

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF BURKA DHINTU DISTRICT,
WASTE HARARHE ZONE OF OROMIA REGION, ETHIOPIA**

M.SC.THEISIS

Mesfin Bekele

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Haramaya University, Haramaya

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF BURKA DHINTU DISTRICT,
WASTE HARARHE ZONE OF OROMIA REGION, ETHIOPIA**

**A Thesis Submitted to the College of Natural and Computational Sciences, School of Graduate Studies,
Haramaya University.**

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By

MESFIN BEKELE

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Haramaya

APPROVAL SHEET

SCHOOL OF GRADUATE STUDIES

HARAMAYA UNIVERSITY

As Thesis research advisor, I hereby certify that I have read and evaluated this Thesis prepared, under my guidance, by Mesfin Bekele Debela, entitled: **Ethno Botanical Study of Medicinal Plants of Burka Dhintu District, Waste Hararghe Zone of Oromia Region, Ethiopia**. I recommend that it be accepted as fulfilling the Thesis requirement.

Dr. Meseret Chimedessa (PHD)

Name of Major Advisor

Signature

Date

As member of the Board of examiners of the M.Sc. Thesis Open Defense Examination, we certify that we have read, evaluated the thesis prepared by **Mesfin Bekele Debela** and examined the candidate. We recommended that the Thesis be accepted as fulfilling the Thesis requirement for the degree of Master of Science in Biology.

Chairperson

Signature

Date

Internal Examiner

Signature

Date

External Examiner

Signature

Date

DEDICATION

I dedicated this manuscript to my beloved mother, Shita Hunde, and my father Bekele Debela, who scarified a lot to bring me up to this level, nursing me with affection, and for their dedicated partnership in success of my life. But all of my family and friends has pitched into help and support me.

STATEMENT OF THE AUTHOR

By my signature below, I declare that this thesis is my own work and all sources of materials consulted for this work have been duly acknowledged. I have followed all ethical principles of the research in data collection, analysis, the preparation and completion of this thesis. All scholarly matters that are included in the thesis have been given recognition through citation. I affirm that I have cited and referenced all sources used in this document.

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Author

Name: Mesfin Bekele

Signature: _____

Place: Haramaya University

Department: Biology

LIST OF ABBREVIATIONS AND ACRONYMS

BDAF	Burka Dhintu Agricultural Office
FL	Fidelity Level
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
NBSAP	National Biodiversity Strategies and Action Plan
WHO	World Health Organization
BDAF	Burka Dhintu Agricultural Office

BIOGRAPHICAL SKETCH

The author, Mesfin Bekele, was born to his father Bekele Debela and his mother Shita Hunde on May 22, 1983 E.C. in Odajela kebele, Hexosa District, Arsi Zone, Oromia Region, Ethiopia. He attended his elementary education at Shorema Sharara Primary School. He attended grade nine and ten at Adama Senior Secondary School. After completion of his preparatory education at Hawas Preparatory School in 1999E.C, he joined Samara University Department of Biology and graduated in July 2002 with a B.Ed. degree in Biology.

After graduating with first degree, he was employed as a teacher at kurfa Secondary School in Waste Hararghe zone. In 2007 E.C. he joined the School of Graduate Studies at Haramaya University as a candidate for Master of Biology.

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ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF BURKA DHINTU DISTRICT, WASTE HARARHE ZONE OF OROMIA REGION, ETHIOPIA

ABSTRACT

Ethobotanical study of medicinal plants was conducted to document the indigenous plant-based medical knowledge of people in Burka Dhintu District, Waste Hararghe Zone Ethiopia from January to May, 2018. A total of 80 informants (age \geq 25) were selected to collect information on medicinal plant use from four sampled kebeles. Of these, 15 key informants were selected purposively based on recommendation by local elders and authorities. The rest were selected randomly. Data were collected using semi-structured questionnaires and interviews, field observations and group discussions. Informant consensus factor (ICF) and fidelity level were calculated to assess the agreement of informants on the medicinal value of plants. A total of 58 plant species distributed in 57 genera and 38 families were collected and identified. Out of the collected 58 medicinal plants of the study area, 48 species (82.75%) were used against 31 human ailments, 7 species (12.06%) were used against livestock ailments and the remaining 3 species (5.17%) were used to treat both human and livestock ailments. From the total medicinal plant species, 28 were herbs, followed by 15 species of shrubs, 9 species of trees, and 7 species of climbers. The most frequently used plant parts were leaves (42.42%) followed by roots (19.69%). The most widely used method of preparation was crushing (51.72%) of the different plant parts. The common route of administration recorded was oral (58.82%) followed by dermal (35.29%) and nasal (4.41%). Disease categories such as Gonorrhoea and Asthma, cough and common cold had higher ICF values, suggesting high incidence of these diseases in the study area and agreement of people on their remedies. Agricultural expansion, firewood collection, and use of plants for construction were reported as major threats to plants of the study area. In order to protect biodiversity erosion and loss of indigenous knowledge, local communities must be taught and involved in conservation and management of plant resources and their indigenous knowledge.

1. INTRODUCTION

Ethiopia is a country characterized by a wide range of climate and ecological conditions, possessing enormous diversity of fauna and flora (Pankhurst, 2001). The country possesses a wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world. Popular knowledge of plants used by humans is based on thousands of years of experience. By “trial and error”, people have learnt how to recognize and use plants, including those with a magic-religious function. In Ethiopia, even though the traditional medical practitioners are the best sources of information about the knowledge of the medicinal plants, it was found very difficult to obtain their traditional medicinal information as they considered their indigenous knowledge as a professional secret, only to be passed orally to their older son, at their oldest age (Jansen, 1981).

As a result, the local indigenous knowledge on medicinal plants is being lost at a faster rate with increase in modern education, which has made the younger generation to underestimate its traditional values. In addition the increase in population growth rate resulted in the intensification of agriculture in marginal areas which led to deforestation and decrease in number or loss of medicinal plants in the wild (Pankhurst, 2001). Dawit (1986) estimated that 95% of traditional medical preparations in Ethiopia are of plant origin.

Medicinal plants are the base for the development of new drugs and the survival of mankind as well as other livestock. In Ethiopia little emphasis has been given to traditional medicinal studies over the past decade (Debella, 2001). Therefore, it can be said that ethno botanical studies are merely at the start in Ethiopia though there have been some attempts in investigating medicinal plant uses and there is as yet no in depth study on the relation between medicinal plants and indigenous knowledge on sustainable management of such plant resources. Modern healthcare has never been and probably never will provide for the

foreseeable future adequate and equitable health service anywhere due to the financial limitations related to rapid population growth, political instability and poor economic performance (Anokbonggo, 1992).

Due to incomplete coverage of modern medical system, shortage of pharmaceuticals and unaffordable prices of modern drugs, the majority of Ethiopians still depend on traditional medicine. Traditional medicine remains the main resource for a large majority (80%) of the people in Ethiopia to treat their illnesses and veterinary diseases and maintain their health and a traditional medical consultancy including the consumption of the medicinal plants has a much lower cost than modern medical attention (Asfaw Debela *et al.*, 1999).

However, this is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs. So, medicinal plants are the main source of traditional medicine for the rural population and are of high demand in the healthcare systems of the population, and when compared to modern medicine, ethno medicine activities need special consideration and back-up (Abbiw, 1996).

