

# Ethnomedicinal study of Plants in Wonchi District, South Western Shewa, Oromia Regional State, Ethiopia

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## Abstract

Wonchi district is rich in medicinal plant and people of the area used traditional indigenous knowledge to treat human ailments and livestock ailments. Agricultural expansion and deforestation the major threatens of medicinal plants in the study area. Hence, this study aimed at documentation and analyzing the plant-based Ethnomedicinal knowledge of people in order to prevent to become gradually less indigenous knowledge. Ethnobotanical data were collected using semi-structural interview and field observation. A total of 68 plant species belonging to 62 genera and 34 families were documented in the study area. The most commonly used plant families were Lamiaceae (9, 13.23%) followed by Asteraceae (8, 11.76%). Most of the plants (70.6%) were reportedly used to treat human diseases. The most frequently used plant parts were leaves (66%), followed by roots (17.64%). The dominant route of remedy administration was oral (38 preparations, 55.9%) followed by dermal (20, 29.4%), nasal (8, 11.8%) and optical (2, 3%). The study resulted in documenting 68 medicinal plants species where Lamiaceae is leading family with the highest section of medicinal plants. Most of medicinal plants in the study area were collected from wild. Herbs were found to be the dominant growth form of medicinal plants used for preparation traditional remedies and followed by shrubs. Leaves were to be the most frequent used plant parts for the preparation of traditional remedies. Traditional medicinal preparation was mainly through crushing followed by pounding. The major threats on medicinal plants in the study area ascend from agricultural expansion, deforestation, overgrazing, charcoal making and fire wood collection. For this reason Conservation promotion strategy for medicinal plants of the study area is recommended.

**Keywords:** Ethnobotany, Indigenous knowledge, Medicinal plants, Wonchi

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## Introduction

The science of ethnobotany investigates the reciprocal interaction among people, plants and the environment (Martin, 1995). Over centuries, local people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1996). The complex knowledge, beliefs and practices generally known as indigenous and local develops and changes within time and space due to cultural changes and alteration on resource base.

A total of 25000-75000 species of higher plants have been reported to be used traditional medicine worldwide (Farnsworth, 1994). Ethiopia is characterized by a wide range of ecological, edaphic and climatic conditions giving ground for higher floral and faunal diversity (Friis *et al.*, 2001). There are more than 1000 medicinal plant species that are currently used by Ethiopian People (Lulekal, 2018) of which 12% are endemic (Pankhurst, 2011). The total number of Ethiopian vascular plants range between 6500 and 7000 of which 10% are reported for endemism (Kelbessa & Demissew, 2014).

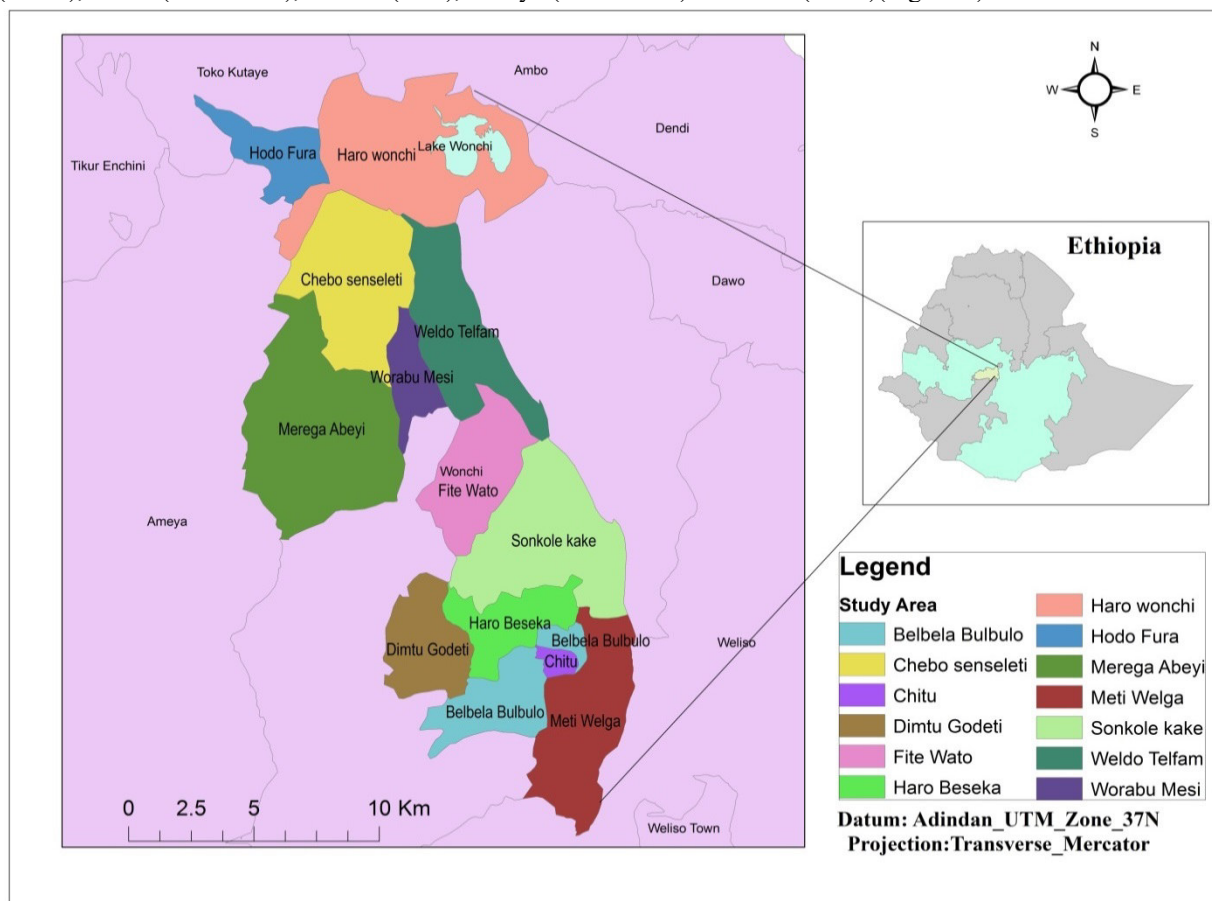
The preventive and curative role of traditional medicine is the reason for traditional medicinal plants for generations. The history of medicinal plants have been identified and used throughout human history (Hodes, 1997). A study (Abebe & Hagos, 1991) showed that about 80% of Ethiopians still depend on traditional medicine mainly for addressing their primary healthcare issues. The traditional medical system of Ethiopia is mainly medico-religious systems. The major reasons why medicinal plants are wanted in the country are culturally connected traditions, accessibility traditional medicine, efficacy and relatively low cost (Bekele, 2007).

This rich medicinal plant lore of the country is seriously affected due to the age related loss of knowledgeable people, deforestation and environmental degradation taking place in the country. Ethnobotanical studies and linked with medicinal plant conservation strategies are mandatory to safeguard the medicinal plants and associated indigenous knowledge in the country. The purpose of this Ethnobotanical study was to record and analyze medicinal plants knowledge of indigenous people of the Wonchi District South West Shewa, Oromia Regional State, Ethiopia.

