Ethnobotanical study of medicinal plants in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia

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Journal of Ethnobiology and Ethnomedicine2018**14**:64
https://doi.org/10.1186/s13002-018-0266-z

- **Received:** 29 March 2018
- **Accepted:** 12 October 2018
- **Published:** 3 November 2018

Abstract

Background

Starting from the ancient time, the people of Ethiopia use medicinal plants as traditional medicine to heal different human and livestock ailments. This ethnobotanical study of medicinal plants was carried out in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia, to identify medicinal plant species used by the local community to treat various human and livestock ailments.

Methods

A total of 78 informants (54 men and 24 women) were selected to collect ethnobotanical information from four study sites. Among the 78 informants, 20 key informants were selected purposefully; the other 58 informants were selected randomly by lottery method. Ethnobotanical data were collected using semi-structured interviews, field observations, guided field walks, and group discussions and were analyzed by preference ranking, paired comparison, direct matrix ranking, informant consensus factor, fidelity level (FL), use-value, independent samples *t* test, and Pearson correlation coefficients.

Results

A total of 173 medicinal plants were collected and identified that were distributed across 77 families and 156 genera. The family Fabaceae stood first by contributing 17 (9.8%) species followed by Lamiaceae and Solanaceae with 9 (5.2%) species each. *Rhamnus prinoides* was reported for the treatment of many of the described diseases. One hundred sixteen (67.1%)

medicinal plant species were collected from natural vegetation, 34 (19.7) were from home gardens, 13 (7.5%) from farmland, and 10 (5.8%) were from natural vegetation and home gardens. The most widely used life form was herbs (69 species, 39.9%) followed by shrubs (58 species, 33.5%). The most commonly used part of the medicinal plants was the leaves followed by roots. The plants were prepared by grinding, powdering, squeezing, roasting, and burning and were administered through oral, dermal, nasal, anal, ocular, and vaginal, and on the surface of the teeth. The most commonly used applications were by drinking, smearing, eating, fumigation, and chewing. There was no difference between men and women informants, showing that the two sexes had similar knowledge in the use of traditional medicinal plants. Educational level and medicinal plant knowledge of informants were negatively correlated; whereas age and medicinal plant knowledge of informants were positively correlated.

Conclusions

Ganta Afeshum District is relatively rich in diversity of medicinal plant resources accompanied with a rich indigenous knowledge within the local communities to harvest and effectively use to prevent different human and livestock ailments. However, nowadays, deforestation, agricultural expansion, overgrazing, drought, and overexploitation are threatening these properties. Therefore, people of the study area should apply complementary conservation approaches (in situ and ex situ) for sustainable use of these resources and to prevent species extinction.

Keywords

- Diversity
- Ethnomedicine
- Extinction
- Ganta Afeshum
- Medicinal plant
- Sustainable use
- Tigray

Background

Humans began to employ plants for the intention of health a long time ago, maybe at the first moment when they suffered from diseases [1]. Since the antique time plants have been an essential supply for deterrent and healing for humans and livestock [2]. The population living in Sub-Saharan Africa continues to suffer from infectious as well as noninfectious and deficiency diseases [3]. Because of these and other problems, a large number of people of Africa die daily of preventable and curable diseases due to the lack of simple primary health care [4].

The ailment saddle is provoked by the limitation of the medical personnel and medical provisions such as remedial devices and access to fundamental medicine. The ratio of medical doctors to patients in Africa is not fair; in Ethiopia, for example, there is one doctor to 33,000 patients and in Malawi one doctor to 50,000 patients [5]. Because of this, human beings use different plant species known in ancient traditional medicine instead. Traditional medicine has been applied by

humans for the healing of different diseases since a long time before the beginning of conventional medicine and up to this time serve the health care needs of the majority of the people of Africa [3, 5, 6, 7].

Thus, traditional medicine remains popular for both historical and cultural reasons. It is estimated that 80% of the African people depend on traditional medicine to meet up their care needs [8].

Like other parts of sub-Saharan countries, 70% of human and 90% of livestock population of Ethiopia rely on traditional medicine for primary health care [9]. In addition to the lack of availability of modern medicine, there are also culturally linked traditions. The communities have trust in the medicinal values of traditional medicine which can also be obtained at a relatively low cost as compared to the modern ones [10].

Ethiopia is exceptionally rich in history, culture, and biological diversity. It is the origin of the early of hominine species of which Lucy was a member. Around 80 languages are spoken by various ethnic groups. The country is also recognized for its diverse habitats, vegetation, and faith which results in a high diversity of traditional medicinal knowledge and practices of the people in using medicinal plants [11]. However, this rich cultural heritage is threatened, especially in the form of deforestation, fuelwood collection, illegal logging, overgrazing by stock animals, and agricultural expansion [11, 12, 13]. Such problems include the Tigray Region where the study was conducted.