The problem of ensuring the equitable distribution of modern healthcare has become more serious as the gap between supply and demand has continued to widen. According to Sebsebe and Ermias (2001), there is a considerable global interest in tapping the accumulated knowledge of traditional medicine, and therefore, researches are being carried out in many countries with the aim of increasing the use of traditional medicine to the welfare of the human population. The same document also explains that basic and applied researches on medicinal plants are interconnected and the basic research is primarily important in realizing new knowledge and serving as the basis for applied research. Ethno botanical studies are useful in documenting, analyzing and disseminating of knowledge and interaction between the plant world and human society. It can emphasize how diversity in nature is used and influenced by human activities, how human beings classify, manage and use plants available around them (Martin, 1995).

Ethno botanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs. Right from its beginning, the documentation of traditional knowledge especially on the medicinal use of plants has provided many important drugs to treat human and lives-stock ailments in modern day (Wright, 2005). Traditional medicinal consultancy including the consumption of the medicinal plants has a much lower cost than modern attention (Tesema *et al.*, 2003). The current account of medicinal plants of Ethiopia, as documented for national biodiversity strategy and action plan by Tesema *et al.* (2002), shows that about 887 plant species are reported to be utilized in the traditional medicine. Among these, about 26 species are endemic and they are becoming increasingly rare and rare at the verge of extinction. Moreover, both the traditional medicinal plants and the indigenous knowledge about them are equally threatened as the ethno botanical information is not documented and remains in the memory of elderly practitioners.

Ethiopian traditional medical system is characterized by variation and is shaped by the ecological diversity of the country, socio-cultural back ground of the different ethnic groups as well as historical developments, which are related to migration. Previous studies showed the existence of traditional medical pluralism in the country. Therefore, in Ethiopia in general and in Oromia regional state in particular, knowledge from herbalists is passed either secretly from one generation to the next through words of mouth or their descendants inherit the medico-spiritual manuscripts (Jansen,1981), as there is little accessibility to written documents and records on medicinal plants.

Most of the reviewed literatures show that studies on medicinal plants of Ethiopia have so far concentrated in the south and south-west (Dula, 2013; Tolossa *et al.*, 2013; Yibrah, 2014; Kidane *et al.*,2014; Birhanu *et al.*, 2015), central (Birhan *et al.*, 2011; *Ermias et al.*, 2013), north, north-western and north-east (Gidey, 2010dbcd; Birhane *et al.*, 2011; Zenebe, *et al.*, 2012; Giday and Teklehaymanot, 2013; *Yigezu et al.*, 20140), and western parts (Gidey an2012; *Megersa et al.*, 2013) of the country. Through there are few studies in eastern Ethiopia too (e.g., Mulatu 2015; Shumete, 2016; Tewodros, 2015) nothing has been done in Burka Dhintu district of Oromia Region, Ethiopia. According to Pankhurst (2001), detailed information on

the medicinal plant could only be obtained when studies are taken place in the various areas where little or no botanical and ethno botanical explorations have been made. Thus, the purpose of this study is to investigate and document the traditional medicinal plants used by indigenous people for the treatment of human and livestock ailments with the following objectives.

General objective

- To investigate and document the traditional medicinal plants used by the people of Burka Dhintu district to treat the human.

Specific objectives

- To collect and identify the traditional medicinal plants that are used by local people of Burka Dhintu *district* for the treatment of human and livestock ailments
- To identify plant part (s) used, mode of preparation and administration of the remedies;
- To document indigenous knowledge on the use and management practices of medicinal plants by indigenous people of Burka Dhintu *district*.

2. LITERATURE REVIEW

2.1. Indigenous Knowledge on Medicinal Plants

Indigenous knowledge refers to accumulation of knowledge, rule, standards, skills and mental sets, which are possessed by local people in a particular area (Quanash, 1998). The immediate and intimate dependency of local people on natural resources resulted in the accumulation of indigenous knowledge that helps 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, environmental conservation and a host of other activities (Thomas, 1995).

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 environments (Alcorn, 1984). Therefore, it is the result of many generations long year's experiences, careful observations and trial and error experiments (Martin, 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, it builds up on the historic experiences of people and adapts to social, economic, environmental, spiritual and political change. The quantity and quality of traditional knowledge differs among community members according to their gender, age, social standing, profession and intellectual capabilities. For instance, societies concerned with biological diversity will most interested in knowledge about the environment, this information must be understood in a manner, which encompasses knowledge about the cultural, economic, political and spiritual relationships with

the land. It provides a distinctive world view of which outsiders are rarely aware and at best can only incompletely grasp (Balick and Cox, 1996).

Indigenous people of different localities have developed their own specific knowledge on plant resources, use management and conservation (Cotton, 1996). Thus, systematic application of indigenous knowledge is important for sustainable use of resources and sustainable development (Thomas, 1995). One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine. Such knowledge, known as ethno medicinal knowledge involve traditional diagnosis, collection of raw materials, preparation of remedies in many countries including Ethiopia, pass from one generation to the other generation verbally with great secrecy (Jansen,1981). Such secret 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 (Amare, 1976). Hence, there is a need for systematic documentation of such useful knowledge through ethno botanical research.

2.2. Original and Development of Traditional Medicine

Ethno medicine encompasses studies that are concerned with the mutual relationships between plants and traditional people (cotton, 1996), it deals with the documentation analysis and dissemination of knowledge on the interaction between biodiversity and human society and how biodiversity is valued in different societies as well as how it is influenced by human activities. Among the relationships of humans with plants, traditional knowledge on medicinal plants is one on which people depend for preparation of remedies. Traditionally people around the world possess unique knowledge of plant resources of their locality in terms of their use for food medicine and other uses (Martin, 1995).

Since ancient times plants have been indispensable source of both preventive and curative traditional medicine for human being and livestock. Historical accounts of traditionally used medicinal plants depict that different medicinal plants were in use

as early as 5000 to 4000BC in china and 1600BC by Syrians, Babylonians, Hebrews and Egyptians (Derry *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).

2.3. Traditional Medicine Practice in Ethiopia

Traditional practitioners mostly use herbs, spiritual healing, bone-setting and minor surgical procedures in treating disease. Most traditional medical traditions in Ethiopia rely on explanations of diseases that draw on both the mystical and natural causes of an illness and employ a holistic approach to treatment (Bishaw, 1991). Under the rule of Menelik (1865-1913) western medicine became more incorporated in to 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 (Pankhurst, 1990).

Ethiopians tends to rely more on traditional medicine. Conventional medical services remain concentrated in urban areas and have failed to keep pace with the growing population, keeping health care access out of reach for most Ethiopians living in rural. Because traditional medicine is culturally entrenched accessible and affordable up to 80% of the Ethiopian populations rely on traditional remedies as a primary source of health care (Pankhurst, 1990; Kebede *et al.*, 2006).

From time immemorial, plants have been used as source of traditional medicine in Ethiopia to combat different ailments and human sufferings (Mirutse, 2001). Due to its long periods of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Pankhurst, 1995). About 80% of human population and 90% of livestock of Ethiopians are dependent on traditional medicine preparations of plant origin (national biodiversity strategies and actions plan,

2005). About 1000 identified medicinal plant species are reported in the Ethiopian flora, however, many other are not yet identified. Of these, about 300 species are frequently mentioned in many sources. (Endashaw, 2007)

2.4. Traditional Medicinal Plants in Public and Livestock Health Care System in Ethiopia

The available modern health care services of the country are not only insufficient, but also in accessible and unaffordable to the majority (Haile, 2008). 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 traditional medicines mainly of plant origin (Dawit, 2001). However, little investigation has been done in recent decades to enhance and develop the beneficial aspects of traditional medicine including related research and its gradual integration into modern health care system (Lambert, 2001).