## 2. Materials and Methods

## 2.1 Description of the study area

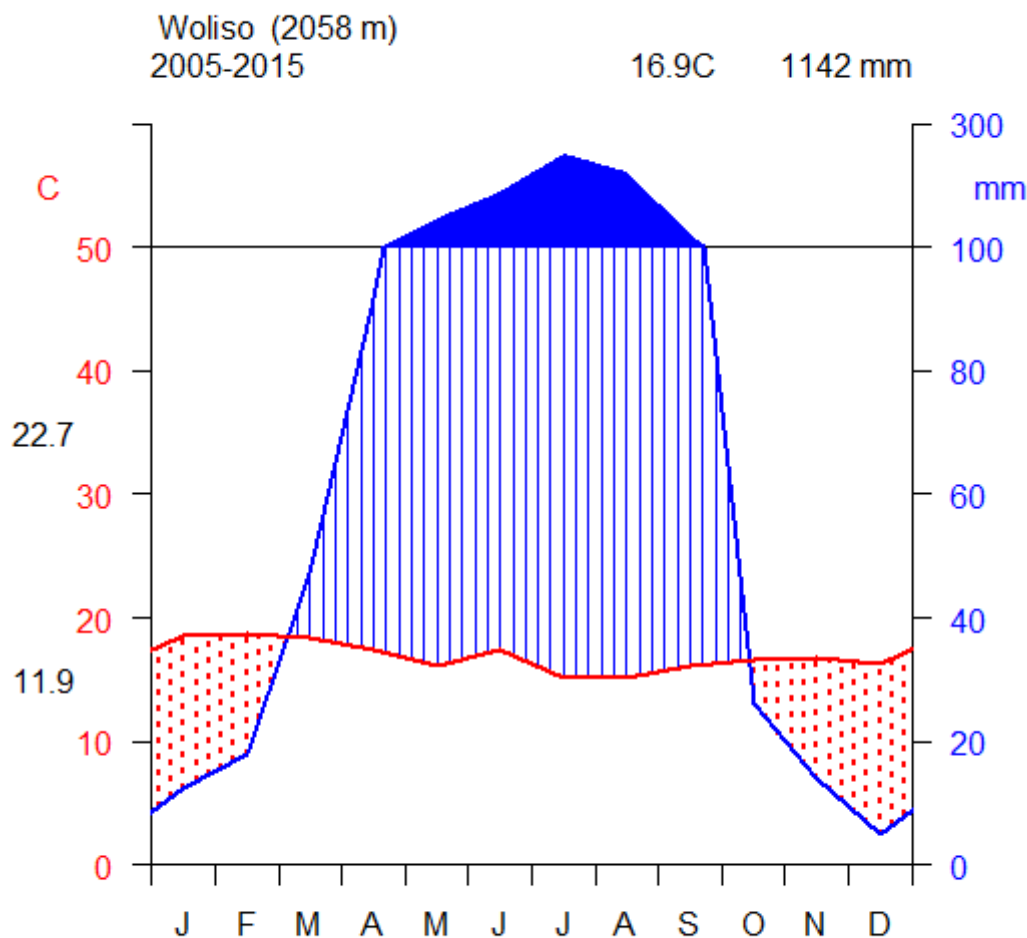
The study was conducted in Wonchi District located in South West Shewa Zone of Oromia Regional State, Ethiopia (Figure 1). Wonchi District is located about 37 km West of Woliso, the administrative capital of the South West Shewa Zone and 27 km South East of Ambo. Wonchi District is found 150 km West of Addis Ababa, Ethiopia. The geographic location of the district lies between 08°41'N and 037°53'E. The altitudinal variation of the district extends from 1700 to 3387 m a.s.l from the Crater rim in the North on Mt. Wonchi to the lowest altitude along the south slope of Mt Wonchi toward the undulating foot slopes to the Woliso plain. The total area of a Woreda is 475.6 km<sup>2</sup> according to (Beyene, 2014) and the total human population of the district is about 119,736. Seven Woredas are bordering the Wonchi District: Toke Kutaye (North West), Ambo and Dendi (North), Dawo (North East), Woliso (East), Amaya (south West) and Goro (south)(Figure 1).



**Figure 1** Map of Ethiopia showing the study area of ethnomedicinal plant in Wonchi District

## 2.2 Climate of the study area

The rainfall and temperature data collected from Woliso Giyon meteorological station indicated that the study area receives annual rainfall reaching up to 1142 mm in some peak years. The monthly mean maximum and mean minimum temperature of the area are 22.7 °C and 11.9 °C respectively. The mean annual temperature is 16.9 °C with slight variation from year to year (Figure 2). The rainfall pattern shows low rainfall in December and February, gradually increasing to the peak period in July and then decreasing in November and December.



**Figure 2 Clima Diagram showing the distribution of rain fall and temperature of the study area Data source: (ENMA, 2016).**

### 2.3 Methods of data collection

For ethnobotanical data collection, the following thirteen Kebeles were selected. Haro Wonchi, Hodo Fura, WeldoTelfam, Sonkole Kake, Belbela Bulbulo, Meti Welga, Chitu, Dimtu Godeti, Fite Wato, Haro Beseka, Chebo Senselati, Meraga Abayi and Werabu Masi were purposively selected among the 25 kebeles. The kebeles were selected based on vegetation cover, the presence of traditional healers and accessibility of road for transportation after discussing with the Woreda administration office. The plant samples were collected both from home garden and the wild. We have permission letter from Administration Office for plant specimen collection and written informed consent was obtained from all participants prior to data collection.

#### 2.3.1 Informants' selection

Respondents were contacted through kebele Administration and local elders (Jaarsa Biyyaa) and interviewed in Afan Oromo. A total of 260 (104 Male and 156 Female) informants were selected from 13 kebeles (20 respondents = 8 Male and 12 Female respondents per kebele). The age range of informants was between 25 and 90 years old. A total of 39 key informants were purposively selected following (Farnsworth 1994) based on recommendation from elders and local authorities (Development Agent and kebele administration leader). The other 221 Respondents were randomly selected from the representative kebeles. Key informants were first interviewed individually using Afan Oromo language to mention about the local names of the plants they use to treat diseases, diseases treated, part (s) of plants used, methods of gathering, methods of preparation, route of application, dosage, uses of the plants other than medicine and major threats to medicinal plants.

The methods used for ethnobotanical data collection were semi structured interviews; field observation, preference ranking and direct matrix ranking. The respondents' background, health problems treated, diagnosis

and treatment method, local name of medicinal plants used, source of collection, growth form, plants part used, method of preparation and application and threats to medicinal plants were carefully recorded. Specimens were air dried, numbered, labelled, pressed and identification of the specimen was performed at National Herbarium (ETH) in Addis Ababa University.

### 3. Results

#### 3.1 Medicinal plants in Wonchi District

In this study 68 plant species distributed into 62 genera and 34 families were recorded for their medicinal values. Of these, about (48 species, 70.6%), (14, 20.62%) and (6, 8.8%) were reported to treat only human, livestock ailments and both human and livestock ailments respectively. The family Lamiaceae was represented by the highest number of medicinal plants 9 species (13.23%), followed by Asteraceae 8 species (11.76%) (Table1).

**Table 1 Number of medicinal plant family, genera and species**

No	Families	No. of genera	Genera in %	No. of plants	Species in %
1	Acanthaceae	3	4.83	3	4.41
2	Alliaceae	1	1.61	1	1.47
3	Araceae	1	1.61	1	1.47
4	Asteraceae	8	12.9	8	11.7
5	Apiaceae	1	1.61	1	1.47
6	Boraginaceae	1	1.61	1	1.47
7	Crassulaceae	1	1.61	1	1.47
8	Commelinaceae	1	1.61	1	1.47
9	Cucurbitaceae	2	3.22	2	2.94
10	Cupressaceae	2	3.22	2	2.94
11	Euphorbiaceae	2	3.22	2	2.94
12	Fabaceae	3	4.83	4	5.55
13	Flacourtiaceae	1	1.61	1	1.47
14	Lauraceae	1	1.61	1	1.47
15	Lamiaceae	8	12.90	9	13.23
16	Myrtaceae	1	1.61	2	2.94
17	Oleaceae	1	1.61	1	1.47
18	Oliniaceae	1	1.61	1	1.47
19	Poaceae	4	6.45	4	5.55
20	Plantaginaceae	1	1.61	1	1.47
21	Polygonaceae	1	1.61	2	2.94
22	Phytolaccaceae	1	1.61	1	1.47
23	Rhamnaceae	1	1.61	1	1.47
24	Rubiaceae	1	1.61	1	1.47
25	Rutaceae	3	4.83	4	5.55
26	Rosaceae	1	1.61	1	1.47
27	Scrophulariaceae	1	1.61	1	1.47
28	Simaroubaceae	1	1.61	1	1.47
29	Solanaceae	3	4.83	4	5.55
30	Urticaceae	1	1.61	1	1.47
31	Verbenaceae	1	1.61	1	1.47
32	Zingiberaceae	1	1.61	1	1.47
33	Chenopodiaceae	1	1.61	1	1.47
34	Ranunculaceae	1	1.61	1	1.47
	Total families 34	62	4.83	68	