Although the literature on ethnobotany in Ethiopia is increasing, there is still a limited ethnobotanical documentation on medicinal plants and minimum phytomedicine preparation of crude extracts and isolation of active ingredients [14]. Besides, the rural population of Tigray in general and the people of Ganta Afeshum District in particular greatly depend on medicinal plants because of their acceptability, availability, affordability, and efficacy to treat human and livestock health problem and due to lack of certain infrastructure like roads, ambulance, hospital, and health center. However, these important medicinal plants become exhausted mainly due to agricultural and urban expansion as well as deforestation and heavy livestock grazing pressure.

Available reports show that limited ethnobotanical studies have been conducted in Tigray to document the use of medicinal plants [14, 15, 16, 17, 18, 19, 20]. The studies conducted in the districts of Alamata [14], Enderta [15], Hawzen [16], LaelayAdi-yabo [17], Asgede Tsimbela [18], Ofla [19], and Kilte Awulaelo [20] documented 25, 27, 33, 37, 68, 113, and 114 medicinal plants, respectively. However, no such study has so far been conducted in Ganta Afeshum District. Therefore, the protection of these resources and documentation of related traditional knowledge are needed, and it is on the basis of this gap that the present study was undertaken. The study examined and documented the diverse medicinal plant species which are used by the people of Ganta Afeshum District, Eastern Tigray Regional State Northern Ethiopia to treat different human and livestock ailments.

Materials and methods

Description of the study area and selection of study sites

Tigray is located in Northern Ethiopia at 12° and 15° latitude and 36° and 40° N east longitudes. The total area of Tigray is about 53,000 km^2 with an average population density of 65/km^2, and the population growth rate is 3%. Most part of Tigray is arid or semi-arid with annual rainfall of 450 to 980 mm. The total population is about 5.5 million, out of which 85% inhabit rural areas, deriving a livelihood from mixed crop/livestock subsistence agriculture [21]. The study area Ganta Afeshum District lies between 14° 20′ N and 32° 29′ E with a total area of 1636.36 km^2. It is located 921 km north of Addis Ababa and 120 km north of Mekelle, the capital city of the regional state (Fig. 1).