In Ethiopia as well as in most developing countries, animal disease remained one of the principal causes of poor livestock products. In Ethiopia conventional veterinary services have been playing a paramount role in the control and prophylaxis of livestock disease in the last three decades (Teshale *et al.*, 2004). 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 (Ermias, 2006).

Ethiopia with its diverse physic-geographic features has diverse flora, which is estimated to be between 6500 and 7000 species of vascular plants. Even though, therefore some common medicinal plants in traditional health care practice, only few species of medicinal plants has been identified and documented so far. A large number of medicinal plant species and associated ethno medicinal knowledge at Mana angetu district bale zone was documented when compared to the number of species reported for other regions in Ethiopia. This indicates that the area has a very high diversity of medicinal plant species and is a site for various traditional knowledge (Ermias, 2008). In this study area 230 medicinal plant species were used for treating human and/or/ livestock ailments.

According to Tesfaye *et al.*, (2009) a total of 120 medicinal plant species grouped within 100 genera and 47 families were identified in Konta special district of southern nation's nationalities and peoples regional state. Among Oromo ethnic group in south western Ethiopia 67 species of plants that belong to 65 genera and 35 families are used for traditional medicine (Haile *et al.*, 2008). In Zegie peninsula north western Ethiopia 67 medicinal plants belonging to 64 genera and 42 families have been documented (Tilahun and Miritse, 2007). Tesfaye and Sebsebe (2009) documented 124 medicinal plants belonging to 107 genera and 42 families in Kafa zone Ethiopia. In Bench south western Ethiopia ethnic group, 35 medicinal plants species belonging 34 genera and 25 families were identified by (Miritse *et al.*, 2009). According to Giday (2010) a total of 27 species of medicinal plants were collected and identified in Darta district south eastern Tigrina. The Cheffa people utilize 83 medicinal plants for both livestock and human diseases treatment in south welo (Bayafers *et al.*, 2000). Ethno medicinal survey of Berta ethnic group in Benishangul Gumuz revealed that peoples in the area use 40 plant species to treat different ailments (Tefari *et al.*, 2009). In Jimma zone, 39 medicinal plants were recognized for the treatment of various diseases (Balcha, 2003). Teshale *et al.*, (2004) documented 77 medicinal plant species used by Borena pastoralists to treat or prevent a wide range of livestock diseases.

Majority of ethno medicinal plants species are collected from the wild natural vegetation of different natural ecosystem (e.g. Forest, grass land, wood land, wet lands) (Endashaw, 2007). They are free resources to all who want to use them for the family to practicing traditional medicine or for sales. According to Haile and Dilnesaw (2007), local healers in sokoru district reported that traditional medicines are use full for poor people who have little access and could not afford the cost of modern medicine. The inhabitant rely on wild plant not only for medicinal use but also for various purposes such as forage, fire wood, charcoal making, construction and wood (Ermias *et al.*, 2008, Giday, 2010). The practice of traditional medicine in Ethiopia mostly harvest for medicinal importance are the shrubs, herbs, trees, and climber and plant parts used widely to treat human include roots, leaves, and seeds (Tena,2008).

2.5. Threats and Conservation of Traditional Medicinal Plants in Ethiopia

Even though plants play a vital role in treating various human and livestock health care they are currently under pressure because of accelerated devastation of plant resources with loss of indigenous knowledge (Ensrmu *et al.*, 1991, Giday, 2010). The current loss of medicinal plants and the associated indigenous knowledge in Ethiopia is due to natural and anthropogenic factors (Giday, 2010, Ermias *et al.*, 2008). 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 and Sebsebe, 2009).

Equally threatened is the knowledge base on which the traditional medical system is based as the ethno medicinal information is 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.

A good example of threatened species is *Tavarniera abyssinica* whose slender roots are swathed and small coiled bundles presented for market. *Tavarniera abyssinica* is a popular traditional medicine for what is known as sudden diseases (Endashaw, 2007). There are 40 species of Aloe where the sap of some species is used for medicinal food and cosmetic application and is widely used internationally of these 20 species are endemic and 18 are threatened.

Debela *et al.*, (2004) and Mirutse (2001) also stressed modern education as having an impact on the knowledge. They pointed out that those students who attended modern schools are showing unwillingness to learn from their parents, which is an evidence for the gradually disappearing traditional knowledge. Ethiopia has policies and strategies that support the

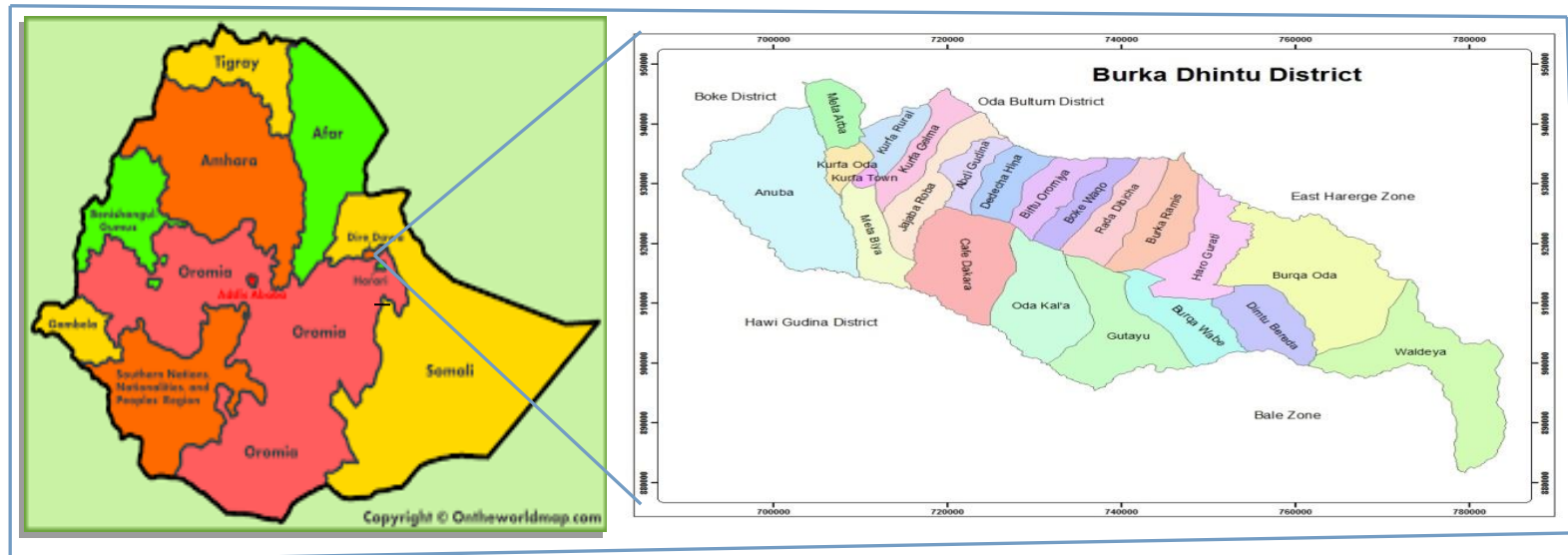
development and utilization of plant resource in a suitable manner. The policies are reflected under various sectors including environmental protection, development of natural resources and diversification of the domestic and export commodities (Endashaw, 2007). The country also has developed policy and a guide line for intellectual property right protection of traditional medicine. The policy encourages and promotes the appropriate use and protections of traditional medicine knowledge in Ethiopia taking into account the need of the traditional medicinal knowledge holders and the communities who benefit in the development activities that support public efforts in meeting livelihood requirements.