#### Endemic plant species

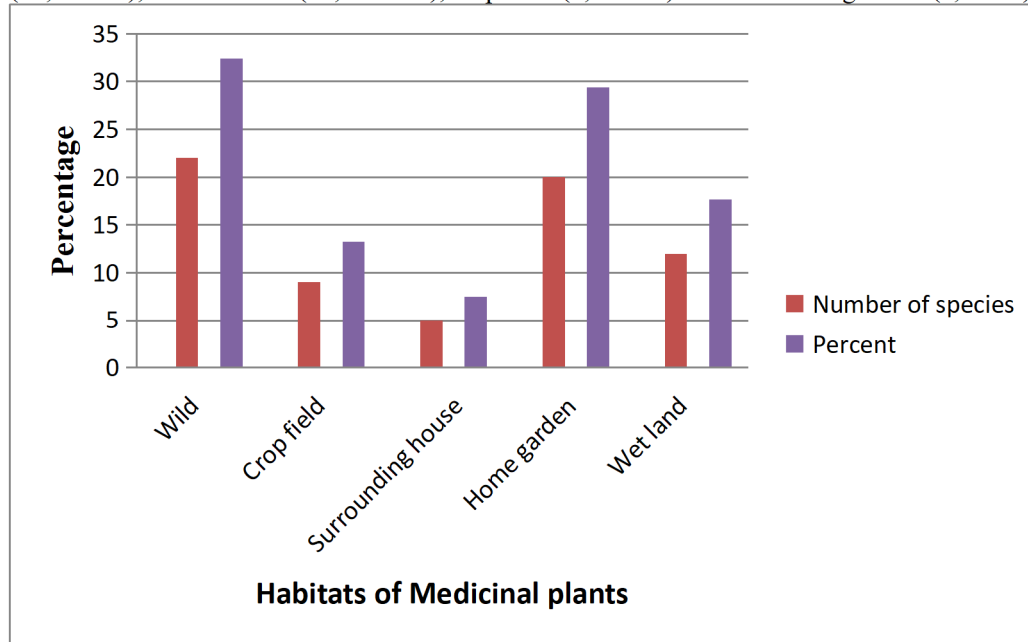
Four endemic plant species were recorded from the Ethnomedicinal plant study of the Wonchi District. The endemic species were found to represent the families Lamiaceae, Verbenaceae, and Urticaceae (Table 2).

**Table 2 Endemic species used for medicinal purpose in the study area**

Species	Families	Habit	Distribution in Ethiopia
<i>Lippia adoensis</i> Hochst. ex Walp.	Verbenaceae	Herb	TU, GD, GJ, SU,AR, WG, AR, KF,GG
<i>Pycnostachys abyssinica</i> Fresen.	Lamiaceae	Shrub	IL, KF, GG, SD, WU, SU, AR, HA
<i>Thymus schimperi</i> Ronninger	Lamiaceae	Herb	TU, GD, WU, SU, AR, SD, BA, HA
<i>Urtica simensis</i> Steudel.	Urticaceae	Herb	TU, GD, GJ, SU, AR, BA, SD

**Habitats of medicinal plants in the study area**

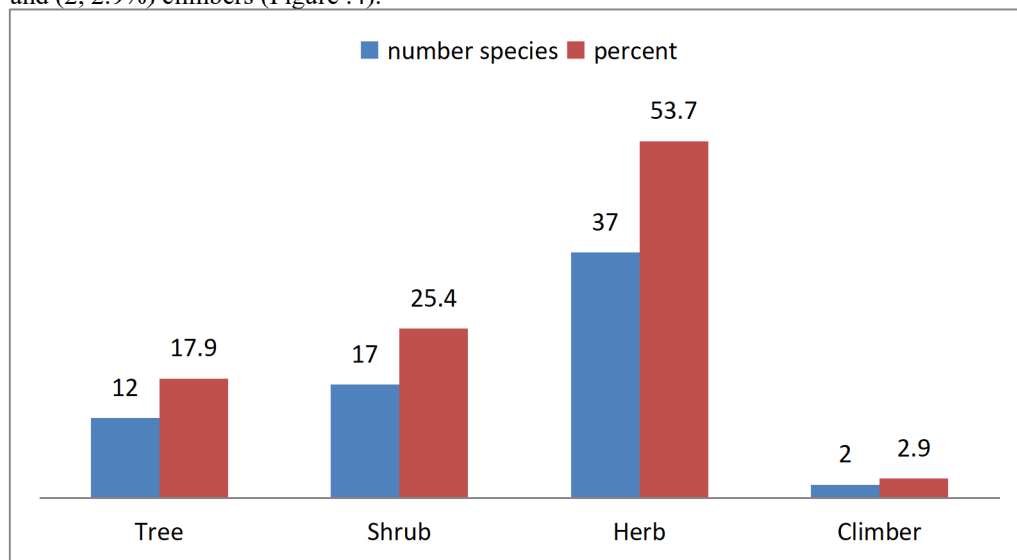
Most of the plants were collected from the wild (22 Species, 32.4%), followed by collections from home gardens (20, 29.4%), Wetland area (12, 17.64%), crop field (9, 13.2%) and surrounding house (5, 7.3%) (Figure 3).



**Figure 3: Habitats of medicinal plants in the study area**

**Plant habit (growth forms)**

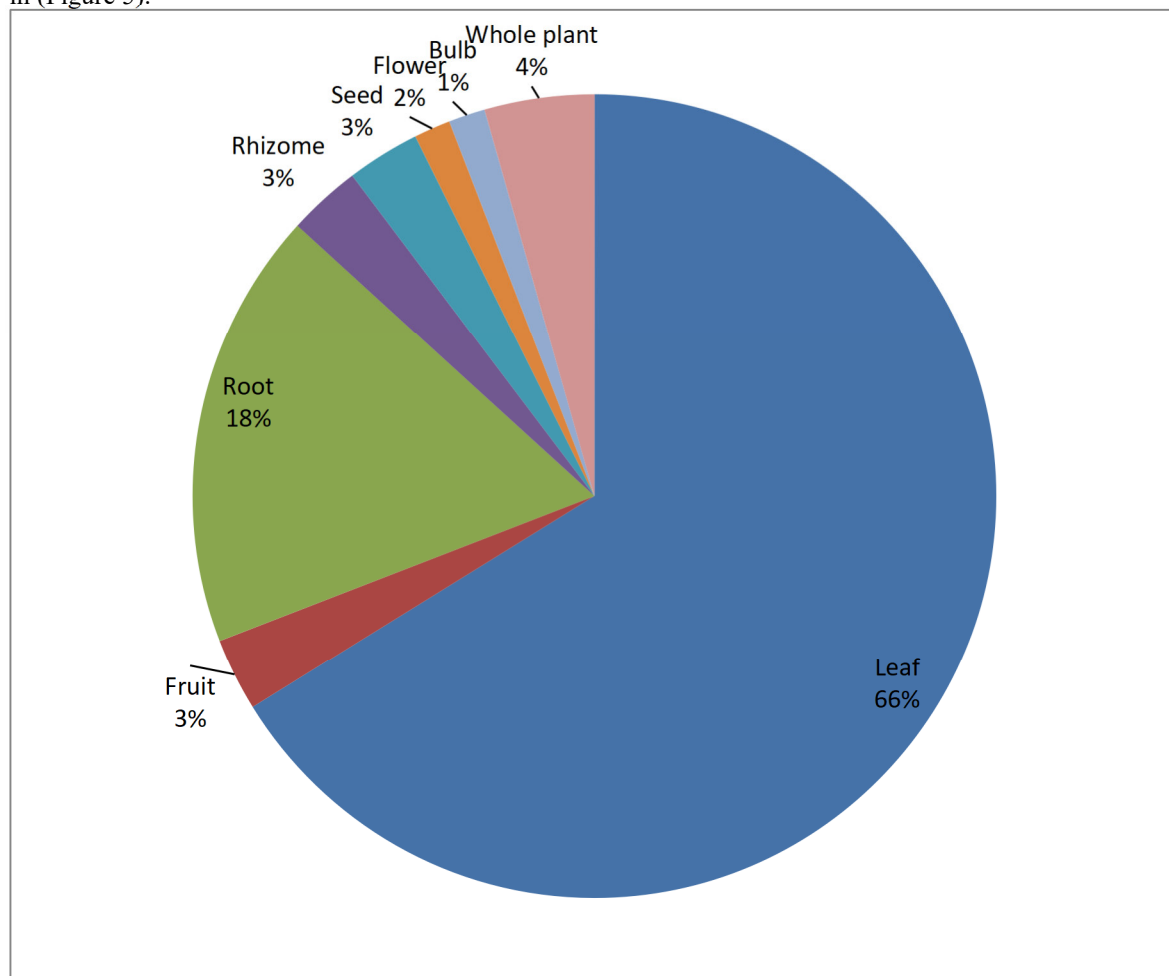
Herbs were the most frequently reported (37, 53.7%) species followed by shrubs (17, 25.4%), trees (12, 17.9%) and (2, 2.9%) climbers (Figure .4).



