial and was supposed to be the only system available for health care to get cured from disease arising from worms, fungi, virus, protozoa and other human ailments. This shows that using traditional medicine in Ethiopia for primary health care are becoming accepted and popular. Indigenous stewardship of the natural resource, including

the TM plants, has to be documented and augmented with government and non-government environmental rehabilitation programs to conserve the vegetation of the area. The study will carry out in Aleta–Chuko woreda, Ethno botanical study of Medicinal plants and their use to treat Human ailments in SNNPR, Sidama Zone.

This would possibly important to contribute the current global drug development in different situations, like that of:-

- Well established tradition of plant cultivation and domestication
- Existence of many traditional healers who could be easily taken on board to develop the medicinal plant
- If opportunities could be exploited farmers could cultivate medicinal plants
- Demand for medicinal plant is high due to emergence or re-emergence of certain disease, cost of modern drug and their limitations, environmentally friendly of medicinal plants, chance of discovery of new drug

1.5 Limitations of the Study

The study was focusing on “ Ethno Botanical study of medicinal plant used to treat Human Aliments” is limited to the Eight (8) kebels out of the total 24 Aleta- Chuko woreda rural kebeles, the study was conducted only in eight kebeles of the district by taking samples. This is due to financial scarcity and other logistics shortage and also transportation problems of the rural roads and luck vehicles. Since the woreda is newly formed from other neighbouring woredas with in the recent 10-12 years, it also has no previous document on the study and related topics. Thus, the researcher was limited to study on specified or selected kebeles because it was very broad area and difficult to conduct all the kebeles of the district.

1.6 Objectives of the Study

1.6.1 General objective

To document medicinal plants and indigenous knowledge of the people on the use, threat and conservation of medicinal plants, in Aleta- chuko district.

1.6.2 Specific objectives

The specific objectives of the study are to:-

- ❖ Document medicinal plant species used for treating human ailments in the study area;
- ❖ Document IK related to plant part(s) used for medicinal value, methods of preparation and ways of administration in the study area.
- ❖ Assess conservation status of MPs, their value and major threats to the medicinal plants.
- ❖ Identify important habitats where medicinal plants occur;

Chapter two

2. LITERATURE REVIEW

2.1 Origin and Development of Ethno botanical Study

It is difficult to tell exactly when the term ethno botany became part of modern science. However, it can be traced back to the time when humans started making conscious interaction with plants and animals. Ethno botanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba and other immigrants from the new world documented food, medicine and other useful plants (Martin, 1995). John Hershberger proposed the term ethno botany for the first time in 1895. However, this term has been given different interpretations and definitions depending on the interest of workers involved in the study. He also redefined ethno botany as the study of the relationship, which exist between humans and their ambient vegetation.

Ethno botany as a science investigates the biological (including the ecological) basis of interaction and relationship between plants and people over evolutionary time and geological space. 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).

Ethiopia, the heart of eastern Africa, is extremely heterogeneous ecologically. It is also explained to be a land of topographic diversities and home of multiple ethnic groups (Afework Kassu, 2004). One aspect of this indigenous knowledge that began since time immemorial was applied for treating various ailments of human beings and animals.

2.2 Indigenous knowledge and Medicinal Plants

The complex knowledge, beliefs and practices generally known as indigenous knowledge develops and changes with time and space. Hence, such knowledge includes time-tested practices that develop in the process of interaction of humans with their environment. Therefore, it is the result of many generations long year's experiences, careful observations and trial and error experiments.

The 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 live. 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).

Indigenous knowledge is a body of knowledge built up by a group of people through generations of living in close contact with nature and it is cumulative and dynamic. Haile Yineger, (2008) indicated that the various parts of medicinal plants have been used such as leaves, roots and barks of the stem. The various literature available show the significant role of medicinal plants in primary healthcare delivery in Ethiopia where 70% of human and 90% of livestock population depend on traditional medicine similar to many developing countries particularly that of Sub-Saharan Africa countries. Thus, systematic application of indigenous knowledge is important for sustainable use of resources and sustainable development. Indigenous knowledge on remedies in many countries including Ethiopia, pass from one generation to the other generation verbally with great secrecy (Jansen, 1981). Such secrete and crude transfer makes indigenous knowledge or ethno medicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer hence there is a need for systematic documentation of such useful knowledge through ethno botanical research.

2.3 Medicinal Plants and Ethno medicine in Ethiopia

In Ethiopia, the practice of traditional medicine was diverse and varies greatly among different ethnic groups. Traditional medical practitioners mostly use herbs, spiritual healing, bone-setting and minor surgical procedures in treating diseases. Most traditional medical practices in Ethiopia rely on an explanation of disease that draws on both the “mystical” and “natural” causes of an illness and employ a holistic approach to treatment (Bishaw Mengiste, 1991). Under the rule of Menelik (1865-1913), Western medicine became more incorporated into the Ethiopian medical system. Numerous medical envoys from abroad, starting with the Italians and Russians were influential in building hospitals, providing medical training and participating in vaccination campaigns. However, most medical establishments primarily served the urban elites and foreign missionaries, and were concentrated in the major cities.

Despite Western medicine becoming wide spread in Ethiopia, Ethiopians tend to rely more on traditional medicine. From time immemorial, plants have been used as source of traditional medicine in Ethiopia to combat different ailments and human sufferings (Mirutse Giday, 2001). Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people. About 80% of human population and 90% of livestock of Ethiopia are dependent on traditional medicines for their health care practice; and more than 95% of traditional medicine preparations are of plant origin. Due to cultural and biological diversity, medicinal plants are more known in the south and south-western parts of Ethiopia (Edwards, 2001).

2.3.1 Role of medicinal plants in Ethiopia

Plants have played crucial role as a source of traditional medicine in Ethiopia from the time immemorial to combat different ailments and human sufferings. It was the only system available for health care prior to the introduction of modern medicine for prevention, diagnosis and treatment of social, mental and physical illness (Dawit Abate, 1986). The antiquity of the traditional use of medicinal plants in Ethiopia could never be disregarded (Pankhurst, 1990 and Mirutse Giday, 1999). Due to accessibility, acceptability and biomedical benefits there is a large magnitude of use and interest of medicinal plants in Ethiopia (Dawit Abebe, 2001). The long history of use of medicinal plants in Ethiopia is reflected in various Medico-religious manuscripts produced on parchments and believed to

have originated several Centuries ago (Fassil Kibebew, 2001). Reviews of medicinal textbooks that have been written in Geez or Arabic between 17th and 18th centuries indicated that the majority of Ethiopians, with the exceptions of few privileged groups, starting from the time of the Italian occupation, have been depending almost entirely on the traditional medicine (Pankhurst, 1990).

2.3.2 Traditional Medicinal plants in Human Health Care System of Ethiopia

The available modern health care services of the country are not only insufficient, but also in accessible and unaffordable to the majority. This problem along with the rapidly increasing human population and cultural resistance towards the use of modern medicines made the majority of the people in Ethiopia to depend more on are dependent on traditional medicines mainly of plant origin.

About 1000 identified medicinal plant species are reported in the Ethiopian Flora, however, many others are not yet identified. Of these, about 300 species are frequently mentioned in many sources (Endashaw Bekele, 2007). Plant diversity remains crucial for human well-being and provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of various afflictions (distress) in Ethiopia. However, they cannot yet deliver complete coverage in preventive and curative health care practices, because of inadequate supply of drugs and the high cost of drugs. Ethiopia with its diverse physio geographic features has diverse flora, which is estimated to be between 6,500 and 7,000 species of vascular plants (Haile Yineger *et al.*, 2008).

Majority of ethno medicinal plant species are collected from the wild natural vegetation of different natural ecosystems. They are free resources to all who want to use them for the family to practicing traditional medicine or for sales. The preparation and application methods vary from country to country based on the type of disease treated and the actual site of the ailment.

2.3.3 Threats to indigenous knowledge and traditional medicinal plants in Ethiopia

Ethiopia's traditional medicine as elsewhere in Africa is faced with problems of continuity and sustainability (Ensermu Kelbessa *et al.*, 1992). The current loss of medicinal plants and the associated indigenous knowledge in Ethiopia is due to natural and anthropogenic factors. Some medicinal plant species of Ethiopia are reported to have been threatened

because of over harvesting for marketing as medicine. Among many medicinal plants in Ethiopia, about 26 species are endemic and they are becoming increasingly rare and at the verge of extinction (Tesfaye Awas and Sebsebe Demissew, 2009).

Equally threatened is the knowledge base on which the traditional medical system is based, as the ethno medicinal information was not documented and remains in the memory of elderly practitioner members of society since only a few young people are willing to acquire the knowledge. According to Fisseha Mesfin *et al.* (2009), less than 2% of them were ready to transfer their knowledge on incentive bases. Therefore, detailed information on the medicinal plants of Ethiopia could only be obtained when studies are undertaken in the various parts of the country where little or no botanical and ethno botanical explorations have been made. Among the 6000 plant species, about 800 species are employed in traditional health care system of the country, and 600 of them have been collected and identified. Recent evidence from Ethiopia as well as other countries indicates that the existence of this indigenous resource is threatened. The conservation of ethno botanical knowledge as part of living cultural knowledge and practice between communities and the environment is essential for biodiversity conservation (NBSAP, 2005).

2.3.4 Conservation of Medicinal Plants and Associated knowledge

Considering the role-played by plant-derived products in human and livestock health, the effective conservation of these resources (medicinal plants and associated indigenous knowledge), needs to be initiated as a matter of urgency. Plant diversity remains indispensable for human wellbeing in providing a significant number of traditional and modern remedies required in healthcare. The problem is further compounded by the fact that traditional knowledge on traditional medicine is also being lost at an alarming rate (Tewoldeberhan G/Egziabher, 1991). Traditional herbal practitioners are skilled 'botanists' and have a great talent for locating the correct plant from among the many plants species found around them. If these and other precious plant species constituting the flora of the country continue to succumb to manmade and natural calamities, we would be losing potential Lifesavers and their environs within short period. Hence, there is an urgent need for conservation and sustainable utilization of this resources. As a solution, there is some

conservation actions that have been undertaken around the world designed to protect threatened medicinal plants from further damage.

This includes *in-situ* and *ex-situ* conservation measures. Both *in-situ* and *ex-situ* conservation efforts are implemented to capture medicinal plant genetic resources and the traditional practice associated with them. In the study at hand, some cultural beliefs and traditional practices that associated with traditional medicines were found to contribute much to the conservation of medicinal plants in their natural habitat.

Chapter three

3. MATERIALS AND METHODS

3.1. DESCRIPTION OF THE STUDY AREA

3.1.1. Location of the Study Area

The study was conducted in **Aleta- Chuko** District which is one of 21 Sidama Zone woredas of the SNNPR, Ethiopia. The District is 330 km away from Addis Ababa to the south and about 62 km away from the Regional and Zonal town Hawasa.

The study mainly focused on the rural people of the district; totally the woreda contained 24 rural kebeles. From these 8 kebeles are considered as nearly dry lowlands with altitude ranging between 1000 - 1800 **masl**, 4 kebeles with altitude ranging 2001 – 2700 **masl** highlands and the rest 14 kebeles including 5 Town kebeles are considered as medium highlands with altitude ranging between 1300 – 2000 **masl** on average. Totally there are 29 kebeles in the woreda. The District is located at 6°46' to 6°72' North Longitude and 38°2' to 38°56' East Latitude.

Table- 1 Specific GPS measures and Average Geographic location in each study sites

Study Sites (kebeles)	Specific measures	Average Geographic locations	
		Longitude	Latitude

1.Mangudo	1300 – 1840 masl	06°35'22.2N	038°23'04.7E
2.Gelima	1600 – 2000 masl	06°33'52.9N	038°21'41.5E
3.Lella-huncho	1750 – 2160 masl	06 °31'39.5N	038°20'55.6E
4.Korke	1100 – 1610 masl	06°39'30.4N	038°21'10.8E
5.Loko-hitela	1200 – 1580 masl	06° 37'29.4N	038°16'17.4E
6.Hallo	2400 – 2750 masl	06°32'00.5N	038°22'21.9E
7.Dongora Qawado	1000 – 1580 masl	06°41'298.1N	038°18'22.4E
8. Makalla	1500 –1950 masl	06°28'10.5N	038°20'16.7E

It is situated near the center of the Zone and bordered by Dale District in the north, Aletawondo District in the east, Dara District in the south, and Luka- Abaya District in the west of Sidama woredas (Figure 1).

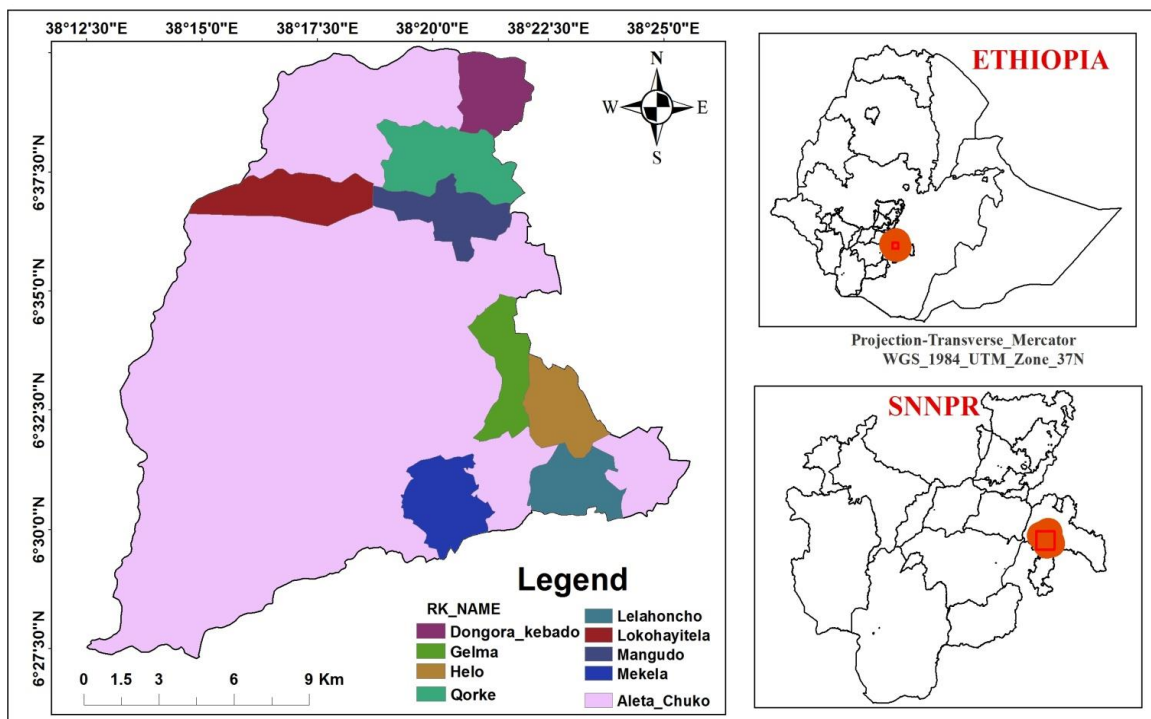


Figure1- Adminstrative Map of Aleta- chuko woreda with eight selected kebeles, Sidam Zone, South Ethiopia

3.1.2. Climate

The area has a bimodal rainfall pattern with the first peak from April to May and the second peak from August and October which is called “kiremt”. The eleven years from (2009 – 2018) climate graph showed that the lowest rainfall was recorded between November and February which is called “meher”. The mean annual rainfall of the area is 1100 mm – 1698, which is 7mm per year. The mean annual temperature ranges between 13.7°C – 18.4°C. Agro forestry practices appear to be the major features of the land use systems in the area. Generally the woreda agro ecology is categorized in three, these are 60% medium highlands, locally called “woynadega”, 25% lowlands known as “kola” and the remaining 15% is highlands known as “Dega” (AWCSAO, 2017).