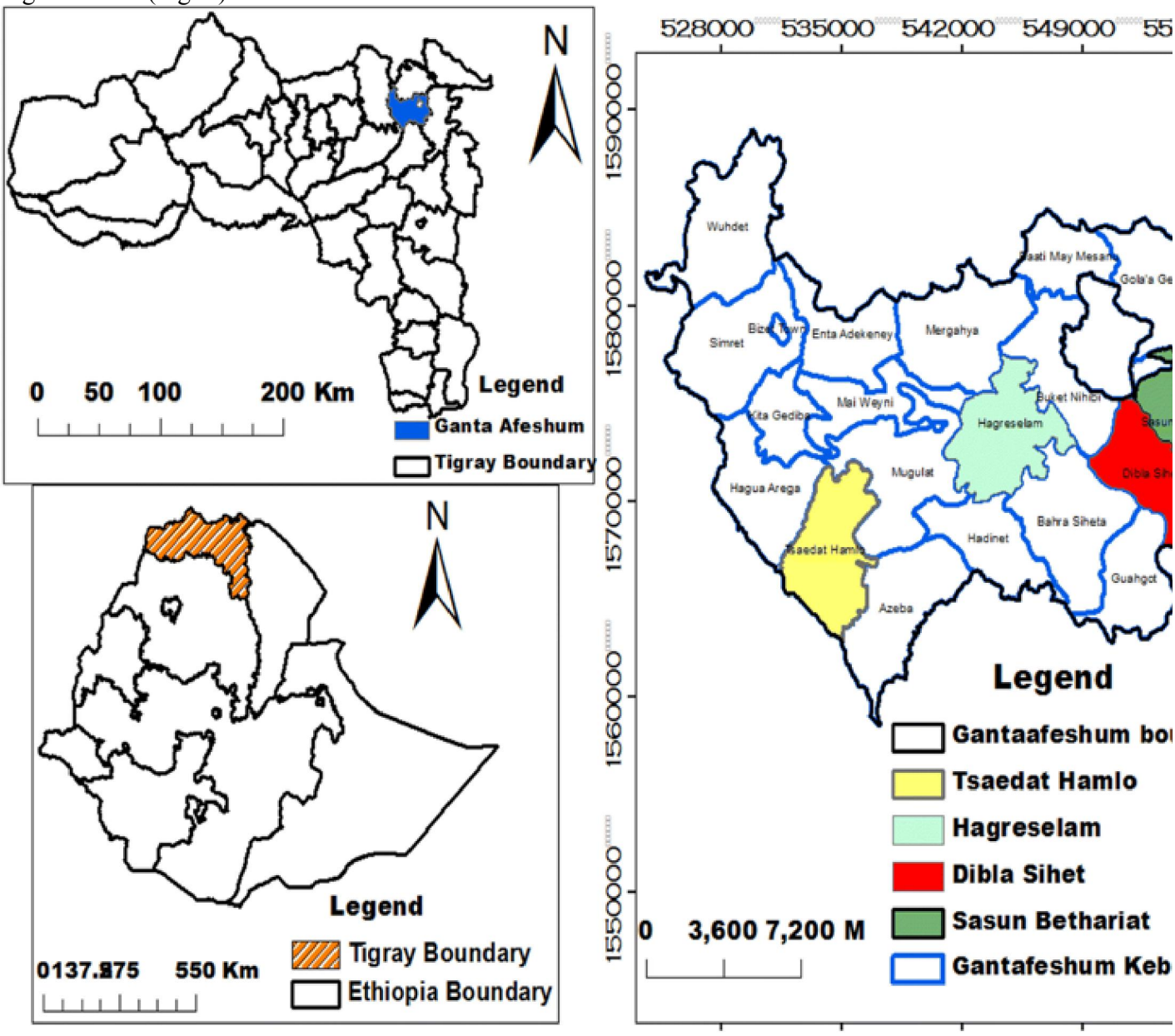

Fig. 1

Map of the study area

There are 22,581 households with an average of 4.59 persons for a household in Ganta Afeshum District with a population density of 54.17 persons/km^2 [21] showing it is one of the most densely populated districts in Tigray Region. The main economy of the population in the wereda has full agriculture based on a mixed farming system. There are only 5 clinics with 114 health servants which provide modern health services. But, these health service buildings and the health servants cannot satisfy the needs of the huge population.

Based on the information gathered by a reconnaissance survey, four kebeles (study sites) at different distance from the administrative center of Adigrat were purposefully selected for the collection of ethnobotanical data. The four selected study sites were Sasun-Bethaweriat, Hagereselam, Dbla-Siet, and Tsaedat-Hamlo. The criteria for the selection of these study sites were availability of traditional practitioner healers and vegetation cover.

Selection of informants

A total of 78 individuals (54 men and 24 women) were selected randomly and purposefully with different ages (see Additional file 1: Table S1). Out of the 78 individuals, 58 were selected randomly by a lottery method from the total households in order to give equal chances, and 20 key informants who are traditional healers and knowledgeable persons were selected purposefully based on the recommendations of local authorities, elders, and religious leaders. The key informants in the study area are very few and they were purposely selected because of their knowledge and relevance (Table 1).
Table 1

Number of general and key informants

District	Kebele	Total households	General informants			Key informants			Total
Ganta Afeshum			M	F	Total	M	F	Total	
	Tsaedat-Hamlo	1082	7	5	12	5	1	6	18
	Hagerselam	1308	13	4	17	3	2	5	22
	Sasun-Bethaweriat	1094	10	4	14	3	2	5	19
	Dbla-Siet	1114	11	4	15	2	2	4	19
Total		4598	41	17	58	13	7	20	78

Determining sample size

In order to collect ethnobotanical data, men and women household informants with different age were selected from four kebeles, and the sample size was determined using Cochran's sample size formula as indicated by Bartlett et al. [22] as follows:

$$n=N1=N(e)2$$

where n is the sample size of the research, N is the total number of households in the district (22581), e is the maximum variability of making error 5% (0.05), and 1 is the probability of event occurring.

$$n=22581/1+22581(0.05)2$$

n = 393 which is based on the total number of households of the district (from the 20 kebeles of the district); but our study sites were four kebeles. Therefore, the sample size for each of these "four kebeles" was calculated using the proportion of the number of households in each kebele to the total number of the household in the district.

Collection of ethnobotanical data

Ethnobotanical data were collected during January and February 2017 through semi-structured interviews, field observation, guided field walk, and focus group discussion. The semi-structured interviews were based on the questions prepared beforehand in English language that were translated into Tigrigna that is the mother language of the informants.

Semi-structured interviews

The semi-structured interviews followed Martin [23] in order to obtain ethnobotanical information such as medicinal plant species, common human and livestock ailments, methods of preparation, dosage, routes of administration, vernacular names of the medicinal plants, plant parts used, and conservation and threats of the medicinal plants.