**Figure 4: Habits of medicinal plants used for human and livestock**

### Parts of medicinal plants used

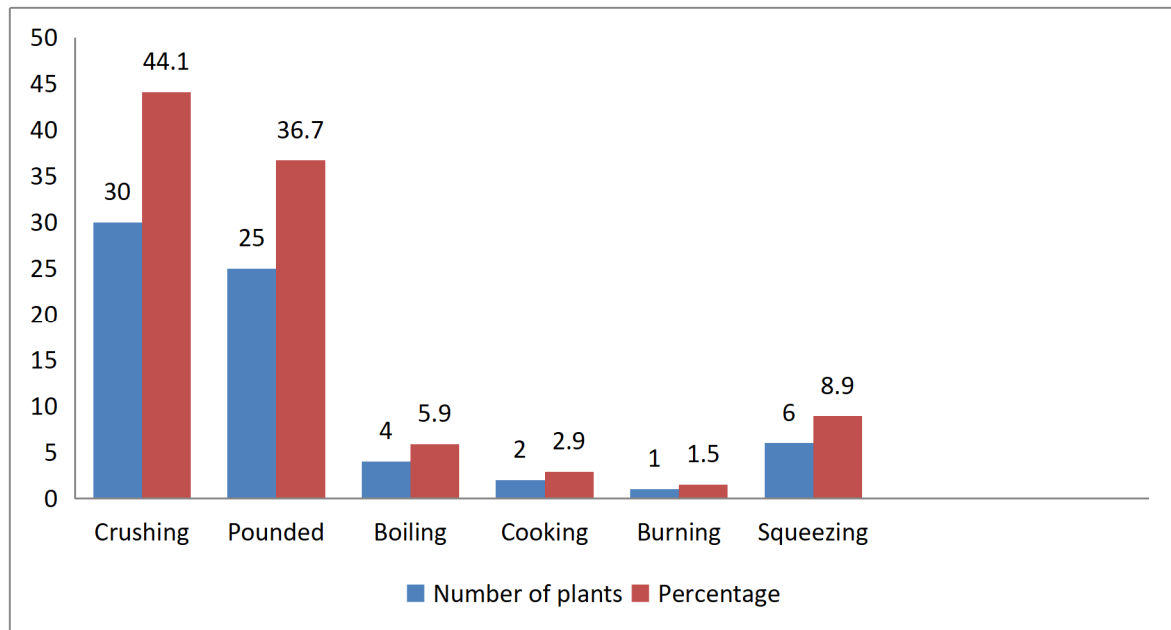
During the study different parts of medicinal plants were reported by respondents to be used for medicines. The most frequently utilized plant part was leaf 45 (66.2%) followed by root that accounts for 12 (18%) as indicated in (Figure 5).



**Figure 5** Parts of medicinal plants used

### Method of preparation

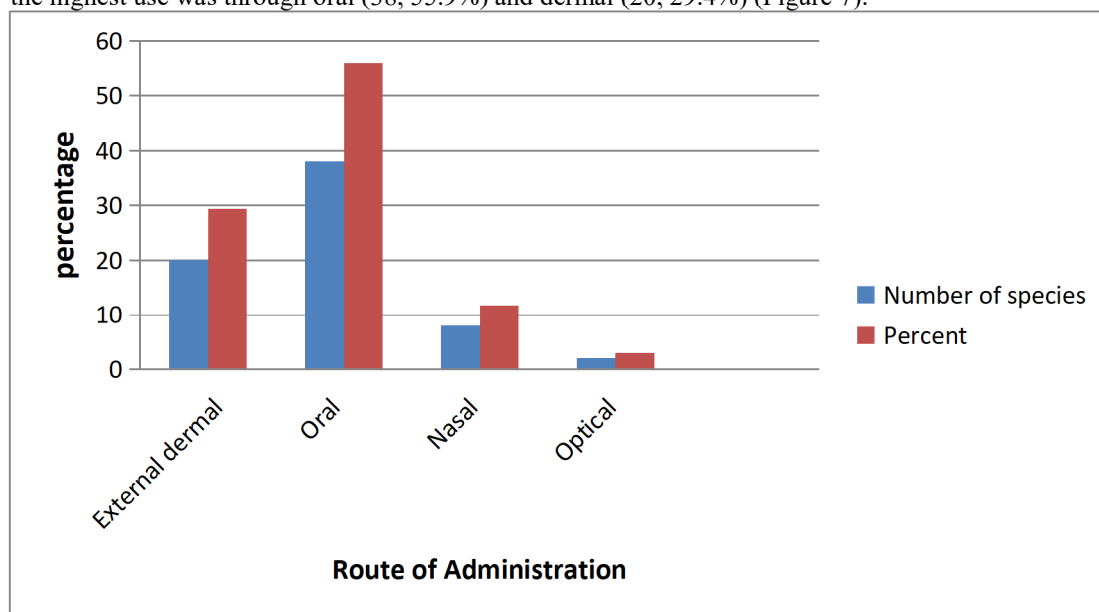
People of the study area used various methods of preparation of traditional medicines for human and livestock ailments. The method of preparation depends on the types of disease treated. The major methods of preparation of medicinal plants were crushing (44.1%), pounding (36.7%), squeezing (8.9%), boiling (5.9), cooking (2.9%) and burning (1.5%). Indigenous people have knowledge on the preparation of medicinal plants. Some of the traditional medicines had strong taste and bitter in order to reduce these they dilute them with honey, butter coffee, milk and salt.(Figure 6).



**Figure 6 Method of Preparation of remedies**

**Route of administration of medicinal plants in the study area**

The route of administration includes oral, dermal, nasal and optical. From the reported route of administration, the highest use was through oral (38, 55.9%) and dermal (20, 29.4%) (Figure 7).



**Figure 7 Route of Administration of medicinal plants**

**Preference ranking**

*Ocimum lamiifolium* scored 44 and ranked first indicating that it is most effective in treating febrile illness followed by *Leonotis ocymifolia*, *Ruta chalepensis*, *Croton macrostachyus* and the least effective was *Eucalyptus globulus* (Table 3).

**Table 3 Preference ranking of plants treating febrile illness**

Medicinal plant species	Respondents coded ( R1-R10)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
<i>Croton macrostachyus</i>	3	2	3	1	2	3	5	1	3	3	26	4
<i>Leonotis ocymifolia</i>	4	5	2	2	4	1	1	4	5	2	30	2
<i>Ruta chalepensis</i>	2	1	4	3	3	5	2	2	1	5	28	3
<i>Ocimum lamiifolium</i>	5	4	5	4	5	4	4	5	4	4	44	1
<i>Eucalyptus globulus</i>	1	2	1	5	1	2	3	3	2	1	21	5

**Paired Comparisons**

A pair wise comparison was made among five medicinal plants. Nine key Respondents did the paired comparison of the five medicinal plants and the value was summarized. *Ruta chalepensis* comes first for treating stomach-ache followed by *Ajuga integrifolia*, *Solanum incanum*, *Cymbopogon caesius* respectively. *Rumex nepalensis* was the least preferred species to treat the stomach-ache disease in the study area. (Table 4).

**Table 4: Paired Comparison of five medicinal plants reported against stomach-ache**

Medicinal plants	Respondents coded ( R1-R9)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9			
<i>Ajuga integrifolia</i>	4	5	5	3	5	1	4	5	4	36	2	
<i>Ruta chalepensis</i>	5	4	4	5	4	5	5	4	5	41	1	
<i>Solanum incanum</i>	2	3	3	4	2	4	5	2	1	26	3	
<i>Rumex nepalensis</i>	3	1	2	1	1	3	1	1	2	15	5	
<i>Cymbopogon caesius</i>	1	2	1	2	3	2	2	3	3	19	4	

**Direct Matrix Ranking**

Five commonly reported multipurpose species and six use-categories were involved in direct matrix ranking with five Respondents. Respondents evaluate their relative importance to the local people and use reports across the selected species were summed up and ranked. Results of the direct matrix ranking showed that *Eucalyptus globulus* ranked first and hence it is the most preferred plant by local people for various uses. *Hagenia abyssinica* ranked second, *Croton macrostachyus* ranked third, *Cordia africana* took fourth place and *Olea europaea* subsp cuspidate got the last place (Table 5).