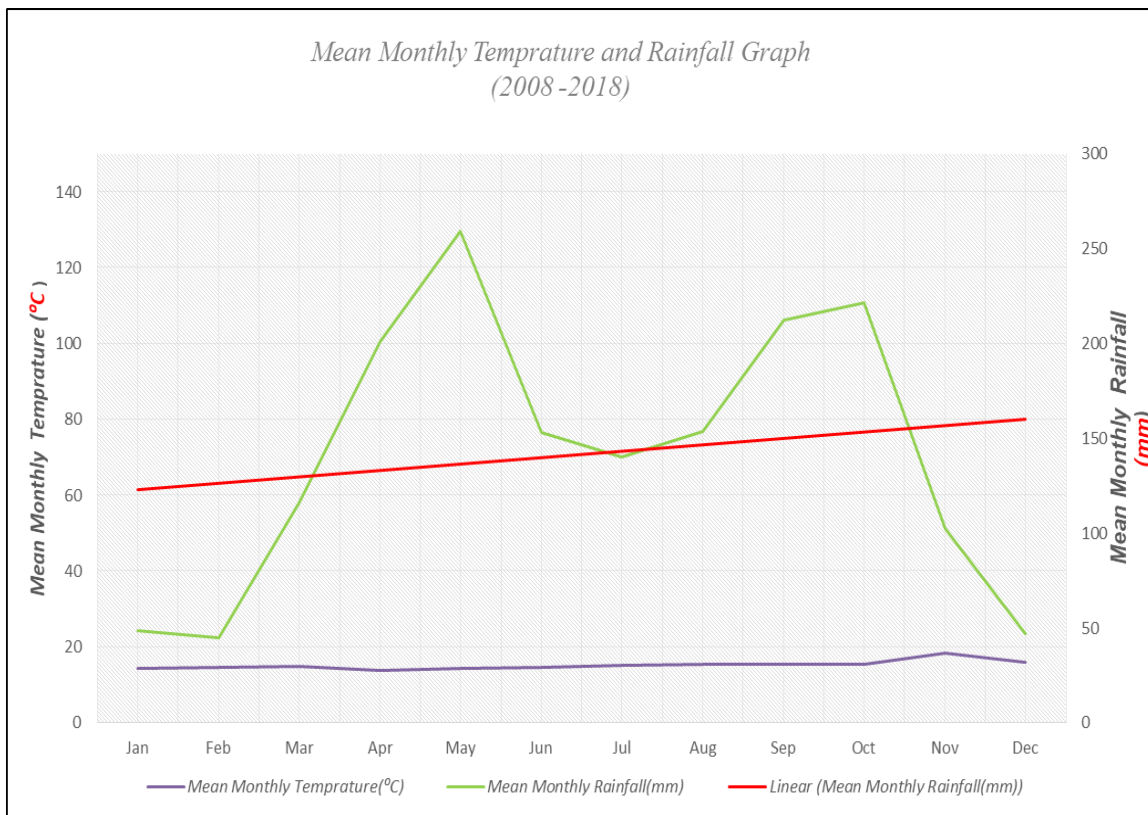


Figure 2- Shows clima diagram of Rainfall and Temperature of Aleta - Chuko district,
(Source SNNPR metrological station, 2019)

3.1.3. Population and Medicinal Services

The district covers a total area of about 32,248 ha and an elevation range of 1,400 masl – 2,500 masl. This district is comprised of 24 Rural and 5 Town Totally 29 kebeles (the smallest administrative units next to district in Ethiopia) with a total population according to central statistical Agency (CSA) of 2007 Estimating that Males 114,139 Females 108,001 Total= 222,140. From these the rural dwellers population could be Males 94400 Females 93288 Total= 187688. The local language spoken in the Zone and woreda is mainly "Sidamigna".

According to (AWHO, 2017) the District has only 8 health centers and 26 health posts supporting the entire population. In the district there are also various types of water resources such as 18 handy rope-pump spring- halls, 130 medium spring borrow-halls, 15 deep spring halls, 53 small springs and 96 "bono" water distribution centers.

3.1.4. Natural Vegetation and Major Cultivated Crops

The vegetation of the study area consists of various trees, shrubs and herbaceous species. Some of the common plant species include *Olea europaea*, *Juniperus procera*, *Calpurnea aurea*, *Acacia* spp., *Ocimum* spp., *Ficus* spp, *Phoenix reclinata*, *Podocarpus falcatus*, *Eucalyptus* spp., *Cordia africana*, *Croton macrostachyus* etc are some of the examples. The common crop cultivated in the study area include *Zea mays* (Maize), *Eragrostis tef* (Tef), *Hordeum vulgare* (Barley), *Triticum aestivum* (Wheat), *Pisum sativum* (Field peas), *Vicia faba* (Horse beans) etc. *Coffea arabica*, *Enset ventricosum*, *Catha edulis* etc. Mountainous parts of the District such as Hallo, Gelma and Lelahuncho have higher vegetation cover than low-lying areas. Barley (*Hordeum vulgare*), wheat (*Triticum* spp.), *Sorghum bicolor*, sugarcane and other similar Rooty crops, cabbages and other vegetables are among the commonly cultivated crops in the study area (AWARDO, 2017).

3.1.5. Land use and Soil types

The livelihood of people in Aleta- Chukodistrict was mainly based on crop production and animal husbandry. The soil type is mostly brown clay loam and Black gray loam soil is regarded as highly fertile. As a result, people in the study area classify and used land for various purposes. In general the land covered perennial crops and vegetation is 14570.7 ha,

from this for annual crop production used is (6663 ha), for grazing 2509 ha, for Natural vegetation 2083.7 ha and 321 ha is covered by water, 521 ha for others purposes while some parts was also left free for future purpose is 2743.6 ha. In the district there have been 5 perennial water flow Rivers and a number of seasonal water flow drainages appear annually (AWARDO, 2017).

3.1.6. Socio- economic Activity

The house hold economy was based on enset (false banana) the main food source and for sale, coffee and chat (*Catha edulis*) production are the main Agricultural income source and other home garden crops like root tubers, sugarcane, maize, barley, beans, peas and other cereals crops, fruits and numbers of vegetables produced in the district. The varied agro ecological condition made the woreda capable with the production of different food crops, vegetables and fruits. Moreover, livestock like cattle, sheep, goat, poultry rearing etc is more common.

According to AWEO (Educational office report, 2017) in the woreda there are eleven (1-4) and thirty (5–8) primary schools, four (9–10) and one preparatory (11–12) secondary schools. Generally the district contains 92 % sidama ethnic people and 8% others which are living in the main town chuko. From these 80% are farmers, 6% traders, 9% employees and 5% daily laborers.

3.1.7. Livestock and Wild life

Livestock population of the area was significant. According to Chuko Woreda Agricultural Office (2017), livestock population consisting of 111276 cattle, 33308 goats, 8933 mule, horses and donkey together, 28260 sheep and poultry 266233 are rearing in the woreda. The woreda had one central veterinary clinic and 17 health posts.

People try to treat their livestock by ethno veterinary medicine. In the woreda of natural vegetation there are different kinds of wild animals like birds, hyenas; fox, monkey, baboon etc are some of the common.

3.2. Materials used for Data Collection

Different materials were used to collect data from the study area. These materials include plastic bag, sharp knife, digger, scissors, card board; newspapers, foam sheet, Mobil phone

for photography of medicinal plants, labeling materials, string for plant collection and plant press to paper voucher, note book, pen, markers stickers etc... were used.

3.3. Reconnaissance survey and Selection of Study Sites

Preliminary survey was made from February 9 – 12/2018 with government officers. Prior to ethno botanical data collection, the selection of study sites was based on altitudinal viability or on local agro ecological zone of the area, locally known as “woynadega” for medium “Dega” for highlands and “Qola” for lowlands.

Totally Eight Kebeles locally called (Gelema, lela-huncho, Mangudo, Makalla, Hallo, Loko-hitela, Dongora- Qebado and Qorke) were selected. These Kebeles were purposively selected to represent different altitudinal ranges and Agro ecological zones and vegetation coverage. Moreover, access to lack of modern medical facilities, availability of traditional medicine and practitioners were considered as criteria to select these kebeles. The first 4 kebeles selected from medium with altitudinal range between (1600 - 2200 masl) and the next one (Hallo kebele) was from highland with altitudinal range (above 2700 masl), and the rest 3 kebeles from low lands ranging between (1000–1610 masl) were selected from among the 24 rural kebeles (AWARDO, 2017).

3.4. Informant Selection (Sampling)

As the expected suggestion it was difficult to get detail information from local informants because of cultural influence, believing that the secret of MPs not effective, if exposed to others and also loss of gaining income from sale has been the main challenge for the research achievement. However in the selection of informants, totally 100 informants were selected (aged > 20) of which 10 in each 8 selected kebeles (80 random selection of informants and the rest 20 key informants) considering gender participation of ordinary residents. The Key informants purposively selected based on the medicinal knowledge and skill of traditional healing experience 2 - 3 from each kebeles participated in the study.

In this case the information gathered from the local elder people used to drain necessary information for the selection of key informants, while other informants were randomly selected based on kebele Administrative leaders and recommendations from the local people, development agents and with other concerned bodies following the suggestion

from Martin (1995). The purposive sampling techniques for specific selections of Key informants in each sites was done by using the mechanisms of:-

1st Selecting all the key informants in each study sites and villages indicated

2nd Refiltrating the indicated key informant's adjusting additional criteria of:

- i. The key informant which can give TM for more than two or three ailments
- ii. Perfection of remedies, curing potential or long time practies for similar ailments &
- iii. The effectiveness of remedies for different ages and genders.

3.5. Ethno botanical Data Collection

Ethno botanical data was collected between June 15, 2018 and August 30, 2018 taking more than ten field trips. Data collection methods used were as semi-structured interviews focused group discussions and guided field walks with key informants or with respondents. Field observations were also used to record habit and habitat of each medicinal plant with the assistance of local guides and interviewed informants. Samples were taken from the home gardens and the surrounding wild fields of the informants in all the selected kebeles. For taking samples of trees, shrubs and herbs of plant vegetation in each home garden and the fields around. Key informants were interviewed individually to mention about the local names of plants on the vegetation sites and fields.

3.6. Types and ways of Data Collection

Semi-structured interview, guided field walk, direct observation and focus group discussions with key informants and other community members was applied and their knowledge on medicinal plants gathered. Interview was held based on checklist of questions prepared before hand in English language and simultaneously translated into Amharic. Interviews focused on informant's demographic features including sex, age, marital status, occupation, religion, educational background and duration of time an informant lived in the study area. The major part of the interview was focused on the local names of medicinal plants, their habits and habitats, plant part/s used, remedy preparation methods, condition of preparation, and route of administration. Further, the distribution (status) of medicinal plants, threats and major problems, conservation methods and

traditional healer also the major interview points targeted in the group discussion section, following the methods used by Martin, (1995).

- **The semi-structured interviews held with informants** started at their sitting places and further broadened into field walk with interviewed informants in order to see the plants mentioned in their habitats and voucher collections.
- **Focus group discussions** have been done with informants to obtain additional information and to check the reliability. Informants' contacted two times and responses of an informant in harmony with each other were taken as relevant and used for data analysis.
- **The traditional healers** were well-known by the local community and owned traditional home pharmacies derived from plant remedies. They were asked to demonstrate their work at their homes and in the field, which was recorded in order to check the consistency in knowledge. Most field observations conducted with a single informant in order to keep the knowledge secret.



Figure-3: Orientation and group discussion before the collection MP in Aleta-Cuko woreda Gellma kebele with the selected informants.

- **Field observation** was taken to know which part of the plant have been used the root, stem, leaf, bark etc and to know the source (habitat) of these plants such as homegarden, wild, livefence and roadside etc.
- **Guided field walk** was taken for the purpose of specimen collection and identification of plants in the field.



Figure- 4: Specimen collection with an informant in the study area of “Hallo” Kebele

3.7. Specimen Collection and Identification

During Specimen collection in the study sites, group discussions has been made with them and asked for field walk for on site observation of the plants. Similar procedure was also applied with randomly selected non- practitioners.

Thereafter, Voucher specimens collected, pressed, and dried for identification. For some species, preliminary identification was done in the field. Further identification of all specimens was done by comparison with authentic specimens, illustrations and Taxonomic keys were done with the assistance of experts at Addis Ababa University National Herbarium by the help of my advisor Dr.Talemos Seta. The overall identification was based on Flora of Ethiopia and Eritrea, on the works of: Hedberg and Edwards (1989); Edwards et al., (1995); Phillips (1995); Edwards et al.,(1997);

Edwards et al., (2000); Hedberg et. al., (2003); Hedberg et al., (2004) and Hedberg et. al.,(2006).

3.8. Data Analysis

3.8.1. The Informant Consensus Factor (ICF)

It is the factor used to calculate the level of agreements between information provided by different informants (Tilahun Teklehaymanot and Mirutse Giday, 2007). Accordingly, **ICF** is calculated for each category to identify the agreements of the informants on the reported cures.

Informant consensus (ICF) is calculated using the formula,

$$\text{ICF} = \frac{(n_{uc} - n_s)}{(n_{uc} - 1)},$$

Where

ICF = Informant consensus factors

n_{uc} = number of use citations,

n_s = number of species used for each use citation

3.8.2 Direct Matrix Ranking

Direct matrix ranking was conducted for multipurpose uses of medicinal plants that reported by key informants. Randomly chosen by keyinformants were specified varieties of medicinal plant species and ranked with their various value which include medicinal, fodder, food, construction, fire wood, charcoal, fencing, and production of furniture. The informants were enough to assign values to each attribute (Direct matrix ranking of individual score ranges from 0 to 5). Based on data achieved from informants, the average values were summed up and ranked.

3.8.3 Paired Comparison Method

Paired comparison method was used to determine the relative importance of plant species, which was used in the treatment of **Gonorhea**. In paired comparison, items were presented in pairs and decisions were made by individual respondents on the relative importance of one of the items from pairs adopted by martin(1995). In this case, five

medicinal plants were paired with each other to be chosen by seven of the key informants. The total number of possible pairs was obtained by applying the formula.

$p = \frac{n(n-1)}{2}$ where n ;- is the number of medicinal plants being compared.

2

As a final point, the mean given by each key informant for each medicinal plant in the pairs was calculated and the given mean values were summed up for each plant species and ranked.

3.8.4. Fidelity Level (FL)

Fidelity Level (FL) ;- was used to estimate the relative healing potential of each medicinal Plants based on the proportion of informants who agree on its use against a given ailment category (Friedman . *et . al.*, 1986). Fidelity level indicates that the comparison of the relative healing capacity of medicinal plant species for particular disease.

Using the formula;- $FL (\%) = \frac{Ns}{Nu} \times 100$ where ;

Ns – is number of use-reports cited for a given species for a specific ailment

Nu - is the total number of informants who indicate the plant for any

Major ailments

3.8.5. Medicinal Use Value

Some plant species are known to treat a single ailment; some others may be used for multiple of health problems. Medicinal use value (UV) is a quantitative method that demonstrates the relative importance of species known locally (Luiz *et al.*, 2005). Some species that were cited for more than one ailment calculated using the following formula;

$$UV = \frac{\sum U}{n}$$

Where:

UV = use value of a species;

U = number of citations per species;

n = number of informants

Chapter four

4. RESULTS AND DISCUSSION

4.1 Knowledge of Local Community on Traditional Medicinal Plants

4.1.1 Traditional Knowledge with respect to Age

The Age group and ranges of informants categorized in basic ethno botanical data collection fall into three age groups. Accordingly, 3 males (3%) were 30 and below; 46, which were 41 males and 5 females (46 %) between 31-45 middle ages and 51, which were 47 males and 4 females (51 %) were 46 and above ages (Table-1).

Table 2: General information about respondents compared by age groups in the study area

Age groups	Age Category	Total Number of Informants			Percent (%)	Those who married			Percent (%) of married
		M	F	T		M	F	T	
First	Bellow 30	3	--	3	3	2	--	2	66.6
Second	31--- 45	41	5	46	46	40	4	44	95.6
Third	Above 46	47	4	51	51	45	2	47	92.2
Total		91	9	100	100	87	6	93	93%

The general information about use knowledge analysis showed that it is directly proportional to age increment. As we can see from the table, Data collected from field observation and interviews revealed that informants in the 1st age group, the youngers group were not familiar age in providing some ethno botanical information clearly on the method of preparation, plant part used and mode of application. Almost all key informants were found in the second and third category of age groups.



Figures –5: Pictures showing field observation, specimen collection, Group discussion and Informant discussion in different Selected Kebeles of the study site

This could have contributed for the identification of more medicinal plants and the associated medicinal plants use knowledge mostly practiced by both second and third age groups, as they are more knowledgeable than the people in the first age group. The younger generation has less exposure and experience on medicinal plants ingeneral. Beside this the marital status of informants also indicated that most of the practitioners (93%) were married and had good opportunity to transfer their knowledge to the next generation easily. However, the elders use Youngs and other members of their families only to act as a facilitator in the preparation for the purpose of keeping the sacret of traditional medicine for gaining income in the livelihood of the family ingeneral.

This shows that enough knowledge of medicinal plants is mainly found among the elderly members of indigenous people. In the same way, people become older and older their knowledge of traditional medicine becomes better and better. This could be related to the fact that increases in age aspect of the informant to more information about traditionally used medicinal plants. On the other hand young people were less likely clued-up to medicinal plants. The practice in the age-related knowledge of Medicinal plants that of old people and middle age elders. This is because, they told for the young as if it was the gift from God, only for elders locally called ” **Mageno**” in the study site. According to Fisseha Mesfin (2014) , Abera Balcha (2014), reported that decreasing positive attitude towards use of medicinal plants in traditional medicine by young generation indicate the loss of vital indigenous knowledge.

4.1.2. Traditional knowledge with respect to Education

Table- 3: Educational status of the informants in the study area

Educational Status	Number of informants	Percent (%)
No formal education	13	13

1 – 4 grades	23	23
5 – 8 “	42	42
9 – 12 “	22	22
>12 “	--	--

According to the data obtained more informants were not well educated (the largest percent from the total informants (65%) is categorized in the Elementary schools and (13%) not educated. This indicates that non-educated informants handle much knowledge of traditional medicine than educated informants. This confirms that modern education limits the knowledge on traditional medicine. This may be due to the fact that education makes new generation to depart from their elder parents and loss the transferred knowledge from parents. Also education resulted in increasing the attitudes of educated people to choose modern medicine than traditional medicines. Consequently, medicinal plant knowledge of educated respondents declined. Similar findings were reported by Fisseha Mesfin *et.al* (2009), Mitutse Giday *et.al.* (2009), Tesfaye Awas and Sebsebe Demissew (2009), suggested that use and transfer of knowledge to the young generation can be affected by education and modernization of living conditions.