Field observation

During the field observations, information about land form, soil type, distribution of medicinal plants, conservation activities and threats of medicinal plants, habit, and habitat of medicinal plants was recorded on site.

Guided field walks

Guided field walks were carried out with the assistance of local guides and interviewees on the study sites combined with interviews in order to obtain essential ethnobotanical information as well as to gather medicinal plant specimens by recording all the necessary information of the particular medicinal plant species, such as local name, parts used, and diseases treated by the medicinal plant.

Group discussions

Group discussions were made with seven to ten informants at each study site composed of knowledgeable traditional healers in order to collect information about the local soil and land classification, topographic classification, indigenous vegetation classification, and threats and conservation activities of medicinal plants.

Medicinal plant specimen collection and identification

During the field investigation, plants with medicinal value were collected from home gardens and from the wild and cultivated areas. Essential information such as local name and habit was recorded and herbarium specimens collected. For plant identification, the Flora of Ethiopia and Eritrea [24, 25, 26, 27, 28, 29, 30, 31] was used. The accuracy of the identifications was confirmed by the comparison with the deposited authenticated specimens from Addis Ababa University Herbarium and by the help of taxonomists.

Data presentation and analysis

The ethnobotanical data were analyzed both qualitatively and quantitatively using informant consensus factor (ICF), fidelity level index (FLI), preference ranking, paired comparisons, Jaccard's coefficient of similarity, and direct matrix ranking. Diseases recorded in this study were grouped into nine major categories associated with specific symptoms and signs with the help of a medical doctor, and informant consensus factor (ICF) was calculated to determine the effectiveness of medicinal plants in each ailment category according to Heinrich et al. [32]. The ICF computed every category to discover the accord of informants on the reported therapy for the group of diseases. It was calculated as follows: *numbers of use citation in each category (n_{ur}) minus the number of species used (n_t), divided by the number of use citations in each category minus one.* The result of the calculation (ICF) is from 0 to1. According to Heinrich et al. [32], the higher the value, the more consensuses of the informants.

$$ICF = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

where ICF is the informant consensus factor, n_{ur} is the number of use citation in each category, and n_t is the number of species used.

The FL index quantifies the importance of a species for a given purpose. Most commonly used medicinal plants have high fidelity level index, thus used and agreed by large number of people, whereas medicinal plants that are not commonly used have low fidelity level index and the informants vary on that species in the treatment of particular ailments [33]. Fidelity level index was used to determine the relative healing potential of medicinal plants against human or livestock ailments based on the proportion of informants' agreement on the use of a given medicinal plant. The formula for FL is given as [34]:

$$FL\% = Ip/IU \times 100$$

where FL% is the percentage of fidelity level, Ip is the number of informants who independently indicated the use of a species for the same major ailments, and IU is the total number of informants who mentioned the plant for any major ailment.

The use value was also calculated to see the relative importance of selected traditional medicinal plant species for treating diseases in the study area according to Phillips et al. [35]. It was calculated by the formula $UV = \Sigma Ui/n$ where UV stands for the total use value of the traditional medicinal plant species, U refers to the number of use reports cited by each informant for a given

plant species, and *n* stands for the total number of informants interviewed for a given plant species.

Preference ranking was conducted by asking informants to rank the most important medicinal plants that were frequently used by the local community based on their preference and the importance in the community. The most preferred medicinal plants scored 5 while the least preferred medicinal plant by the informants scored 1. These numbers were summed for all informants, giving an overall ranking for the medicinal plants by sample group of the informants [23].

Direct matrix ranking draws explicitly upon multipurpose dimensions. Direct matrix ranking was performed following the method of Martin [23] to medicinal plant species for their multipurpose use and to relate this to the extent of its utilization versus its dominance. The values of each use diversity for a species were taken, and the value of each species was summed and ranked.

A paired comparison was conducted following [23]. A list of the pairs of selected medicinal plants with all possible combinations was made, and a sequence of the pairs and the order within each pair were randomized before every pair was presented to selected informants; their response recorded and the total value summarized. Besides, independent sample *t* test was calculated in order to compare the average traditional medicinal plant knowledge of men and women informants by using SPSS software.

Jaccard's coefficient of similarity (JCS) was performed to evaluate medicinal plant species composition and similarity among different areas. The similarity was calculated between the present study area (Ganta Afeshum District) and other areas of a similar agroecological zone which have been studied by other researchers in different parts of Ethiopia. The formula of JCS is represented as [36]:

$$JCS=c(a+b+c)$$

where JCS is Jaccard's coefficient of similarity, *a* is the number of species which is found in habitat A, *b* is the number of species found only in habitat B, and *c* is the number of common species found in habitats A and B.