**Table 5: Ranking of Multipurpose medicinal plants**

Direct matrix ranking Mp-Medicine, Cons-Construction , FW-Fire wood , CH- Charcoal , FR-Furniture , BF-Bee forage RT-Total Respondants, R-Respondents

Use value	<i>Croton macrostachyus</i>					<i>Olea europaea</i> subsp cuspidate					<i>Hagenia abyssinica</i>					<i>Cordia africana</i>					<i>Eucalyptus globulus</i>				
	R					R					R					R					R				
R	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
MP	5	4	5	2	5	4	3	2	3	4	5	5	4	4	5	4	3	2	1	4	5	4	4	3	5
Cons	4	4	3	3	4	5	5	4	2	3	4	5	5	3	4	5	5	4	3	5	4	5	5	3	5
FW	3	4	2	3	5	5	4	5	1	5	4	3	3	2	4	4	3	4	1	5	5	5	4	2	5
BF	5	4	3	3	3	3	2	1	2	2	5	4	4	1	5	5	4	2	1	4	4	5	5	3	4
CH	2	3	2	2	4	5	2	3	3	1	3	2	1	4	2	3	2	3	3	2	4	3	2	2	3
FR	4	5	4	1	3	5	4	4	2	5	4	4	5	3	3	4	5	4	2	3	5	4	5	3	5
RT	23	25	19	14	24	27	20	19	13	20	25	22	22	17	23	25	22	19	11	23	27	26	25	16	27
GT	104					99					109					100					121				
R	3					5					2					4					1				

**Informant consensus**

Results showed that some medicinal plants were popular than others. In this study the highest informant consensus value was found for *Ocimum lamiifolium* which was cited by 56 respondents. *Ruta chalepensis* was



cited by 54 respondents for treating stomach-ache, *Acmella caulirhiza* was cited by 42 respondents for the treatment of tonsil, and *Rumex nepalensis* cited by 39 respondents for treating stomach-ache (Table 6).

**Table 6: Informant consensus**

No	Botanical name of Medicinal plants	Families	No. of Informants	Percent	Rank
1	<i>Ocimum lamiifolium</i> Hochst. ex Benth.	Lamiaceae	56	21.50	1st
2	<i>Ruta chalepensis</i> L.	Rutaceae	54	20.77	2nd
3	<i>Acmella caulirhiza</i> Del.	Asteraceae	42	16.20	3rd
4	<i>Rumex nepalensis</i> Spreng.	Polygonaceae	38	14.60	4th
5	<i>Allium sativum</i> L.	Aliaceae	36	13.80	5th
6	<i>Ajuga integrifolia</i> Buch,Ham	Lamiaceae	33	12.70	6th
7	<i>Premna schimperi</i> Engl.	Lamiaceae	32	12.30	7th
8	<i>Solanum incanum</i> L.	Solanaceae	30	11.54	8th
9	<i>Croton macrostachyus</i> Del.	Euphorbiaceae	27	10.40	9th
10	<i>Eucalyptus globulus</i> Labill.	Myrtaceae	25	9.60	10th
11	<i>Rhamnus prinoides</i> L.	Rhamnaceae	23	8.85	11th
12	<i>Cucumis ficifolius</i> A. Rich.	Cucurbitaceae	20	7.70	12th
13	<i>Leonotis ocyimifolia</i> (Burn.f) Iwarsson, var. <i>ocyimifolia</i>	Lamiaceae	19	7.30	13th
14	<i>Justicia schimperiana</i> (Hochst. ex Nees) T.Anders.	Acanthaceae	18	6.90	14th
15	<i>Hagenia abyssinica</i> (Brace) J.F.Gmel.	Rosaceae	17	6.50	15th
16	<i>Olea europaea</i> L. subsp <i>Cuspidata</i> (Wall. Ex G.Don) Cif.	Oleaceae	15	5.80	16th

**Informant consensus factor for the given disease categories**

The headache and acute febrile, tooth ache, tonsil, evil eye and cough scored the highest ICF value (0.95) followed by stomachache, internal disease problems; placenta and urine retention and Gonorrhoea that scored the second highest value (0.92). In this study the lowest ICF value (0.87) scored for the category of diseases like wound, tumor, stabbing and swelling (Table 7).

**Table 7: Informant consensus factor (ICF)**

Categories	No. Species	Nur	ICF
Stomach ache , Gastritis	14	172	0.92
Head ache and Acute Febrile illness	6	106	0.95
Dermatological infection Wound, Swelling , Tumor, Dandruff, Body itching, stabbing , <b>Roobbii</b>	13	97	0.87
Internal and external parasites problems , Tape worm, Ascaries , Leeches, Blotting	7	75	0.91
Rabies, Diarrhea , Malaria, Horse disease, Black leg , Cattle cough	6	58	0.91
External injury and Poisoning problems Bleeding, Fire burn , Snake breath, Cataracts , Poison and Spider poison	8	81	0.90
Tooth ache, Tonsil, Evil eye , Cough	8	150	0.95
Internal disease problems, Blood pressure , Placenta and urine Retention and Gonorrhoea	6	60	0.92

**Major threats to medicinal plants**

Results from nine respondents (R1-R9) on priority ranking of six factors that are described as threats to medicinal plants based on their degree of destructiveness (1 = least destructive, 6= most destructive) were summarized. The result of the present study showed that agricultural expansion and deforestation were ranked 1<sup>st</sup> and 2<sup>nd</sup> factors respectively posing threats to medicinal plants of the area (Table 8).

**Table 8 Major threats to medicinal plants**

Threats	Key Respondents coded (R1-R9)									Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9		
Deforestation	4	3	4	4	5	6	4	5	5	40	2nd
Agricultural expansion	5	6	4	6	4	5	6	5	5	46	1st
Fire wood collection	4	3	2	1	5	4	3	6	1	29	6th
Over grazing	6	4	5	3	2	1	5	3	6	35	3rd
Charcoal making	5	4	3	2	3	4	5	5	3	34	4th
Construction and furniture making	4	3	4	3	4	3	5	4	2	32	5th

## 4. Discussion

### 4.1 Medicinal plants of the study area

A total of 68 medicinal plants belonging to 62 genera and 34 families were identified and documented during the study period. The families that have the highest number of medicinal plants were Lamiaceae followed by Asteraceae. This finding agrees with the research done in Fiche District, Central Ethiopia (Enyew *et al.*, 2014). Why Asteraceae dominant in Ethiopia this could be related to the fact that Asteraceae due to the adaptation potential of plant species in the family. They are very large and wide spread family of flowering plant that have advanced reproductive organs used for attracting pollinators this factors made the Asteraceae dominant in Ethiopia. The evidence given for similar result from by (Lulekal *et al.*, 2008).

Four endemic plants were identified from the study area and these were *Lippia adoensis*, *Pycnostachys abyssinica*, *Thymus schimperi* and *Urtica simensis*. These species were also reported by (Kasa, 2009) ethnobotanical study of Jeldu Woreda.

In this study medicinal plants were reported to have been collected from the wild (32.4%), home gardens (29.4%), crop field (13.2%), surrounding house (7.3%) and wetland (18%). Other reports also indicate (Awaw and Asfaw, 1919) that more medicinal plants are obtained from the wild vegetation. From the total collected medicinal plants 12 (18%) were recorded from the wetland area. These medicinal plants include *Acmella caulirhiza*, *Ageratum conyzoides*, *Colocasia esculenta*, *Cyanotis barbata*, *Cynodon dactylon*, *Datura stramonium*, *Guizotia scabra*, *Hygrophila auriculata*, *Pennisetum sphacelatum*, *Plectranthus punctatus*, *Ranunculus multifidus* and *Thunbergia ruspolii*. The output is very good indicates that wetlands serve as sources of medicinal plants for local communities, thus need proper conservation attention.

Of the total 68 medicinal plants collected from the study area, herbs were the dominant growth forms 54% followed by 25.4% shrub species, 18% tree species, and 3% climbers. The dominance of herb could relate to the fact that herbs are easily accessible in the nearby areas than trees and shrubs often harvested from patches of forests distantly located from resident area. The finding agrees with the general pattern of dominance herbaceous species seen in most medicinal plants inventories in Ethiopia (Hunde, 2004, Bizuayehu *et al.*, 2019, Seid & Tsegay, 2011, Giday *et al.*, 2010, Giday *et al.*, 2003).