4.2. Indigenous Knowledge of Local Community in the Study Area

The local people of the study area, specially elders and knowledgeable community members have their own knowledge about their environment and surroundings. They are knowledgeable on how to classify the vegetation, land and topographical arrangement of their environment traditionally. It was seen on the preliminary survey and during data collection with local people of the study area. The medicinal plants which are seasonal especially herbs, trees and shrubs are more abundant on the rainy seasons like *Catha edulis*, *Croton macrostachyus* and *Nicotina tubacum* respectively collected their leafs during the rainy seasons according to their agroclimatic zones and with topographic variations by the indigenous knowledge of the local people. Beside to this they suggested that some mps are found only in highlans like *Hagenia abyssinica*, shrubs such as *Ocimum lamiifolium* and *Arundinaria alpine* and some others found in lowlands like *Olea europaea*, *Garcinia buchananii*. There are also trees around the

boundaries of farm land, river side and grazing land particularly in the medium and highland areas of the district. These include trees like *Cordia africana*, *Croton macrostachys*, *Erythrina brucei*, *Millettia ferruginea*.

This is similar with the study of Sintayehu Tamene (2011), Local people of the study area based on topographic arrangements of land and Indigenous categories of vegetation which was helping to get Mps at their specific area; they classify their land in to five categories.

4.2.1. Local Topographic Classification of Land

The local people of the study area classify their land based on their perception of land topographic arrangement and benefits they get from the land. Namely in the following ways:-

- i. **Suwado bato:** Land form which has plain land suitable for settlement, Agriculture and livestock grazing.
- ii. **Roge:** Land form which has very low elevations suitable for agriculture and after harvesting a product available for grazing.
- iii. **Tullo:** Land forms which has some elevations than the first one and suitable for agriculture and grazing.
- iv. **Ilalla:** Land form which has high elevations or mountains the advantages is for grazing and fire wood collection.
- v. **Laga:** Land forms which has found in between elevated land form (Valley).

4.2.2. Indigenous categories of vegetation

The data collection method was random sampling, because the collection of medicinal plants depends on the type of ailment and season of collection in their area. Thus local communities categorized the vegetation of the study area into five types based on plant density and composition in the three agroecological zones of wild fields, homegardens and farm lands namely in the following ways:-

- i. **Dubbo:** Refers to densely forested lands composed of trees, shrubs, herbs, climbers and grasses. Now a day this type of vegetation has declined because of

agricultural expansion, cash crop expansion, deforestations, fire and urbanization.

- ii. **Qorccishu ula:** Refers to the heterogeneous mixture of shrubs and grass communities.
- iii. **Caffa:** Refers to vegetation growing in marshy or water logged areas. Plant species Such as *Cyperus* spp. were more frequent.
- iv. **Hawaddi lelo:** Refers to a bare land or with poor vegetation cover with Some types of herbs and grasses appearing only during the rainy season.
- v. **Kalloo:** Refers grass communities which are above 1m in height, grow in Rainy Seasons used for livestock feeds.

4.3. Sources of medicinal plants for human ailment treatment of the study area

In this study 81 plant species distributed in 75 genera and 45 families were recorded to have medicinal values for 39 different health problems (Appendix 1 and 4). The presence of knowledge and practice on large number of medicinal plants by people of Aleta- Chuko district shows that the indigenous people of the area still depend on traditional medicine of plant origin. The findings indicate that the local people obtained more medicinal plants from the wild vegetation than home gardens for treating human ailments. In this case the various sources for harvesting medicinal plants are on (Fig.5), 42 (51.9%) collected from wild vegetation followed by 34 (42%) from home gardens, 3(3.7%) from Road side and the rest 2 (2.4%) is from Fence area. In terms of species composition, family Lamiaceae and Fabaceae contains the highest 6 species, Asteraceae and Solanaceae contains 5 species each, followed by Rutaceae and Myrtaceae consisting 4 species each, Euphorbiaceae, Boraginaceae, Celastraceae and Cucurbitaceae consisted 3 species each, the remaining family consisted 2 and less than 2 species each (Appendix -3). The majority of medicinal plant species were obtained from wild field followed by home garden, live- fences and on the road sides in the study district. The fact that high number of medicinal plant species was obtained from wild fields and home gardens suggesting that natural fields and home gardens are a good option to conserve medicinal plants (Figure 6).

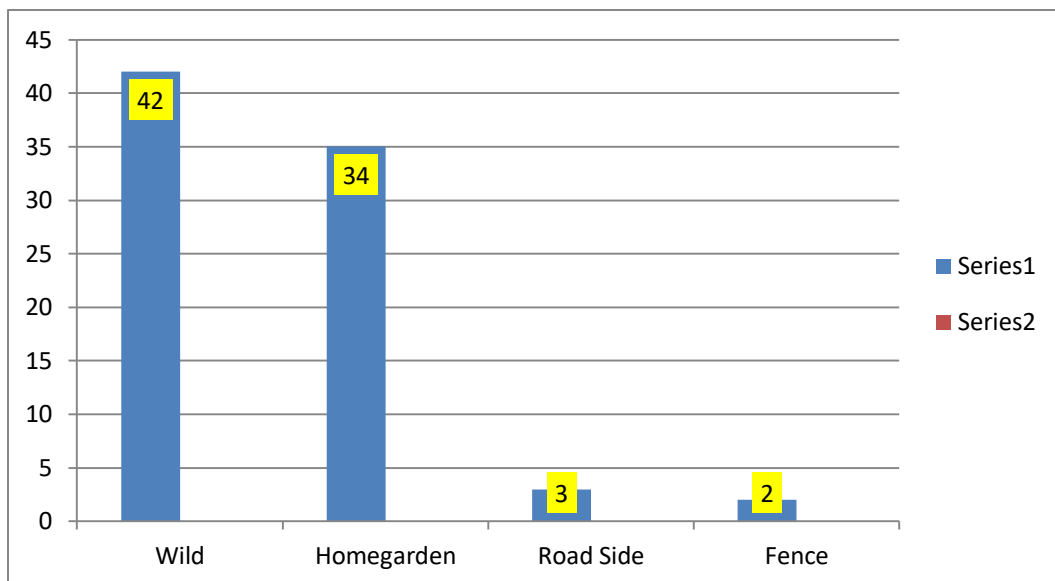


Figure-6: Sources (Habitats) of Medicinal plants in the study area

This result agrees with the work of Misganaw *et.al* (2016), the Status of Ethnobotanical Knowledge of Medicinal Plants and the Impacts of Resettlement in Delanta, Northwestern Wello. This finding also agrees with Daniel Kalul and Ali Seid, (2014) ethnobotanical study of medicinal plants in Ankober woreda, central Ethiopia, most dominant and effective species in curing various diseases obtained from natural habitats. Most of the plant species reported as medicinal plants in this study were also reported as having medicinal properties by different reserchers from different parts of Ethiopia. To mension some, 30 species of medicinal plants reported by Endalew Amenu, (2007); 25 species of medicinal plants reported by Etana Tolasa, (2007) and Mulugeta Kuma Alito (2014), 25 species were also reported in their studies as medicinal plants. Thus, it was acquired for critical and more mutual study to continued the stability between their availability in the wild state and utilization by the community showed that from 42 mps indicated in this study the majority of the local hears depend on the natural habitat of medicinal plant species. The fact that similar plant species reported from different parts of the country for medicinal properties may suggest the genuine therapeutic potential of these medicinal plants.

4.3.1 Distribution of Medicinal Plants in the Study Area and Sites

The study area was endowed with diverse and rich sources of medicinal plants and these serve to the local communities as source of medicine. Out of the 81 medicinal plants collected in eight sites of the study area, the number of medicinal plants recorded by informants in the selected kebeles shown on (Appendix-3). The highest and lowest GPS or altitudinal measurement is shown on (Table – 4). From the 81 plant species and 45 Families; Fabaceae and Lamiaceae holds them gratest aboundace or diversity which containing the highest percentage (7.5 %) each in relation to others in the study sites of the district.

Table 4: Specific GPS measures of the minimum and maximum
Altitudnal mesures in each study sites

Study Sites (kebeles)	Specific GPS measures	Number of species indicated
1. Mangudo	1300–1840 masl	60
2. Gelima	1600–2000 masl	66
3. Lella-huncho	1750–2160 masl	68
4. Korke	1100–1610 masl	55
5. Loko-hitela	1200–1580 masl	59
6. Hallo	2400–2750 masl	57
7. Dongora Qawado	1000–1580 masl	46
8. Makalla	1500–1950 masl	62

4.4. Comparative Distribution of Medicinal Plants in the three

Agro-ecological Zones

The comparative distribution of medicinal plants in the three agro ecological zones known as high land, medium, and low land was summarized comparing each other on their plant

species type and diversity according to the data collected. However, few kebeles were consisted of mixed agro climatic conditions, for instance "Qorke and Mangudo" consisted of (both low and medium) and "Hallo" is also consisted of (both high and medium) agro climatic conditions in it. The distribution of medicinal plants in all selected kebeles shows highest in lela-huncho 68, Gelima 66, Makala 62 and Mangudo 60 which is indicating the distribution and abundance of medicinal plants is more in medium agro climatic zones and relatively smallest in low altitudinal areas of Loko-hitela 59, Korke 55 and Dongorakebado 46. In addition, the highest agroclimatic kebele called 'Hallo' had 57 numbers of species indicated by informants (Table-4).

The fact that such large number of medicinal plants recorded in the study area is encouraging, despite the very fast degradation of natural vegetation due to population pressure and overgrazing. In the three agro-ecological climates probably enabled it to have the highest number of medicinal plants. Generally the 'woynadega' Agroecology has highest species than the 'Dega' and the 'Qolla' in a respective order.

The documentation of a relatively good number of plants from an area with similar pressures on the vegetation is also observed in different parts of Ethiopia as pointed out in the works of Bayafers Tamene (2000); Debela Hundie (2001); Kebu Balemie et al.(2004). The result of the study revealed that the medicinal plants are unevenly distributed in the three agro climatic zones were almost similar in their distribution and abundance relatively. The overall analysis of the data revealed that the family Lamiaceae and Fabaceae has the highest number of species, 6 (7.5%); followed by Asteraceae and Solanaceae consisting of 5 species each which is (6.25 %); Myrtaceae and Rutaceae consisting 4 species each, which is (5.0%); Boraginaceae, Celastraceae, Euphorbiaceae and Cucurbitaceae consisting of 3 species each, which is (3.75%); Alliaceae, Acanthaceae, Musaceae and Oleaceae each consisting of 2 species, which is (2.5 %), the remaining families have only one species each which is (1.25 %). This finding is a good indicator for the presence of a considerable diversity of plant species in the area. Furthermore, the existence and utilization of such a large number of medicinal plants by people in the study area may indicate that majority of the people continue to employ indigenous medicinal practices. Certainly, these medicinal plants are not unique to the study area.

In cross checking with previous works carried out in different parts of the country such as, Eyasu Chama (2015) from wolaita Zone and Gonfa Kewessa et al.(2015) - Indigenous Knowledge on the Use and Management of Native Medicinal Trees and Shrubs in Dale District, Sidama Zone, Southern Ethiopia. When compared relatively similar in number and species types with the study area. From this finding we can see that the local people over a wide area of Southern parts of Ethiopia show the tendency to use relatively similar and this can be an indicator for the genuine therapeutic value or use as treatment of these medicinal plants as well as indigenous knowledge on medicinal plants.

4.5. Medicinal Plants Used to Treat Human Diseases

Human diseases treatment using medicinal plants in the study area have been used as the nearest clinical service, locally accepted with the knowledge (experience) of the healer and also not expensive as well. A total of 81 species of medicinal plants, grouped into 45 families and 75 genera were documented as useful for the treatment of human ailments. The study also showed that the different species were used as remedy for different ailments, thus Stomachache used the leading 16, 9 for wounds , 10 for Swelling, 8 for intestinal pain, 8 for Diarrhea, 8 for Amoeba, 8 for Skin infections, 7 for Gonorrhea, 5 Species for Malaria and 2 Sps for Diabetes in each respectively (Table -5).

Table 5- Showing type of human ailments, their Habits, number of medicinal plants species used and the number of informants indicated in the study area

R. No	Names of Ailments	Number of medicinal plants used	The Habits & number of Mps used			Numbers of informants indicated
			Trees	Shrubs	Herbs	
1	Stomachache	16	6	6	4	27
2	Wound	9	3	4	2	18
3	Swelling	10	4	4	2	15
4	Amoeba	8	3	3	2	13
5	Diarrhea	8	3	3	2	25

6	Intestinal parasites	8	3	2	3	27
7	Skin infection	8	3	3	2	16
8	Cancer	7	3	3	1	11
9	Gonorrhea	7	3	3	1	10
10	Teeth ache	4	3	-	1	11
11	Gastritis	4	1	3	-	9
12	Malaria	5	1	2	2	12
13	Blood pressure	4	-	3	1	10
14	Evil Eye	3	1	1	1	8
15	Eye infection	3	2	1	-	3
16	Pneumonia	3	-	2	1	7
17	Tonsillitis	2	-	-	2	5
18	Jaundiced	2	1	1	-	6
19	Diabetes	2	1	1	-	4
20	Headache	3	-	2	1	13
21	Sudden fever	3	-	2	1	8
22	Hemorrhoid	3	1	-	2	6
23	Wrist pain	1	1	-	-	2
24	Meningitis	1	-	1	-	3
25	Tuberculosis	2	1	1	-	6
26	Blooding	2	-	2	-	5
27	Brest pain	1	-	1	-	2
28	Dandruff	1	-	1	-	1
29	Stabbing pain	1	-	1	-	3
30	Goiter	1	-	-	1	2
31	Liver pain	1	1	-	-	1
32	Lung pain	2	1	1	-	3
33	Malesexual weakness	1	1	-	-	3
34	Snake beat	2	-	2	-	8
35	Growth retardation	1	-	-	1	3

36	Cough	2	1	-	1	9
37	Vitamin shortage	1	1	-	-	3
38	Febrile illness	2	2	-	-	5
39	Fever	1	1	-	-	4
	Total	145	52	59	34	

These plants are reported as treatment for 145 human diseases generally in the study area. In the District informants and government officers informed that, the main common ailments are Stomachache, Diarrhhea, Amoeba, intestinal problems, Malaria, Veneral diseases, Wounds, Skin infections which is related with (Table-5). Depending on the categories of reported ailments local practitioners make a diagnosis of each health difficulty by interview for symptoms and visual observation of patients and numbers of plant species used by the traditional healers treated for various diseases. This may be due to the distribution of various pathogens as a result of less hygiene and control measures in the District. According to informants the highest number of traditional medicinal knowledge was acquired from elder parents or relatives followed by self-trial and error, from healers and from other sources. The traditional healers of the study area showed a strong tendency to keep their knowledge secret. Most of the healers not interested to transfer their knowledge to the outsider without any incentives, except to close family members of matured person.

4. 6. Habits of Medicinal Plants

From the medicinal plants recorded in the study district shrubs were the most harvested for medicinal purpose. They were represented with 33 (40.2 %) shrub plant species followed by 25 (30.5 %) trees, 16 (22 %) herbs and 6 (7.3 %) are climbers (Fig.7). Due to agro climatic conditions and the abundance of shrub plant community is the dominant one in the study area. As we can see from Table – 5, the frequency of number of Mps using the different parts plants for each ailment shows, Shrubs holds the highest 59, Trees following with 52 and Herbs with 34 , showing similarity with the study of Gonfa Kewessa et. al., (2015) - Indigenous Knowledge on the Use and Management of Native Medicinal Trees and Shrubs in Dale District, Sidama Zone, Southern shows with similar cultural influence,

due to the common diseases in the area, availability of Mps and agroclimatic conditions. Others also reported similar findings which were agreed with the investigation of Ethnobotanical study of medicinal plants used by local communities of Minjar--Shenkora District, North Shewa Zone of Amhara Region by Getu Alemayehu *et.al.* (2015), Plants used in traditional Management of Human ailments at Bale Mountain National Park, South eastern Ethiopia Haile Yineger *et.al* (2008), An Ethnobotanical Study of Medicinal Plants in Amaro Woreda, Ethiopia by means of Fisseha Mesfin *et.al* (2014).

This shows that the people mainly rely on wild plants; which accordingly indicates their availability in the wild state and utilization by the community showed that the majority of the local healers depend on the natural habitat of medicinal plant species rather than the home gardens resource.