Results

The informants involved in the present study were 17–79 years old with an average age of 47 years. From the total informants, 45 (57.7%) were in the age range of 38–58, while 17 of the informants were 59–79 years old and 16 were in the age range of 17–37 years old (see Additional file 1: Table S1).

More than half of the informants (43, 55.1%) were illiterate, and 21 (26.6%) of the informants had been in school for 1–8 years, 12 (15%) of the informants finished school in grade 9–12, and the remaining 2 had schooling above grade 12. From the 54 men informants, 47 were married while 7 men informants were single. From the total of 24 women informants, 11 were married whereas 13 women informants were single.

Medicinal plants in the study area

Diversity of medicinal plants

From the four study sites, a total of 173 medicinal plant species were documented (see Additional file **2**: Table S2). These were distributed across 77 plant families and 156 genera. The family Fabaceae stood first by contributing 17 (9.8%) species followed by Lamiaceae and Solanaceae with 9 (5.2%) species each (Table **2**).

Table 2

Diversity of medicinal plant species belonging to each plant family

No.	Family	Number of medicinal plant species	Percentage
1	Fabaceae	17	9.8
2	Lamiaceae	9	5.2
3	Solanaceae	9	5.2
4	Asteraceae	8	4.6
5	Apiaceae	6	3.5
6	Euphorbiaceae	6	3.5
7	Asclepiadaceae	5	2.9
8	Cucurbitaceae	5	2.9
9	Amaranthaceae	4	2.3
10	Moraceae	4	2.3
11	Polygonaceae	4	2.3
12	Rutaceae	4	2.3
	Others	92	53.2
	Total	173	100

Distribution of medicinal plants in the study sites

The medicinal plants were unevenly distributed in the four study sites: 38.6% in Tsaedat-Hamlo, 33.5% in Hagereselam, 15.9% in Sasun-Bethaweryat, and 12.1% in Dbla-Siet (Fig. **2**).

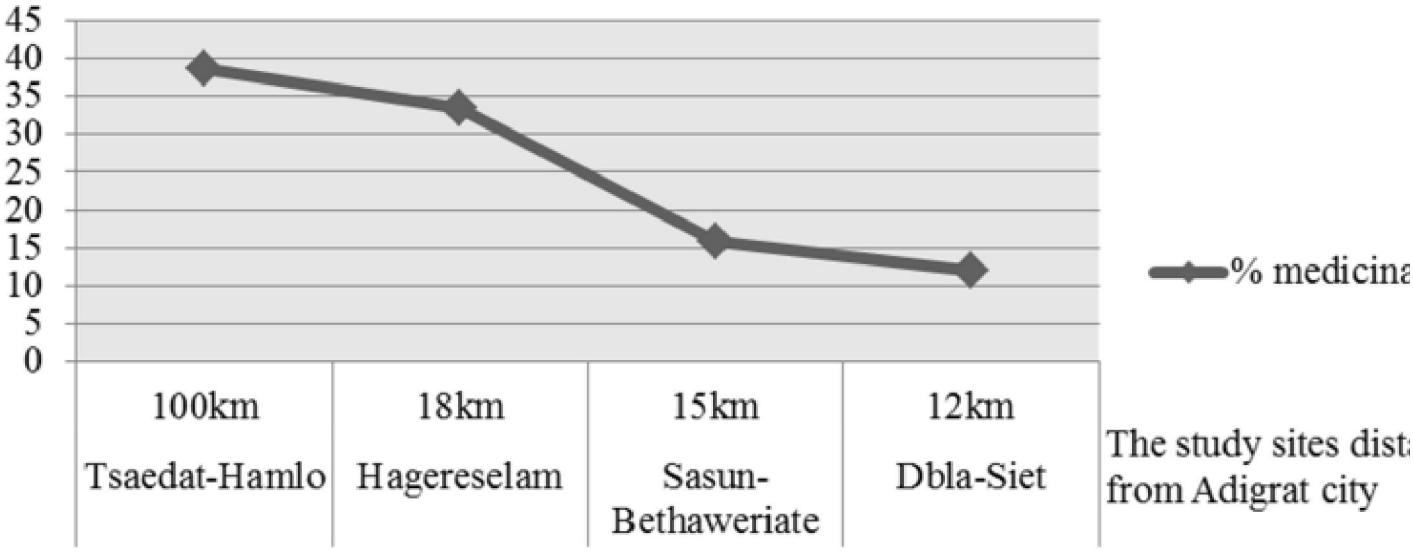

Fig. 2

Distribution of medicinal plants in the four study sites

Source of medicinal plants

From the 173 medicinal plant species, 116 (67.4%) were gathered from the natural vegetation followed by 34 (19.7%) from home gardens (Fig. **3**).