3. MATERIALS AND METHODS

3.1. Description of the Study Area

The study will be conducted in Burka Dhintu District West Hararghe Zone of Oromia Region, Ethiopia. Burka Dhintu is located between $08^{\circ}34'40''\text{N}$ - $04^{\circ}05'40''\text{N}$ and $08^{\circ}32'23''\text{E}$ - $04^{\circ}10'09''\text{E}$ latitude and longitude, respectively. The altitude of the study area ranges between 1019m and 1680m above sea level. Its total land mass coverage is about 219,177 hectares and is subdivided into 24 kebeles of which two are the districts of urban kebeles and the rest are rural (Burka Dhintu District Agricultural office, 2017). The climate of the study area varies with altitude. Middle altitude (badda daree in local language) that covers about 15% of the area has temperature of 18°C - 20°C and average rain fall of 1400mm per annum and dry desert areas (gammoojjii gogaa in local language) that covers about 85% of the area has temperature of 25°C - 36°C and average rain fall 500 mm per annum (Burka Dhintu District Agricultural Office). Fig1. Map of study area.

Figure 1 . Map of study area.



3.2. Vegetation and Major Cultivated Crops

The vegetation of the study area consists of different tree, shrub and herbaceous species. Some of the common plant species include *Olea europea*, *Juniperus procera*, *Calpurnea aurea*, *Acacia* pp, *Ocimum* spp, *Ficus* spp, *Phoenixreclinata*, *Carissaedulis*, *Podocarpus falcatus*, *Eucalyptus* pp, etc. Commonly cultivated crops in the study area include Barley (*Hordeum vulgare*), Wheat (*Triticum* spp.), broad bean (*Vicia faba*), Teff (*Eragrostis tef*), field pea (*Pisum sativum*), ground nut and *Sorghum*.

3.3. Ethobotanical Data Collection

Reconnaissance survey will first be conducted to purposively select four kebeles that represent clear altitudinal variations, and have tradition of traditional medicine practice. Thereafter, respondents will be selected from the district for ethno botanical data collection. Totally, 80 respondents (aged ≥ 25), which are ordinary residents (non-traditional healers) in 1:1 sex ratio (if possible) and all available traditional healers 15 as key informants will be selected. Key informants will be purposively selected based on the information gathered from the local people while other respondents will be randomly selected. Data collection methods will be through semi-structured interviews, group discussions, and guided field walks with key informants for field observations. Key informants will be first interviewed individually to mention about the local names of the plants they use to treat diseases, diseases treated, part(s) of plants used, methods of preparation of remedies, route of application of the remedies and dosage. Similar procedure will be also applied with randomly selected non-practitioners of traditional medicine.

Further group discussions will be made with key informants on the entire mentioned medicinal plants and field visit will be made with them for onsite observation of the plants. Voucher specimens will be collected, pressed, and dried for identification. For some species, preliminary identification will be done in the field using illustrations. In addition, further identification of all specimens will be done by comparison with authentic specimens, illustrations and taxonomic keys from Flora of Ethiopia and Eritrea, and with the assistance of experts at in Haramaya University. The identified specimens will be deposited in Haramaya University Herbarium.

3.4. Data Analysis

A descriptive statistical method (e.g., percentage and/or frequency) will be employed to summarize ethno botanical data.

Informant consensus factor (ICF) will be calculated for categories of ailments to identify the agreements of the informants on the reported cures using the formula used by Rodrigo *et al.*, (2005) and Teklehaymanot and Giday (2007)

$$ICF = \frac{Nuc - Ns}{Nuc - 1}$$

Where, Nuc is the number of use citations in each illness category and Ns is the total number of species used by all informants for this illness category. The ICF values range from 0 to 1, with high values (i.e. close to 1) indicating that relatively few plants are used by a large proportion of informants, while low values (< 0.5) indicate that informants do not agree on the plant species to be used to treat a category of ailments.

Fidelity Level index (FL) will be calculated using the following formula indicated in Alexiades (1996) as follows.

$$FL(\%) = \frac{IP}{IU} \times 100$$

Where, IP is the number of informants independently suggested the use of a species to treat a particular disease category and IU is the total number of informants mentioned the plant for any major disease. FL is used to quantify the importance of a given species for a particular purpose in a given cultural group (Ermias *et al.*, 2013; Ong and Kim, 2014).

Preference ranking: To compare the most effective medicinal plants used by the community to treat the particular disease, preference ranking will be conducted following Martin (1995) and Cotton (1996) for most important medicinal plants used in treating a particular illness. For this, ten informants will be selected to identify the best preferred medicinal plant species for treatment of the illness. Each informant will be provided with the mentioned medicinal plants reported to cure the illness with leaves of medicinal plant used being paper tagged then will be asked to assign the highest value for the most preferred species against the illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining one.

The value of each species will be summed up and the rank for each species will be determined based on the total score. This helps to indicate the rank order of the most effective medicinal plants used by the community to treat the disease

4. RESULTS AND DISCUSSION

4.1. Medicinal Plants of the Study Area

In this study 58 plant species distributed in 57 genera and 38 families were recorded to have medicinal values for 39 different health problems. These plant species were affecting both humans and livestock (48 [82.75%] for human and 7 [12.06%] for livestock) while 3 species (5.17%) were reported to treat both humans and livestock ailments (Appendix 1). The presence of knowledge and practice on large number of medicinal plants by people of Burka Dhintu district shows that the indigenous people of the area still depend on traditional medicine of plant origin. According to Fassil Kibebew (2001), about 75-90 % of the rural population in the world (excluding western countries) relies on traditional medicines as their only healthcare system.

In terms of species composition, family *Solanaceae* consisted of 6 species followed by Poaceae 5 species and Asteraceae 3 species. The remaining families contained two or one species each (Appendix 1). The majority of medicinal plant species were obtained from Crop fields followed by Forest, Grazing land and live fence (Table 1). The fact that high number of medicinal plant species was obtained from home garden suggests that home gardens are a good option to conserve medicinal plants

Table.1. Distribution of medicinal plants in different habitats

Habitat type	No. of medicinal plants	Percentage
Forest	10	17.24
Home garden	6	10.90
Grazing land	9	16.36
Live fence	7	12.72
Crop fields	13	23.63
Roadside	6	10.90
On tree	7	12.72
Total	58	100

In this study some plants were reported to have medicinal value more frequently than others to treat various ailments. For example, *Allium sativum* was cited by 60 (75%) of informants as a source of remedy for stomach ache & cough followed by *Citrus limon* cited by 55 (68.75%) informants for common cold and Athletes foot and *Ocimum lamiifolium* by 45 (56.25%) informants to treat Common cold and Febrile (Table 2).