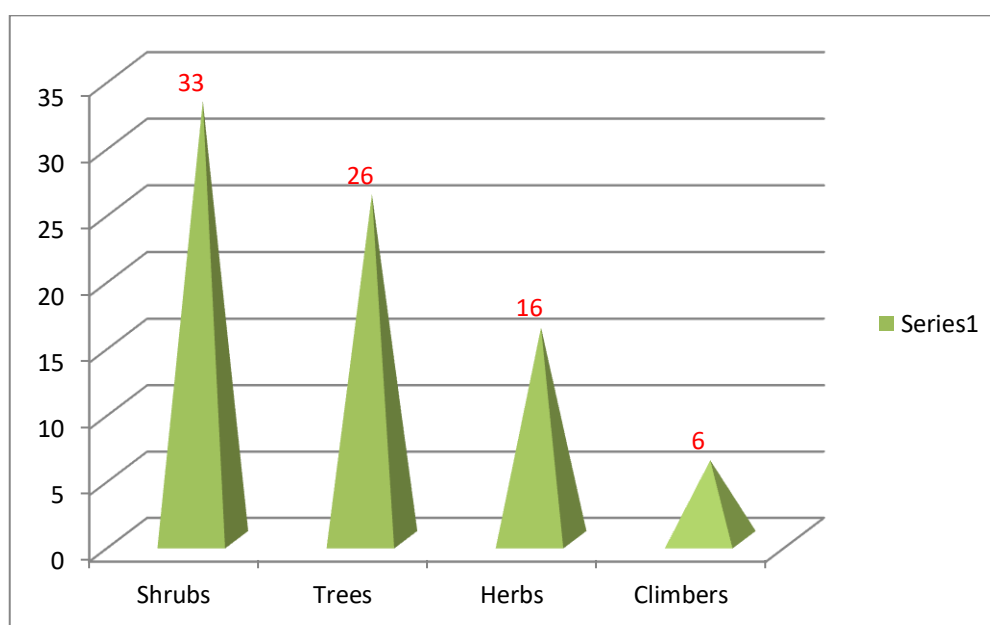


Figure - 7 : Growth forms of Medicinal plants for treatment of human health problems

4.7. Parts of Medicinal Plants Used

Based on the information from all 100 informants in the study area, the most commonly used plant parts for remedy preparations were Leafs (38.4%), followed by Roots (14.14%), Barks(13.13%), Seeds and fruit (4%) each, Leaf with Bark (9 %), Leaf with Root (7 %), Sap and Leaf (3%) and the rest less than (3%) (Table 6). Thus, leaves are the significant part of the plants when compared to other parts of plants in the study area. This could be

related to the fact that utilization of leaves for remedy preparation were helped for conservation of medicinal plants as compared to the use of roots, stems and entire plant parts which would caused harsh effect on the plant species. This findings agreed with similar work of several studies in Ethiopia which showed that leaves were the most important parts to prepare the remedy by Misganaw Meragiaw *et.al.*,(2016),Getu Alemayehu *et.al* (2015), Fisseha Mesfin *et.al* (20014).

Table 6: Plant Parts used in the preparation of remedies

R. No.	Used part	Number of plant species parts	Percent (%)
1	Leaf only	38	38.4%
2	Bark only	13	13.13 %
3	Root only	14	14.14%
4	Fruit only	4	4 %
5	Seeds	4	4 %
6	Sap	2	2 %
7	Flower	2	2 %
8	Bulb	2	2 %
9	Root & bark	1	1 %
10	Leaf & root	7	7 %
11	Leaf & Bark	9	9 %
12	Sap & Leaf	3	3 %
	Total		100

4.8. Methods of Preparation and Forms Used

In this study informants used different preparation methods. Pounding takes the highest 38 (31.1%) followed by chewing 25 (20.5%), Rubbing, Painting and creaming together 12 (9.8 %) and crushing, decocting, fumigating and others account less than (9 %) in the form of plant parts used for treatment of human health problems (Table- 7). The method of preparation shows that the local people used the fresh forms of medicinal plants than the

dried plants. The preparations are drawn from mixtures of different plant species with different additive substances like honey, sugar, butter, salt, ground honey for the treatment of single ailment. These additive substances have double function i.e to improve flavor and reduce adverse effects such as vomiting and diarrhoea, and enhance the efficacy and healing conditions.

Table -7: Preparation Methods of Traditional Medicine in the study area

Preparation methods	Preparations	Percent (%)
Chewing	25	20.5 %
Pounding	38	31.1 %
Decoction	10	8.2 %
Squeezing	4	3.3 %
Rubbing	12	9.8 %
Painting and Creaming	12	9.8 %
Crushing	11	9 %
Fumigating	3	2.5 %
Others	7	5.7 %
Total	122	

The preparation methods vary based on the type of disease treated and actual site of the human ailment. The local community of the study area used for a single Mps more than one plant part or preparation methods. In the table the number 122 indicates the total preparation methods informants used. The various units of measurement in the preparation of traditional medicines are; finger length (for roots, root bark, and stem-barks), using Tea cup and water glasses for powdered and pounded plant parts by drinking with tea, coffee, water or boiled water for remedy, and also numbers (for leaves, seeds, fruits and flowers) in the form of eating, rubbing, heating and fumigating were used to estimate and fix the amount of medicine according to the size of the infected area. This could be related to the fact that some ailments were treated using two or more medicinal plant species based on the effectiveness of the remedy from each species. Similarly, related results were also reported by

Tamru Temam and Asalfew Dillo (2016) suggested that cases where more than one plant were used to treat a particular ailment. However, the current finding revealed the interrelationships of the use of medicinal plants in combination and high level of curing efficacy in a single plant medicine is similar with the findings of Bayafers Tamene,(2000), Debela Hundie (2001) and Etana Tolessa (2007).

4.8. Routes of Administration

The prepared traditional drugs are administered through different routes of administration. The major routes of administration in the study area include; oral, dermal, nasal, ocular and Anal etc. In this study, the most popular way of administration of plant medicines were internal particularly oral which accounted for 62 (66 %) followed by Dermal 22(23.4%), Nasal 4(4.2%), and the rest Ocular, Anal takes less than (4 %) in respective order (Table-8).

Table -8: Routes of administrations and number of applications of plant medicines

Route of Administration	Total Application	Percent (%)	Ranks
Oral	63	68.1	1
Dermal	22	23.0	2
Ocular	3	3.1	4
Nasal	4	4.0	3
Anal	3	2.0	5
	95	100	

On the table the number 95 indicates informants used more than one route of administration for specific medicinal plant species for the remedy of different ailments.

This could be related to the fact that the for most routes of application support a fast physiological response of prepared medicines with the ailments and improve the beneficial influence. This finding agree with Getu Alemayehu *et.al* (2015), Atinafu kebede *et.al* (2016), Haile Yineger *et.al* (2008), Daniel Kalul and Alli Seid

(2014) confirmed that oral administration was the most important ways of administration.

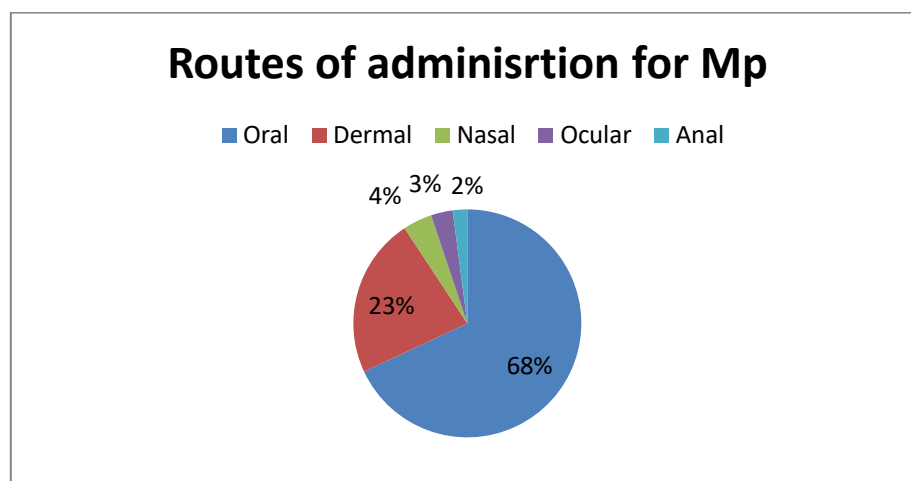


Figure 8: Shows percentage of Routes of administrations used in the study area

In the case of Route of administration findings of the study in various ethno botanical researches elsewhere in Ethiopia most applications include oral, through the eyes, nasal, anal or through the ear canal. External application involves dermal treatment. Overall, oral administration was reported as a dominant route of administration followed by dermal application, this is because the most common diseases in the study area were internal and dermal. This is similar with the study of Dawit Abebe (1986); Bayafers Tamene (2000); Debela Hunde (2001); Endale Amenu (2007); Mirutse Giday (2007); Etana Tolosa (2007) and Tamiru Temam et al., (2017). Both the dominant routes of administration (oral and dermal) routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power.

4.9 Dosage of Traditional Medicine Usage

The dosage of medicine to be administered is given by rough estimation of the age and physical condition of the patient. Hence there is no precision on the dosage of the remedy. According to healers information's few types of medicinal plants have been given for specific ages even for similar type of ailments, for instance locally called "Amessa" "*Lactuca inermis*" was given for children less than 1 year of age for

stomachache using boiled water even though the dosage is different in each TH in the study sites, but ages above one year use other types of medicinal plants. Dawit Abebe and Ahadu Ayehu (1993) reported that lack of precision in the dosage is one of the major drawbacks of practicing traditional remedy. As regards to route of administration, medicines are applied internally or externally (Figure-8). This finding agrees with some previous reports (Dawit Abebe, 1986 and Kebu Balemie et al., 2004). Most medicinal plants prescribed and given to patients are applied by the healers' local experience but lack of standardized doses. Approximate dosages were reported to be determined based on age, sex and physical appearance of patients. This study also agrees with other studies such as Genene Bekele and Reddy (2015), Daniel Kalul and Ali Seid (2014) the real drawback in traditional medicine system mostly arises from lack of precision in dosage. The administration is not scientifically standardized because of estimating the amount of traditional medicine mostly by counting the leaves and seeds, measuring by using tea-cups and other local materials. Applying individual trends of the informants, which is not similar with each other on the preparation of remedy. They also commonly used antidotes like coffee, milk, honey and butter in addition for the flavor change.

4.10. Applications of Medicinal Plants

The traditional healers prepared medicinal plants in different ways and applied it in different methods to the patients. Applications such as Drinking accounts for 26.1%, Rubbing 6.7%, painting 6.7 %, chewing or Swallowing 14%, Fumigating (smelling) or smoking 2.38% and Squeezing 2.3% respectively. The findings show that internal ailments were commonly treated by drinking, chewing and swallowing. Skin infections like snake bite were treated by rubbing and painting on the infected parts. Ailments like jaundice and pneumonia were treated by crushing and pounding, decoction and infusion applied through oral administration. Headache was treated through nasal smell and evil eye through oral administration and different methods were used to treat other ailments. For example, stem bark and roots of *Bersama abyssinica* chewed or drunk the sap against intestinal parasites.

The local healer believed that one medicinal plant can treat many diseases by applying same or different parts of the plant for instance *Croton macrostachyus*, applied

through drinking, dropping, put on, and chewing of leaves, root and stem bark to treat ailments like diarrhea, intestinal parasites and gonorrhea etc. In all cases, application through mouth is the dominant one (Figure- 9).

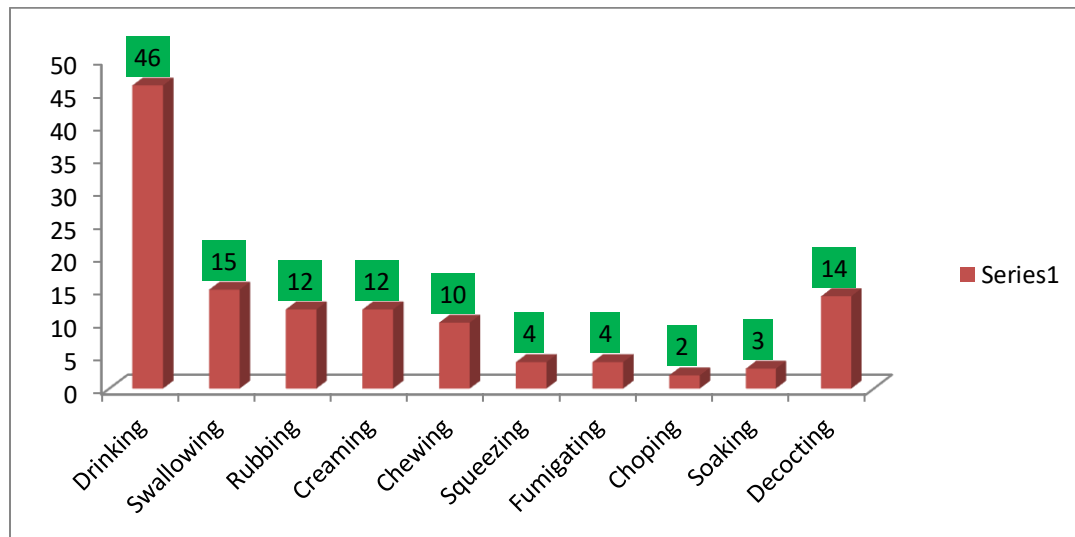


Figure 9 - Applications of traditional medicinal plants in the remedies

Furthermore, they used on the way they were prepared to keep their success for the treatment of interrelated diseases in which most of the remedy application for single or mixture drinking were the dominant method. This results agree with the finding of the study conducted by Gidey Yirga (2010), Seyoum Getaneh and Zerihun Girma (2014) in which they point out drinking by powdering and pounding is the dominant way of preparation.

This findings agreed with similar work of several studies that carried out in Ethiopia showed that leaves were the most important parts to prepare the remedy by Getu Alemayhu *et. al.* (2015), Fisseha Mesfin *et.al* (20014), Tesfaye Awas (2009); Misganaw Meragiaw *et.al.*,(2016). From this evidence one can understand that leaf is a very important part of plants in terms of medicinal value at least in the context of the local people. Usage of the leaf may not have a significant negative impact on the medicinal plant as compared to the root. This is because aerial parts of the plant are highly dependent on roots for physically support and physiological processes. This makes the treatmeant of medicinal plants consistent and simple every time.

4. 10.1 Conditions of preparations of medicinal plants

The finding in the utilization of medicinal plants used indicates that most commonly the local people selectively use the fresh form of medicinal plants than dried part of the MPs for remedy preparation. They rarely use either condition with no selection. Among the total MPs preparation out of 115 different kinds of preparations, 74 of them (64.3%) used for their fresh part, 27 (23.5%) used their dried part. And the rest 14 (12.2%) used other types of mixed preparation methods. Some of the medicinal plants were seasonal for their leaves and flowers; in this case informants used other optional plants or other parts of that plants (Figure 10). Most medicinal plants are shrubs because they are easily accessible than trees and herbs in their medicinal value in the study area.

The result is in agreement with the findings of Dawit Abebe (1986), Debela Hundie (2001), Etana Tolasa (2007) and Misganaw Meragiaw *et.al*, (2016) in which the single plant preparation were reported to be high in a similar manner with the study area.

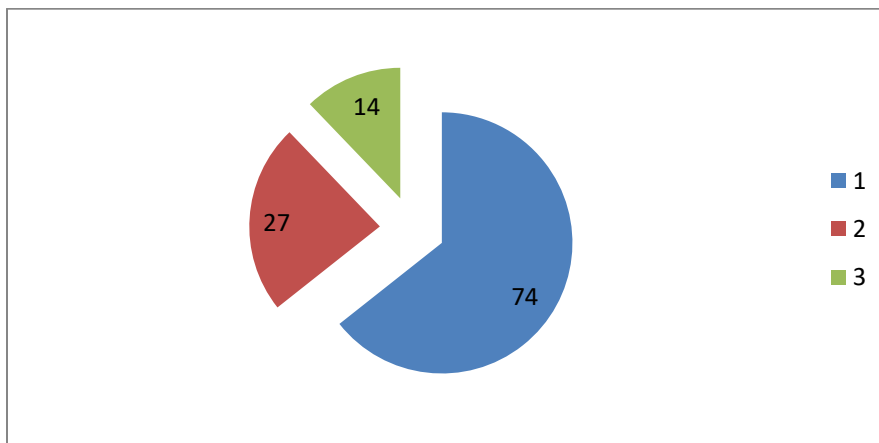


Figure 10: Conditions of preparation of medicinal plants in the remedy

4.11. Importance of Medicinal Plants

4.11.1 Informant Consensus

The popularity of medicinal plants in the area is based on the effectiveness of the species to treat the ailments and due to the abundance of the plant in the area for easy access. Even if some local people have similar knowledge towards the medicinal values of some plants,

some of them have limited knowledge in order to evaluate the reliability of information during the interview, informants were made contact with at least two times for the same ideas and the validity of the information was proved and recorded. Therefore, if the idea of the informant departs from the original information, it was rejected since it is considered as unreliable. The results of the study showed that some medicinal plants are popular than the others, the informants' consensus obtained during this study showed that some plants were cited by their abundance and medicinal value in the area.