The most frequently utilized plant part was leaf with 66.2% species followed by root which account for 17.6%. The finding agrees with previous reports in Ethiopia which showed that leaves were the most commonly used parts followed by roots to treat various health problems Bizuayehu *et al.*, 2019, Tamene *et al.*, 2000, Getnet *et al.*, 2016). The most popular mode of preparation was in the form of crushing the plants materials which accounts 44.1% followed by pounding 36.7%, pounding and squeezing (8.9%). This finding was in line with earlier results in which crushing was the common type of preparation (Enyew *et al.*, 2014, Getaneh & Girma, 2014, Yinegar & Yewhalaw, 2007). In the study area highest proportion of medicinal plants were prepared from fresh (85%) followed by dry (15%). The report from the local people shows that people in the study area prefer fresh plant materials to dried ones for their high efficacy of curing the disease.

The identified routes of administration include oral, dermal, nasal and optical routes. From the reported routes of administration, the highest report was found for oral (55.9%) and dermal, (29.4%) applications. This result agrees with similar studies in northern part of Ethiopia and Mena Angetu forest in Bale, (Abebe, 1993, Lulekal *et al.*, 2008, Yinegar & Yewhalaw, 2007). The dosage determination was the big problem in the study because there was no standardized known unit of measurements of the plant remedies.

The preference ranking exercise helped to identify the most preferred medicinal plant species to treat febrile illness. Accordingly *Ocimum lamiifolium*, *Leonotis ocymifolium*, *Ruta chalepensis* and *Croton macrostachyus* were found to treat the disease. Ethnobotanical investigation done elsewhere in Ethiopia (Kasa, 2016) also reported the *Ocimum lamiifolium* for treating febrile illness. Five respondents ranked five commonly reported multipurpose species and six use-categories were involved in direct matrix ranking exercise in order to evaluate their relative importance to the local people related to their use values *Eucalyptus globulus* ranked 1<sup>st</sup> followed by *Hagenia abyssinica*, *Olea europaea* subsp *cuspidata*, *Cordia africana* and *Croton macrostachyus* ranked respectively similar result with research done in Ejere District (Kasa *et al.*, 2016).

The results showed that some medicinal plants were popular than others, in this study the highest informant consensus went to *Ocimum lamiifolium* which was cited by 56 respondents. The popularity of this medicinal plant was due to the preference of the species for treating febrile illness in the community and its easy access at the home gardens. *Ruta chalepensis* was cited by 54 respondents for treating stomach-ache, *Acmella caulirhiza* was cited by 42 respondents for the treatment of tonsil, and *Rumex nepalensis* cited by 39 respondents for treating stomach-ache. As population growth is increasing medicinal plants went threatened due to destruction of their habitats. The result of the present study showed that agricultural expansion, deforestation over grazing ranked as the most serious threats not only to medicinal plants but also to the plants of the Wonchi District as a whole respectively. The finding was in line with other findings too (Giday, 2001), in Dale district (Gonfa, 2015), the BennaTsehay district (Assegid & Tesfaye, 2014), the Mana Angetu district Lulekal *et al.*, 2008), Wando Genet (Mesfin *et al.*, 2009). Similar to other places in Ethiopia, people living in Wonchi District have traditional

practices which they have accumulated for generations to treat both human and livestock ailments.

#### 4.2 Conclusion

The study resulted in documenting 68 medicinal plants species where Lamiaceae is leading family with the highest section of medicinal plants. Most of medicinal plants in the study area were collected from wild. Herbs were found to be the dominant growth form of medicinal plants used for preparation traditional remedies and followed by shrubs. Leaves were to be the most frequent used plant parts for the preparation of traditional remedies. Traditional medicinal preparation was mainly through crushing followed by pounding. The major threats on medicinal plants in the study area ascend from agricultural expansion, deforestation, overgrazing, charcoal making and fire wood collection. For this reason Conservation promotion strategy for medicinal plants of the study area is recommended.

#### Declarations

##### Ethics approval and consent to participate

Written Informed consent was obtained from all local participants prior to the research. All knowledge is documented with full participation and agreement of traditional healers.

##### Consent for publication

Not applicable

##### Availability of data and materials

Data up on request I will present

##### Competing interests

The authors declare that they have no competing interests

##### Funding

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#### Authors' contributions

The corresponding author or 1<sup>st</sup> author by collecting data from study area, analysis and interpretation data received the submission and substantive with correspondence with editors. The remain 2<sup>nd</sup> and 3<sup>rd</sup> authors have approved before manuscript submission, approved the submitted version and approving the final manuscript

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### Figure title and legend section

Figure 1 Map of Ethiopia showing Oromia Region and the Wonchi District / The map depicted in figure 1 is my own original work drawn for this particular research using GIS software

Figure 2 Clima Diagram showing the distribution of rain fall and temperature of the study area Data source: (ENMA, 2016)

Figure 3: Habitats of medicinal plants in the study area

Figure 4: Habits of medicinal plants used for human and livestock

Figure 5 Parts of medicinal plants used

Figure 6 Method of Preparation of remedies

Figure 7 Route of Administration of medicinal plants

**Table title**

- Table 1 Number of medicinal plant family, genera and species  
 Table 2 Endemic species used for medicinal purpose in the study area  
 Table 3 Preference ranking of plants treating febrile illness  
 Table 4 Preference ranking  
 Table 5 Direct matrix ranking  
 Table 6: Informant consensus  
 Table 7: Informant consensus factor (ICF)  
 Table 8 Threats to medicinal plants

**Additional file**

**Appendix 1.** Lists of medicinal plants used for human ailments, scientific name, growth form, disease treated, condition of plant parts used, methods of preparation and application and voucher number  
 key : T-Tree, S-Shrub, H-Herb, HBT-Habit, PU -Part Used, UT -used to treat, RA-Route of administration ,  
 L- Leaf, Br- Bark F- Fresh, D-Dry, Ex-External/Dermal, O-Oral, Na-Nasal, Bn-Burn, Op-Optical,  
 CP-Condition of preparation, Fr- Fruit

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
1	Acacia abyssinica Hochst. Ex Benth.	T	L	B	F	Ex	Snake breath	Fresh leaf is chewed with Cynodon dactylon spray on the body	GD 0035
	Fabaceae								
	<b>Laaftoo</b>								
2	Acmella caulirhiza Del.	H	L	Hu	F	O	Tonsilitis	The flower part is chewed and swallowed	GD 006
	Asteraceae						Toothache	Leaf chewed and put under tooth	
	<b>Gororsa</b>								
3	Ageratum Conyzoides L.	H	L	Hu	F	Ex	Blood clotting	Fresh leaf crushed and put on it	GD 0057
	Asteraceae								
	Qorichamichii								
4	Ajuga integrifolia Buch,Ham	H	L	Hu	F	O/Na/ Ex	Stomach ache	Fresh leaf A. integrifolia are pounded with that Vernonia amygdalina is drunk	GD 002
	Lamiaceae						Mitch /Fever		
	<b>Harmaguusa/ Gondii</b>						Gonorrhoea	Leaf of A. integrifolia and Juniperus procera pounded together drink one spon	
5	Allium sativum L.	H	Bu	Hu	F	O	Malaria	Bulb is pounded make soup and drunk	GD 0039
	Alliaceae						Stomach ache	Bulb is eaten or drunk as soup	
	<b>Qullubbii Adii</b>						Cough	Bulb is pounded with Zingiber officinale boiling is drunk	
							Blotting	Bulb is pounded with seed of Ricinus communis is givn to cattle	
							Evil Eye	Allium sativum , Carissa edulis and Ruta chalepensis pounded together dry smoked to patient	