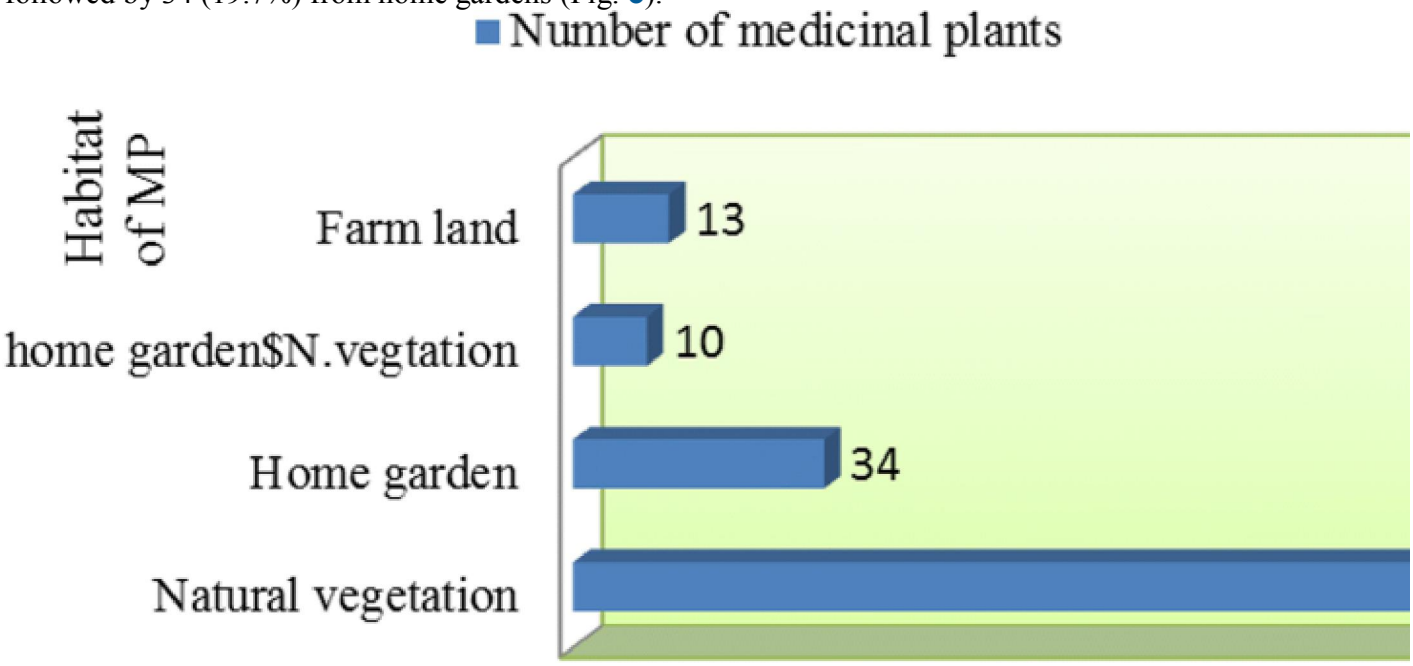

Fig. 3

Source of medicinal plants in the study area

Growth form (habit) of medicinal plants

The collected medicinal plant species have diverse life forms. From a total of 173 medicinal plants, 69 (39.9%) were herbs which constitute the highest number followed by shrubs 58 (33.5%) (Fig. 4).

