Ethnobotanical study of medicinal plant species in Nensebo District, south-eastern Ethiopia

Gemedi Abdela, Zerihun Girma and Tesfaye Awas

Correspondence

Gemedi Abdela[1] Zerihun Girma [2*] and Tesfaye Awas[3]

[1]Department of Biodiversity Conservation and Ecotourism, Madda Walabu University.
[2]Department of Wildlife and Protected Area Management, Wondo Genet College of Forestry and Natural Resources, Hawassa University.
[3]Ethiopian Biodiversity Institute, Addis Ababa, Ethiopia.

[*]Corresponding Author: zeru75@yahoo.com

Ethnobotany Research and Applications 24:6 (2022)

Research

Abstract

Background: Plants are important sources of traditional medicine in many cultures. Ethiopia, being rich in floral and cultural diversity, merits documentation of medicinal plants and associated traditional medicinal knowledge in various parts of the country. To this end, an ethnobotanical study of medicinal plants was conducted in Nensebo district, southern Ethiopia.

Methods: Ethnobotanical data were collected using semi-structured interviews, field guided walks, direct observation, focus group discussions and market surveys from December 2018 to February 2019. Both descriptive and quantitative methods were used for data analysis, as appropriate. Ethnobotanical data analysis techniques such as informant consensus factor, paired comparison, and preference ranking.

Results: A total of 127 medicinal plant species belonging to 108 genera and 67 families were identified and documented. Medicinal plants were mostly (60%) collected from the wild. Of the recorded plant species, 70% were reported to be used to treat human ailments and 12% were used to treat livestock ailments. Herbs were the most frequently harvested medicinal plant growth form (32%). Among the plant parts used for medicine, leaves (36%) were the most frequently used. The most widely used mode of preparation for medicines was crushing (38%) and the most frequent route of administration was orally (31%). The most common human aliments treated in the area were gonorrhea, diarrhea, fever, tapeworm and headache, whereas the most common livestock aliments treated in the area were blackleg, cattle coughing, equine coughing, equine rheumatism. There was 21% informant consensus that *Croton macrostachyus* is effective in treating the common human aliment gonorrhea and also the preference raking findings indicated that *Croton macrostachyus* as most preferred medicinal plant species to treat gonorrhea.

Conclusions: Several medicinal plant species and associated indigenous knowledge were reported to be used to treat human and livestock ailments, implying the local community depends on them for primary health care. As a result, there is a need for conservation of medicinal plants and associated indigenous knowledge in the area.

Key words: Informants consensus, mode of preparation, pairwise comparison, route of administration

Background

Plants are fundamental components of many ecosystems on earth, forming the productive bases and physical structures that produce resources to support a diversity of organisms. Many medicinal plant species have multiple uses, providing essential materials for human survival including food and building materials as well as supporting many ecological processes (Assefa *et al.* 2021; Kebede *et al.* 2017, Nigussie & Dong 2019).

Manuscript received: 30/06/2022 – Revised manuscript received: 24/10/2022 - Published: 27/10/2022
http://dx.doi.org/10.32859/era.24.28.1-25

Ethnobotany is the study of people's classification, management and use of plants. It is defined as "local people's interaction with the natural environment: how they classify, manage and use plants available around them" (Martin 1995). Indigenous knowledge is unique knowledge held by a given culture or society that involves practices acquired over time, based on traditional practices (Negi *et al.* 2021). Indigenous knowledge of medicinal plants and their use by indigenous cultures are not only beneficial for conservation of cultural traditions and biodiversity, but also for primary healthcare and treatment development of the poor community who may have limited access or ability to afford cost of modern medicine (Firaol *et al.* 2013, Gijan & Dalle 2019). They may also offer new treatments in the context of "modern medicine" as pathogens become resistant to current treatments.

An available, deep rooted traditional knowledge of human health care and the culturally important traditional medicines form the basis of an accessible and affordable healthcare system and are an important source of livelihood among rural populations (Mesfin *et al.* 2009, Woldemariam *et al.* 2021). The accessibility of medicinal plants, a cultural acceptance of natural medication and the contrasting high costs of "western" biomedical health care are factors that promote extensive use of plant therapy for human primary health care. As a result, traditional medicine is a widely growing health care system of significant economic importance. Therefore, documenting the plant biodiversity and its associated indigenous knowledge brings an urgent call for conservation efforts (Woldemariam *et al.* 2021).

Populations in most developing countries use traditional medicine to meet their primary health care needs. Currently, it is estimated that individual countries range between 50-95% reliance on medicinal plants (Pan *et al.* 2019, Wanjohi *et al.* 2020). As a nation in a developing country, Ethiopians mostly relied for centuries on a system of traditional health care knowledge for treating various physical and mental disorders (Chekole 2017, Gebre 2018, Kebede *et al.* 2016, Woldemariam *et al.* 2021). This implies that traditional medicine continues to be an essential part of the local culture as well as the basis of a rural community health care system (Gijan & Dalle 2019).
Environmental degradation due to agricultural expansion, loss of forests and woodlands, over-harvesting, forest fires, overgrazing and urbanization appear to be the major threat to the medicinal plants of Ethiopia (Assefa *et al.* 2021, Assen *et al.* 2021, Tolossa & Megersa 2018). Currently, over 20% of the global wild medicinal plant species are already nearly exhausted (Ssenku *et al.* 2022). This poses a significant risk to the future wellbeing of the human and animal populations that have, for generations, relied on these resources to combat various ailments (Kassa *et al.* 2020, Mesfin *et al.* 2014, Teklehaymanot 2017). Changing of cultures, habits and lifestyles further aggravate the situation (Japan Association for International Collaboration of Agriculture and Forestry (JAICAF) 2007). The documentation of medicinal plants is gaining recognition in recent times to preserve indigenous knowledge for future generations and sustainable use of resources in Ethiopia due to medicinal plant species and associated indigenous knowledge resource degradation throughout the country (Enyew *et al.* 2014, Kelbessa 1992, Melkamu 2021). Ecosystem conservation will ensure *in-situ* conservation of medicinal plants so as to apply sustainable harvesting methods for collecting medicinal plants from wild habitats. However, in some regions, traditional practitioners are collecting medicinal plants with less attention to protection of rare species than would be preferred (Yirga 2010). In addition, traditional medicinal knowledge is transferred from generation to generation by word of mouth (Chekole 2017, Melkamu 2021), but unfortunately the current generation is losing interest in traditional medicine knowledge. The limitations of oral knowledge transfer and the lack of interest on the part of the younger generation may lead to indigenous knowledge erosion in the near future (Santhosh *et al.* 2019, Tugume & Nyakoojo 2019).

Nensebo District has a rich floral, cultural and spiritual diversity that has long been associated with traditional medicinal plant knowledge. However anthropogenic pressures such as deforestation for agricultural expansion, fuel wood collection, overgrazing, settlements have been degrading the floral diversity and concurrently threatening the rich ethnobotanical Knowledge (Getachew 2019). The loss of medicinal plants is a common problem in Ethiopia due to unsustainable use (Kelbessa *et al.* 1992); this is particularly true in the study area. Most rural communities in Ethiopia continue to use various indigenous plants to treat human and livestock ailments (Mengistu *et al.* 2022). Nensebo District is an especially ethnobotanically rich part of Ethiopia, where medicinal plants are widely collected to treat various disorders, and for food, spice, fodder, and treatment of farm animals (Oromia Forest and Wildlife Enterprise (OFWI) 2018). But until the present, no scientific study has attempted to document medicinal plant diversity and uses in the district. Awas (2007) noted that detailed information on medicinal plants of Ethiopia could only be developed if studies were undertaken in several parts of the country where little or no botanical and ethnobotanical explorations had been conducted. For that reason, the present study was conducted to document the locally used medicinal plants, the plant parts that are used, diseases treated, the mode of application and route of administration. This would provide a foundation of baseline information that could be used by pharmacists and phytochemists to further explore the scientific basis of locally used medicinal plants.

Materials and Methods

Geographic location

Nensebo District is located in the West Arsi Zone of Oromia National Regional State of Ethiopia. It lies between 6^0 25'0"- 6^0 45'0"N and 38^0 50'0" - 39^0 40'0"E (Figure 1) and is surrounded by several distinct districts. Nensebo is bordered to the southeast by Harena-Buluk, to the south by Madawalabu and Girja Districts; to the west and

Northwest by Kokosa; to the north by Dodola; to the East by Adaba District; to the southwest by Chire and to the west by Bensa Districts of the Sidama National Regional State (Figure 1). The district's headquarter is located 407 km from Addis Ababa along the southeast part of the country, and 135 km southeast of the town of Shashemene, the capital of the West Arsi Zone. The districts together comprise 19 rural kebeles (a lower level of administration) and three urban kebeles, all characterized by diverse agro-ecological zones (Nensebo District Agricultural and Natural Resources Office (NDANRO) 2016).

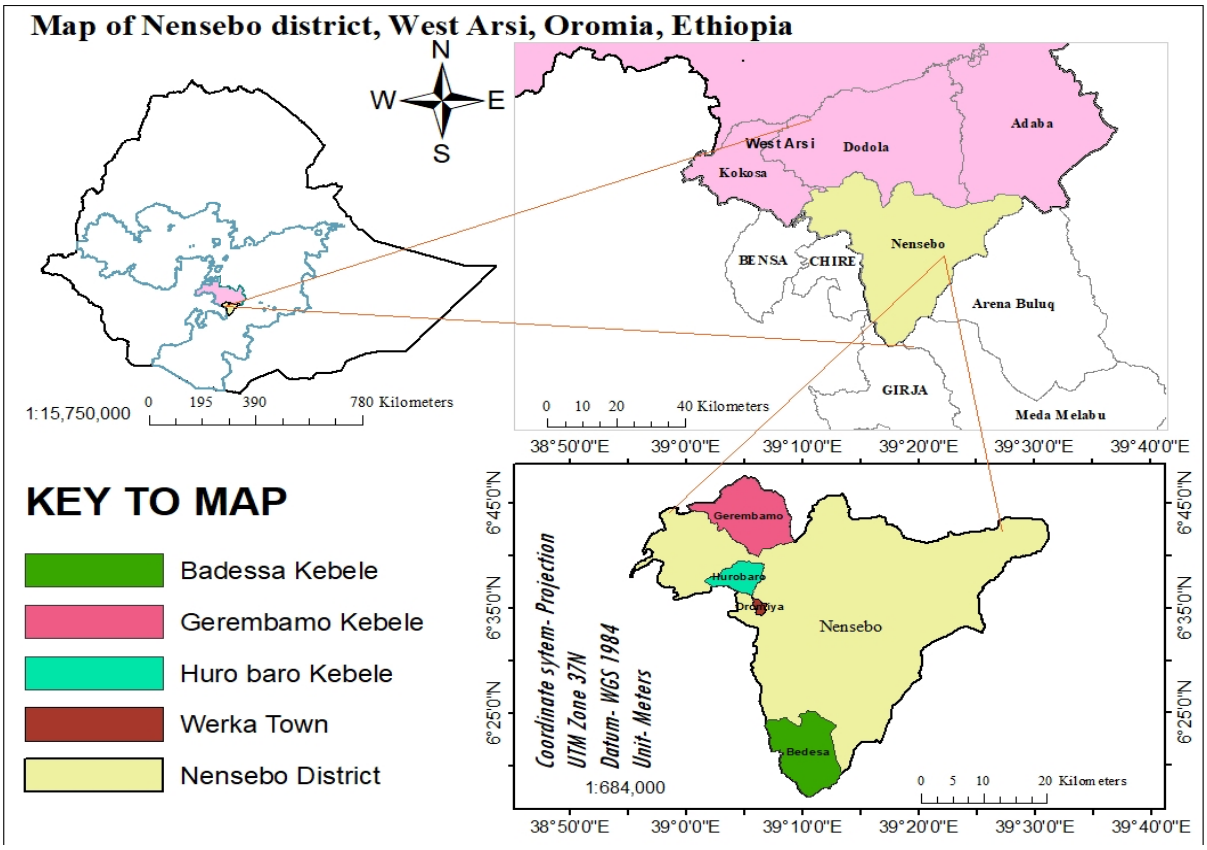

Figure 1. Location map of study area. Note that Badessa kebele is lowland, Huro baro kebele is mid altitude and Gerembamo kebele is highland

Sampling design

Site selection and pilot survey

A reconnaissance survey was carried out during the last week of November 2018 in order to obtain basic information about medicinal plants, accessibility, topography, distribution of plants and to design an appropriate sampling procedure for kebeles. Guided by this reconnaissance survey, three representative kebeles were selected out of 19 available kebeles, based on vegetation cover and agro-ecology. Criteria were as follows: Gerembamo, Huro baro and Badessa kebeles were selected to represent three distinct major agro-ecological zones (highland, mid-altitude and lowland respectively).