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
6	Artemisia abyssinica Sch. Bi. ex A. Rich.	H	L	Hu	F	O	Gastritis	Squeezed and drunk one tea cup	GD 0012
	Asteraceae						Used to clean eye	Leaf of Artemisia abyssinica is used to clean the eye	
	<b>Caancee</b>								
7	Arundinaria alpina K. Schum	H	L	Hu	D	Ex	Spider poison	Dry leaf of A. alpina burn ash mixed with butter used on it	GD 0061
	Poaceae								
	<b>Shimela or Leemnee</b>								
8	Brucea antidysenterica J.F.Mill.	Sh	L	Hu	F	O	Stomach ache	Leaf and seeds are crushed together decanted the liquid and drunk with honey	GD 0033
	Simaroubaceae						Diarrhea	leaf B. antidysenterica crushed and taken orally	
	<b>Qomanyoo</b>						Ticks	Red fruit of B. antidysenterica pounded painted on the area of affected cattle	
9	Calpurnia aurea (Ait.) Benth.	Sh	L	Hu	F	Na	Nose bleeding	Squeezed leaf on hand put in nose	GD 0032
	Fabaceae	Sh	L	Hu	F	O	Diarrhea	Fresh leaf C.aurea and root of plantago lanceolata pounded together liquid drunk with honey	
	<b>Ceekaa</b>			Ls	F	O	Leeches	Leaves and seed crushed together spray external part and gives orally	
				Ls			Horse Disease	Leaf C.aurea and Justicia shimperiana pounded gives through left nose and ear	
				Ls		O	Rabies	Leaf of C. aurea and Justicia schimperiana pounded together given for cattle Orally	
10	Citrus medica L.	T	fr	Hu	F	O	Stabbing pain	C. medica Cooked and drunk the sap	GD 0067
	Rutaceae								
	<b>Turungoo</b>								
11	Citrus sinensis(L.) Osb.		L	Ls	F	O/E	Wound body	Leaf C.sinensis, Citrus medica pounded together	GD 0056
	Rutaceae								
	<b>Burtukaana</b>								
12	Cymbopogon caesius (Hook. And Arn.) Stapf ,Poaceae	H	W	Hu	F	O	Stomach-ache	C. caesius, leaf of Croton macrostachyus, Ruta chalepensi, Allium sativum pounded taken orally	GD 0010

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
13	<i>Clausena anisata</i> (Willd.) Benth.	Sh	L	Hu	F	O/Na	Acute fibrill illness	Leaf <i>C. anisata</i> , Croton macrostachyus, Eucalyptus globulus boiling smell steam	GD 0031
	Rutaceae								
	<b>Ulmayi</b>								
14	<i>Colocasia esculenta</i> (L.) Schott.	H	Rh	Hu	F	O	Ascaries	Rhizome is Cooked and eaten expel ascaries	GD 0028
	Araceae	H		Ls	F	O	Placenta retetion	Root <i>C. esculenta</i> is pounded given to cattle	
	<b>Godarree</b>								
15	<i>Cordia africana</i> Lam.	T	L	Hu	F	O	Stomach- ache	Leaf <i>C. africana</i> , Rumex neplensis, Ruta chalepensis and Allium sativum crushed and drunk	GD 005
	Boraginaceae						Expel internal parasite	Rapen fruit of <i>Cordia africana</i> eaten expel internal parasite	
	<b>Waddessa</b>								
16	<i>Croton macrostachyus</i> Del.	T	L	Hu	D	O	Cough	Leaf crushed dissolved drunk with salt	GD 0021
	Euphorbiaceae						Stomach- ache	Bark is crushed dissolved and drunk	
	<b>Bakkannisa</b>						Wound	Dry leaf is powdered put on the wound	
							<b>'Roobbii'</b> Chirt	Fresh leaf used for wound area	
17	<i>Cucumis ficifolius</i> A. Rich	Ci	R	Ls	F	O	Rabies	Root washed peeled by measuring finger line chewed	GD 009
	Cucurbitaceae						Tooth-ache	Root is chewed and put under affected teeth	
	<b>Hiddii oolallo</b>								
18	<i>Cupressus lusitanica</i> Mill.						Dhibeegaraak cessa ' <b>Biduu</b> '	Leaf of <i>C. lusitanica</i> , Croton macrostachyus, Justicia schimperiana and Rhamnus prinoides crushing together washed body of patient and small dosage taken orally.	GD 0042
	Cupressaceae								
	<b>Gatiraa Faranjii</b>								
19	<i>Chenopodium ambrosioides</i> L.	H	L	Hu	F	Ex	Spider poison	Leaf crudhed and pasted on the affected area	GD 0060
	Chenopodiaceae								
	<b>Qoricha Shararitii</b>								

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
20	Cyanotis barbata D. Don	H	L	Hu	F	O	<b>Naqarsa</b>	Leaf crushed and 1 coffee cup taken by sugar	GD 0068
	Commeliaceae								
	<b>Arama Dawaa</b>								
21	Cynodondactylon (L.) Pers	H	Wp	B	F	Ex	Snake breath	Fresh C. dactylon pounded with leaf of Acacia abyssinica sprayed on body	GD 0062
	Poaceae								
	<b>Coqorsa</b>								
22	Datura stramonium L.	H	L	Hu	F	Ex	Wound	Leaf is crushed put on the wound.	GD 0052
	Solanaceae								
	<b>Asangira/ Manjii</b>								
23	Dovyalis abyssinica (A. Rich.) Warb.	T	L	Hu	F	O	Internal parasite expel	Rapen Fruit of D. abyssinica are eaten orally	GD 0043
	Flacourtiaceae								
	<b>Koshimi</b>								
24	Eucalyptus camaldulensis Dehnh.	T	L	Hu	F	O	Stomach - ache	Fresh leaf of E. camaldulensis chewed	GD 0064
	Myrtaceae			Ls			Blak leg	Fruit E. camadulensis and R. communis pounded and gives orally for cattle	
	<b>Bargamo Diimaa</b>								
25	Eucalyptus globulus Labill.	T	L	Hu	F	O	Cough	Fresh leaf boiled smell the stem and drunk small amount	GD 0034
	Myrtaceae						Fever / <b>Mich</b>	Leaf boiled smell	
	<b>Bargamoo Adii</b>								
26	Foeniculum vulgare L.	H	L	B	F	O	Urine retetion	Leaf of F. vulgare and Ruta chalepensis pounded together is taken orally human and animal	GD 0011
	Apiaceae						Blood pressure	Crushed and drunk	
	<b>Insilaalee</b>						Stomach-ache	Squeezed with Ocimum lamiifolium and Withania somnifera and taken orally	
27	Guizotia scabra (Vis.) Chiov	H	L	Hu	F	Ex	Wound	Leaf Guizotia scabra squeezed added th wound	GD 0046
	Asteraceae								
	<b>Tuufoo/ Hadaa</b>								



SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
28	Hagenia abyssinica (Brace) J.F.Gmel.	T	Se	Hu	D	O	Tape warm	Seed of H. abyssinica dried crushed dissolved is drunk dossage base on age different	GD 0020
	Rosaceae								
	<b>Heexoo</b>								
29	Hygrophila auriculata (Schumach.) Heine	H	L	Hu	F	Ex	Wound	Leaf are crushed and added on the body affected	GD 0050
	Acanthaceae								
	<b>Arrabadubarti</b>								
30	Juniperus procera Hochst. exEndl.	T	L	Hu	F	Ex	Wound	Leaf of Juniperus procera pounded and put on the wound area	GD 0030
	Cupressaceae								
	<b>Gaattiraa habashaa</b>								
31	Justicia schimperiana (Hochst. ex Nees) T. Anders.	Sh	L	Hu	F	O/Na/Ex	Eye Evil	Leaf of J. schimperiana, Eucalyptus globulus, Ocimum lamiifolium boiling and washed body small amount take throu oral and nasal	GD 0024
	Acanthaceae	Sh	L	Ls	F	O	Cattle Blotting	Leaf of J. schimperiana and Vernonia amygdalina pounded together gives through orally	
	<b>Dhumugaa</b>								
32	Kalanchoe petitiiana A. Rich.	H	L	Hu	F	Ex	Wound	Root of Kalanchoe petitiiana and Plantago lanceolata pounded put on wound	GD 0017
	Crassulaceae						Swelling Wound	Fresh leaf warm by heat placed on it	
	<b>Bosoqgee</b>								
33	Leonotis ocymifolia (Burn.f) Iwarsson var. ocymifolia	H	L	Hu	F	Dr/Ex	Fever/ mich	Leaf crushed between hands and taken through nasal	GD 0018
	Lamiaceae								
	<b>Bokkolluu</b>								
34	Lippia adoensis Hochst. Ex Walp *	H	L	Hu	F	O	Cough	Fresh leaf pounded liquid part is taken orally	GD0059
	Verbenaceae								
	<b>Kusaaye</b>								
35	Momordica foetida Schumach.	H	R	Ls	F	O	Cattle bloting	Root of M. foetida with root Salvia nilotica pounded together and gives orall	GD 0013
	Cucurbitaceae						Urine retetion	Root of M. foetida with V. sinaiticum pounded and given	
	<b>Qoriisinbiraa</b>								