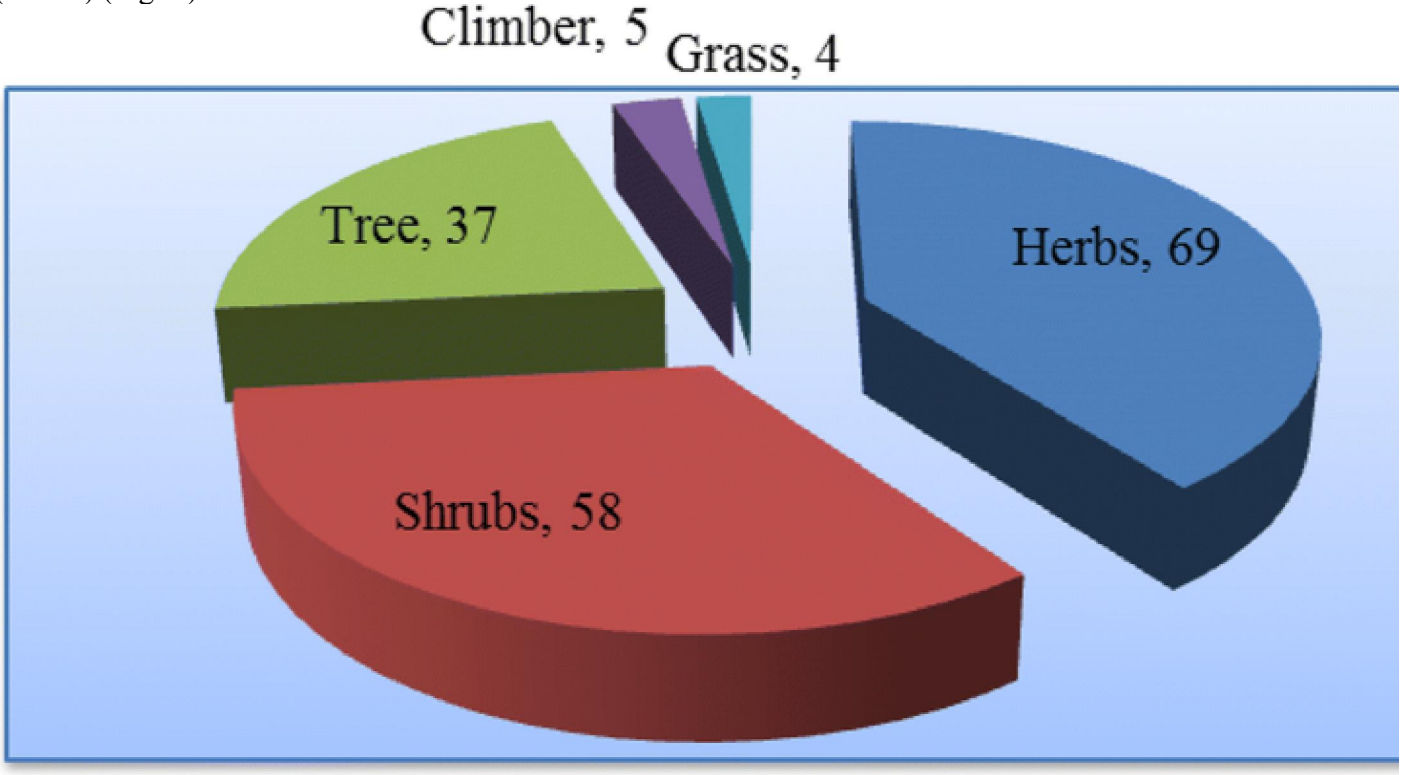

Fig. 4

Habit of medicinal plants

Parts of the medicinal plants used

Leaves were the most commonly used part of the medicinal plants and accounted for 129 species (38.6%) followed by roots 57 (17.4%) and seeds 38 (11.4%) (Table 3).

Table 3

Medicinal plant parts used in traditional medicines

Part used	Number	Percentage
Leaf	129	38.62
Root	57	17.06
Seed	38	11.38
Fruit	32	9.58

Part used	Number	Percentage
Bulb	23	6.88
Bark	19	5.68
Latex	11	3.29
Stem	7	2.09
Leaf and root	6	1.79
Whole plant	5	1.49
Flower	3	0.89
Leaf and stem	2	0.59
Root and bark	2	0.59
Total	334	100

Conditions of preparation

Plants were prepared fresh, dry, or both fresh and dry. The majority of 212 (64%) were prepared in fresh form followed by dry 78 (23%) (Fig. **5**).