Sample size determination and informant sampling

A total of 3175 households were distributed as follows: Gerembamo (1020 households), Huro baro (914 households) and Badessa (1241 households). Based on this, the sub-population to be sampled was calculated using the formula

$$\mathrm{n} = \frac{NP(1-p)}{(N-1)(d/Z\alpha/2)^{2} + \mathrm{P}(1-\mathrm{P})}$$ to determine the sample size (Espinosa *et al.* 2012),

where, n = number of sample size; N= total number of households in selected kebeles, Z α/2 = from the table of standard normal distribution (Scheaffer *et al.* 2012), α = level of significance; P= expected proportion (80%, P=0.8, (Tadesse *et al.* 2005) and d= precision (10% of p, then d= 0.08, (Suresh & Chandrashekara 2012).

Using this formula, the calculated sample size was 113 households. Assuming a 10% non-response rate, the actual sample size was 123 and sample households at each kebele were taken proportionally (Table 1). In addition, a total of 27 key informants (KIs) were selected from the three kebeles, making the total number of households selected for the study 150 (Table 1).

Table 1. Sample size of respondents' household from the selected kebeles, Nensebo District, Ethiopia.

Kebele	Altitude/Agro ecology	Total Number of Households	Sampled Households	Sampled KIs	Total
Badessa	lowland	1239	45	9	54
Gerembamo	highland	1020	41	9	50
Huro baro	mid-altitude	914	37	9	46
Total		3175	123	27	150

Key informants were selected using the snowball method (Bernad 2002, Patton 1990). Three male farmers were selected from each of the kebeles based on the recommendation of local administrators and elders. Individual farmers were asked to give the name of three KIs depending on their knowledge and experiences (i.e., three farmers * three kebeles * three KI selected from each kebele = 27 Key informants (9 women and 18 men)). Household respondents were selected by interval using the household lists that are found in each kebele (i.e., every fifth household was selected). Out of the mentioned 27 KIs, 10 top ranked KIs were selected for preference ranking of nine medicinal plants used to treat gonorrhea in the study area and for pairwise comparison of six medicinal plants used to treat toothache in the study area. Gonorrhea and toothache diseases were selected because they are both frequently occurring diseases in the area.

Pilot survey

Before the formal data collection began, a pilot survey was carried out to ensure the clarity and understandability of the questionnaire. In each kebele, five informants, (so a total of 15 informants), were randomly selected based on the principle of first come first served and the semi-structured interview questionnaire was tested through household interview. Based on the outcome of the pilot survey, the questionnaire was modified to improve its clarity and understandability.

Data collection

To collect ethnobotanical data from semi-structured interviews, focus group discussions, market surveys and field observations were used on selected informants from the selected kebeles from December 2018 to February 2019.

Semi-structured interview

In order to acquire appropriate and relevant information, semi-structured interviews were prepared, and house-to-house interviews were carried out with head of household (husband or wife or any adult children incase husband or wife was not in the house during the interview) and key informants following Cotton (1996) and Martin (1995). In this study household was defined as a group of one or more persons living together under the same roof or several roofs within the same dwelling and making common provision for food and other living arrangements. The interviews were held in the "Afan Oromo'' language to obtain information on local names of plants, parts used, modes of applications, routes of administration, conservation status and management practices.

Field observation, specimen collection and identification

Field visits were conducted with the traditional healers to observe and collect medicinal plant species. Sample specimens of each medicinal plant species were collected with the guidance of "Key Informants". Global Positioning System (GPS) co-ordinates were used to record the altitude, latitude and longitude of the locality where each plant was collected. Plant specimens collected were pressed, dried and prepared using standardized herbarium techniques. The specimens were identified and deposited in the Herbarium of Ethiopian Biodiversity Institute at Addis Ababa, Ethiopia (Hedberg *et al.* 2006). Specimen identification was made through comparison with archived herbarium specimens in the herbarium and with the help of the Flora of Ethiopia and Eritrea (Judd *et al.* 2002).

Focus group discussion (FGD)

Focus group discussion was conducted to obtain valuable and detailed information (Martin 1995) and was held with selected informants. In each kebele, one focus group discussion was held, so a total of three FGD were conducted in the three sampled kebeles. In each kebele the FGD comprised eight members, all elders and herbalists. Each FGD is composed of equal proportion of men and femen, but discussion conducted separately for men and women. The FGD was carried out in 'Afan Oromo' and focused on medicinal plant uses, methods of preparation, diseases treated, ways of administration, and threats to plants and conservation practices. Focus group discussions were held in the field, where the herbarium specimens of medicinal plants were collected.

Market survey

To identify and record additional uses of medicinal plants beyond their use in medicine, two market surveys were carried out in Badessa and Worka local markets. Direct observations as well as face to face interview of local healers and buyers were conducted to obtain information about medicinal plants sold in the market.

Data analysis

The data collected were coded and summarized in a table using the Microsoft Excel version 2010 spreadsheet computer program. Descriptive statistics such as tables, graphs and charts were used to describe and synthesize

data. The Stata version 64 computer program was used for statistical tests. T-tests were applied to test mean differences among various social groups in terms of their knowledge of medicinal plants.

Preference ranking
Following Martin (1995) preference ranking was conducted to compare the nine most preferred medicinal plants used to treat gonorrhea. The 12 top-ranked informants (out of the 27 key informants those top ranked 12 based on their traditional medicine knowledge) were selected and asked to rank nine medicinal plants for its application to treat gonorrhea. Lastly total score was recorded, and plant species were ranked on the basis of the informants' responses.

Informant consensus factor
Informant consensus factors were calculated to evaluate the reliability and validity of the information recorded for each category of disease reported to be cured using a particular medicinal plant species. The degree of agreement among informants on the appropriate treatments for an illness was calculated following Heinrich *et al.* (1998) using the formula below.

$$\text{ICF} = \frac{nur - ns}{nur - 1}$$

Where, ICF= Informant Consensus Factor, nur= number of use citations, *ns*= number of species used to treat the illness. A total of 10 categories of disease were used. These were: headache, evil eye/sprit, cattle disease, body swelling related disease, sensor organ disease, respiratory related disease, reproductive organ disease, both human and livestock disease, dermal disease, stomach related disease.

Paired wise comparison
Paired comparisons were made to assess the value and popularity of six medicinal plants used to treat toothache Martin (1995). Toothache was selected because it was reported to be the most frequently occurring ailment in the area. The six medicinal plants selected for paired comparison were *Warburgia uganlensis, Albizia schimperiana, Phoenix reclinata, Pycnostachys abyssinica, Ekebergia capensis and Angelica atropurpea,* selected due to highest informant citation. Following Höft *et al.* (1999), numbers of pairs were calculated using the formula

$$\text{N} = \frac{n(n-1)}{2}$$

Where N= total number of pairs, n= number of items.

Results and Discussion

Demographic profile of respondents
Of the total sampled respondents, 113 were men and 37 were women. Most of the respondents (109, 73%) were aged ≥40 years old. About 82% of household respondents were married and 72% were Illiterate (Table 2).

Table 2. Characteristics of each household's respondent, Nensebo District, Ethiopia.

Characteristics	Class	Frequency	(%)
Gender	Male	113	75.33
	Female	37	24.67
Ages	<40	41	27.33
	≥40	109	72.67
Marital Status	Single	7	4.67
	Married	123	82
	Widowed	11	7.33
	Divorced	9	6
Educational level	Illiterate	108	72
	Literate	42	28

Note that there was only one respondent per household.

Diversity of medicinal plants
A total of 127 medicinal plant species belonging to 66 families and 108 genera were identified in the study area (Appendix 1). This makes the district an important site for the practice of traditional medicine. It also indicates that the local communities are heavily dependent on traditional medicine for primary health care (Mengistu *et al.* 2022, Woldemariam *et al.* 2021). Of the reported medicinal plants, 34 species were reported by Ashagire *et al.* (2016) in Bule Hora district, southern Ethiopia and 35 species were also reported by Chekole *et al.* (2015) in Libo Kemkem

district northern Ethiopia. This is a good indication that some of the local medicinal plants have also been shown to have medicinal values by communities living elsewhere in Ethiopia.

Table 3. Distribution of medicinal plants according to plant family in Nensebo District, Ethiopia.

Families	Number of species	(%) of total
Asteraceae	7	5.51
Euphorbiaceae	7	5.51
Fabaceae	7	5.51
Solanaceae	6	4.72
Lamiaceae	5	3.94
Apiaceae, Moraceae, Rubiaceae, Oleaceae , Urticaceae	4*5=20	15.74
Araliaceae, Boraginaceae, Myrtaceae,	3*3=9	7.09
Apocynaceae, Campanulaceae, Celasteraceae, Cucurbaceae, Ebenaceae, Lorantaceae, Malvaceae, Orchidiaceae, Rosaceae, Rutaceae, Poaceae, Polygonaceae, Teliaceae	2*13=26	20.47
Other 40 Families	42*1=40	31.49

Asteraceae (5.5%), Euphorbiaceae (5.5%), and Fabaceae (5.5%), were the predominant flowering plant families in the area, and each were represented by seven species. These were followed by Solanaceae (6 species, 4.72%) and Lamiaceae (5 species, 3.94%) (see Table 3). This finding agrees with other studies in Ethiopia (Assefa *et al.* 2021, Chekole *et al.* 2015, Limenih *et al.* 2015, Tekle 2015, Woldemariam *et al.* 2021) and in Uganda (Tugume & Nyakoojo 2019). The Asteraceae are one of the largest dicot families in the flora of Ethiopia and Eritrea. Out of the 66 angiosperm plant families identified, Asteraceae, Euphorbiaceae and Fabaceae are among the most abundant families ranked first, third and seventh respectively (APG (Angiosperm Phylogeny Group) 2016). Out of the total of 127 identified medicinal plants 89 or 70% of the species were reported to be used to treat human ailments, whereas only 15, or 11.8% species were used solely to treat livestock ailments and (23, 18.11%) used to treat both human and livestock ailments. This result is consistent with reports by different authors; Central Ethiopia (Kassa *et al.* 2016), Sheka, southern Ethiopia (Kassa *et al* 2020) and Swabi and Hazara region of Pakistan (Hussain *et al.* 2022).