Table.2. some of the medicinal plants cited most by informants

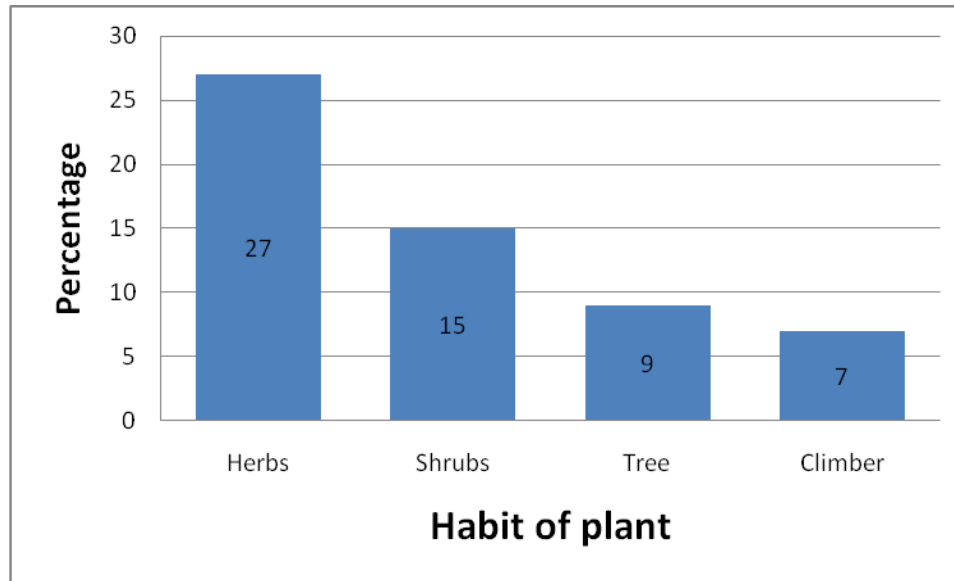
Botanical Name of Medicinal Plants	No. of Informants	Percentage %
<i>Allium sativum</i> L.	60	75
<i>Ocimum lamiifolium</i>	45	56.25
<i>Citrus Limon</i>	55	68.75
<i>Aloe sp</i>	30	37.5
<i>Kalanchoe Petitiana</i>	28	35
<i>Moringa stenopetala</i>	19	23.75
<i>Pentas schimperiana</i>	20	25

4.2 Plant habit, Part(S) used and Preparation

4.2.1 Plant habit

Of the total 58 medicinal plants collected from the study area, 27(46.55 %) were herb species followed by 15 (25.86 %) shrub species, 9 (15.51%) tree species, and 7 (12.06%) climbers (Fig. 2). In the same way high number of herbs and shrubs for medicinal purpose has also been reported previously by Debela Hundie (2004)

Figure 2. Growth forms of medicinal plant used for human and livestock ailments in the study area



4.2.2 Plant Part(s) Used for Medicine

People of the study area use different plant parts for the preparation of traditional medicine. Results of this study showed that leaf is the most cited plant part in medicine preparation followed by root and seed. Plant parts such as stem, fruit, sap, etc. were also reported (Table 3). This result accords (agree) with some previous studies conducted in different parts of the country (Dawit Abebe 1991; Bayafers Tamene, 2000; Mirutse Giday, 1999; Endalew Amenu, 2007). According to Dawit Abebe & Ahadu Ayehu (1993), herbal preparation that involves roots, rhizomes, bulbs, barks, stems or whole parts have negative effects on the survival of the mother plants. Though excessive harvest of leaves may damage plants, particularly the young plants bearing few leaves, the fear of destruction of medicinal plants due to the nature of plant parts 21 collected for the purpose of

medicine seems to be minimal in the area where this study was conducted. Because, collection of plant parts that often serve as organ of regeneration were not reported much.

Table.3 Plant parts used for traditional medicine preparations in Burka Dhintu District

Plant parts	Total responses	% of total
Leaf	28	42.42
Root	13	19.69
Fruit	3	4.76
Seed	9	14.28
Latex/Sap	6	9.52
stem	3	4.76
Bark	1	1.58
Bulb	2	3.17
Rhizome	1	1.58
Total	66	100

4.2.3 Preparation

Concerning the preparation of traditional medicine, the local people employ various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of disease treated and the actual site of the ailment. The principal method of traditional medicine preparation reported was crushing (pounding or pulverizing) (Table 4). This may be due to the possibility of effective extraction of plant ingredients when crushed/powdered so that its curative potential would increase. Preparations may involve using a single plant part or mixtures of different organs of the same plant or mixture of organs from different plants. In this study, the local people also use some other products as additives in their preparations. For example, coffee, sugar, tea, hot pepper, salt, lemon juice, milk, honey, etc. are some of the additives that the local people reported to be used to improve the flavor and reduce adverse effects such as vomiting and diarrhea so that the efficacy of the traditional medicine would be maintained or increased. Such additives were also reported by some previous researchers (Dawit Abebe 1986; Mirutse Giday, 1999; Bayafers Tamene, 2000).

Table.4. Preparation methods of herbal medicine reported by people of Burka Dhintu District

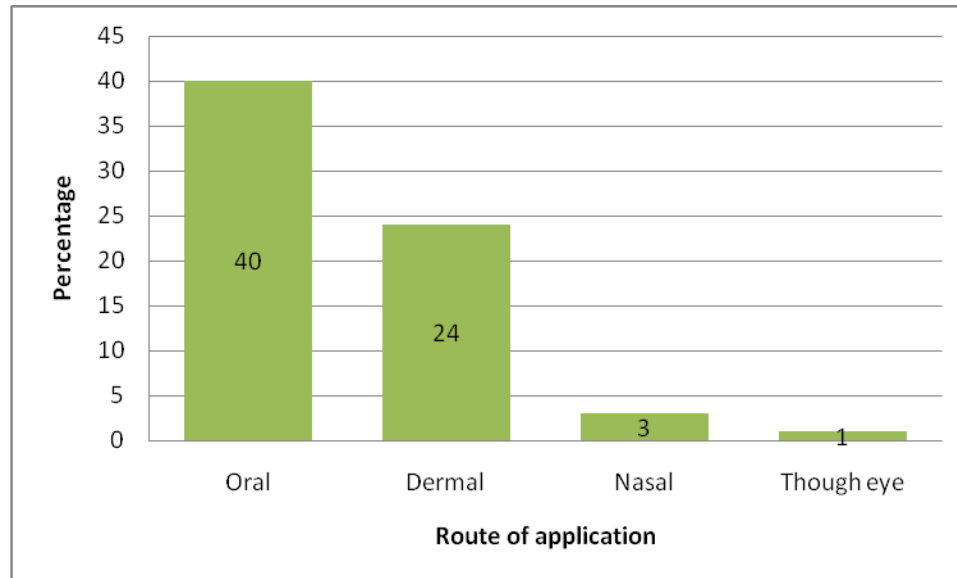
Forms of preparation	Total responses	% of total
Crushing/Pounding/Pulverizing	30	51.72
Squeezing	4	7.27
Cooking (Boiling + roasting)	9	15.51
Chewing in raw	6	10.34
Painting	5	9.09
Immersed	1	1.81
Heated	3	5.45
Total	58	100

4.2.4 Dosage and Ways of application

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. 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. Internal application include through oral, through the eyes, nasal 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 (Appendix 1). This finding agrees with some previous reports (Dawit Abebe, 1986; Bayafers Tamene, 2000; Kebu Balemie *et al.*, 2004).