Table 9: Informant Consensus on mostly used medicinal plants

Botanical name	Number of informants	Percent (%)	Ranks
<i>Ruta chalepensis</i> L.	31	31	5th
<i>Vernonia amygdalina</i> Del.	25	25	9th
<i>Ocimum lamiifolium</i> Hochst.ex Benth.	38	38	1st
<i>Croton Macrostachyus</i> Hochst.ex Delil	35	35	2nd
<i>Lagenaria siceraria</i> (Molina) standl.	27	27	7th
<i>Lepidium sativum</i>	26	26	8th
<i>Nicotiana tabacum</i> L.	33	33	3rd
<i>Hagenia abyssinica</i> (Bruce) J.F.Gmel	18	18	11th
<i>Phytolacca dodecandra</i> L'Herit.	29	29	6th
<i>Solanum incanum</i> I.	32	32	4th
<i>Sida ovata</i> forsk.	23	23	10th
<i>Rumex abyssinicus</i> Jacq.	16	16	12th

According to informant's consensus value and due to the abundance of the plant in the area for easy access, the case of *Ocimum lamiifolium*, *Croton macrostachyus* and *Nicotiana tabacum* can be cited for their abundant distribution the leading position in the study area respectively. As shown in table 8, informants cited for the treatment of different ailments the most 5 medicinal plant species of having percentage greater than 31% including *Ruta chalepensis* 31%, *Solanum incanum* 32%, *Nicotiana tabacum* 33%, *Croton Macrostachyus* 35% and *Ocimum lamiifolium* 38% in a respective order.

However, some of the medicinal plants were relatively identified by fewer Informants. When it was compared with others twelve MPs, *Rumex nepalensis* 16%, *Hagenia abyssinica* 18% and *Sida ovata* 23% which are having less medicinal value for the local people than others having high informant consensus due to their abundance. But, it does not mean that it was not used by the local people rather still given by traditional healers. This is because the availability the above mentioned plants in the selected sites is limited than other areas of the district. Thus informants of the selected kebele used mostly abundant plant species in their local area.

4.11.2 Informant Consensus Factor (ICF)

The value of medicinal plants in treating various ailment differ from each other based on the plant species used. A high ICF value (value close to 1 or 0.91) indicates that the informants rely most on the same taxa to manage specific disease conditions, while a low value (close to 0 or 0.75) indicates that the informants disagree on the taxa to be used in the treatment of a given ailments. Medicinal plants that have the potential of treating particular ailments had given a high informant consensus factor value. The higher ICF result (91%) was achieved from difficulties of intestinal parasites and stomachache followed by Malaria and headache (90%), skin infection and wound (88%), then nasal bleeding and fibril illness (86%). The minimum value of Informant consensus factor was acquired from problems of Evil spirit and evil eye (75%) (Table -10).

Table 10: Informant consensus factor by categories of diseases in the study area

Category	Species (nt)	Use citations (nur)	ICF	%
Gonorrhea and hemorrhoid	4	15	0.78	78
Evil spirit and evil eye	3	9	0.75	75
Skin infection and wound	8	61	0.88	88
Nasal bleeding and fibril illness	3	16	0.86	86
Malaria and headache	5	41	0.90	90

Diarrhea and Amoeba	7	47	0.87	87
Intestinal parasite and stomachache	8	75	0.91	91
Pneumonia and Cough	6	25	0.79	79

4.11.3 Fidelity Level

The fidelity level (FL), the percentage of informants claiming the use of certain plant for the same major purpose, was also calculated for the most frequently reported diseases or ailments. 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 medicinal plants. Thus high FL could also be an indication of efficiency of the reported plant to cure a specific ailment (Table-11). In this case, we can see about Malaria disease informants prefer the most powerful MPs from certain others MPs treating Malaria.

Table 11: Fidelity level index of some medicinal plants

Name of Medicinal Plants	Types of Ailment treated	NP	N	FL	FL %
1. <i>Dodonea angustifolia</i> L.f.	stomach pain	26	31	0.84	84
2. <i>Croton macrostachyus</i> Hochst.ex Delil	Intestinal pain	26	38	0.68	68
3. <i>Drynaria volkensii</i>	Toothache	12	16	0.75	75
4. <i>Ocimum lamiifolium</i> Hochst.ex Benth.	sudden pain	15	21	0.71	71
5. <i>Musa paradisiace</i> L.	Wound	23	26	0.88	88
6. <i>Justicia schimperi</i> (Hochst. ex A. Nees) T. Anders	Diarrhea	17	18	0.81	94
7. <i>Albizia schimperina</i> (J.F.Gmell) C.A.sm	Malaria	13	13	1.00	100
8. <i>Calpurnia aure</i> (Atton) Benth	Gonorrhea	10	11	0.90	90

As we can see from the table, 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 plants for that specific ailment in this case *Albizia schimperina* was

reported by many informants to treat **Malaria** and hence had 100% FL. The other medicinal plants having high fidelity level index next were *Premna schimperi* 94% for Diarrhea, *Calpurnia aure* 90% for Gonorrhea, *Musa paradisiace* 88% for wounds and *Ocimum lamiifolium* 71% for sudden pain, the result indicates the informants used these plants more commonly in the study area. On the other hand the relative healing potential of the other plants on the specified ailments shows less percent indicating the medicinal plants having less and less fidelity level value implying Mp also used for other additional ailments. Thus, *Ocimum lamiifolium* Hochst.ex Benth (71%) and *Croton macrostachyus* Hochst.ex Delil, (68%) are good examples for using more than one ailment. The result showed (Table 11) that high fidelity level could also be an indication of effectiveness of the reported medicinal plant species to treat a particular disease. This indicated that the medicinal value of some species in the study area was high in comparative to other medicinal plants. This result agree with Mekonen,(2013),Tilahun and Mirutse, (2007).

5.11.4 Paired comparison

A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized and summarized by selected informants and their responses recorded value. The possible pairs were shown in the study area by local informants. In this study, eight key informants (R1- R8) were selected to conduct pair wise ranking exercise of five medicinal plants used to treat **Gonorrhea**, which are *Plectranthus garckenus*, *Ehretia cymosa*, *Croton macrostachyus*, *Ekebergia capensis* Sparrum and *Foeniculum vulgare* were taken by the informant's suggestion (Table - 12).

Table 12: Paired comparison of selected five medicinal plants used to treat Gonorrhea based on the informants perceptions. (Values given 0 to 5; 0= not used,1=least used, 2= less used,3=good,4=very good,and 5=excellent.)

	Plant species	Respondents leveled (1- 8)								Tot	Ra
		R1	R2	R3	R4	R5	R6	R7	R8		

										al	nk
1	<i>Plectranthus garckenus</i> (vatke) J.k Morton	6	10	0	1	0	3	0	1	21	4th
2	<i>Ehretia cymosa</i> Thonn.	0	0	3	6	6	1	10	3	29	3rd
3	<i>Croton macrostachyus</i> Hochst.ex Delil	3	1	10	10	3	6	3	6	42	2nd
4	<i>Ekebergia capensis</i> Sparrum	10	6	1	0	1	0	1	0	19	5th
5	<i>Foeniculum vulgare</i> Mill.	1	3	6	3	10	10	6	10	49	1st

As we can see from the table the value of each medicinal plant pair formation to treat the ailment Gonorrhea was recorded by the value of possible pair formation given by the informants. According to the result of pair wise ranking *Foeniculum vulgare* stood first whereas, *Croton macrostachyus* ranked 2nd, *Ehretia cymosa* ranked 3rd, *Plectranthus garckenus* and *Ekebergia capensis* Sparrum ranked 4th, 5th respectively and are less preferred and believed to be less effective when compared to the first and second ranked plants for treating gonorrhea in the study sites (Table-12).

4.11.5. Preference Ranking

When there are more than one plant species which are used to treat the same ailments, people prefer the better one. Preference ranking was conducted following Martin (1995) Informants selected to identify the best-preferred medicinal plant species for treatment of a particular ailment. Each informant provided with specified number of medicinal plants reported to cure this disease, and asked to assign the highest value for plant species most preferred, against this illness and the lowest value for the least preferred plant. These values summed up and ranked each plant species. According to the preference ranking six medicinal plants that were reported as effective for treating diarrhea was conducted after selecting 6 key informants (A - F) (Table:13).

The informants were asked to compare the given medicinal plants based on their efficacy, and to give the highest number (5) for the medicinal plant which they thought most effective and the lowest number (1) for the least effective plant in treating **diarrhea**. As shown in table 13, *Albinzia gummifera* , *Justicia schimpriana* , *Solanium incanum* ,

Codia Africana, *Ajuga integrifolia* and *Combratum molle* R. are believed to be the most effective and preferred medicinal plants to treat Diarrhea in their respective order.

Table 13: Preference ranking of six selected medicinal plants used to treat diarrhea according to perceptions of informants

	Plant species	Respondents A to F							
		A	B	C	D	E	F	Total	Rank
1	<i>Codia africana</i> Lam.	4	3	3	2	1	4	17	4th
2	<i>Solanum incanum</i> L.	3	5	1	3	2	5	19	3rd
3	<i>Ajuga integrifolia</i> Buch.-Ham.	4	4	1	2	1	4	16	5th
4	<i>Combretum molle</i> R. Br.ex G. Don	1	0	3	2	3	5	14	6th
5	<i>Albinzia gummifera</i> (J.F.Gmell)C.A.sm	2	3	4	5	5	4	23	1st
6	<i>Justicia schimpriana</i> (Hochst. ex A. Nees) T. Anders	3	4	5	2	5	1	20	2nd

4.11.6. Direct matrix ranking

Direct matrix ranking exercise has been done following Martin (1995) in order to compare multipurpose use of a given species and to relate this to the extent of its utilization versus its dominance. Based on the information gathered from informants, multipurpose tree species selected out of the total medicinal plants and listed their use-values including medicinal, fodder, food, firewood, construction, charcoal, fencing, and furniture making. Key informants were conducted this activity by assigning direct use- values shown on (Table-14).

Table-14: Direct matrix ranking of eight medicinal plant species based on their general use values (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used)

Use-categories		
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Species	Fire wood	Forage	Construction	Furniture	Food	Charcoal	Fencing	Medicine	Total	Rank
<i>Croton macrostachyus</i> Hochst.ex Delil	4	2	3	3	0	0	4	5	21	7 th
<i>Cordia Africana</i> Lam.	4	3	5	5	1	4	4	4	30	1 st
<i>Rhamnus prinoides</i> L'Herit	4	0	3	2	0	4	3	3	19	8 th
<i>Syzygium guineense</i> (Willd.) Dc	3	1	4	5	4	3	1	4	25	3 rd
<i>Vernonia amygdalina</i> Del.	4	3	3	3	0	3	3	5	24	4 th
<i>Ficus vasta</i> Forssk.	3	3	5	4	0	3	2	2	22	6 th
<i>Millettia ferruginea</i> (Hochst.) Bak	5	2	4	3	0	2	4	3	23	5 th
<i>Eucalyptus globules</i> Labill	5	0	5	5	0	1	5	5	26	2 nd
Total	32	14	32	30	5	20	26	31	191	
Rank	1 st	6 th	1 st	2 nd	7 th	5 th	4 th	3 rd		

Accordingly, each key informants use values for the multipurpose medicinal plant species, average value of each use-diversity for a species was taken and the values of each species summed up and ranked. In this study as we can see from the table Species *Cordia Africana*, *Eucalyptus globules* and *Syzygm guineense* takes the leading lines of multipurpose use by informants' information with 30, 26, and 25 from 1st, 2nd and 3rd ranks respectively (Table -14). Thus, these species are now on the way of extinction due to over consumption for firewood and construction purposes in the study area.

4.11.7. Medicinal Use Value

Some plant species are known to treat a single ailment; some others may be used for multiple of health problems. Medicinal use value (UV) is a quantitative method that

demonstrates the relative importance of species known locally. Some species that were cited for more than one ailment calculated using the following formula;

$$UV = \Sigma U / n \quad \text{Where:}$$

UV = use value of a species;

U = number of citations per species;

n = number of informants

Table15. Use Value of Certain Medicinal Plants in the Study Area

Plant Species	Use citation (ΣU)	Informants (n)	Use value (UV)
1. <i>Croton macrostachyus</i> Hochst.ex Delil	17	13	1.3
2. <i>Allium sativum</i> L.	12	10	1.2
3. <i>Moringa stenopetala</i> L.	15	11	1.3
4. <i>Phytolacca dodecandra</i> L'Herit.	6	6	1.0
5. <i>Ricinus communis</i> L.	9	8	1.1
6. <i>Calpurnia aurea</i> (Atton)Benth	6	7	0.8
7. <i>Nicotiana tobacum</i> L.	8	7	1.1
8. <i>Dodonaea angustifolia</i> L.f.	3	4	0.75

Results of use value computation for these species on (Table-15) showed that *Croton macrostachyus* and *Moringa stenopetala* had the highest use value 1.3, followed by *Allium sativum* having 1.2, *Ricinus communis* and *Nicotiana tobacum* 1.1 the same highest use value more than one, which is showing a number of medicinal plants can serve as multiple purpose of curing potential.

This suggests that these species are used to treat many ailments. For instance, *Croton macrostachyus* was reported to treat ailments such as headache, evil eye, febrile illness, gonorrhea, skin infection and rabies. On the other hand *Allium sativum* with the combination of other plants used to treat Malaria, Tonsillitis, Stomach pain and sudden

pain etc, and *Moringa stenopetalaw* was reported to treat diabetes, blood pressure, wound, febrile illness.

4.12 Conservation and Threats to Medicinal Plants

4.12.1. Threats to Medicinal Plants and Indigenous Knowledge

Rural people need plants in their livelihood for different purposes. From the interview with informants various factors were recorded as the main threats to medicinal plants in Aleta-Chuko District. Agricultural encroachment, firewood collection, charcoal production, plant use for house and fence construction, overgrazing, and urbanization were reported to be factors for the dwindling of vegetation in general and medicinal plants in particular. As a result, informants require long distance of travelling to fetch medicinal plants. The informants were ranked (R1 to R8) the threats based on their possible effect that aggravated the difficulty. However, the major causes of the threats of medicinal plants species in the district includes; agricultural expansion (22.4%) followed by construction purposes (21.5%), fire wood (18.4%), drought (11.7%), Urbanization (12.1%), overgrazing (7.2%) and charcoal production (6.7%) respectively (Table 16). Similar study of (Etana Tolosa, 2007) the use for Fire wood and construction as well as agricultural expansion were the main causes for the depletion of medicinal plants.

Table16: Threatening factors of medicinal plants in the study area

Threatening factors	Respondents								Total	percent	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈			
Agricultural expansion	7	6	7	5	6	7	7	5	50	22.4%	1 st
Construction purposes	6	7	5	6	7	6	4	6	48	21.5%	2 nd
Over grazing	2	1	3	2	1	2	2	3	16	7.2%	6 th
Fire wood	4	5	6	7	4	5	6	4	41	18.4%	3 rd
Urbanization	5	4	1	4	2	3	1	7	27	12.1%	4 th

Charcoal production	1	3	2	1	3	1	3	1	15	6.7%	7 th
Drought	3	2	2	3	5	4	5	2	26	11.7%	5 th
Total									223	100%	

Moreover various anthropogenic factors threatened useful medicinal plants and interrelated indigenous knowledge in the area. The ethno botanical knowledge transferred from one generation to the next by orally. From the discussion with informants, it was observed that the fore fathers tell information only to one or few family members to use in secrecy. They disclose their knowledge on medicinal plants at old age by the time when they most probably die before teaching the details of medicinal plants or when they are too old to walk to the field to show the plants in their habitat. As a result the indigenous knowledge seems to be vanishing from the study area. When comparing the abundance of tree species existing in the study area, it was recorded that *Croton macrostachyus* is more abundant than other tree species. Because of it is not harvested as other plants for firewood, building, not browsed and grazed compared to others in the area. In fact, the plant is popular among the informants for its medicinal value. In addition to that, from the above table we can understand factors affecting natural vegetation and overall medicinal plants mainly by Agricultural expansion and construction purposes or urbanization. As a result healers travel long distance to get medicinal plants. These main factors were regarded as main threats that contributed to loss of plant species in general and medicinal plants in particular in the study area. This finding is agreed with the work of (Kebu Baleme et.al.,2004) and similarly by (Etana Tolosa, 2007) reported that the use for construction as well as agricultural expansion were the main causes for the depletion of the medicinal plants.

4.12.2 Conservation of Medicinal Plants

The above causes and other similar reasons are the problems for the conservation of medicinal plants and associated knowledge. Even though, there are many problems plus high population growth and thus there are over exploitation of medicinal plants

for different purposes and for getting the daily income, some traditional practitioners had started to conserve medicinal plants by growing them in home gardens. Included in this category were *Allium sativum*, *Nicotiana tabacum*, *Ocimum lamiifolium*, *Ruta chalepensis*, *Zingiber officinale*, *Cucurbita pepo*, *Momordica boivinii*, *Catha edulis*, *Rhamnus prinoides*, *Coffea arabica* and *Carica papaya* etc. The significant numbers of the local people of the area know the importance of conserving the plants in their local area. Beside this, some people and Government office expertise were giving awareness on conserving the medicinal plants. Thus cultivation of medicinal plants in the study area could contribute to the conservation of biodiversity in the area as a whole.

Chapter five

5. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

Traditional healers or practitioners of Aleta-Cuko district, kebeles were found to keep their knowledge of TM away from the community to retain its secrecy. Especially, the elderly practitioners collect and process the remedy in strict secrecy. They asserted that they do this in order to sustain the income they earn by giving the remedy for the customers who consult them for their health problems. Some also mentioned a belief that if the plant is widely known by the community, the potency of the plant will be lost. So, it has to be done that:

- The main threat for medicinal plants in the area arises from agricultural expansion, fire wood, charcoal production, and different constructions. Threat comes to medicinal plants due to the utilization of these plants for medicinal purpose is negligible. Whereas threats that erode indigenous knowledge comes from the secrecy and by the influence of :-
 - ❖ Oral based knowledge transfer,
 - ❖ Reluctance of young generation to gain the knowledge,
 - ❖ Unavailability of some of the species around local area,
 - ❖ Modern education and awareness factors are the major problems.