Plant parts used and growth forms of medicinal plants in Nensebo District

Leaves were majorly used in the study area (46 species, 33.1%), followed by Fruits (12 species, 9.4%) (Figure 2). Leaves are most used due to its bioactive potential and effectiveness and their higher concentrations of bioactive compounds. Leaves are the sites of photosynthesis and initial food storage; they often contain secondary compounds that are intended to deter herbivores. Generally, leaves are primary reservoirs for secondary metabolites and easily accessible, easily prepared and have renewable capacity, which makes them preferred for medicinal use (Teklehaymanot 2017, Tesfaye *et al.* 2020). From the perspective of conservation of medicinal plants, using leaves for medicinal preparations is less likely to cause major damage to the plant (i.e. harvesting this part has less effect on plant species survival). In contrast, harvesting roots of plant species can be detrimental to plant survival. Other studies in Ethiopia and other countries also reported leaves are the parts of medicinal plants most to be used frequently for traditional health care (Gonfa *et al.* 2020, Santhosh *et al.* 2019, Teklehaymanot 2017, Tesfaye *et al.* 2020, Tugume *et al.* 2016, Tugume & Nyakoojo 2019).

Habitats of medicinal plants

Of the 127 medicinal plant species, 76 were collected from the wild (forest, woodlots and grasslands), 33 were collected from both home gardens and the wild, 13 were collected from home gardens alone and five were collected from farmland. This finding agrees with findings elsewhere from Ethiopia (Fenetahun & Eshetu 2017, Gebre 2018, Gonfa *et al.* 2020, Tolossa & Megersa 2018), where more medicinal plants were collected from the wild than from the home garden and farmland. This illustrates the dependency of local people in the study area on wild sources of medicinal plants rather than cultivation in gardens and farmland. From a conservation point of view this may suggest the potential for negative impacts on wild medicinal plants due to overharvesting unless controls are in place. As a result, priority should be placed on the protection and conservation of the wild habitats of these medicinal plants. In particular, sustainable forest and grassland ecosystem management practices would ensure access to medicinal plants for generations. In addition, awareness of the importance of conservation of medicinal plants should be promoted and families should also be encouraged to cultivate medicinal plants in their home gardens (Assen *et al.* 2021, Lulekal *et al.* 2013, Nigussie & Dong 2019).

Growth forms of medicinal plants

The most frequently used growth forms of medicinal plants were herbs (40%) and the least used were epiphytes (4%) (Figure 3). This could be related to the fact that herbaceous plants are very abundant and easy to collect, since they are easily collected from home gardens and forest patches. They also grow to maturity within short period of time in contrast to other growth forms. Additionally, the high number of herbaceous medicinal plant species

reported in the study could be due sufficient rainfall and extensive availability of moisture. This finding supports similar studies by Chekole (2017), Kassa *et al.* (2020), Nigussie & Dong (2019), Santhosh *et al.* (2019), and Woldemariam *et al.* (2021) who all reported dominance of herbs among plants collected for medicinal purposes.

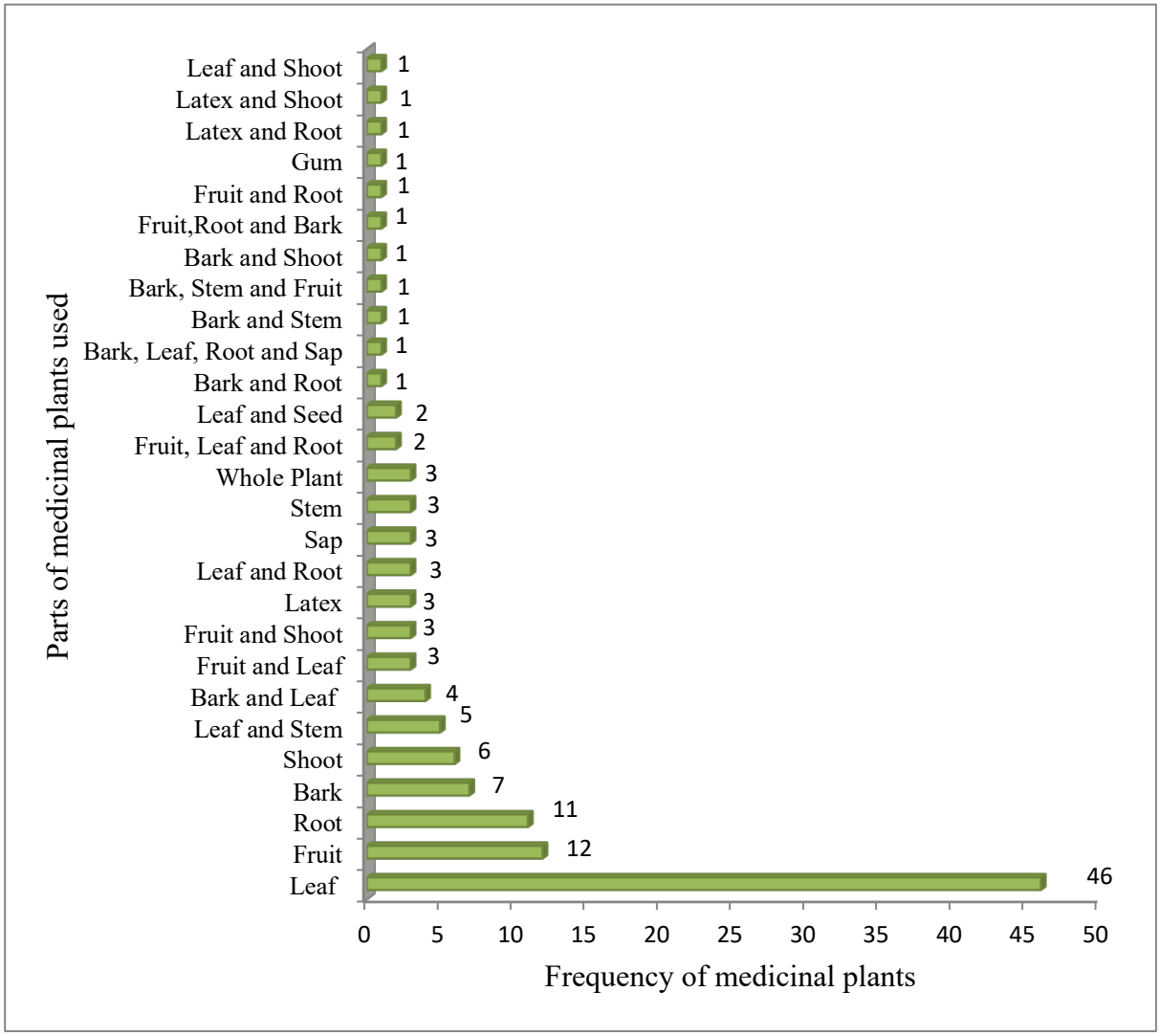

Figure 2. Frequency of use of different plant parts in traditional medicine in Nensebo District, Ethiopia.

Modes of preparation and routes of administration

The major modes of preparation were crushing (38%), followed by squeezing (15%) (Figure 4, Appendix 1); This higher occurrence of crushed plants use may be related to the use simple preparations techniques and ease of access local by most herbal practitioners (Tahir *et al.* 2021). The majority of the preparations were made by blending different plant species with water and various additional substances like honey, sugar, butter, salt and milk which served to dilute the medicinal extract. These additional substances have various functions (e.g., to reduce poisons, improve flavor and to prevent adverse effects such as vomiting, skin rash or diarrhea).

Similarly, major ethnobotanical investigations of medicinal plants in various parts of Ethiopia have reported the dominance of the practice of crushing as the mode of preparation of medicinal plants for both human and livestock treatment (Chekole 2017, Gijan & Dalle 2019, Gonfa *et al.* 2020, Tahir *et al.* 2021, Tolossa & Megerssa 2018).

Various routes were used to administer herbal remedies to human and livestock patients (Figure 5; Appendix 1). The major routes of administration used in the study area were: oral (50%), followed by dermal (applied directly to the skin) (30%). Pharmacologically, oral delivery provides a rapid response when pathogens are involved; it also maximizes curative potential and effectiveness since oral route accelerates the patient's reaction and is more effective for addressing various ailments including parasites and bacterial infections (Teklehaymanot 2017). Oral application of remedies was also reported to be the most popular strategy by Alebie & Mehamed (2016), Damie *et al.* (2018), Gebre (2018), Gijan & Dalle (2019), Mengistu *et al.* (2022), Teklehaymanot (2017), Tolossa & Megersa

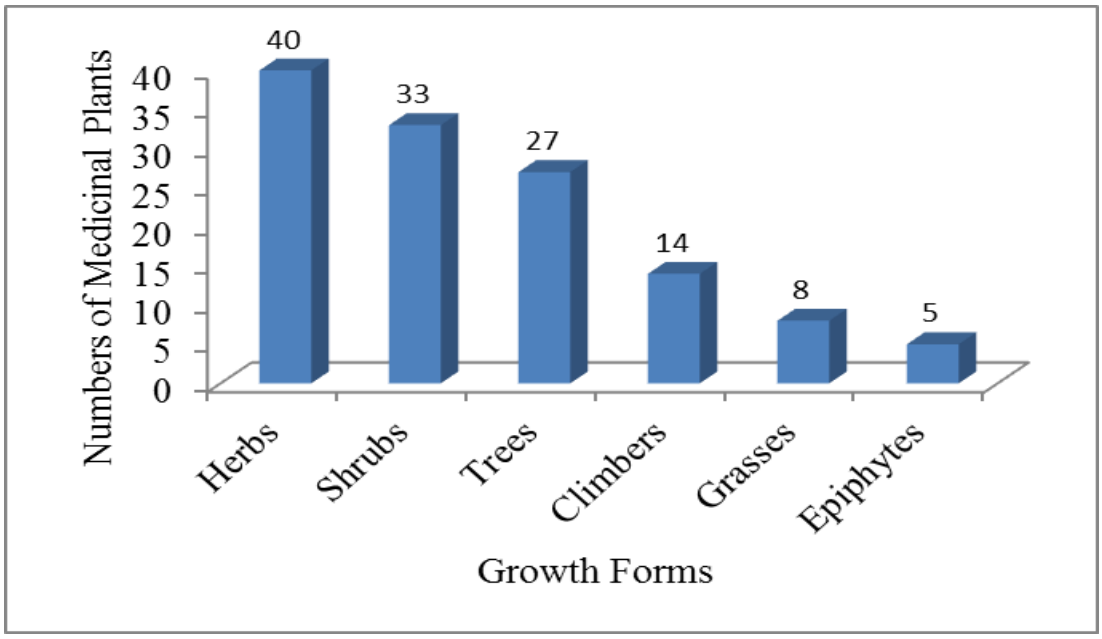

Figure 3. The frequency of different plant growth forms used medicinally in Nensebo District, Ethiopia.