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
36	Ocimum basilicum L.var. basilicum	H	L	Hu	F	O	Headache	Fresh leaf of is chewed and swallowed	GD 0066
	Lamiaceae								
	<b>Bossobilaa</b>								
37	Ocimum lamiifolium Hochst. exBenth.	H	L	Hu	F	Na	<b>Mich</b> / fever	Leaf of O. lamiifolium crushed on hand taken liquid through nasal	GD 001
	Lamiaceae						Head ache	Squeezed and drunk one tea cup with coffee	
	<b>Ancabbii</b>								
38	Olea europaea L.subsp cuspidata (Wall. ex G.Don) Cif.	T	L	Hu	F	Ex	Headache	The oil is extracted mixed with powder of Echinops kebericho put on it	GD 0051
	Oleaceae								
	<b>Ejersa</b>								
39	Olinia rochetiana A. Juss.	Sh	L	Hu	F	O	Toothache	Leaf of O. rochetiana crushed put under affected tooth	GD 0038
	Oliniaceae								
	<b>Soolee</b>								
	Phytolacca dodecandra L. Herit	Sh	R	Ls	F	O	Rabies	Root of P. dodecandra and J. schimperiana pounded together given for cattle	GD 0022
	Phytolaccaceae								
	<b>Handoodee</b>								
40	Plantago lanceolate L.	H	L	Hu	F	Ex	Wound	leaf of Plantago lanceolata crushed put on it	GD 0055
	Plantaginaceae								
	<b>Qorxobbee</b>								
41	Pennisetum sphacelatum (Nees) Th. Dur. and Schinz	H	W	Hu	F	Ex	Body itching	Fresh P.sphscelatum chewed spray on the body	GD 0044
	Poaceae								
	<b>Migira</b>								
42	Plectranthus punctatus (L.f) Her.	H	L	Hu	F	Ex	Head ache	Leaf of P. punctatus and snifted through nasal	GD 0048
	Asteraceae								
	<b>Dabasee</b>								
43	Persea americana L.	T	Fr	Hu	F	Ex	Dandruff	Fruit of P. american used for hair fungal treatment	GD 0041
	Lauraceae								
	<b>Avokadoo</b>								

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
44	Premna schimperi Engl.	Sh	L	Hu	F	O	Toothache	Leaf of Premna schimperi is crushed and put under affect tooth.	GD 0015
	Lamiaceae								
	<b>Urgeessa</b>								
45	Pycnostachys abyssinica Fresen. *	Sh	L	Ls	F	Op	Affected eye	Leaf P. abyssinica squeezed added in Sheep eye	GD 008
	Lamiaceae					O	Hen disease	Leaf P. abyssinica Crushed gives orally opening peak	
	<b>Abba muddaa / Ajoo</b>								
46	Ranunculus multifidus. Forssk	H	L	Hu	F	Ex	Urine of bat	Leaf of R. multifidus crushed and paint on it	GD 0065
	Ranunculaceae								
	<b>Gashuwwe</b>								
48	Rhamnus prinoides L.	Sh	L	Hu	F	O	Tonsilities	Fresh leaf of Rhamnus prinoides chewed and Swallowed	GD 007
	Rhamnaceae								
	<b>Geeshee</b>								
49	Ricinus communis L. Herit.	Sh	Se	Hu	D	Ex	Wound	Seed crushe and the oil is painted on wound	GD 0026
	Euphorbiaceae			Ls	F	O	Stomach cramp	Root of R.communis and Momordica foetida crushed given to cattle	
	<b>Qobboo</b>								
51	Rubiocordifolia L.	H	R	Hu	F	O	Diarrhea	Crushed the root and drunk the watery part	GD 0016
	Rubiaceae	H	R	Hu	F	O	Stomach-ache	Root of R. cordifolia pounded and drunk the water part	
	<b>HundeeDiimaa</b>								
52	Rumex nepalensis Spreng.	H	R	Hu	F	O	Stomach cramp	The root part of R. nepalensis washed and chewed drunk liquid	GD 004
	Polygonaceae								
	<b>Tultii</b>								
53	Rumex nervosus Vahl	H	L	Hu	F	Ex	Blood clotting	Fresh leaf of R. nervosus crushed and added on it	GD 0019
	Polygonaceae								
	<b>Dhangaggoo</b>								
54	Satureja abyssinica (Benth.) Briq.	H	L	Hu	F/D	Na	<b>Mich</b> /Fever	Leaf crushed between hands taken through nose	GD 0037
	Lamiaceae								
	<b>Xoosinyiiharree</b>								

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
55	<i>Senna didymobotrya</i> (Fresen.) Irwin & Barneby. Fabaceae	Sh	L	B	F	Ex	Poison	Leaf <i>S. didymobotrya</i> pounded added on affected area	GD 0063
	<b>Mukaajawa</b>								
56	<i>Senna occidentalis</i> L. Fabaceae			B	F	Ex	Poison	Leaf <i>S. occidentalis</i> crushed and used	GD 0054
	<b>Sanamakii</b>								
57	<i>Solanum incanum</i> L. Solanaceae	H	R	Hu	F	O	Stomach ache Tonsilitis	Root of <i>S. incanum</i> peeled washed and chewed The inside liquid is used for child tonsil	GD 003
	<b>Hiddii</b>								
58	<i>Solanum nigrum</i> L. Solanaceae	H	R	Ls	F	O	Cattle blotting	Root of <i>S. nigrum</i> and <i>Verbascum sinaiticum</i> pounded together well given to cattle	GD 0029
	<b>Abashurree</b>								
59	<i>Tagetes minuta</i> L. Asteraceae	H	L	Hu	F	Ex	Swelling	Leaf of <i>Tagetes minuta</i> crushed and put on it	
	<b>Ajawa</b>								
60	<i>Thymus schimperi</i> Ronninger * Lamiaceae	H	L	Hu	F/D	O	Cough Cattle Cough	Leaf is boiled drunk with sugar Leaf <i>T. schimperi</i> , <i>Nicotiana tabacum</i> and <i>Alium sativum</i> pounded dissolved gives through nose	GD 0027
	<b>Xoosinyii Namaa</b>								
61	<i>Thunbergia ruspolii</i> Lindau * Acanthaceae	H	R	Ls	F	O	Urine retention	Root of <i>T. ruspolii</i> and <i>S. nilotica</i> pounded use it	GD 0059
	<b>Hidda Bofaa</b>								
62	<i>Urtica simensis</i> Steudel. Urticaceae	H	R	Hu	F	Ex	Kormomu /Tumor Placenta retetion	Root pounded the solid part tid on it Root is pounded gives to cattle by salt while humans used by honey	GD 0045
	<b>Doobbii</b>	H	R	Hu	F	O	Horse disease	Root of <i>U. simensis</i> and <i>Justicia schimperiana</i> pounded gives orally	

SN	Scientific name /Family/ Local name	HBT	PU	UT	CP	RA	Disease treated	Preparation and Application	Code.No
64	<i>Verbascum sinaiticum</i>	H	R	Ls	F	O	Cattle Blotting	Root of <i>V. sinaiticum</i> , <i>Cucumis ficifolius</i> and <i>Rubia cordifolia</i> pounded together given for cattle	GD 0023
	Scrophulariaceae						Urine retention	Root of <i>V. sinaiticum</i> is pounded mixed with water gives to cattle	
	<b>Gurra harree</b>								
65	<i>Vernonia amygdalina</i> Del.	H	L	Hu	F	O	Stomach pain	Leaf of <i>V. amygdalina</i> and <i>Justicia schimperiana</i> crushed together and drunk	GD 0025
	Asteraceae								
	<b>Eebicha</b>								
66	<i>Vernonia auriculifera</i> Hiern	Sh	L	Ls	F	Op	Cataracts	Leaf of <i>V. auriculifera</i> is pounded and added into affected eye	GD 0036
	Asteraceae								
	<b>Reejii</b>								
67	<i>Withania somnifera</i> (L.) Dunal in DC.	Sh	L	Hu	F	Ex	Blood clotting	Leaf squeezed and added on the bleeding area	GD 0014
	Solonaceae	Sh	L	Hu	F	O	Eye evil	Squeezed and leaf of <i>Ruta chalepensis</i> drink one spoon.	
	<b>Kumoo</b>								
68	<i>Zingiber officinale</i> Roscoe	H	Rh	B	F/D	O	Cough	Rhizome pounded with <i>A. sativum</i> boiled drunk with sugar	GD 0058
	Zingiberaceae						Stomach-ache	Rhizome chewed and swallowed	
	<b>Jinjibila</b>								

**NB:** \* Indicates Endemic species