Fig.3. Percentage distribution of route of application



4.2.5 Informant consensus factor (ICF)

The diseases of the study area have been grouped into different categories based on the site of incidence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. The results of the study showed that diseases that are frequent in the study area have higher informant consensus factor. It is further shown that medicinal plants that are effective in treating certain diseases and well known by community members also have higher ICF values (Table. 5). With the ICF values ranging from 0.95 to 0.84 per illness category. Gonorrhoea had the highest ICF value (0.95) due

to the high incidence of the disease in the area whereas; Snake bite and Rabies, had the lowest (0.84) may be due to the rare occurrence of these diseases and the fact that most are successfully treated by local healers

Table.5 Informant Consensus Factor (ICF)

Category	Species(Ns)	Use citation(Nuc)	ICF
Swelling, Wound, Hemorrhoid	10	80	0.88
Diarrhea, Gastritis, Stomachache	7	50	0.87
Liver, Heart Disease	2	14	0.92
Toothache, Tonsillitis, Jaw deformity	5	35	0.88
Gonorrhea	2	22	0.95
Common cold, cough, Asthma	5	70	0.94
Skin rash, Ring worm	7	78	0.92
Snake bite, Rabies	4	20	0.84
Urine retention, Placental retention	2	9	0.87
Nasal bleeding, Gum bleeding, Athlete foot	4	38	0.91
Hook worm, Infection of arthropod pest, Ascariasis	3	25	0.91

4.2.6 Fidelity level index (FI)

Fidelity level (FL) values were calculated for some commonly used medicinal plants against the some commonly reported ailments: *Allium stivum* (against stomachache), *Guizotia scabra* (against Snake bite), *Zingiber officinale Roscoe* (against Tonsillitis), *Aloe sp* (against Eye disease.), *Lagenaria siceraria* (against Body swelling), *Euphorbia abyssinica* (against wound) and *Azadirachat indica* (against Diarrhea) (Table6). The medicinal plants that are widely used by the local people to treat one or very few ailments will have higher FL values than those that are less popular (Tilahun Teklehaymanot and Mirutse Giday, 2007). For example, *Allium stivum* was reported by many informants to treat Stomachache and hence had 96% FL. High FL could also be an indication of efficiency of the reported plant to cure a specific ailment.

Table6. Fidelity index of some plants

Botanical Name of Medicinal Plants	Examples of ailment treated	IP	IU	FL	FL (%)
<i>Allium sativum</i> L	Stomach ache	24	25	0.96	96
<i>Guizotia scabra</i> (Vis) Cgiov	Snake bite	18	22	0.81	81
<i>Zingiber officinale</i> Roscoe	Tonsillitis	22	26	0.84	84
<i>Aloe sp</i>	Eye disease	15	20	0.88	88
<i>Lagenaria Siceraria</i>	Body Swelling	12	17	0.70	70
<i>Euphorbia abyssinica</i> Gmel.	Wound	16	20	0.8	80
<i>Azadirachat indica</i>	Diarrhea	14	19	0.73	73

4.2.7 Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of five medicinal plants that were reported for treating fungal infection was conducted after selecting ten key informants. 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 in treating Fungal infection and the lowest number (1) for the least effective plant in treating Fungal infection. *Croton macrostachyus* Del scored 41 ranked first indicating that it is the most effective in treating fungal infection followed by *Citrus Limon* and the least effective was *Lantana camara* (Table 7).

Table7. Preference ranking of medicinal plants used for treating fungal infection

List of medicinal plants	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
<i>Croton macrostachyus</i> Del.	4	5	4	3	5	5	3	4	5	3	41	1 st
<i>Citrus limon</i> (L.)	4	4	3	3	4	4	2	3	5	4	36	2 nd
<i>Snowdenia Polystachya</i>	3	3	5	4	2	4	5	2	3	3	34	3 rd
<i>Rhamnus Prinoides</i>	5	3	3	4	3	3	4	3	2	3	33	4 th
<i>Lantana Camara</i> L	4	2	5	3	2	3	2	5	1	3	30	5 th

Key: R=informant

4.3. Threats to Medicinal Plants and Indigenous Knowledge

Rural people need plants in their livelihood for different aspects. From the interview with informants various factors were recorded as the main threats to medicinal plants in Burka Dhintu 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 natural vegetation in general and medicinal plants in particular. As a result, informants require long distance of travelling to fetch medicinal plants.

The Ethobotanical knowledge on uses of some medicinal plants is secrete and transferred from one generation to the next orally. From discussion with informants, it was observed that the forefathers 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. Modernization and facility to modern medication has also contributing to the loss of indigenous knowledge as new generations give less attention to traditional medicinal plants. As a result the indigenous knowledge seems to be vanishing from the study area.

4.4. Management and conservation of medicinal plants

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

Medicinal plants are also maintained or protected near vicinity due to their fragrance, as live fences to avoid enemies, as spices and for food. Plants are also left as remnants of forest in agricultural field due to their uses for construction, fuel wood and other values. Here, the intermixing of multi- purpose plant species by farmers on their farmland is evidence to management practices in the area. The healers conserved some medicinal plants by cultivated mixing with crops in agricultural field, planted in special places, such as road sides, live fences of gardens and fields.

The healers also know the direction, site and angle from which the plant should be harvested. Shoots, main root, regenerating parts and insect or human and animal injured plants are not harvested. During root harvest, the healer buries the pit from which the harvest has taken place. This is either to increase the healing power of the medicine or to increase the regenerating capacity of the plant.

5. SUMMARY AND CONCLUSIONS

The Ethnobotanical study of medicinal plants indicates that the study area is rich in its medicinal plant composition and the associated indigenous knowledge. Fifty eight the medicinal plants were recorded of which 48 species were noted to treat human ailments while 7 species are documented to treat livestock ailments and 3 species are used to treat both livestock and human ailments. The medicinal plant species collected and identified from the crop field were 13 species and those from grazing land were 9 species. In the study area, 39 ailments were reported (31 for human 7 for livestock and 3 for both) which are being treated by traditional medicinal plants of the area. Herbs are highly utilized (46.55%) for medicinal purpose than trees and shrubs. Leaves (42.42%) are use for medicinal purpose more than other plant parts for preparation of human and livestock remedies. the remedies are taken with different additive and solvents and water is more frequently used for this purpose. Most of the medicinal plants are administered orally (58.82%). The major threats to medicinal plants and the associated knowledge in the study area are agricultural expansion, firewood collection, charcoal production, drought, uses of plants for construction and grazing in that order. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, influence of modern education and awareness factors are the major ones. Therefore, awareness creation campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness raising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use.