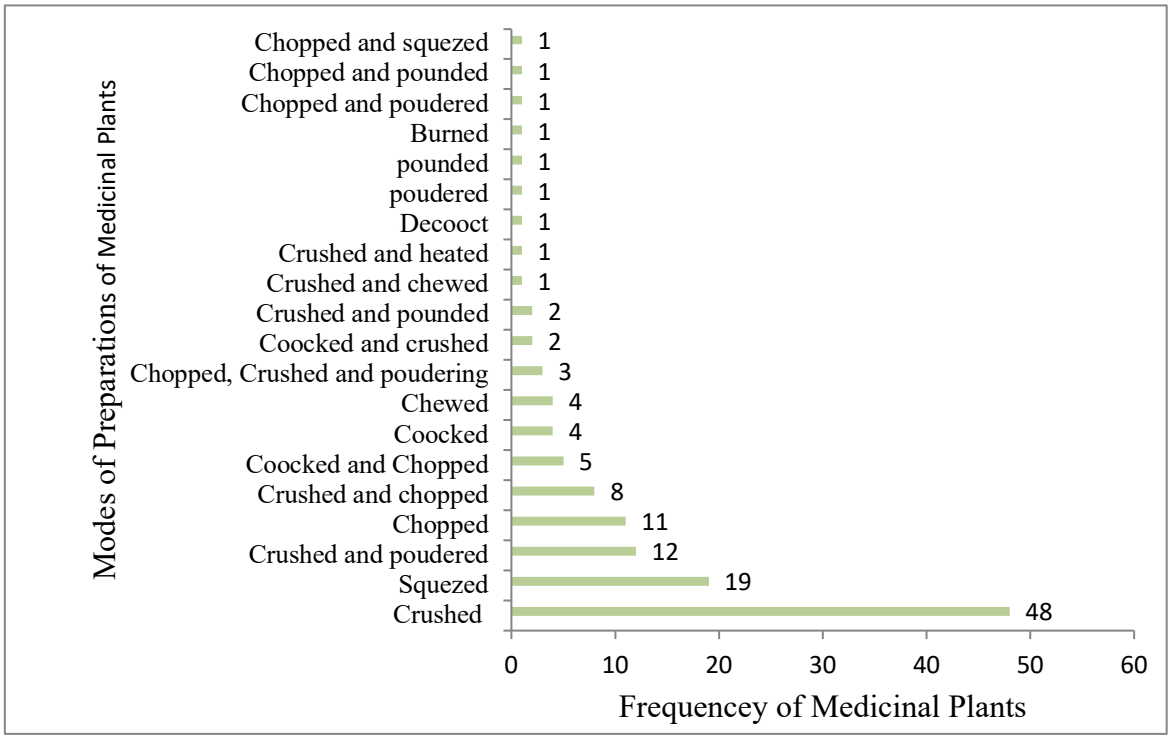

Figure 4. The frequency of different modes of preparation for medicinal plants in Nensebo District, Ethiopia

Diseases affecting human and livestock health in the study area

Common diseases affecting human health and the medicinal plants used to treat them

Out of 72 identified ailments, 48 were reported to be human health problems in the area and the informants reported that they used herbal medicines to treat most of the common, widespread diseases in the study area (Table 4). This is due to the fact that people living in rural areas are particularly poor, and those that live in the most remote areas cannot readily access or afford modern health care. Generally, the district is known as one of the remote areas in the region, with mountains landscape dominated by forest cover and poor road facilities (NDANRO 2016). Particularly, during the data collection period, it was observed that there were few number of health facilities; there is no hospital, but one health center and health posts with very limited health supplies and few health professionals. On top of that road infrastructure coupled with mountains and landscape and frequent rainfall makes travel to the nearest major towns such as Shashamane and Hawassa almost impossible during the wet season. Thus respondents reported that most their community heavily rely on traditional medicinal plants for primary health care. The most frequent human aliments in the areas were gonorrhea, diarrhea, fever, tapeworm and headache. A

similar range of dominant human ailments has been reported by researchers elsewhere in Ethiopia (Gebre 2018, Gijan & Dalle 2019, Mengistu & Bekele 2021). Ethiopia has diverse communities with distinct cultural differences. The cultural variations together with the plant biodiversity differences have led to differences in ethnobotanical knowledge among community groups found in different parts of Ethiopia (Awas 2007, Checkol *et al.* 2017, Kassa *et al.* 2020, Mengistu & Bekele 2021). Although there are some overlaps of indigenous traditional medicine knowledge. For example in all places where *Hagenia abyssinica* grows, it is used as treatment against tapeworm (Abdela *et al.* 2018, Assen *et al.* 2021). The use of the same plant species to treat completely different conditions may be due to traditional knowledge being a closely guarded secret. The use of the same plant species for the same ailment in different locations demonstrates their cosmopolitan distribution as well as the fact that such plant species are effective for treating specific ailments.

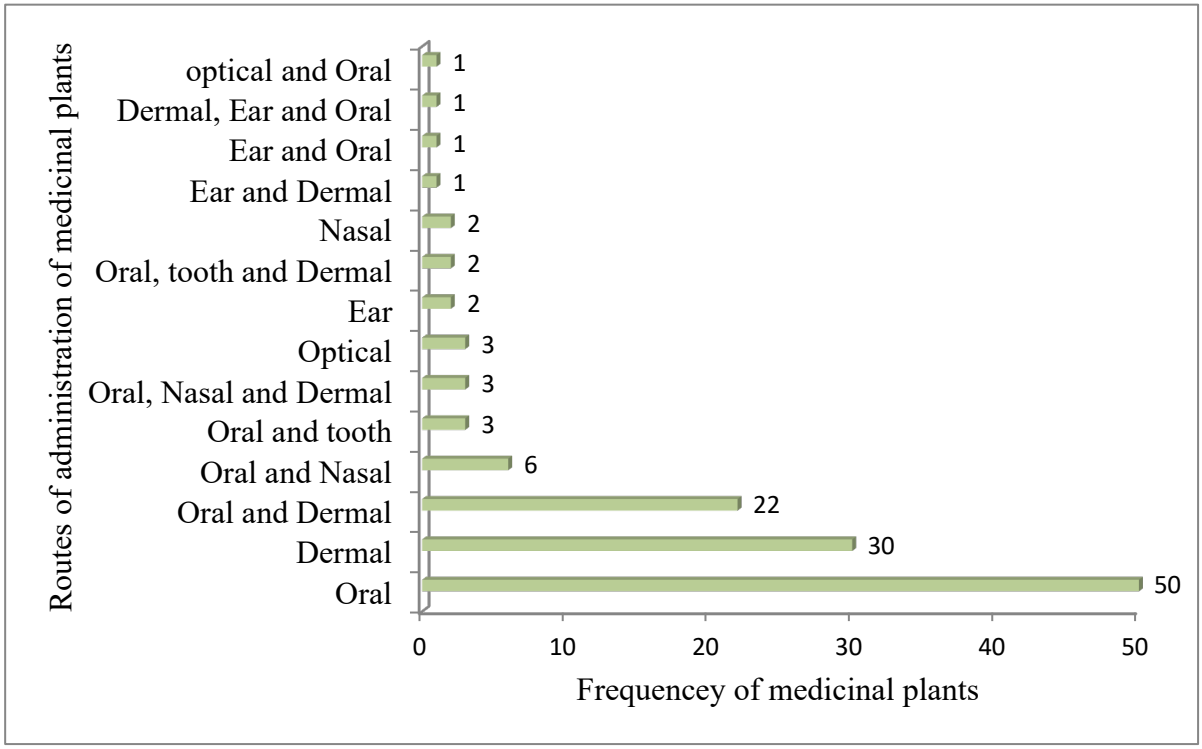

Figure 5. The frequency of different routes of administration of medicinal plants in Nensebo District, Ethiopia.

Table 4. Common diseases affecting human health, and medicinal plants used to treat them in Nensebo District, Ethiopia.

Diseases with its local names (Afan Oromo)	Commonly used medicinal plant species	Family	Informants citation	Voucher number
Gonorrhea (**cophxoo**)	*Croton macrostachyus* Hochst. ex Delile	Euphorbiaceae	21	GA063
Diarrhea (**baasaa**)	*Calpurnia aurea* (Aiton) Benth.	Fabaceae	17	GA005
Fever (**michii**)	*Ocimum lamiifolium* Hochst. ex. Benth.	Lamiaceae	15	GA121
Tapeworm (**heexoo**)	*Hagenia abyssinica* (Bruce) J.F. Gmel.	Rosaceae	15	GA040
Headache (**bowwoo**)	*Allium sativum* L.	Alliaceae	13	GA052

Widely distributed livestock diseases and medicinal plants used to treat them

The most common medicinal plant species used to treat livestock diseases were reported through key informant's' interviews (Table 5). A number Livestock ailments were treated with thirteen distinct medicinal plant species, and seven different modes of preparation were used. The most common livestock aliments were blackleg, cattle coughing, equine coughing, equine rheumatism. This result supports findings elsewhere in Ethiopia (Abdela *et al.* 2018, Gijan & Dalle 2019) where comparative analyses of medicinal plants and modes of preparation for common livestock ailments were carried out.

Table 5. Medicinal plants used to treat common livestock diseases in Nensebo District, Ethiopia.

Vernacular and local names (Afan Oromo)	Commonly used medicinal plant species	Family	Frequency	Voucher number
Blackleg (abbaa gorbaa)	*Rhoicissus tridentata (L. f.) Wild &Drummond*	Anacordiaceae	19	GA001
Cattle coughing (**gammoojjii**)	*Lobelia rhynchopetalum Hems*	Campanulaceae	17	GA088
Equine cough (**sallaaxa**)	*Clematis hirsuta Guill. & Perr.*	Ranunculaceae	15	GA037
Equine Rheumatism (**hokkola kottee**)	*Kalanchoe petitiana A. Rich*	Crasulaceae	14	GA102
External parasites (**cinii**)	*Origanum onites L.*	Vervenaceae	14	GA017
Eye infection (**dhibee ijaa**)	*Echinops ellenbecki O.Hoffm*	Asteraceae	11	GA039
Blocked urine (fincaan dide)	*Stephania japonica (Thunberg) Miers*	Menispennaceae	9	GA043

Marketability of medicinal plants

Market survey results obtained from Worka (Saturday market, and Badessa (Sunday market) indicated that medicinal plants were widely sold (Table 6). The most commonly medicinal plant species soled were *Thymus schimperi*, *Allium sativum*, *Hagenia abyssinica*, *Echinops kebericho*, *Embelia schimperi*. Mostly, they were sold dried and unpacked. This finding contrasted with those of Giday *et al.* (2009) and Misfit *et al.* (2014), who reported that most medicinal plants were not traded at market, but rather were collected from the environment as needed. The reason for this difference is that, in Nensebo, local healers use medicinal plants as source of income; the health system depends on medicinal plants, and there are no sufficient local modern health system services. This reinforces the finding that there are active herbal medicine practices in the study area.

Table 6. Medicinal plants species marketed in Nensebo District Ethiopia based on market assessments by the researchers.

Botanical Name	Family	Uses	Voucher number
Allium sativum L.	Alliaceae	M, Sp ; F	GA052
Catha edulis (Vahl) Forssk. ex Endl.	Celastraceae	M ; Ps	GA047
Clematis hirsuta Guill. & Perr.	Ranunculaceae	M	GA037
Croton macrostachyus Hochst. ex Delile	Euphorbiaceae	M, Fu	GA063
Cymbopogon citratus (DC.) Stapf	Poaceae	M ; Sp	GA046
Dodonea angustifolia (L. f.) Benth.	Sapindaceae	M; Fu	GA061
Echinops kebericho Mesfin	Asteraceae	M	GA077
Embelia schimperi (Vatke)	Myrsinaceae	M	GA089
Euphorbia dumalis S.Carter	Euphorbiaceae	M	GA108
Hagenia abyssinica (Bruce) J.F. Gmel.	Rosaceae	M; Fr	GA040
Jasminum abyssinicum Hochst. Ex.	Oleaceae	M	GA126
Lippia adoensis Hochst	Verbenaceae	M; Sp	GA012
Maytenus arbutifolia (Hochst. ex A.R.) R.W.	Celasteraceae	M; Fu	GA032
Moringa stenopetala (*E*.G. Baker) Cufodon.	Moringaceae	M	GA092
Nicotiana tabacum L.	Solanaceae	M; Ps	GA049
Ruta chalepensis L.	Rutaceae	M; Sp	GA045
Thymus schimperi Ronninger	Lamiaceae	M; Sp	GA048
Warburgia uganlensis Sprague	Canellaceae	M; Fu	GA003

Key:F= food, Fu= fuel, Fr= furniture, M=medicine, Ps= psychoactive, Sp= spice

Preference ranking of medicinal plants for human and livestock disease

Croton macrostachyus scored 57 and ranked first indicating that it was most effective in treating gonorrhea and the least effective was *Juniperus procera* (Table 7). A similar finding was reported by Limenih *et al.* (2015) that *Croton macrostachyus* ranked first to treat Malaria human disease. The reason behind this is that: it has a wide range of pharmacological activities such as antibacterial, anti-mycobacterial, antidiarrheal, antifungal, ant diabetic, anti-inflammatory and anti-plasmodial effects (Alfred 2017) and the highest informant consensus certifies further ethnobotanical medicinal plants for assessment of energetic constituents of the plants.