As the government officer's suggestion, most of the problems of distribution of the ailments in the study area were due to less social and personal hygienic conditions or neatness problems.

5.2 – RECOMMENDATIONS

❖ Based on the result of the study, the following recommendations were forwarded:

- Identifying genuinely effective medicinal plants and encourage their production, cultivation and formalizing the activities of traditional medicine practitioners through licensing.
- Users and practitioners of TMs encounter a number of constraints such as, their seasonal availability and shortages of finance and lack of technical know-how.
- Local community must be aware of preserving indigenous knowledge on medicinal plants
- Attention should be given to standardization of measurement and hygiene of the medicines made from plants by training both the healers and local community.
- Establishing conservation measures strategies to ensure the sustainability of multipurpose and widely used medicinal plants as most medicinal plants are obtained from the wild. This can be achieved by:-
 - i. Encouraging people to grow medicinal plants in the home gardens, mixing with crops in farmlands and live fences.
 - ii. Promoting the establishment of local botanical garden starting at least at the Woreda level
- The indigenous knowledge and skill of traditional medicine practitioners must be encouraged and protected.
- Special consideration and all possible endeavors must be made to use the traditional medicine and traditional medicinal plants in the study area.
- Therefore, awareness rising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure medicinal plants sustainable use. Further biological studies should also be conducted on the reported medicinal plant species of the study area so as to utilize them in drug development.

REFERENCES

- Abera Balcha (2014) Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia. *Journal of Ethnobiology and Ethnomedicine* **10:40**.
- Abiyu Enyew, Zemedet Asfaw, Ensermu Kelbessa, Reja Nagappan (2014) Ethnobotanical Study of Traditional Medicinal Plants in and Around Fiche District, Central Ethiopia, *Journal of Biological Sciences*; **6(4):154-167**.
- Afwork Kassu (2004). Ethnobotanical survey and the medicinal plants of some areas in South and Central Ethiopia. In: Traditional Medicine in Ethiopia, Proceedings of A National Workshop Held in Addis Ababa, Ethiopia, on June 30-2July, 2003. Pp.81-91,
- AWARDO(2018).Report of Aleta-chuko Wereda Agriculture and Rural Development Office 2018.
- AWFDO (2018).Report of Aleta Wereda Financial & Economic Development Office, 2018.
- Atinafu Kebede, Shimelis Ayalew, Akalu Mesfin and Getachew Muluaalem; Ethnobotanical investigation of traditional medicinal plants commercialized in the markets of Dire Dawa city, eastern Ethiopia, *Journal of Medicinal Plants Studies* **2016; 4(3): 170-178**
- Bayafers Tamene (2000). A floristic analysis and ethnobotanical study of the semi-wetland of Cheffa area, South Welo, Ethiopia. M.Sc. Thesis. Addis Ababa University.
- Bishaw Mengiste, 1991. Promoting traditional medicine in Ethiopia: a brief historical review of government policy. *Social Science and Medicine*, 33: 193-200.
- Daniel Kalu¹ and Ali Seid (2014) Ethnobotanical study of medicinal plants in Ankober woreda, central Ethiopia. *Ethiopia Journal of Science & Technol.* **7(2) 105-114, 2014**
- Dawit Abebe and Ahadu Ayehu (1993). *Medicinal plants and Enigmatic Health Practices of Northern Ethiopia*, Berhanina selam printing Enterprise, Addis Ababa.
- Dawit Abebe (1986).Traditional Medicine in Ethiopia: the attempt being made to promote it for effective and better utilization. *SINET: Ethiopian Journal of Biological science* **9(supp1.) 61-69**

- Debela Hunde (2001). Use and Management of Traditional Medicinal Plants by Indigenous People of Bosat Woreda, Wolenchiti area: An ethnobotanical approach. M.Sc. Thesis, Addis Ababa, Ethiopia.
- Edwards, S. (2001). The ecology and conservation status of medicinal plants in Ethiopia. What do we know? In: Conservation and Sustainable Use of Medicinal Plants in Ethiopia, Proceeding of the National Workshop on Biodiversity Conservation and Sustainable Use of Medicinal Plants in Ethiopia, 28 April-01 May 1998. Pp.46-55,
- Endale Amenu, 2007. Use and management of medicinal plants by indigenous people of Ejajirea (Chelya Woreda) west shoa : An ethnobotanical approach. M.Sc.Thesis, Addis Ababa, Ethiopia.
- Endashaw Bekele, 2007. Study on Actual Situation of Medicinal Plants in Ethiopia; Prepared for Japan Association for International Collaboration of Agriculture and Forestry, http://www.jaicaf.or.jp/publications/ethiopia_ac.pdf accessed on 06/03/2011.
- Ermias Lulekal, Ensermu Kelbessa and Tamrat Bekele, HaileYineger 2008.An Ethnobotanical Study of Medicinal Plants in Mana Angetu District, South Eastern Ethiopia. ***Journal of Ethnobiology and Ethnomedicine. 4:1-10***
- Etana Tolasa (2007). Use and Conservation of Traditional Medicinal Plants by Indigenous People in Gimbi Woreda, Western Wellega. M.Sc. Thesis. Addis Ababa, Ethiopia.
- Eyasu Cama (2015),TheStudy on Medicinal Plants and their Uses to Treat Human Ailments in Damot-Gale District, Wolaita Zone, South Ethiopia, ***International journalof science and Research vol.6, Issue 2, P. 391***
- Farnsworth NR. 1985. Plants and Modern Medicine: Where Science and Folklore Meets.World Health Forum, 6 (1): 76-80
- Fisseha Mesfin, Talemso Seta & Abreham Assefa, 2014. An Ethnobotanical Study of Medicinal Plants in Amaro Woreda, Ethiopia. ***A Journal of Plants, People and Applied Research: Ethnobotany Research & Applications, 12: 341-354***
- Friis, I., and White, F.(2003). Ebenaceae. In: (Hedberg, I., Edwards, S. and Sileshi Nemomisa (eds.)). *Flora of Ethiopia and Eritrea, Volume 4. Apiaceae to Dipsacaceae.*

The National Herbarium, Addis Ababa University, Addis Ababa, Ethiopia and Uppsala, Sweden Pp.258-358.

- Fisseha Mesfin, Sebsebe Demissew and Tilahun Teklehaymanot, 2009. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia, ***Journal of Ethnobiology and Ethnomedicine*, 5:1-18.**
- Friedman, J.Yani, Z., Dafni, A. and Palewitch, D. (1986). A Preliminary Classification of the Haling Potential of Medicinal Plants, Based on the Rational Analysis of Ethnopharmacological Survey Among Bedouins in Negue Desert, Israel. ***Journal of Ethnopharmacology* 16:275-287**
- Getu Alemayehu, Zemedet Asfaw, Ensermu Kelbessa (2015) Ethnobotanical study of medicinal plants used by local communities of Minjar—Shenkora District, North Shewa Zone of Amhara Region, Ethiopia, ***Journal of Medicinal Plants Studies* 3(6): 01-11**
- Gidey Yirga (2010). Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. ***Afr. J. Plant Sci.* 4(1): 6-11.**
- Gonfa Kewessa, Tesfaye Abebe and Ambachew Demisse (2015) - Indigenous Knowledge on the Use and Management of Native Medicinal Trees and Shrubs in Dale District, Sidama Zone, Southern Ethiopia *Ethnobotany Research & Applications* 14:171-182.
- Haile Yineger, Ensermu Kelbessa, Tamrat Bekele and Ermias Lulekal (2008). Plants Used in Traditional Management of Human Ailments at Bale Mountain National Park, Southeastern Ethiopia. ***Journal of Medicinal Plant Research*.2:132-153.**
- Kebu Balemie, Ensermu Kelbessa and Zemedet Asfaw (2004). Indigenous medicinal plant utilization management threats in Fentalle area, Eastern Shewa, Ethiopia. ***Ethiop. J. Biol. Sci.* 3(1): 1--58.**
- Lulekal, E; Asfaw, Z; Kelbessa, E; Van Damme, P. ***Journal of Ethnobiology And Ethnomedicine* , 2013. 9 :63.**
- Luiz.R. Saldanha.G., Reinaldo, F., Paiva de A., (2005). Knowledge and use of medicinal plants by local specialist in a region of Atlantic Forest in the state of Pernambuco (North eastern Brazil).

- Martin GJ.1995. Ethnobotany: A Method Manual. Chapman and Hall, London, pp: 267-347.
- Mekonnen Abebe,2013.Ethnobotanical study of traditional medicinal plants of Gololcha District, Bale Zone of Oromia Region, Ethiopia, a reserech on Mps pp.17- 30.
- Megersa, M; Asfaw, Z; Kelbessa, E; Beyene, **A. *Journal of Ethno biology and Ethno medicine* ,2013: 6:68.**
- Mirutse Giday, 2001. An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia, ***CBM: s Skriftserie 3:81-99.***
- Misganaw Meragiaw, Zemedet Asfaw, and Mekuria Argaw (2016),The Status of Ethnobotanical Knowledge of Medicinal Plants and the Impacts of Resettlement in Delanta, Northwestern Wello, Northern Ethiopia
- Mulugeta Kuma Alito (2014), Use and management of medicinal plants by indigenous people of Jima Rare district in Oromia Region, Ethiopia M.Sc.Thesis Research,pp.2022
- National Biodiversity Strategies and Action Plan (NBSAP), 2005. National Biodiversity Strategy and Action Plan: Institute of Biodiversity Conservation. Addis Ababa, Ethiopia, pp. 1-27.
- Seyoum Getaneh and Zerihun Girma (2014), an ethnobotanical study of medicinal plants in Debre Libanos Wereda,Central Ethiopia. ***African Journal of Plant Science*, 8(7),.366—379,**
- Sintayehu Tamene (2011),An Ethno botanical study of medicinal plants in Wondogenet Natural Forest and Adjacent Kebele, Sidama Zone, SNNP Region, ETHIOPIA, a Research on MP pp26-27
- Tamru Temam and Asalfew Dillo (2016), Ethnobotanical study of medicinal plants of Mirab-Badwacho district, Ethiopia.***Journal of biological science Biotechnology*,5(2): 151-158**
- Tesfaye Awas and Sebsebe Demissew (2009), Ethnobotanical study of medicinal plants in Kafficho people, South western Ethiopia, In: Proceedings of the 16th International Conference of Ethiopian Studies, ed. by Svein Ege, Harald Aspen, Birhanu Teferra and Shiferaw Bekele, Trondheim, pp. 711-726.

- Teweldebirhan G. (1991), Diversity of Ethiopian flora. Cambridge University Press, Cambridge
- Thomas, H., 1995. Indigenous Knowledge, Emancipation and Alienation. *Journal of Knowledge Transfer and utilization* 8: 63-73.
- Tilahun Teklehaymanot and Mirutse Giday, 2007. Ethno botanical studies of medicinal plants used by people in Zegie Peninsula, Northwest Ethiopia; *Journal of Ethno biology and ethno medicine*, 3: 1-11.
- WHO, 2007. International Standard Terminologies on Traditional Medicine in the Western Pacific Region, Western Pacific, Manila, Philippines, Pp. 356.
- WHO (2002). Traditional Medicines Strategy 2002-2005. World Health Organization, Geneva: **WHO.**<http://www.Who.int/medicines/organization/trm/orgtrmmain.shtml>.

APPENDICES

Appendix I. List of medicinal plants used for human:- scientific name; family ; local name; habit; parts used; diseasetreated; methods of preparation with route of application and For collection, (voucher numbers).

Keys:

Habit(Ha.): Herb(H) ; Shrub(Sh) ; Tree(T) ; Climber(Cl.); Epiphyte(Ep.). **Parts used** (Bark, B; Latex, La; Root, R; Leaf, L; Fruit, Fu.; Flower, Fw.; Seed, Se.; Sap, Sa; Bulb, Bu.; Root and leaf, LR.; Leaf and seed, LSe; Bark and leaf, BL.; Sap and Leaf SaL. and Leaf and fruit, LFu. **Vo. No.**,for voucher numbers indicated by codes.Habitat(Ha/bt): home garden, h; wild, w; road side, r ; fence, f

VO .No .	Scientfic name	Family	Local name	Ha/bt	Ha	Pu	Disease treated	Mode of preparation	Route of App/n
me008	<i>Achyranthes aspera</i> L.	Amarantha ceae	Nolle	w	T	L	Stomach Pain Toothache and fever	-Pounding the leaf, mixing with water drinking a glass the mixture early in the morning -Chewing the leaf in between the teeth for at list one hour.	Oral
me012	<i>Acmella caulirhza</i> Del	Asteraceae	Bexxo	h	H	fl	Tonsillitis	The flower and Stem Chewed and swallowed during sleeping and early morning times.	Oral

me073	<i>Acokonthero schimperi</i> (A.Dc.) Schweinf.	Apocynaceae	Qarraro	w	Sh	LB	Gonorrhea Amoeba	Leaves and barks crushed or pounded with water, filtered and drunk (paint) until recovery	Oral
me004	<i>Ajuga integrifolia</i> Buch.-Ham. (bugleweed)	Lamiaceae	Anamuro	h	H	L	Intestinal ache Diarrhea	By pounding the leaf mixing with water, filtering and drinking a glass early morning	Oral
me075	<i>Albizia gummifera</i> (J.F.Gmell)C. A.sm	Fabaceae	Matticho	w	T	B	Tooth ache Amoeba Diarrhea	-By chewing the bark at the time of pain -By pounding (powdering) the bark, macerating in water and drinking the mixed	Oral
me077	<i>Allium sativum</i> L.	Alliaceae	Wajjo-tumma	h	H	Bu	Tonsillitis Malaria & Stomach pain	The garlic Pounded with <i>Zingiber officinale</i> , batter and swallowed	Oral
me028	<i>Aloe deibrana</i> Christian	Aloaceae	Arggessa	w	Sh	L	Fibril illness Swelling and wound	-leaf is pounded, and (about 1 teaspoon) is drunken the morning -Rubbing wound by fresh leaf until recovery.	Oral Dermal
me080	<i>Asparagus africanus</i> Lam.	Asparagaceae	Butticho	w	Sh	R	Swelling Stabbing pain	The root is pounded, decocted, filtered and drunk	Oral
me011	<i>Bersama abyssinica</i> Fresen.	Melanthaceae	Xewerrako	w	T	B L	Liver and Lung pain Skin infection	-Chewing the bark and swallowing the fluid for 3 days in the morning -By cooking and eating the leaf as food	Oral

me002	<i>Borassus aethiopum</i>	Areaceae	Satticho	h	T	R	Intestinal parasite wound	-By chewing the root and swallowing the sap -Crushing the root and painting the wound	Oral Dermal
me053	<i>Brucea antidysenterica</i> J.F.Mill.	Simarouba ceae	Haxxawo	w	Sh	R	Sudden fever	By chewing the fresh root and swallowing the fluid for not less than a hour.	Oral
me014	<i>Buddieja Polystachya</i> Fresen.	Loganiaceae	Bulassincho	w	Sh	L	Cancer	The leaves are pounded, macerated, and drunk a glass at night before sleeping.	Oral
me045	<i>Calpurnia aurea</i> (Atton)Benth	Fabaceae	Cekatta	h	Sh	L	Gonorrhea dandruff	Fresh leaves pounded and painted on the head and infected area until recovery	Dermal
me016	<i>Capparis tomentosa</i> Lam.	Capparaceae	Gaawo	w	Sh	L Se Sa	Diarrhea Eye infection	-By chewing the leaf or seed and swallowing -Rubbing the leaf and dropping the sap on eye	Oral Optical
me007	<i>Capsicum annum</i> L.	Solanaceae	Miximixo	h	H	F,Se	Malaria	By pounding with zingiber officinale and Allium sativum and eating as food	Oral
me001	<i>Carica papaya</i> L.	Caricaceae	Phaphaya	h	Sh	L sa Se	Skin infection Gastritis	Rubbing and squeezing the leaf on the infected area of the skin Crushing the seed and drinking with tea for 2-3days	Dermal Oral

me019	<i>Catha edulis</i> (Vahl.) Forssk.ex Endl.	Celastraceae	Cate	h	Sh	R St	Amoeba Gastritis	Roots and stem crushed, boiled, cooled and drunk after filtering until recovery in the morning before sleeping and early morning	Oral
me070	<i>Citruslimon</i> (L.) Burm. F.	Rutaceae	Lomme	h	Sh	fu	Blood pressure	Fresh fruits juice drunk in the morning by squeezing the fruit	Oral
me021	<i>Clerodendrum myricoides</i> (Hochst.) Vatke	Lamiaceae	Ma'niisa	w	H	L,R	Cancer Swelling	By pounding together, Decocting, cooling and drinking	Oral
me032	<i>Clutia abyssinica</i> (Jaub.&Spach.)	Euphorbiaceae	Mallaasinc ho	w	Sh	LR	Meningitis Tuberculosis Swelling	The leaf or root of the plant and fresh Aloe sp. are pounded, boiled, cold and given orally	Oral
me013	<i>Coffea arabica</i>	Rubiaceae	Bunno	h	Sh	LSt & se	Malaria Gastric illness Wound	-Whole parts are burned and smoking -Seeds are cocked and chewed and swallowed -Painting the crushed roasted seed	Nasal Oral Dermal
me024	<i>Combretum molle</i> R. Br.ex G. Don	Combretaceae	Dawaqqa	w	T	B	Diarrhea Wrist pain	Crushing the dried bark, Macerating with water drinking in the morning for 3- 4 days	Oral
me035	<i>Cordia Africana</i> Lam.	Boraginaceae	Waddicho	h	T	B	Evil eye Diarrhea	By chewing the bark for 3 days Pounding the bark ; soaking with water and drinking in	Oral