6. RECOMMENDATIONS

Based on the findings of the study the following recommendations are forwarded:

- Encourage the people to cultivate medicinal plants in their home gardens and farmlands. In addition to this, local peoples' management and conservation of local resources need to be maintained.
- The local people need supports through awareness raising education on the sustainable utilization and management of plant resources.
- Encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives.
- Young generation need raising awareness to avoid negative impacts on the medicinal plants and associated knowledge in the area, hence, documentation of the medicinal plants of the area needs to continue.
- Attention should be given to standardization of measurement and hygiene of the medicines made from plants by training both the healers and other members of the local community

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8. APPENDEX

Appendix 1

Table 1: List of medicinal plants used for human, livestock and both diseases

Scientific Name and plant habit	Family	Local Name	Health problem treated	Part(s) used, Mode of Preparations and application	Route of application
<i>Brassica nigra</i> (L.) Koch ** Herb	<i>Brassicaceae</i>	Sinaafici\zaroo	Blotting	Seed: Seed will be powdered mixed with water and given to animal	Oral
<i>Rumex nepalensis</i> Spreng*. Herb	<i>Polygonaceae</i>	Shulti	Stomach ache	Root: Root will be crushed mixed with water and given to animal	Oral
<i>Argemone ochroleuca</i> Herb	<i>Papaveraceae</i>	Qoore	Wound	Whole part: the part of plant will be cut contain yellow fluid and drop on wound	Dermal
<i>Azadirachata indica</i> Tree	<i>Moraceae</i>	Kinini Zafii	Diarrhea	Leaf: the leaf crushed and the water part drunk	Oral
<i>Parthenium hysterophorus</i> Herb	<i>Asteraceae</i>	Faramisisi	Wound	Leaf and Root: both leaf and root crushed together and the water part drop on	Dermal

				wound	
<i>Euclea schimperi</i> Shrub	Ebenaceae	Mi'essa	Swelling body	Leaf: the leaf Crushed and put on the swollen body	Dermal
<i>Gossypium barbadense</i> L. Shrub	Malvaceae	Jirbii	Hemorrhoid	Leaf: the leaf crashed put on	Dermal
<i>Ruta chalepensis</i> L. Herb	Rutaceae	Teenaadaama	Stomachache	Leaf: Leaf will be crushed mixed with coffee and drunk	Oral
<i>Clematis hirsute</i> Perr. & Guill.* Climber	Ranunculaceae	Fiitii	Liver disease	Leaf: Leaf will be pounded mixed with water and given to the animal	Oral
<i>Clerodendrum myricoides</i> (Hochst.) Shrub	Lamiaceae	Maraasisa/Misirich	Toothache	Stem: Stem will be used to brush teeth	Oral
<i>Croton macrostachyus</i> Del. Tree	Euphorbiaceae	Bakkanisa	Ring worm	Sap: Sap will be rubbed against the affected body part	Dermal
			Wound	Sap: Sap will be rubbed against the affected body part	Dermal
<i>Datura stramonium</i> L. Herb	Solanaceae	Manjii	Wound	Leaf: the leaf pounded and applied (put on) affected area once a day for 2-5 days	Dermal
<i>Ricinus communis</i> L. Shrub	Euphorbiaceae	Qoboo	Dehydration	Seed: the seed dried pulverized, added water then will be drunk before	Oral

				food	
<i>Cicer arietinum</i> Herb	<i>Fabaceae</i>	Shimbera	Ascaries	Seed: dried seed will be roasted ,pondered, boiled, added sugar then will be drunk	Oral
<i>Arachis hypogaea</i> L. Herb	<i>Fabaceae</i>	Loozii	Jaw defomidty	Seed: the dried seeds will be pulverized and added water then will be rubbed the jaw	Dermal
<i>Allium sativum</i> L. Herb	Alliaceae	Qullubi adii	Stomach ache	Bulb: Bulb will be eaten when there is pain	Oral
			Cough	Bulb: Bulb will be crushed and eaten	Oral
<i>Solanum incanum</i> L. Herb	Solanaceae	Hiiddi	Stomach ache	Root: Root tip will be chewed and swallowed	Oral
<i>Schinus molle</i> L*. Tree	Anacardaceae	Qundoobar baree	Blotting	Leaf: Leaf will be pounded mixed with hot pepper and water and given to the animal	Oral
<i>Catha edulis</i> (Vahl) Forssk. ex Endl. Shrub	Celastraceae	Caati	Gonorrhoea	Leaf: Leaf will be infused into tea and drunk	Oral
<i>Euphorbia abyssinica</i> Gmel. Tree	Euphorbiaceae	Adaami	Wound	Sap: The sap will be applied onto the wound	Dermal
<i>Nicotiana tabaccum</i> L.	Solanaceae	Timbaho	Cough	Leaf: Leaf will be pounded mixed with water and given	Oral

Herb				to the animal	
<i>Ocimum lamiifolium</i> Hochst. ex Benth. Shrub	Lamiaceae	Daamaakas	Febrile	Leaf: Leaf will be squeezed and the juice will be pulled in through nostrils	Nasal
			Common Cold	Leaf: Leaf will be crushed mixed with water and drunk	Oral
<i>Zingiber officinale</i> Roscoe Herb	Zingiberaceae	Jinjiibilli	Tonsillitis	Rhizome: Rhizome will be crushed together with <i>Solanum incanum</i> flower and applied	Oral
<i>Carica papaya L.</i> Tree	Caricaceae	Paappaayye	Gastritis	Leaf: Leaf will be crushed mixed with water and drunk before eating brake fast	Oral
<i>Citrus Limon</i> (L.) Shrub	Rutaceae	Loomii	Common cold	Fruit: Juice will be drunk with tea	Oral
			Athletes foot	The fruit is squeezed and creamed on affected for continuous days	Dermal
<i>Psidium guajava L.</i> Tree	Myrtaceae	Zayitunaa	Toothache	Fruit: Fruit will be held between teeth	Oral
<i>Lycopersicon esculentum</i>	Solanaceae	Timaatimii	Skin rash	Leaf: Leaf will be crushed and rubbed against the skin	Dermal

Mill. Herb					
<i>Hordeum vulgare</i> L. Herb	Poaceae	Garbuu	Broken bones	Seed: Seed flour will be made into porridge and eaten	Oral
<i>Coffea Arabica</i> L. Shrub	Rubiaceae	Buna	Asthma	Seed: Powder of roasted coffee seed will be boiled mixed with juice of lemon and ginger and drunk	Oral
<i>Verbascum sinaiticum</i> Benth*. Herb	Scrophulariaceae	Gurra Harree	Urine retention	Root: Root will be crushed mixed with water and given to animal	Oral
<i>Aloe sp.</i> Herb	Aloaceae	Ireet	Eye disease	Leaf: Leaf will be crushed together with leaf of <i>Croton macrostachyus</i> and rubbed on the body	Through the eye
			Infestation of arthropod pest	Sap: The sap/latex will be applied directly into the eye	Dermal
<i>Rhus natalensis</i> Krauss Shrub	Anacardiaceae	Daboobessa	Snake bite	Leaf: Leaf will be pounded and the extract will be mixed with coffee and drunk	Oral
<i>Triticum aestivum</i> L. Herb	Poaceae	Qamadii	Swelling	Seed: the seed will be chewed and the bolus will be put on the swollen part	Dermal