Rabies was frequently reported livestock disease in the study area. *Phytolacca dodecandra* scored (51) and ranked first; indicating that it was the most effective in treating rabies, the least effective was *Euphorbia tirucalli* . This is due to informants' knowledge differences, and ecological differences. This finding is dissimilar to other studies

carried out in Ethiopia (Ashagire *et al.* 2016) that conduct the same comparative analysis but different results which *Momordica foetida* was the highest effective in treating rabies disease.

Table 7. Traditional medicinal knowledge distribution among different social groups

Variables		N	Mean of MP	t-value	df	p-value
Gender	Male	92	5.0±3.4[a]	2.93	121	0.0098
	Female	31	4.4±2.35[b]			
Age	>40 years	41	5.8± 3.10	1.3		0.0044
	< 40 Years	109	6 ± 4			
Education level	Illiterate	108	4.4±3.1	3.4		0.011
	Literate	42	1.7± 1.2			
Informants profile	Household informant	123	5.05±3.53[a]	7.57	148	0.00114
	Key informant (herbalist)	27	13.29±4.29[b]			

Pair wise comparison

Warburgia uganlensis ranked first and *Angelica atropurpea* were less preferred due to its less effectiveness compared to the other species. Informants confirmed that *Warburgia uganlensis* ranked first due to its economic and commercial importance for local communities.

Knowledge transfer

Men were the predominant participants in this study as, in Nensebo, they are more involved with activities in the field such as grazing livestock in the forest and collection of forest resources, except fuel wood (it is performed by women and children). This would make it more likely that they would gain knowledge of the useful values of plant species. Additionally, healers preferred to transfer their indigenous knowledge of medicinal plants to other men as they could collect plants from more inaccessible areas like deep forests, distant deserts and along riverbanks (Assen *et al.* 2021, Mengistu *et al.* 2022).

Traditional healers in the study area transfer indigenous knowledge orally (like modes of preparation, routes of administration and treatment) to their family or relatives. Medicinal plant knowledge transfer is regarded as a secret within the families' members or relatives. We persuade respondents to share this important secret knowledge through approaching them as a researcher student. We told them the objective of the interview is not for personal benefit and not to transfer their indigenous knowledge to individuals, rather to document the indigenous knowledge and pass to the next generation and also to show their contribution as herbalist for providing primary health care for thousands of poor people. The oral transfer of secret indigenous knowledge to only a few individuals in the family and/or to other close relatives might accelerate the loss of knowledge (Gonfa *et al.* 2020, Santhosh *et al.* 2019, Tugume & Nyakoojo 2019). Secrecy, and oral knowledge transfer, combined with the lack of interest on the part of members of the younger generation in terms of gaining that traditional knowledge is likely to lead to further erosion of indigenous knowledge in the near future. Consequently, there is great value in sharing this knowledge more widely, in both verbal and written form. This result is in accord with other studies in Ethiopia (Chekole 2017, Lulekal *et al.* 2013, Melkamu 2021, Tewelde *et al.* 2017).

Comparison of knowledge distribution on medicinal plants amongst social groups

A Significant difference ($P<0.05$) were observed on the level of medicinal plant knowledge among social groups particularly, with respect to age ($P=0.0044$), literacy level ($P=0.011$) (Table 7). The finding showed that elders were more knowledgeable than youngs' and literacy level also affect knowledge of medicinal plants. This is mainly due to the fact that those who went to school better perceive the values of environmental conservation and the role of traditional medicine knowledge for providing primary healthcare for the poor rural people. There was also statistically significant difference on the level of medicinal plant knowledge among men and femen ($P= 0.0098$). The study revealed that male respondents reported more medicinal plants than femen. This is probably attributed to the fact that the knowledge is most of the time transferred to elder soon. Hence, men dominated the traditional medicinal plant knowledge. A significant difference was observed on the level of medicinal plant knowledge among key informants (traditional healers) and the general public (household respondents) ($P= 0.00114$). The key informants reported a greater number of medicinal plants than household respondents (Table 7). This finding in line with the study conducted by Ermias *et al.* 2013 in Ankober district, where several numbers of medicinal plants were reported by key informants than household respondents.

Conclusions

A considerable number of medicinal plants and associated indigenous knowledge were reported in the area. The present study shows that most of the medicinal plants were used to treat human rather than livestock aliments and 23 medicinal plants were used to treat both humans and livestock. Leaves were the plant tissue that was most harvested for medication, and crushing was the predominant mode of preparation. Fresh leaves (rather than dried leaves) were the form that was mostly used. Medicines were mostly applied orally. Local community members in the area have extensive knowledge of medicinal plants inherited from their ancestor and developed through

experience. The main pathway of knowledge transfer from elders to members of the younger generation was oral, which risks the alteration or loss of local practices and knowledge.

Declarations

List of abbreviations: APG- Angiosperm Phylogeny Group; FGD- Focus group discussion; GPS- Global Positioning System**;** JAICAF- Japan Association for International Collaboration of Agriculture and Forestry**;** OFWE- Oromia Forest and Wildlife Enterprise**;** NDANRO- Nensebo District Agricultural and Natural Resources Office

Ethics approval and consent to participate: A letter of cooperation for conducting the research was written on behalf of the first author and issued by the Post graduate program coordination office, Hawassa University to Nensebo District Administration. On behalf of the Nensebo District community, the local authorities acknowledged the letter and provided authorization to conduct the research, collect data from informants, and collect plant samples from the field. Moreover, informants were asked if they approved their name being openly accessed; they agreed to allow their names and personal data to be published. Then, Hawassa University approved the research finding after it was presented for the public defense.

Consent for publication: Not applicable.

Availability of data and materials: Upon request, all the data that support the findings of the manuscript will be made available after acceptance of the manuscript.

Competing interests: The authors declare that they have no competing interests.

Funding: The Ethiopian Ministry of Education provided financial support for data collection.

Authors' contributions: - **Gemedi Abdela:** planned the study, collected and analyzed the data, identified the species, prepared the manuscript, and was the major contributor to the study. **Zerihun Girma**: Designed the research, contributed to data analysis, and was involved in manuscript preparation and approval of the final manuscript. **Tesfaye Awas:** Confirmed species identification, field observation, reviewed, and approved the final manuscript.

Acknowledgements

We would like to extend our gratitude to the local community of the study area who generously exhibited their willingness to share their knowledge on the use of medicinal plants. We would also like to sincerely thank the Ethiopian Ministry of Education, Mettu University, Department of Biodiversity and Ecotourism, Wondo Genet College of Forestry and Natural Resources, Hawassa University and the Ethiopian Biodiversity Institute for facilitating the research and funding the data collection process. We also thank Mr. Jarso Abajida, a well-known herbalist in the community for his unreserved support in the field as guide during the data collection.

Literature cited

Abdela G, Sultan M, Amano T. 2018. Ethnobotanical study of medicinal plants in Heban Arsi District Oromia, South-Eastern Ethiopia. Advances in Life Science and Technology 68:27-45.

Alebie G, Mehamed A. 2016. An ethno-botanical study of medicinal plants in Jigjiga town, Ethiopia. International Journal of Herbal Medicine 4(6):168-175.

Angiosperm Phylogeny Group (APG). 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society. 181(1):1-20.

Ashagire M, Kelbessa E, Dale G. 2016. Ethnobotanical study of medicinal plants in Guji Agro-pastoralists, Blue Hora District of Borana Zone, Oromia Region, Ethiopia. Journal of Medicinal Plants Studies 4(2):170-184.

Assefa B, Megersa M, Tolossa T. 2021. Ethnobotanical study of medicinal plants used to treat human diseases in Gura Damole District, Bale Zone, Southeast Ethiopia. Asian Journal of Ethnobiology 4(1):42-52.

Assen Y, Woldearegay M, Haile A. 2021. Ethnobotanical Study of Medicinal Plants in Kelala District, South Wollo Zone of Amhara Region, Northeastern Ethiopia Evidence-Based Complementary and Alternative Medicine. 24:665192.

Awas T. 2007. Plant diversity in Western Ethiopia: ecology, ethnobotany and conservation. Ph.D. dissertation, University of Oslo.

Bernad HR. 2002. Research Methods in Anthropology: Qualitative and Quantitative Approaches. Altamira Press, Walunt Creek, U.S.A.

Chekole G. 2017. Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia. Journal of Ethnobiology and Ethnomedicine 13. 55.

Chekole G., Asfaw Z. and Kelbessa E. 2015. Ethnobotanical study of medicinal Plants in the environs of Tara-gedam and Amba remnant forests of Libo Kemkem District, northwest Ethiopia. Journal of Ethnobiology and Ethnomedicine 11(4):1-38.

Cotton CM. 1996. Ethnobotany: Principles and Application. Wiley Sons Ltd., New York, U.S.A.

Damie G, Awas T, Negash M. 2018. Ethnobotanical study of medicinal plants used by indigenous people in and around Dirre Sheikh Hussein heritage site of South-eastern Ethiopia. Journal of Ethnopharmacology 220:87-93.

Enyew A, Asfaw Z, Kelbessa E, Nagappan R. 2014. Ethnobotanical study of traditional medicinal plants in and around Fiche District, Central Ethiopia. Current Research Journal of Biological Sciences 6:154-67.

Espinosa, MM, Bieski, IG, Martins, DT. 2012. Probability sampling design in ethnobotanical surveys of medicinal plants. Brazilian Journal of Pharmacognosy 22(6). 1362-1367.

Fenetahun Y, Eshetu G. 2017. A review on ethnobotanical studies of medicinal plants use by agro-pastoral communities in, Ethiopia. Journal of Medicinal Plants Research 5(1):2320-3862.

Firaol T, Waktola T, Ejigu K, Dabessa G, Roy, RK, Mekonnen S. 2013. Ethnoknowledge of plants used in veterinary practices in Dabo Hana District, West Ethiopia. Journal of Medicinal Plants Research 7(40):2960-2971.

Gebre T. 2018. Ethnobotanical study of Traditional medicinal plants and associated indigenous knowledge of Gamo people. The case of Bonke Woreda, Southern Ethiopia. Ethiopian Journal of Biological Science 17(1):57-77.

Getachew E. 2019. Floristic diversity and disturbances in Nensebo and Geremba Remnant Forest Southeastern Ethiopia. M.Sc. thesis, Hawassa University.

Giday M, Asfaw Z, Woldu Z. 2009. Medicinal plants of the Meinit ethnic group of Ethiopia: an Ethnobotany study. Journal of Ethno pharmacology 124(3):513-521.