								the morning until recovery	
me026	<i>Croton macrostachyus</i> Hochst.ex Delile	Euphorbiaceae	Masincho	h	T	L Sa B R	Skin infection Wound Swelling Gonorrhea Tuberculosis Intestinal parasites, Amoeba	-Leaves pounded, powdered and put on or -Leaf Sap dropped on the wound and swelling for 3 days -Bark, Root Drying crushed mixed with water and filtered, then drunk before breakfast	Dermal, vener eal & Oral
me037	<i>Commelina bengholensis</i> L.	Commelinaceae	Lalunxxe	h	Cl	L	wound& Skin infection	Squeezing the leaf & painting the sap on the infected area.	Dermal
me018	<i>Cynoglossum coeruleum</i> (Hochst.ex.Arich.)	Boraginaceae	Hifaticho	w	H	R	Body swelling	Roots chewed and sprayed on swollen part for 2- 3 days	Dermal
me029	<i>Cucumis prophetarum</i> L.	Cucurbitaceae	Baqulichcho	Cl	H	fu se	Intestinal parasites	The fruit cooked and eaten as food. Seeds cooked and eaten before breakfast.	Oral
me060	<i>Dodonaea angustifolia</i> L.f.	Sapindaceae	Itanncha	w	Sh	L	Amoeba Stomach pain	Pounding the leaf, soaking with water, filtering and drunk during pain time and early in the morning for more than two days	Oral
me031	<i>Drynaria volkensii</i>	Polypodaceae	Kokoso	w	H	B	Toothache	By chewing the bark for at least a hour in between the teeth until recovery	Oral

me022	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	Giddincho	w	T	L	Skin infection Gonorrhea Cancer	By drying and powdering the leaf & shout, painting on the infected part Drinking the decocted shout and leaf	Dermal Oral
me063	<i>Ekebergia capensis</i> Sparrm.	Meliaceae	Godichcho	w	sh	fu	Gonorrhea Stomachache	The fruits are pounded, mixed with boiled water, filtered, and drunk	Oral
me074	<i>Ensete ventricosum</i> (Welw.) cheesman	Musaceae	Wesse	h	H	R	Amoeba	Unfermented newly processed “kocho” is baked and eaten until recovery or during the time of pain	Oral
me025	<i>Erythrina brucei</i> Schweinf.	Fabaceae	Welako	w	T	L B	Eye infection Swelling & Teeth ache	Rubbing the eye using leaf-shoot until recovery By chewing on teeth & painting the bark on the swollen area of the body for 3 days	Optical Dermal
me036	<i>Eucalyptus camaldulensis</i>	Myrtaceae	Barzaffe	w	T	L	Stomachache	By chewing the fresh leaf and swallowing	Oral
me067	<i>Eucalyptus glabulus</i> Labill	Myrtaceae	Wajo Barzaffe	w	T	L, Se	Amoeba Stomach ache	By Chewing the Leaf and seeds in the morning for 2 days	Oral
me048	<i>Euphorbia abyssinica</i>	Euphorbiaceae	Caricho	f	sh	LR	Diarrhea	Pounding the leaf or root, mixing with water and drinking in the morning in a glass	Oral
me039	<i>Ficus vasta</i> Forssk.	Moraceae	Qillixxe	w	T	sa	Hemorrhoid. Skin infection	-Taking the stem sap and Painting on the infected areas of the body	Dermal

me050	<i>Flacourtia indica</i> (Burm. f.) merr.	Flacourtiaceae	Hagella	w	Sh	L,B	Headache Evil eye	By Drying the leaf and bark of the plants put in to the fire and fumigating	Nasal
me041	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Malkata	h	H	L	Gonorrhea	Pounding fresh leaf and Painting on the infected area	Venereal
me072	<i>Garcinia buchananii</i> Baker	Clusiaceae	Solollessa	w	T	Fu B L	Sexual weakness Stomach-Swelling	-Eating fresh ripen fruit -Drinking the decocted & cooled bark as tea -Pounding the leaf soaking with water and drinking at night	Oral
me003	<i>Grewia flavescens</i> Juss.	Tiliaceae	Shishsho	w	T	L	Growth retardation	By decocting the leaf with batter and drunk as tea for two weeks respectively	Oral
Me081	<i>Hagenia abyssinica</i> (Bruce) J.F.Gmel	Rosaceae	Dadako	w	T	Se	Intestinal worms	Drying the seeds of the tree, ponding or making as powder form then mixing with water for at list 8 hours and drunk early morning one glass before breakfast.	Oral
me044	<i>Hypoestes forskoolii</i> (vohl) R.Br	Acanthaceae	Xexxe	h	H	R	Stomach problems	Root is pounded with water and after filtering given orally by tea-cup during pain time and early morning	Oral
me015	<i>Justicia schimperiana</i> (Hochst. ex A. Nees) T. Anders	Acanthaceae	Cikicho	w	Sh	L,R	Stomachache Diarrhea	-The leaf is pounded, macerated, and drunk; -The root is chewed, and swallowed during pain as fresh	Oral
me046	<i>Lactuca</i>	Asteraceae	Ammessa	w	Cl	L	-Growth retardation	-The leaf is chopped, boiled, and the filtrate is drunk for not less than three days.	Oral

	<i>inermis</i> Forssk.						Stomachache	-The leaf boiled with water, cooled and given the filtrate by tea- spoon at the time of pain for infants.	
me067	<i>Lagenaria siceraria</i> (Molina) standl.	Cucurbitaceae	Surupha	w	Cl	se	Jaudice	Seeds pounded with water, filtered and drunk using tea-cup after dinner	Oral
me038	<i>Maesa lanceolata</i> Forssk.	Myrsinaceae	Gowachcho	h	sh	L	Skin infection	Leaves are rubbed on the place of infection	Dermal
me049	<i>Maytenus arbutifolia</i>	Celastraceae	Cuco	w	Sh	L	Stomachache	By chewing and swallowing the leaf during pain and early morning	Oral
me040	<i>Maytenus undata</i> (Thunb.) Blakelock	Celastraceae	Kincho	w	Sh	B	Stomachache	- The bark is pounded, boiled, and filtered and taken one tea-cup early morning until recovery or not less than two days	Oral
me051	<i>Millettia ferruginea</i> (Hochst.) Bak	Fabaceae	Hengedde	h	T	B L	Intestinal parasite	Leaf or Bark is crushed and pounded with water and given orally after filtering early in the morning	Oral
me062	<i>Momordica boivinii</i> Baill.	Cucurbitaceae	Kirre	h	Cl	LR	Evil Eye	-Pounding the leaf and root soaking with water and drinking	Oral
me043	<i>Moringa stenopetala</i> L.	Moringaceae	Shiferaw	h	sh	L R	Diabetes Blood pressure	Fresh leaves cooked as food and eaten Leaves are cooked as tea and drunk Chewing the root swallowing	Oral

me034	<i>Musa paradisiacal</i> L.	Musaceae	Muzze	h	H	sa	wound	The oozing fluid from the stem is applied on a freshwound	Dermal
me005	<i>Nicotina tacabum</i> L.	Solanaceae	Araddo	h	sh	L L	Snake beat stomachache	Rubbing the infected area by the leaf By Chewingand swallowing the leaf	Dermal Oral
me056	<i>Ocimum lamiifolium</i> Hochst.ex Benth.	Lamiaceae	Dammaka so	h	sh	L	Sudden pain	The soft leaves are rubbed gently and squeeze through nose and also drunk with coffee	Nasal Oral
me017	<i>Olea capensis</i> L. f.	Oleaceae	Settame	w	T	L B	Cancer Toothache	-The leaf is decocted, mixed with honey, and drunk as tea -Chewingthe barkfor 15 minutes for 3 consecutive days.	Oral
me078	<i>Olea europae</i> subsp.cuspidat a (Wall.ex.G.Do n.)	Oleaceae	Ejerssa	w	T	L	Eye infections	By rubbing the infected eye with leaf or washing by boiled leaf	Optical
me059	<i>Passiflora edulissims</i>	Passifaloraceae	Hophe	F	Cl	Lfu	Blood pressure	Pounding the leaf mixing with fruit and water and drunk a galas of mixture at the time of pain	Oral
me030	<i>Phytolacca dodecandra</i> L'Herit.	Phytolaccaceae	Haraanjicho	w	Sh	L	Brest-swelling	Leaf is Pounded, decocted, and taken orally early in the morning	Oral

me061	<i>Plectranthus garckeanus</i> (Vatke) J.K.Morton	Lamiaceae	Toontona	w	H	L	Diarrhea and Stomachache	By pounding the leaf , macerating with water, filtering and drinking one tea- cup in the morning	Oral
me052	<i>Plectranthus punctatus</i> (L.f.) L'Hér.	Lamiaceae	Helle	h	H	L	wound	The leaf rubbed and creamed on the wound	Dermal
me023	<i>Podocarpus falcatus</i> (Thunb.)Mirb.	Podocarpaceae	Daguchcho	T	w	B	Jaundice wound	Barks decocted and filtered and then drunk. Bark crushed or pounded then painted on the wound	Oral Dermal
me064	<i>Psidium guajava</i> L.	Myrtaceae	Zeyittone	h	T	L	Skin infection	-By decocting fresh leaf and washing the infected part of the skin	Dermal
me055	<i>Pterolobium stellatum</i>	Fabaceae	Harangema (Kontir)	w	Sh	R	Swelling	By rubbing in to the swollen part of the bodyby drying and pounding the root of the plant as paint.	Dermal
me066	<i>Rhamnus prinoides</i> L'Herit	Rhamnaceae	Xaddo	h	Sh	L	Skin infection	Leaves rubbed on the infected skin first by rubbing on hand.	Dermal
me047	<i>Rhus glutinosa</i> A.Rich	Anacardiaceae	Olonchcho	w	T	L&B	Stomach pain Vitamin shortage	Pounding leaf &bark, boiling together then filtering and drunk for 3 days	Oral

me058	<i>Ricinus communis</i> L.	Euphorbiaceae	Qomboho	h	Sh	R & L	Brest - pain	By drying the leaf and Root, crushing , decocting With salt , cooling and drunk as tea	Oral
me069	<i>Rosmarinus officinalis</i>	Lamiaceae	azmirine (metsebes ha)	h	Sh	L	Blood pressure	-By putting the leaf in the tea and coffee ,then drunk	Oral
me020	<i>Rumex abyssinicus</i> Jacq.	Polygonaceae	Shoshinne	h	H	R	Intestinal parasites Goiter	-Roots pounded and boiled and then mixed with milk and drunk in the morning -Roots chewed and swallowed	Oral
me071	<i>Rute chalepensis</i> L.	Rutaceae	Shunkurtta	h	Sh	L	Pneumonia Stomach problem	Fresh leafs are pounded powdered and mixed with oil then drunk in the morning Fresh leaves are chewed and swallowed	Oral
me072	<i>Sativium lipidium</i>	Brassicaceae	Fexxo	h	H	se	Stomachache Wound	-Powdered dry seed mixed with the bulb of <i>Allium sativum</i> and eaten, Painting the Skin with the powder as well on the wounded area	Oral Dermal
me033	<i>Sida ovate</i> forsk.	Malvaceae	Qerqexe	w	sh	L	Skin infection Wound	leaves rubbed on infected skin as well, by pounding and painting on the wounded part of the body.	Dermal
me054	<i>Solanum aculeatissimum</i> Jacq.	Solanaceae	Haanja borbodho	r	Sh	L	Wound	Pounding fresh leaf and creaming on the wounded area of the body	Dermal

me065	<i>Solanum incanum</i> I.	Solanaceae	Borbodha	r	Sh	R L fu	Intestinal parasites & Amoeba Blooding Snake bite	Fresh Root chewed and swallowed during pain for three days before sleeping Leafs are rubbed and inserted in to nose Fruits or leaves are rubbed on the part with the snake bite	Oral Nasal Dermal
me076	<i>Solanum nigrum</i> I.	Solanaceae	Xunnaye	h	H	L	Malaria Intestinal parasite	-By drinking the crushed leaf mixing with water for not less than three days -Leaves cocked and eaten for two days early in the morning	oral
me017	<i>Syzygium guineense</i> (Willd.) Dc	Myrtaceae	Duwanncho	w	T	B	Stomach ache	By pounding the bark; boiling with water Cooling and drinking in the morning	Oral
me068	<i>Teclea nobilis</i> Del.	Rutaceae	Hadhessa	w	T	L	Stomachache	-Pounding fresh leaf, mixing with water, filtering and drinking	Oral
me079	<i>Vernonia amygdalina</i> Del.	Asteraceae	Hechcho	h	sh	L	Pneumonia Stomachache Malaria	Pounding the fresh leaf, mixing with water, filtering and early in the morning before breakfast	Oral
me010	<i>Vernonia auriculifera</i> Hiern.	Asteraceae	Rejjicho	w	sh	R L	Swelling Wound Head ach	-Roots chewed and sprayed on swollen part. -Leaves crushed and pounded on the wound. -Leaves pounded and mixed with butter and put on head	Dermal Head

me021	<i>Zanthoxylum chalybeum</i> Engl.	Rutaceae	Gadda	w	T	L	Cancer Gastritis	The leaf of the plant is pounded, macerated, mixed with honey and eaten	Oral
me006	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Jaanjiwee llo	h	H	R	Stomach ache Cough	The rhizoid is pounded, dried, and mixed with onion and honey feed/drink	Oral

Appendix II: Scientific names of medicinal plants, their family, local name, habitat and Habit in the study area

No.	Scientific names	Family names	Local names	Habitats	Nature
1	<i>Achyranthes asper</i>	Amaranthaceae	Nolle	wild	tree
2	<i>Acmella caulirhiza</i>	Asteraceae	Bexxo	Home garden	herb
3	<i>Acokanthera schimperi</i>	Apocynaceae	Qararro	wild	shrub
4	<i>Ajuga integrifolia</i>	Lamiaceae	Anamuro	home garden	herb
5	<i>Albizia schimperiana</i> Oliv.	Fabaceae	Matichcho	Wild	tree
6	<i>Allium sativum</i> L.	Alliaceae	Wajo tumma	Home garden	herb
7	<i>Aloe deibrana</i> Christian	Aloaceae	Argessa	wild	shrub
8	<i>Bersama abessinica</i> Fresen.	Melastomaceae	Xwerako	wild	tree
9	<i>Borassus aethiopum</i>	Arecaceae	Satticho	Wild	tree
10	<i>Brucea antidysenterica</i> J.F.Mill.	Simaroubaceae	Haxawwo	wild	shrub
11	<i>Buddleia polystachya</i>	Loganiaceae	Bullasincho	wild	shrub
12	<i>Calpurnia aurea</i> (Atton). Benth	Fabaceae	Ceketta	Home garden	shrub
13	<i>Capsicum annum</i> L.	Solanaceae	Mixmixxo	Home garden	herb
14	<i>Capparis tomentosa</i> Lam.	Capparidaceae	Gawwo	wild	shrub
15	<i>Carica papaya</i> L.	Caricaceae	Fafayya	Home garden	shrub
16	<i>Catha edulis</i> (Vahl.)	Celastraceae	Catte	Home garden	shrub
17	<i>Citrus limon</i> L.	Rutaceae	Lomme	Home garden	shrub
18	<i>Clerodendrum myricoides</i> (Hochst.) Vatke	Lamiaceae	Ma'niissa	wild	herb