<i>Ferula communis</i> L**. Shrub	Apiaceae	Kamuun	Urine blockage	Leaf: fresh leaf will be pounded salt and water added and drunk	Oral
			Paralysis	Leaf: fresh leaf crushed then will be paint	Dermal
<i>Coccinia abyssinica</i> (Lam.) Cogn. Climber	Cucurbitaceae	Ancootee	Broken Bone	Root: The root will be cooked and eaten with oat bread	Oral
<i>Eleusine floccifolia</i> Herb	Poaceae	Coqoorsa	Snake bite poison	Stem: Stem will be pounded and applied	Dermal
<i>Jasminum grandiflorum</i> L.subsp. <i>floribundum</i> (R.Br.ex Fresen.) P.S. Green Climber	Oleaceae	Xambelel	Gum bleeding	Root: Root will be used to brush teeth	Oral
<i>Lagenaria</i> <i>Siceraria</i> Climber	<i>Cucurbitaceae</i>	Dabaqulaa	Body Swelling	Fruit: is first heated and then put on infected part of body	Dermal
<i>Linum usitatissimum</i> L*. Herb	Linaceae	Talbaa	Placenta retention	Seed: Seed will be powdered and given to animal to drink	Oral
<i>Ampelocissus bombycina</i> (bank)	Vitaceae	Buqee sexaana	Anthrax	Leaf: leaf of <i>Ampelocissus bombycina</i> with leaf of <i>Croton Macrostachya</i> and	Dermal

<i>Planch*</i> . Climber				Justicia Schimperiana are dried together and pounded then creamed an affected area.	
<i>Justicia schimperiana</i> (<i>Hochst.ex</i> <i>*Nees</i>) <i>T.Ander</i> <i>s</i> Shrub	<i>Acanthaceae</i>	Dhumugaa	Rabies	Root and Leaf: will be pounded together mixed with water and drunk	Oral
<i>Capparis Cartilaginea</i> Climber	<i>Capparidaceae</i>	Gooraa	Back pain	Seed: the seed swallowed once a day	Oral
<i>Snowdenia Polystachiya</i> Herb	<i>Poaceae</i>	Muujaa	Fungal infection	Stem: above ground part will be will be crushed and rubbed the infected skin	Dermal
<i>Rhamns Prinoides</i> Shrub	<i>Rhamanaceae</i>	Geeshoo	Fungal infection	Leaf: will be pounded and applied on affected area	Dermal
<i>Pentas schimperiana</i> Herb	<i>Rubiaceae</i>	maaxanee	Nasal bleeding	Leaf: Freshly leaves squeezed are inhaled through nasal opening	Nasal
			Diarrhea	Root :will be chewed with salt and swallowed	Oral
<i>Olea europaea</i> Tree	<i>Oleaceae</i>	Ejeersaa	Hemorrhoid	Bark: the bark will be heated on fire held on the pain area	Dermal
<i>Kalanchoe Petitiiana</i> Herb	<i>Crassulaceae</i>	Bosoqqee	Nasal bleeding	Root and Leaf : will be powdered and sniffed	Nasal
			Lymphatic swelling	Root and Leaf : will be powdered and taken with coffee	Oral
<i>Ficus sur</i>	<i>Moraceae</i>	Harbuu	Skin	Sap: sap will be creamed on	Dermal

<i>Forssk</i> Tree			infection	affected skin	
<i>Pavonia Procumbens</i> (Wight and Arn.)Walp. Herb	<i>Malvaceae</i>	Doobi	Hook worm and Abdominal pain	Root: the root ground along with root of Rumex abyssinicus,Z.officinale and Allium stivvm ,homogenized in water and taking one tea cup every morning for 3 days and eating food banned for 5 hours	Oral
<i>Guizotia scabra</i> (Vis) Cgiov Shrub	<i>Asteraceae</i>	Hadaa	Snake bite	Root: the root along with root of Acacia brevispica and Ficus vasta ground in water, boiled and given to victim .one teacup only once	Oral
<i>Cirsium Vulgare</i> Herb	<i>Asteraceae</i>	Kosoruu	Skin infection	Leaf: together with that of Rumex nervosus and Juncus Oxycarpus will be mixed with wood ash and milk heated together and creamed on affected area for two weeks	Dermal
<i>Lantana Camara</i> L Shrub	<i>Verbenaceae</i>	kusayee	Fungi	Leaf: fresh leaf is directly rubbed on affected skin	Dermal
<i>Beta vulgaris</i> L. Herb	<i>Chenopodiaceae</i>	Qoostaa	Dehydration	Leaf: the fresh leaves will be cooked with oil and added salt then after will be eaten	Oral
<i>Oryza</i> Herb	<i>Poaceae</i>	Ruuzii	Diarrhea	Seed: the seed will be boiled then added salt drunk the water part	Oral
<i>Otostegia integrifolia</i> ** Shrub	<i>Lamiaceae</i>	Tungut	Stomachache	Leaf: squeezed and drunk the juice	oral
			Rabies	Leaf: the leaf is pounded	Oral

				mixed with milk and drank	
<i>Moringa stenopetala</i> (Bak.f) cfod. Shrub	<i>Moringaceae</i>	Moringaa	Diabetes Blood pressure	Leaf: the fresh leaves will be cooked with oil then will be eaten with food	Oral
<i>Chlorophytum somaliense</i> Herb	<i>Anthericaceae</i>	Udleselem	Swell breast		
<i>Acalypha Fruticosa</i> Forssk Climber	<i>Euphorbiaceae</i>	Bal-tokke	Heart diseases	Root: the root will be eaten	Oral
<i>Grewia bicolor</i> Tree	<i>Tilliaceae</i>	Haroressa	Stop bleeding after birth	Leaf: the leaf will be boiled and drunk	Oral

Key: * =Animal Disease

**=for both animal and livestock

Appendix 2, Semi-structured interviews will be employee in the research area.

Date _____ village (Kebeles) _____

Name of respondent (informant) _____

Sex: Male _____; Female _____; Age _____; Occupation _____; Religion _____

Level of education: High _____; Middle _____; Low _____

1. What are the main or most common human health problems or disease in your locality?
2. What are the main or most common livestock (animals) health problems or diseases?
3. List plant species used to treat a given disease in your area?
4. List plants used to treat both human and livestock diseases?
5. Which plant do you use to treat that particular health problem/disease?
6. Morphological description of the plant(s)
7. For what other purposes do you use the medicinal plants?
8. How is the part(s) gathered? (Including the collected time) _____

9. Season/time of collection_____
10. Preferred maturity level_____
11. Any taboo/ restrictions in plant collections_____
12. Does the dose differ among men, women, children, and elders?_____
13. Any restrictions in taking remedies (pregnancy, age, etc.)?_____
14. Do you store the medicine? If yes, how and for how long_____
15. Are there conditions, which restrict taking of the medicine?_____
16. Are medicinal plants easily accessible?_____
17. How do you assess accessibility of medicinal plants when compared with the past decade?_____
18. Are there any beliefs linked with the utilization of medicinal plants in the study area?(Age, method, storage, time of collection, time of administration, condition like pregnancy)._____
19. Is the medicinal plant marketable?_____
20. How does modernization interfere with traditional medicine?_____
21. Are there economic groups who frequently use the medicinal plant?_____

22. How does the knowledge transfer take place from elders to younger?_____

23. What are the major threats to medicinal plants? As a group or individual species-----

24. How do you conserve medicinal plants?_____

Appendix3: Observation Check List

1. What are the main human problems in your locality Keble?
2. What are the main livestock health problems or disease?
3. How pants parts are collected?
4. Which type is used as a treatment for many diseases?
5. Do you use plants to treat disease in your locality?
 - a) Name of the plant_____
 - b) Habitat of the plant_____
 - c) Parts of the plant used_____
 - d) Preparation methods_____
 - e) Amount used_____
 - f) Application method_____
 - g) Treats to the above plant_____
 - h) Other use of the plant_____
6. Does the dose differ among males, females, children, elders and pregnant?
7. How does modernization interfere with traditional medicine application and use?