Gijan M, Dalle G. 2019. Ethnobotanical study of medicinal plants in Nagelle Arsi District, West Arsi Zone of Oromia, Ethiopia. Journal of Natural Science Research 9(13):1-19.

Gonfa N, Tulu D, Hundera K, Raga D, Yildiz F. 2020. Ethnobotanical study of medicinal plants, its utilizations and conservations by indigenous peoples of Gera district, Ethiopia. Food Science and Technology 6(1):1852716.

Hedberg I, Kelbessa E, Edwards S, Demissew S, Persson E. 2006. Flora of Ethiopia and Eritrea, Gentianaceae to Cyclocheilaceae Volume 5. The National Herbarium, Addis Ababa University/Department of Systematic Botany Uppsala University, Addis Ababa/ Uppsala.

Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. 1998. Medicinal plants in Mexico: Healers' consensus and cultural importance. Social Science and Medicine 47:1863-1875.

Höft M, Barik SK, Lykke AM. 1999. Quantitative Ethnobotany. Applications of multivariate and statistical analyses in Ethnobotany. People and Plant Working Paper 6. UNESCO, Paris.

Hussain MF, Khalid U, Noreen A, Bano A, Hussain A, Alam S, Shah S, Sabir M, Habiba U. 2022. Ethnobotanical study of indigenous medicinal plants their usage in rural valleys of Swabi and Hazara region of Pakistan. Brazilia Journal of Biology 82:e243811.

Japan Association for International Collaboration of Agriculture and Forestry (JAICAF) 2007. Study on Actual Situation of Medicinal Plants in Ethiopia. Main report. http://jaicaf.or.jp (accessed 6/27/2021).

Judd WS, Cambell CS, Kellogg EA, Stevens PF & Donguhue MJ. 2002. Plant Systematics: A phylogenetic Approach. 2nd edition. Sinauer Associates, Inc., Sunderland, U.S.A.

Kassa Z, Asfaw Z, Demissew S. 2020. Ethnobotanical study of medicinal plants in Sheka zone SNNP Ethiopia. Journal of Ethnobiology and Ethnomedicine 16:7.

Kassa Z., Asfaw Z. and Demissew S. 2016. Ethnobotanical study of medicinal plants used by the local people in Tulu Korma and its Surrounding Areas of Ejere District, Western Shewa Zone of Oromia Regional State, Ethiopia. Journal of Medicinal Plant Studies 4(2):24-47.

Kebede A., Ayalew S., Mesfin A., Mulualem G. 2016. Ethnobotanical investigation of traditional medicinal plants commercialized in the markets of Dire Dawa city, eastern Ethiopia. Journal of Medicinal Plants Studies 4(3):170-178.

Kebede A, Ayalew S, Mesfin A, Mulualem G. 2017. An Ethnoveterinary Study of Medicinal Plants Used for the Management of Livestock Ailments. Journal of Plant Sciences 5(1):34-42.

Kelbessa E, Demissew S, Woldu Z, Edwards S. 1992. Some threatened endemic plants of Ethiopia. Botany 2000: NAPREC, Monograph Series No.2. Addis Ababa University, Addis Ababa, Ethiopia.

Limenih Y, Umer S, Wolde-Mariam M. 2015. Ethnobotanical study on Traditional medicinal plants in Dega Damot woreda, Amhara region, north Ethiopia. International Journal of Research in Pharmacy and Chemistry 5(2):258-273.

Lulekal E, Asfaw Z, Kelbessa E, Van-Damme, P. 2013. Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. Journal of Ethnobiology and Ethnomedicine 9(1):63.

Martin G, .1995. Ethnobotany: a methods manual. Chapman and Hall, London, U.K.

Melkamu G. 2021. Ethnobotanical Study on Assessment of Practice on Traditional Plant Medicine use among People of Wonchi District, Central Ethiopia. Health Science Journal 15 (9):880.

Mengistu M, Bekele F. 2021. Traditional Medicinal plants species belonging to Fabaceae Family in Ethiopia: A systematic review. International Journal of Plant Biology 12:8473.

Mengistu DK, Mohammed JN, Kidane YG, Fadda C. 2022. Diversity and Traditional Use Knowledge of Medicinal Plants among Communities in the South and South-Eastern Zones of the Tigray Region, Ethiopia. Diversity 14: 306. https://doi.org/10.3390/d14040306.

Mesfin F, Demissew S and Teklehaymanot T. 2009. An ethnobotanical Study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. Journal of Ethnobiology and Ethnomedicine 5(1):28.

Mesfin F., Seta T. and Assefa A. 2014. An Ethnobotanical Study of Medicinal Plants in Amaro Woreda, Ethiopia. Ethnobotany Research and Applications 12:341-354.

Negi VS, Pathak R, Thakur S, Joshi RK, Bhatt ID, Rawal RS. 2021. Scoping the Need of Mainstreaming Indigenous Knowledge for Sustainable Use of Bioresources in the Indian Himalayan Region. Environmental Management 2021. https://doi.org/10.1007/s00267-021-01510-w.

Nensebo District Agricultural and Natural Resources Office (NDANRO). 2016. A main report for 2016. NDANRO, Worka, Ethiopia.

Nigussie B, Dong KY. 2019. Ethnobotanical study of medicinal plants in the Hawassa Zuria District, Sidama zone, Southern Ethiopia. Journal of Ethnobiology and Ethnomedicine 15:25.

Oromia Forest and Wildlife Enterprise (OFWE). 2009. Non- Timber forest product assessment report. OFWE, Addis Ababa, Ethiopia.

Pan X, Zhang A, Henderson GE, Rennie S, Liu C, Cai W, Wu F, Tuker JD. 2019. Traditional, complementary, and alternative medical cures for HIV: rationale and implications for HIV cure research. Global Public Health 14(1):152-160.

Patton M. 1990. Qualitative evaluation and research methods, Sage Publications, Newbury Park, California, U.S.A.

Santhosh Kumar JU, Krishna Chaitanya MJ, Andrew J Semotiuk and Krishna V. 2019. Indigenous knowledge of MPs used by ethnic communities of South India. Ethnobotany Research & Applications 18(4):1-112.

Scheaffer RL, Mendenhall W, Ott RL, Gerow KG. 2012. Survey sampling. Richard Stratton, Boston, U.S.A.

Ssenku JE, Okurut SA, Namuli A, Kudamba A, Tugume P, Matovu P, Wasige G, Kafeero HM, Walusansa A. 2022. Medicinal plant use, conservation, and the associated traditional knowledge in rural communities in Eastern Uganda. Tropical Medicine and Health 50**:**39 (2022). https://doi.org/10.1186/s41182-022-00428-1.

Suresh KP, Chandrashekara S. 2012. Sample size estimation and power analysis for clinical research study. Journal of Human Reproductive Sciences 5(1):7.

Tadesse M, Hunde D, Getachew G. 2005. Survey of medicinal plants used to treat Human Diseases in Seka Chekorsa, Ethiopia. Ethiopian Journal of Health Sciences 15(2):89-106.

Tafese M. 2021. Handbook of common Ethiopian Traditional Medicinal plants: their parts and uses for Human and Animal treatments. Journal of Disease and Medicinal Plants 7(3):48-60.

Tahir M, Gebremichael L, Damme PV. 2021. Ethnobotanical study of medicinal plants in Adwa District, Central Zone of Tigray Regional State, Northern Ethiopia Journal of Ethnobiology and Ethnomedicine 17:71.

Tekle Y. 2015. Medicinal Plants in the Ethno Veterinary Practices of Bensa Woreda, Southern Ethiopia. Open Access Library Journal 2(1):1-12.

Teklehaymanot T. 2017. An ethnobotanical survey of medicinal and edible plants of Yalo Woreda in Afar regional state, Ethiopia. Journal of Ethnobiology and Ethnomedicine 13-40.

Tesfaye S, Belete A, Engidawork E, Gedif T, Asres K. 2020. Ethnobotanical study of medicinal plants used by Traditional Healers to treat Cancer-like symptoms in Eleven Districts Ethiopia Evidence-Based Complementary and Alternative Medicine 2020:23.

Tewelde F, Mesfin M, Tsewene S. 2017. Ethnobotanical Survey of Traditional Medicinal Practices in Laelay Adi-yabo District, Northern Ethiopia. International Journal of Ophthalmology & Visual Science 2:80- 87.

Tolossa T, Megersa M. 2018. Ethnobotanical Study of Medicinal Plants Used to Treat Human Diseases in Berbere District, Bale Zone of Oromia Regional State, South-East Ethiopia. Evidence-Based Complementary and Alternative Medicine 2018:1-16.

Tugume P, Kakudidi EK, Buyinza M, Namaalwa J, Kamatenesi M, Mucunguzi P, Kalema J. 2016. Ethnobotanical survey of Medicinal plant species used by communities around Mabira Central Forest Reserve Uganda. Journal of Ethnobiology and Ethnomedicine 1-28.

Tugume P, Nyakoojo C. 2019. Ethno-pharmacological survey of herbal remedies used in the treatment of paediatric diseases in Buhunga parish, Rukungiri District, Uganda. Evidence-Based Complementary and Alternative Medicine 5:353.

Wanjohi BK, Njenga EW, Sudoi V, Kipkore WK, Moore HL, Davies MIJ. 2020. Ecological Knowledge of indigenous plants among the Marakwet Community (Embobut Basin), Elgeyo Marakwet County (Kenya). Ethnobotany Research and Applications 20:1-16.

Woldemariam G, Demissew S, Asfaw A. 2021. An ethnobotanical study of traditional medicinal plants used for human ailments in Yem ethnic group, south Ethiopia. Ethnobotany Research and Applications 22:1-15.

Yirga G. 2010. Use of traditional medicinal plants by indigenous people in Mekele town, capital city of Tigray regional state of Ethiopia. Journal of Medicinal Plants Research 4(17):1799-1804.

Appendix 1. List of Medicinal Plants used to treat human aliments in the study area. Columns correspond to: Species name, family, local name, habit (growth form), habitat, condition of preparation (dried or fresh), disease(s) treated, plant parts used, mode of preparations and route of administration. The next column indicates whether the medication is used for humans (H) or livestock (L), and the final column gives the herbarium code for the specimen (voucher and specimen label).