19	<i>Clutia abyssinica</i>	Euphorbiaceae	Malassincho	wild	shrub
20	<i>Coffea Arabica</i>	Rubiaceae	Bunno	Home garden	shrub
21	<i>Combretum molle</i> R.	Combretaceae	Dawakka	wild	tree
22	<i>Commelina benghalensis</i> L.	Commelinaceae	Lalunxe	Home garden	climber
23	<i>Cordia Africana</i> Lam.	Boraginaceae	Wadicho	Home garden	tree
24	<i>Croton macrostachyus</i>	Euphorbiaceae	Masincho	Home garden	tree
25	<i>Cucumis prophetarum</i> L.	Cucurbitaceae	Baqulicho	Home garden	climber
26	<i>Cynoglossum coeruleum</i> (Hochst. ex. A. Rich)	Boraginaceae	Hiffaticho	wild	herb
27	<i>Delbergia lactia</i>	Fabaceae	Qarssicho	wild	tree
28	<i>Dodonaea angustifolia</i>	Sapindaceae	Itanchcha	wild	shrub
29	<i>Drynaria volkensii</i>	Polypodaceae	Kokosso	wild	herb
30	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	Gidicho	wild	tree
31	<i>Ekebergia capensis</i> Sparrm.	Meliaceae	Godicho	wild	shrub
32	<i>Ensete ventricosum</i> (Welw.) Cheesman	Musaceae	wesse	Home garden	herb
33	<i>Erythrina brucei</i> Schweinf	Fabaceae	wellako	wild	tree
34	<i>Eucalyptus camaldulensis</i>	Myrtaceae	Dumo-barzafe	wild	tree
35	<i>Eucalyptus glabulus</i>	Myrtaceae	Wajo-barzafe	wild	tree
36	<i>Euclea racemosa</i>	Ebenaceae	Me'essa	wild	tree
37	<i>Ficus vasta</i> Forssk.	Moraceae	Qillixxe	wild	tree
38	<i>Flacourtia indica</i> (Burm.f.)	Flacourtiaceae	Hagella	wild	shrub
39	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Malkatta	Home garden	herb
40	<i>Garcinia buchananii</i>	Clusiaceae	Sololessa	wild	tree
41	<i>Hagenia abyssinica</i>	Rosaceae	Dadako	wild	tree
42	<i>Hypoestes forskalii</i> (Vahl.) R. Br.	Acanthaceae	xexxe	wild	herb
43	<i>Justicia schimperiana</i> R.Br.	Acanthaceae	Ciiqicho	wild	shrub
44	<i>Lactuca intermis</i> Forssk.	Asteraceae	Amessa	wild	climber
45	<i>Lagenaria siceraria</i> (Molina). Standl.	Cucurbitaceae	Surupha	wild	climber
46	<i>Maesa lanceolata</i> Forssk.	Myrsinaceae	Gowacho	Home garden	shrub
47	<i>Maytenus arbutifolia</i>	Celastraceae	Cuchcho	wild	shrub
48	<i>Maytenus undata</i> (Thunb.) Blakelock	Celastraceae	Kincho	wild	shrub
49	<i>Millettia ferruginea</i> (Hochst.) Bak.	Fabaceae	Hengede	Home garden	tree
50	<i>Momordica boivinii</i> Baill.	Cucurbitaceae	Kirre	Home garden	climber

51	<i>Moringa stenopetala</i> L.	Moringaceae	Haleko	Home garden	tree
52	<i>Musa paradisiace</i> L.	Musaceae	Musse	Home garden	herb
53	<i>Nicotinna tobacum</i> L.	Solanaceae	Araddo	Home garden	shrub
54	<i>Ocimum lamiifolium</i> (hochst).	Lamiaceae	Damakasso	Home garden	shrub
55	<i>Olea Capensis</i> L.f.	Oleaceae	Settame	wild	tree
56	<i>Olea Europa</i> sub.sp cuspidate	Oleaceae	Ejerssa	wild	tree
57	<i>Passiflora edulissims</i>	Passifloraceae	Hophee	fence	climber
58	<i>Phytolacca dodecandra</i> L’Herit	Phytolaccaceae	Harangicho	wild	shrub
59	<i>Plectranthus garckeianus</i> (vatke)J.k Morton	Lamiaceae	Tontona	wild	shrub
60	<i>Plectranthus punctatus</i> (L.f.) L’Her	Lamiaceae	Hellee	Home garden	herb
61	<i>Podocarpus falactus</i> (Thunb.) Mirb	Podocarpaceae	Dagucho	wild	tree
62	<i>Psidium guajava</i> L.	Myrtaceae	Zettone	Home garden	shrub
63	<i>Pterolobium stellatum</i>	Fabaceae	Harangima	wild	shrub
64	<i>Rhamnus prinoides</i> L’Herit	Rhamnaceae	Xaddo	Home garden	shrub
65	<i>Rhus glutinosa</i> A.Rich	Anacardiaceae	Olonchcho	wild	tree
66	<i>Ricinus communis</i> L.	Euphorbiaceae	Qomboho	Home garden	shrub
67	<i>Rosmarinus officinalis</i>	Lamiaceae	Azmerinnee	Home garden	shrub
68	<i>Rumex abyssinica</i> Fresen.	Polygonaceae	Shishone	Home garden	herb
69	<i>Rumex napalensis</i>	Polygonaceae	Butichcho	Home garden	shrub
70	<i>Rute chalepensis</i> L.	Rutaceae	shunkurte	Home garden	shrub
71	<i>Sativium lipidium</i>	Brassicaceae	Fexxee	Home garden	herb
72	<i>Sida ovata</i> forsk.	Malvaceae	Qirqixxe	wild	shrub
73	<i>Solanum aculeatissimum</i> Jacq.	Solanaceae	Hanja- borbodha	Road side	shrub
74	<i>Solanum incanum</i> I.	Solanaceae	Wajo-borbodha	Road side	shrub
75	<i>Solanum nigrum</i>	Solanaceae	Xunaye	Home garden	herb
76	<i>Syzygium guineense</i> (willd.) Dc	Myrtaceae	Duwancho	wild	tree
77	<i>Teclea nobilis</i> Del.	Rutaceae	Hadhessa	wild	tree
78	<i>Vernonia amygdalina</i> Del.	Asteraceae	Hechcho	Home garden	shrub
79	<i>Vernonia auriculifera</i>	Asteraceae	Rejiicho	wild	shrub
80	<i>Zanthoxylum chalybeum</i>	Rutaceae	Gaadda	wild	tree
81	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Janjiwello	Home garden	herb

Appendix-III: Types of Medicinal plant Families, their number and percent in the study area

Type of Family	No. of Family	Percent (%)
1.Acanthaceae	2	2.5
2.Alliaceae	1	1.25
3. Aloaceae	1	1.25
4. Amaranathaceae	1	1.25
5. Anacardiaceae	1	1.25
6. Apiaceae	1	1.25
7. Apocynaceae	1	1.25
8. Asteraceae	5	6.25
9. Boraginaceae	3	3.75
10. Brassicaceae	1	1.25
11. Capparaceae	1	1.25
12. Caricaceae	1	1.25
13. Celastraceae	3	3.75
14. Clusiaceae	1	1.25
15. Combretaceae	1	1.25
16. Commelinaceae	1	1.25
17. Cucurbitaceae	3	3.75
18. Ebenaceae	1	1.25

19. Euphorbiaceae	3	3.75
20. Fabaceae	6	7.5
21. Flacourtiaceae	1	1.25
22. Rubiace	1	1.25
23. Lamiaceae	6	7.5
24. Loganiaceae	1	1.25
25. Malvaceae	1	1.25
26. Meliaceae	1	1.25
27. Melianthaceae	1	1.2
28. Moraceae	1	1.2
29. Moringaceae	1	1.2
30. Musaceae	2	2.4
31. Myrsinaceae	1	1.25
32. Myrtaceae	4	5.0
33. Oleaceae	2	2.5
34. Papaveraceae	1	1.25
35. Passifloraceae	1	1.25
36. Phytolaccaceae	1	1.25
37. Podocarpaceae	1	1.25
38. Polygonaceae	2	2.5
39. Rhamnaceae	1	1.25
40. Rubiaceae	1	1.25

41. Rutaceae	4	5.0
42. Solanaceae	5	6.25
43. Sapindaceae	1	1.25
44. Simaroubaceae	1	1.25
45. Zingiberaceae	1	1.25
Total	81	100

Appendix IV: List of medicinal plants used, human diseases and percent of Ailments indicated by local people.

R. No	Names of Ailments	Number of medicinal plants used	Numbers of informants indicated	Percent of informants indicated (%)
1	Stomachache	16	19	13.6
2	Wound	8	12	8.6
3	Swelling	8	10	7.1
4	Amoeba	7	8	5.7
5	Diarrhea	7	8	5.7
6	Intestinal parasites	8	10	7.1
7	Skin infection	7	8	5
8	Cancer	7	7	5
9	Gonorrhea	6	6	4.3
10	Teeth ache	5	6	4.3
11	Gastritis	4	4	2.9
12	Malaria	5	7	5.0
13	Blood pressure	4	4	2.9
14	Evil Eye	3	3	2.1
15	Eye infection	3	3	2.1

16	Pneumonia	3	3	2.1
17	Tonsillitis	2	2	1.4
18	Jaundiced	2	2	1.4
19	Diabetes	2	2	1.4
20	Headache	2	2	1.4
21	Sudden fever	1	1	0.7
22	Hemorrhoid	1	1	0.7
23	Wrist pain	1	1	0.7
24	Meningitis	1	1	0.7
25	Tuberculosis	1	1	0.7
26	Blooding	1	1	0.7
27	Brest pain	1	1	0.7
28	Dandruff	1	1	0.7
29	Stabbing pain	1	1	0.7
30	Goiter	1	1	0.7
31	Liver pain	1	1	0.7
32	Lung pain	1	1	0.7
33	Male sexual weakness	1	1	0.7
34	Snake beat	1	1	0.7
35	Growth retardation	1	1	0.7
36	Cough	1	1	0.7
37	Vitamin shortage	1	1	0.7
38	Febrile illness	1	1	0.7
39	Fever	1	1	0.7
	Total		145	

Appendix V: List of informants participated in the Data collection of each kebele in Aleta –chuko district

Ro .N	Names Informants	Sex	Age	Educ. Level	Names of Kebeles	Other Identity
1	Aressa Buchacha	m	51	6	Korke	
2	Kedese Alanbo	m	48	8	“	
3	Takele Kakamo	m	49	10	“	
4	Gezahegne Gajawo	m	38	8	“	
5	Sadamo Samano	m	40	6	“	
6	Birhanu Lamisso	m	45	8	“	
7	Berassa Bekele	m	50	4	“	
8	Marero Morka	m	52	5	“	
9	Bekele Dubisso	m	54	6	“	
10	Tariku Hanchamo	m	50	5	“	
11	Kenbata wenna	m	75	3	“	Key-healer
12	Gaffato Kacho	m	55	7	“	Key-healer
13	Mokonon Tunsissa	m	48	10	“	Key-healer
14	Mamote kawi	f	48	--	Gellma	Key-healer
15	Mengesha Torbe	m	35	8	“	Key-healer
16	Ayele Guje	m	45	10	“	Key-healer
17	Abera Mammo	m	58	--	“	
18	Gaffetto Gattisso	m	39	--	“	
19	Legesse Qamaiy	m	52	7	“	
20	Shashamo Dettamo	m	41	5	“	
21	Mijo Heco	m	37	--	“	
22	Yikko Tullu	m	46	6	“	
23	Saile Saddimo	m	48	--	“	
24	Dawina Foxxa	m	54	--	“	
25	Ashenaffi Hakuka	m	62	9	“	
26	Sidamo Be’ella	m	62	4	“	

27	Bekele	Tonka	m	50	8	Lela-Honcho	
28	Fikire	Mokona	m	45	9	“	
29	Bekele	Woxessa	m	60	4	“	
30	Lamisso	Eu'tte	m	45	7	“	
31	Kassahun	Atisso	m	61	9	“	
32	Tafesse	Kebba	m	45	8	“	
33	Yohanis	Akissa	m	32	8	“	
34	Bellete	Yotta	m	56	8	“	
35	Ashenafi	Argado	m	45	3	“	
36	Ayele	ko'ee	m	50	9	“	Key- healers
37	Tagele	Riqiwo	m	40	8	“	
38	Tadesse	Mammara	m	60	6	“	Key- healer
39	Beyene	Shallemo	m	40	9	“	Key- healer
40	Barisso	Gekke	m	72	4	LokoHaitela	
41	Dawit	Teshale	m	38	8	“	
42	Beyene	Berassa	m	48	--	Loko haitela	
43	Fere	Fissha	m	35	10	“	
44	Marmarra	karfafa	m	40	--	“	
45	Jobolla	Gugammo	m	45	10	“	
46	Muxilla	Latammo	m	30	6	“	
47	Nigusse	Musse	m	25	9	“	
48	Teshale	Banatta	m	65	4	“	
49	Asimelashe	Boqa	m	40	10	“	
50	Asina	Futuka	m	45	4	“	Key- healer
51	Taye	Tesemma	m	50	1	“	Key - healer
52	Jalawa	Babe	m	80	--	“	Key - healer
53	Timotiose	Gisasso	m	32	10	Mangudo	
54	Biruke	Eliyase	m	30	10	“	
55	Abainesh	Buchacha	f	40	7	“	
56	Belaiynhe	Bangu	m	38	8	“	
57	Almaze	Mute	f	41	9	“	
58	Dereso	Kerkera	m	31	10	“	

59	Elyase	Dafurssa	m	58	7	“	
60	Adisu	Fodisso	m	54	11	“	
61	Tamiru	Shalla	m	44	8	“	
62	Hailu	Entolla	m	45	8	“	
63	Tafesse	Dayammo	m	57	6	“	Key - healer
64	Kebede	Erbamo	m	50	9	“	Key - healer
65	Melese	Riqiba	m	40	8	Hallo	
66	Enare	Debesa	f	48	3	“	Key- healer
67	Torba	Menna	m	52	3	“	
68	Feleke	Honona	m	52	7	“	
69	Siyum	Kabtimer	m	46	8	“	Key- healer
70	Bogale	Boreda	m	46	4	“	
71	Tefera	Demesso	m	55	5	“	
72	Silla	Qanqasso	m	45	--	“	
73	Amarech	Hore	f	58	2	“	
74	Aseffa	Simano	m	42	5	“	
75	Zenebe	Ayele	m	34	6	“	
76	Mogese	Caka	m	58	10	“	
77	Fissa	Tormme	m	65	4	Makalla	Key - healer
78	Asifawe	Aletto	m	38	10	“	
79	Haile	Kentamo	m	42	6	“	
80	Degeffe	Debiko	m	49	7	“	
81	Mammo	Yoba	m	42	--	“	
82	Yohanis	Borogy	m	42	10	“	Key - healer
83	Mammo	Didammo	m	62	3	“	
84	Amarech	Adimasu	f	40	3	“	
85	Lema	Lalengo	m	43	6	“	
86	Ashenafi	Deyasso	m	47	4	“	
87	Lakech	Lemma	f	56	--	“	
88	Enare	Lemma	m	56	5	“	
89	Lanqa	Almasso	m	55	--	Dngora	Key - healer
90	Qacha	Qaqawo	m	66	2	“	Key- healer

91	Ejigu	Enna	m	42	10	“	
92	Ashagere	Ayele	m	42	8	“	
93	Regassa	Metto	m	56	3	“	
94	Yaiykob	Deyasso	m	38	7	“	
95	Tobbe	Neasha	m	37	7	“	
96	Kasech	Doyammo	f	41	2	“	
97	Bekele	Lamisso	m	39	4	“	
98	Abebe	Berasso	m	53	4	“	
99	Adissu	Adammo	m	41	7	“	
100	Alemitu	Digammo	f	42	5	“	

Appendix-VI:

Checklist of questions used for discussion and semi- structured interview

1- Semi-structured interviews scheduled to be employed in the research area.

General information of the informants

- Date _____ (Kebele) _____
- Name of informants _____ Sex: Male ____; Female ____; Age _____ Occupation (main job) _____ Religion _____
- Educational level: _____ Marital status _____
- For how long you have lived in the Area _____

I. Ethno botanical data information

A) Questions for local informants or respondents:

1. What are the main or most common human health problems or disease in your locality?
2. List plant species used to treat a given disease in your area?

3. Are medicinal plants marketable? _____
4. Tell Local names of the medicinal plant
5. Give Information on edibility and other uses of the plant besides its medicinal uses/value.
6. Are there conditions that restrict taking the medicine for pregnancy and other age groups?
7. What are reciprocal impacts of plant-human interactions?
8. Are there threats to those medicinal plants? _____
9. How widespread is the medicinal plants from your residence?

B) For Aleta- Chuko woreda Agricultural Government office experts:-

1. Which types of human diseases are more common (frequently occurring) in your district mention some samples according to agro ecological zones?
2. How do you conserve MP's in your locality to keep their sustainability?
3. What are the threats to medicinal plants in your area (district)?

2 - Semi-structured interviews scheduled to be employed in the research area.

General information for the key informants

- Date _____ (Kebele) _____
- Name of key informants _____ Sex: Male ____; Female ____; Age _____ Occupation
(main job) _____ Religion _____
- Educational level: _____ Marital status _____
- For how long you have lived in the Area _____

I. Ethnobotanical data information

C) Questions for traditional healers (key informants) prepared specifically :

1. Which plants do you use frequently for treating those particular diseases?
2. What are their local names?_____
3. Which type of the plant habit do you use: tree, shrub and/or herbs?
4. How does the knowledge transfer take place from elders to younger?
5. What are the major threats to medicinal plants? As a group or individual species
6. Habitat of the plant-where it grows in the study area such as wild, live fencing, and in home garden_____
7. Preparation forms (crushed, pounded, powder, exudation, concoction, milky latex/extract with cold water/boiled/juice etc. _____
8. Does the dosage differ among sex and age groups? _____
9. Which age groups of the local people use the medicinal plant frequently?_____
10. How do you preserve traditional medicines, are there restrictions/taboos in collection? _____
11. Informant consensus factor (ICF) ? _____
12. Preference ranking _____
13. Paired comparison _____
14. Fidelity level index_____
15. Use value index (UV) _____
16. Direct matrix ranking _____