Botanical name	**Family**	**Local name (Aafan oromo)**	**GF**	**H**	**Disease treated**	**PU**	**Mode**	**Cn**	**Route**	**Uses**	**C.N°**
Acacia gerrardii Benth.	Fabaceae	**doddota**	T	W	Liver disease	StBa	CrPo	Dr	O	Hu	GA064
Acacia seyal Del.	Fabaceae	**waaccuu**	T	W	Evil sprit	RBa	Bu	Dr	N	Hu	GA101
Achyranthes aspera L. var·*fruticosa*, (Lam.) Boerlage,	Amaranthaceae	**Balballoo**	H	W	Ear pain	L	S	Fr	Er	Hu	GA079
Acokanthera schimperi (A. DC.) Schweinf	Apocynaceae	**aaraaruu**	S	W	Liver Scabies	LSt	Cr	Fr	OD	Hu	GA057
Aegopodium podagraria L.	Apiaceae	**qiinxaa**	G	W	Skin Cancer	L	S	Fr	D	Hu	GA087
Afrocarpusfalcatus(Thunb.) R.B. ex. Mirb	Podocarpaceae	**birbirsa**	T	W	Measles	L	CrCo	Fr	O	Hu	GA114
*Albizia schimperiana*Oliv.	Fabaceae	**sisaa**	T	Fl	Deep wound Stomach pain Toothache	Sh F	Cr	Fr	O	Hu	GA096
Allium sativum L.	Alliaceae	**qullubbiiadii**	H	H G	Cattle cough Febrile Headache	St	Cr	Fr/Dr	OD	Hu	GA052
Aloe debrana Christian	Aloaceae	**hargiisa**	H	B	Cold disease wound	R	Cr	Dr	D	Hu	GA008
Apinanthus globifens(A. Rich.) Tieghem	Lorantaceae	**mukkuree**	E	W	Liver Malnutrition	Wp	Cr	Fr/Dr	DO	Hu	GA033
Apodytes dimidiata (A. Rich.) Boutique	Lcacinaceae	**odaabaddaa**	T	W	Malnutrition	Sh	Co	Fr	OD	Hu	GA122
Argemone mexicana L.	Papaveraceae	**qorsamadaa**	H	Fl	Blood clotting Fresh wound	La	Cho	Fr	D	Hu	GA109
Arundinaria alpina K. Schum.	Gramineae	**leemman**	H	B	Burned body	L	Cr	Fr	D	Hu	GA056
Athyrium brevifrons Nakai ex Tagawa.	Athyriaceae	**kaarrolee**	E	W	Gonorrhea	St	Cr	Dr	O	Hu	GA036
Bersama abyssinica Fresen	Melianthaceae	**koraqqaa**	S	W	Wound	L	Cr	Fr	D	Hu	GA025
Brucea antidysenterica J F. Miller	Simaroubaceae	**ciirontaa**	H	W	Ear infection Hair fungus	L	CrPo	Dr	ErD	Hu	GA026
Canarina eminii Aschers. ex Schweinf.	Campanulaceae	**bilbilloo**	Cl	W	Breast Mastitis	La	Cho	Fr	D	Hu	GA021
Carica papaya L.	Caricaceae	**paappayaa**	S	H G	Anemia	ShF	Cho	Fr	O	Hu	GA091
Carissa edulis (Forssk.) Vahl	Apocynaceae	**agamsa**	S	W	Cold disease	R	Ch	Fr	O	Hu	GA062

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
					Headache						
Catha edulis Forsk	Celastraceae	**caatii**	H	H G	Headache Lymphagities	L	P	Fr	D	Hu	GA047
Celtis africana Burm.f .	Ulmaceae	**amallaqqaa**	T	F L	Fresh wound	L	CrPo	Fr	D	Hu	GA006
Chaerophyllum temulum (L.) Baen.ex Thell	Apiaceae	**boobanqaa**	H	B	Ear infections	R	CrPo	Fr	Er	Hu	GA050
Coffea arabica L.	Rubiaceae	**buna**	S	B	Diarrhea Wound	LF	CrPo Cho	Dr/ Fr	O D	Hu	GA115
Comeliana diffusa Burm.f .	Comunilianaceae	**gorgobboo**	G	W	Body fungus Stomach dryness	Sa	Cho	Fr	D	Hu	GA070
Croton dichogamus L.	Euphorbiaceae	**uleefoonii**	S	W	Evil sprit Kidney infection	L	Cr	Fr	ON	Hu	GA127
Cucurbita pepo L.	Cucurbitaceae	**baasqulaa**	Cl	H G	Parasitic disease	F	Cho Co	Fr	O	Hu	GA120
Cymbopogon citratus (DC.) Stapf	Poaceae	**hixichoo**	G	H G	Cough	WP	CrP	Fr/Dr	O	Hu	GA046
Cynoglossum lanceolatum Forssk	Boraginaceae	**qaccabbaa**	H	W	Headache Febrile	R L	ChoS	Fr	NOD	Hu	GA069
Discopodium penninervum Hochst	Solanaceae	**maraaroo**	S	B	Ringworm/Tinea Corporis/	L	Cr	Dr	O	Hu	GA020
Dodonea angustifolia L. f.	Sapindaceae	**ittacha**	S	W	Liver Scabies	L	Cr	Fr	OD	Hu	GA061
Ehretia obtusifolia Hochst. ex DC.	Boraginaceae	**meewwaa**	S	W	Stomach pain Uterus	Ba	Cr	Dr	O	Hu	GA004
Embelia schimperi Vatke	Myrsinaceae	**qaanquu**	Cl	W	Tapeworm	F	Cr	Fr/Dr	O	Hu	GA089
Euclea divinorum Hiern	Ebenaceae	**mi'eessaa**	S	W	Cold disease Nerve	Sh	Cho	Fr	D	Hu	GA059
Euphorbia candelabrum Trem. ex Kotschy	Euphorbiaceae	**adaamii**	S	W	Dyspepsia Gonorrhea Tumors	Sa	Cho	Fr	O	Hu	GA113
Euphorbia depauperata A. Rich.	Euphorbiaceae	**guuriigammoojjii**	G	W	Warts	Sa	Cho	Fr	D	Hu	GA038

Botanical name	**Family**	**Local name (Aafan oromo)**	**GF**	**H**	**Disease treated**	**PU**	**Mode**	**Cn**	**Route**	**Uses**	**C.N°**
Euphorbia dumalis S.Carter	Euphorbiaceae	**guuriibaddaa**	H	W	Dysmenorrhea	R	Cr	Dr	O	Hu	GA108
Ficus ruspolli Warb.	Moraceae	**daadhii**	Cl	W	Swelled Body Nerve	LSh	Cho Co	Fr	D	Hu	GA074
Ficus sur Forssk.	Moraceae	**odaa**	T	W	Febrile Dry cough	La R	Cho Cr	Fr/Dr	O	Hu	GA060
Ficus thonningii Blume	Moraceae	**dambii**	S	W	Stomach dryness	LBa	Cho Co	Fr	D	Hu	GA067
Ficus vasta Forssk.	Moraceae	**qilxuu**	T	W	Back pain Hemorrhoid	R	Cr	Dr	O	Hu	GA009
Galiniera saxifraga Hochst.ex.Bridson.	Rubiaceae	**koorallaa**	S	B	Stomach Mastitis	L	Cr	Dr	O	Hu	GA030
Grewia mollis Hochst. ex A. Rich	Teliaceae	**harooressakormaa**	S	W	Stomach pain	FRBa	Cr	Dr	O	Hu	GA124
Halleria lucida L.	Stilbaceae	**mukafoonii**	H	W	Evil Eye Kidney problem	L	Cr	Fr/Dr	NO	Hu	GA058
Hordeum vulgare L.	Poaceae	**garbuu**	G	H G	Broken bones Cold disease	F	Cr Po	Dr	O	Hu	GA105
Hypericum revolutum Vahl	Hypericaceae	**garambaa**	T	W	Gonorrhea	L	CrPo	Fr	O	Hu	GA054
Ipomoea abyssinica (Choisy) Schweinf.	Convolvulaceae	**anannoo**	C	W	Cough Sharp pain Wound	BaL	Dec	Dr	DO	Hu	GA015
Jasminum abyssinicum Hochst. ex DC.	Oleaceae	**biluu**	Cl	B	Febrile	Sh	S	Fr	O	Hu	GA126
Juniperus procera Hochst. ex. Endl.	Cupressaceae	**hindheessa**	T	W	Gonorrhea Kidney problem Liver	L	Cr	Fr	O	Hu	GA094
Justicia schimperiana (Hochst. ex Nees) T. Anders.	Acanthaceae	**dhummuugaa**	S	B	Scabies Wound	LF	S	Fr	D	Hu	GA066
Kniphophia foliosa Hochst.	Asphodelaceae	**leendhaa**	H	W	Stomach dryness	R	Cr	Fr/Dr	O	Hu	GA086
Lagenaria abyssinica (Hook. f.) C.Jeffrey	Cucurbitaceae	**buqqeearbaa**	Cl	W	Parasitic disease Stomach pain	F	C	Fr	D	Hu	GA016
Lavandula angustifolia Hidcote	Lamiaceae	**baalbaxxee**	H	W	Febrile Wound	L	S	Fr	D	Hu	GA018
Lippia adoensis Hochst. ex Walp	Verbenaceae	**sokorata**	H	H G	Headache Sharp pain	F	S	Dr	NO	Hu	GA012

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
*Malva verticillata*L.	Malvaceae	**liitaa**	H	B	Tumors	L	Cr	Fr	D	Hu	GA022
Maytenusarbutifolia (A. Rich.) Wilczek	Celasteraceae	**kombolcha**	T	W	Evil Eye Eye sprit Morning sickness	R	Cr	Dr	N O	Hu	GA032
Melia azedarach L.	Meliaceae	**miimmii**	S	H G	Tonsillitis	La	Cho	Fr	O	Hu	GA090
Millettia ferruginia (Hochst.) Baker.	Fabaceae	**dhaadhaatuu**	T	W	Gonorrhea Heart	LSe	Cho	Dr	O	Hu	GA111
Moringa stenopetala (Back. f) Cuf.	Moringaceae	**moriingaa**	S	H G	Diarrhea Gastritis	Sh	Cr	Fr/Dr	O	Hu	GA092
Ocimum lamiifolium Hochst. ex. Benth.	Lamiaceae	**daamaakasee**	H	B	Febrile	L	S	Fr	OD	Hu	GA121
Ocimum sanctum L.	Lamiaceae	**cabbichaa**	H	B	Eye infection Febrile	L	S	Fr	Op	Hu	GA125
Olea europea. (Wall. ex DC.) Cifferri	Oleaceae	**ejersa**	S	W	Kidney problem Liver Tuberculosis	R	Cho CrPo	Dr	O	Hu	GA053
Olinia usambarensis Gilg ex Engl.	Oleaceae	**gunaa**	S	W	Cold disease Nerve	L	Cho Co	Fr	D	Hu	GA106
Phoenix reclinata Jacq.	Arecaceae	**meexxii**	S	B	Toothache	F	Ch	Fr	TO	Hu	GA093
Pittosporum viridiflorum Sims	Pittosporaceae	**aaraa**	T	W	Diarrhea Ear pain Evil eye	L	Cr	Dr	*ErO*	Hu	GA034
Polyscias ferrugenia Hiern.	Araliaceae	**hudhaa**	T	W	Febrile	L	S	Fr	NOD	Hu	GA103
Polystachya caduca Rchb.f	Orchidaceae	**billiqqee**	E	W	Malnutrition	BaL	Co	Fr/Dr	D O	Hu	GA075
Prunus africana (Hook. f.) Kalkm.	Rosaceae	**sukkee**	T	W	Skin cancer Diarrhea	Ba	CrPo	Dr	D	Hu	GA099
Psydrax schimperiana (A. Rich.) Bridson	Rubiaceae	**gaalloo**	H	W	Dyspepsia	Sh	Ch	Fr	TO	Hu	GA119
Pycnostachys abyssinica Fresen.	Lamiaceae	**ajaayee**	H	W	Toothache	F	S	Fr	O	Hu	GA071
Rhamnus prinoides L`Hèrit	Rhamnaceae	**giishoo**	H	H G	Tonsillitis	FL	Cho Cr	Fr	O	Hu	GA013
Ricinus communis L.	Euphorbiaceae	**qobboo**	S	B	Rabies Stomach pain	F Sh	Cr	Fr	O	Hu	GA044
Rumex nepalensi Spreng.	Polygonaceae	**shaabbee**	H	B	Cold disease	L	Cr	Fr	OD	Hu	GA011

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
					Stomach pain	R					
Rumex nervousus Vahl.	Polygonaceae	**dhangaggoo**	S	W	Morning Sickness	FR	Cho Po	Dr	O	Hu	GA110
Ruta chalepensi L	Rutaceae	**caarotaa**	H	H G	Dysmenorrhea Evil sprit Stomach pain	L	Cr	Fr	O	Hu	GA045
Scadoxusmultiflorus (Martyn) Raf.	Amaryllidaceae	**burii**	H	W	Stabbing Stomach pain	St	CrPo	Fr/Dr	DO	Hu	GA023
Schefflera volkensii (Engl.) Harms	Araliaceae	**anshaa**	T	W	Hemorrhoid	Gum	Cho	Fr	D	Hu	GA035
Sida cuneifolia Roxb.	Malvaceae	**kottejabeessa**	H	B	Cold disease Swelled body	L	S	Fr	D	Hu	GA029
Solanium anguivi Lam.	Solanaceae	**hidiroolee**	H	W	Warts	L	S	Fr	D	Hu	GA014
Solanium incanum L.	Solanaceae	**hiddiiOromoo**	H	W	Tonsillitis	F	S	Fr	O	Hu	GA010
Solanium marginatum L. f.	Solanaceae	**hiddiiadii**	H	W	Snake Bite	F	S	Fr	D	Hu	GA076
Sphagneticola trilobata (L.) Pruski	Asteraceae	**latii**	G	B	Tonsillitis	L	S	Fr	O	Hu	GA083
Tagetes patula L.	Asteraceae	**qorsaMichii**	H	W	Febrile	L	S	Fr	NOD	Hu	GA081
Thymus schimperi Ronninger	Lamiaceae	**xooshinee**	G	B	Cough Headache	L St	S	Fr/Dr	O	Hu	GA048
Tragia durbanensis Kuntze	Urticaceae	**laalessaa**	CL	W	Gonorrhea	R	Cr	Dr	O	Hu	GA002
Urerahypsedodendron (A. Rich.) Wedd	Urticaceae	**haliillaa**	C L	W	Uterus problem	L	Cr	Fr	D	Hu	GA031
Urtica simensis Steudel	Urticaceae	**doobbiibusaa**	H	B	Gastric disease	L	Cho Co	Fr	O	Hu	GA019
Vernonia noveboracensis (L) Michx.	Asteraceae	**hincinnii**	H	W	Hepatitis	L	Cr	Fr	D	Hu	GA073
Vicia fava L.	Fabaceae	**baaqelaa**	H	H G	Gastritis Swell body	F	Po	Dr	O D	Hu	GA117
Viscum album L.	Lorantaceae	**xamqoo**	E	W	Malnutrition	LSt	Co	Fr	DO	Hu	GA072

Appendix 2. List of medicinal plants used to treat livestock diseases

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
Agarista salicifolia Lam.	Ericaceae	**sotiraa**	S	W	Fresh wound	L	Cr	Fr	D	Ls	GA123
Clematis hirsuta Perr. & Guill.	Ranunculaceae	**fiitii**	Cl	W	Equis coughing	L	Cr	Fr	N	Ls	GA037
Dombeya torrida (J.F. Gmel.) P. Bamps	Sterculiaceae	**daannisa**	T	W	Equis cough	Ba	CrPo	Dr	O	Ls	GA055
Echinops ellenbeckii D. Hoffm.	Asteraceae	**sokorruu**	S	W	Eye infection	Sh	Cr	Fr	Op	Ls	GA039
Grewia bicolor Juss.	Teliaceae	**harooressadhalaa**	S	W	Internal Parasite Sharp pain	R	Cr	Fr/Dr	O	Ls	GA104
Huperzia dacrydioides (Baker) Pic. Serm.	Lycopodiaceae	**rarra'aa**	E	W	Cattle coughing Liver illness	LSt	Cr	Fr	O	Ls	GA085
Kalanchoe petitiana A. Rich.	Crasulaceae	**hancuurraa**	H	W	Equis Rheumatic	L	Co	Fr	D	Ls	GA102
Lobelia rhynchopetalum Hems	Campanulaceae	**taruuraa**	S	W	Cattle cough	L	Cr	Fr	O	Ls	GA088
Mentha arvensis Linn.	Lamaceae	**daaddoo**	G	W	Eye infections	L	S	Fr	Op	Ls	GA080
Olea capensis.(Bak.) Fries & P.S. Green	Oleaceae	**siigeda**	T	W	Cattle cough	Ba	Cr	Dr	O	Ls	GA098
Origanum onites L.	Vervenaceae	**qorsacinii**	H	B	External parasites	F	Cr	Dr	NO	Ls	GA017
Psydrax subcordata (DC.	Rubiaceae	**buna booyyee**	S	W	Cattle coughing	L	CrP	Fr	O	Ls	GA068
Rhoicissus tridentata (L. f.) Wild & Drummond	Anacordiaceae	**gaaleewaata**	Cl	W	Blackleg	L	Cr	Fr	O	Ls	GA001
Schefflera abyssinica (Hochst. ex. A. Rich.)	Araliaceae	**gatamee**	Cl	B	Cattles coughing	Ba	CrCo	Fr	O	Ls	GA042
Stephania japonica Var.	Menispennaceae	**kalaalaa**	Cl	W	Blocked urine	L	Cho	Fr	D	Ls	GA043

Appendix 3. Lists of medicinal plants used to treat both human and livestock diseases

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
Anacamptis coriophora (L.) R.M. Bateman	Orchidaceae	**weesii gogorrii**	H	W	Rabies	Wp	Cr	Dr	O	Ls Hu	GA084
*Angelica atropurpurea*L.	Apiaceae	**shaatii**	H	B	Cattle cough Cough Headache Toothache Tumors	R L	CrPo	Fr/Dr	O	Ls Hu	GA082
*Asparagus racemosus*Lam	Asparagaceae	**sariitii**	Cl	Fl	Rabies	L	Cr	Fr/Dr	O	Hu Ls	GA078
Calpurinaaurea(Ait.) Benth	Fabaceae	**ceekataa**	S	Fl	Blotting Diarrhea Rabies Wound	SeL	CrPo	Fr	OD	Ls Hu	GA005
*Cordia africana*Lam.	Boraginaceae	**waddeessa**	T	B	Warts Leeches Spider poison	St L	Cr	Dr	DO	Hu Ls	GA100
Croton macrostachyus Del.	Euphorbiaceae	**mokonniisa**	T	B	Bloating Body fungus Gonorrhea Tapeworm	BaLR	Cr Cho	Fr/Dr	OD	Ls Hu	GA063
Datura stramonium L.	Solanaceae	**banjii**	H	B	Rabies	L	CrPo	Dr	O	Hu Ls	GA118
Echinops kebericho Mesfin	Asteraceae	**bursa**	H	B	Cattle coughing Stomachache	LFR	CrCh	Fr/Dr	OT	Ls Hu	GA077
Ekebergia capensis Spam	Ebenaceae	**onoonuu**	T	W	Cattle coughing Liver Toothache Warts	BaSt F	Cr Cho	Fr/Dr	OTD	Ls Hu	GA065
Erythrina brucii Schweinf.	Fabaceae	**waleenaa**	T	B	Eye disease Sharp pain	Sh Ba	Ch	Fr	DO	Ls Hu	GA041

Botanical name	Family	Local name (Aafan oromo)	GF	H	Disease treated	PU	Mode	Cn	Route	Uses	C.N°
Eucalyptus globulus Labill	Myrtaceae	**baargamooadii**	T	B	Headache Rabies	L	Cr	Fr	N O	Ls Hu	GA107
Euphorbia tirucalli L.	Euphorbiaceae	**qincibii**	S	B	Rabies Wound	La Sh	Cho Cr	Fr	D	Ls Hu	GA097
Girardinia bullosa (Steudel) Wood.	Urticaceae	**arbooyyee**	H	B	Cold disease Retained placenta	R	CrHt	Fr	D O	Hu Ls	GA028
Hagenia abyssinica (Bruce) J.F. Gmelin	Rosaceae	**heexoo**	T	B	Eye infection Tapeworm	F	S	Dr	OpO	Ls Hu	GA040
Maesa lanceolata Forssk	Myrtaceae	**abbayyii**	T	W	Blooded Urine Scabies Equis wound	Ba L	Cr	Fr	DO	Ls Hu	GA112
Nicotiana tabacum L.	Solanaceae	**tamboo**	H	H G	External parasites	L	Cr	Fr/Dr	DOEr	Hu Ls	GA049
Phytolacca dodecandra L'Her.	Phytolaccaceae	**handoodee**	Cl	B	Gonorrhea Scabies Rabies	FLR	Cr	Fr/Dr	OD	Hu Ls	GA051
Pimpinella arussorum Chiov.	Apiaceae	**koomanaa**	H	B	Blocked urine Stomachache	L	Cho Cr	Fr/Dr	D O	Ls Hu	GA095
Syzygium guineense(Willd.) DC.	Myrtaceae	**baddeessaa**	T	W	Diarrhea Morning sickness Leeches	Ba	ChoP	Fr	O	Hu Ls	GA116
Teclea nobilis Del.	Rutaceae	**hadheessaa**	S	W	Tonsillitis Blackleg	L	Cr	Fr/ Dr	O	Hu Ls	GA007
*Vernonia auriculifera*Hiern	Asteraceae	**reejjii**	S	B	Blood clotting Fresh wound	L	Cr	Fr	D	Hu Ls	GA024
Vernonia amygdalina Del.in Caill.	Asteraceae	**ebicha**	S	W	Bloating Blood clotting Dyspepsia	L	Cho Cr	Fr	O D	Ls Hu	GA027
*Warburgia uganlensis*S prague	Canellaceae	**beeftii**	T	W	Breast Mastitis Cattle coughing Gonorrhea	Ba	Cho Cr Po	Fr/ Dr	D O T	Hu Ls	GA003

Botanical name	**Family**	**Local name (Aafan oromo)**	**GF**	**H**	**Disease treated**	**PU**	**Mode**	**Cn**	**Route**	**Uses**	**C.Nº**
					Headache Stomach pain Toothache						

Note: C.Nº *(collection number, vo*ucher specimen number), ***Cn (****Condition****)*** *=Dr (dry), Fr (fresh), Fr/Dr (fresh & dry).* ***GF (****Growth form****)*** *(Cl=climber, E=Epiphyte H=herb, S=shrub, T=tree);* ***H (****habitat), (B=both wild and home garden, HG=Home garden, W=wild;* ***PU(****Parts used****)****= Ba (bark), F (fruit), G (gum), La (latex), L (leaf), LSt (leaf and stem), LSe (leaf and seed, R (root), RL (root and leaf), Sa (sap), Sh (shoot), St (Stem),WP (whole part).* ***Route****; D (dermal), DN (dermal and nasal), DNO (dermal, nasal and oral), DO (dermal and oral), DOOp (dermal, oral and optical), DOp (dermal and optical), DOT (dermal, oral and tooth), DT (dermal and tooth), E (eye), Er (ear), ErO (ear and oral), N(nasal), ON (oral and nasal), O (oral), Op (optical), OT (oral and tooth) and T(tooth);* ***Mode of preparation****: Bu (burned) Ch (chewed), ChP (chewed and pounded), Cho (chopped), ChoCo (chopped and cooked), Chopped and Squeezed, Co (cooked), Cr (crushed), CrCh (crushed and chewed),CrCo (Crushed and Cooked) CrHt (crushed and heated), CrP (crushed and pounded), CrPo (crushed and powdered), Dec (decoct), Ht (heated), P (pounded), ChoCrPo (chopped, crushed, pounded and powdered), ChoPo (chopped and powdered), P (pounded), Po (powdered), S (squeezed).* ***Uses*** *(Hu=human, Ls=livestock)*