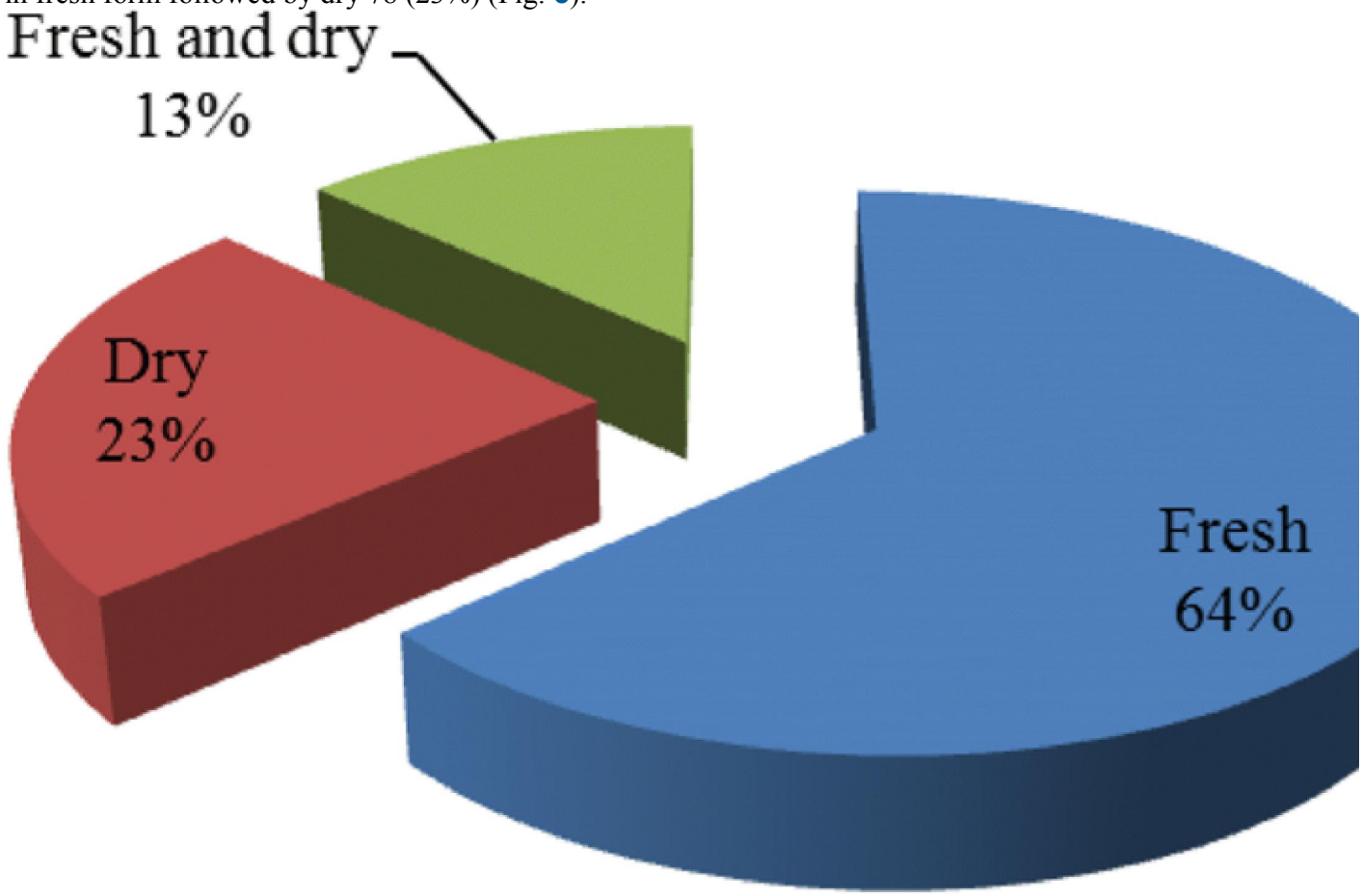

Fig. 5

Condition of remedy preparation of medicinal plants

Method of preparation

It is known that there are different ways to prepare medicinal plants to treat human and livestock ailments. In the case of Ganta Afeshum District, the major method of preparation was direct and immediate/unprocessed use of the medicinal plants which amounted to 17.9%, followed by grinding 16.8% (Table **4**).

Table 4

Methods used in the preparation of remedies

No.	Method of preparation	Frequency	Percentage
1	Direct and immediate/unprocessed use of medicinal plants	60	17.96
2	Grinding part of the medicinal plants	56	16.75
3	Grinding then mixing with water, honey, and other	52	15.57
4	Boiling in water, milk, honey, and other	37	11.08
5	Grinding and then filtering	28	8.38
6	Powdering and then mixing with water, honey, and other	27	8.08
7	Burning	17	5.09
8	Powdering	16	4.79
9	Heating	7	2.09
10	Squeezing	6	1.79
11	Roasting	4	1.2
12	Powdering and cooking	3	0.9
13	Grinding and boiling	4	1.2
14	Grinding and soaking	2	0.6
15	Grinding and then burning	2	0.6
16	Powdering and heating	2	0.6
17	Grinding and squeezing	2	0.6
18	Powdering and boiling	2	0.6
19	Powdering and smoking by burning	2	0.6
20	Powdering and heating then mixing	2	0.6
21	Roasting and then grinding	2	0.6
22	Soaking	1	0.3
	Total	334	100

Routes of administration

The result showed that the traditional medicine was administered through different routes; the most common one was orally that accounted for 144 (43.1%) followed by dermal which account for 114 (34.1%) (Fig. **6**).

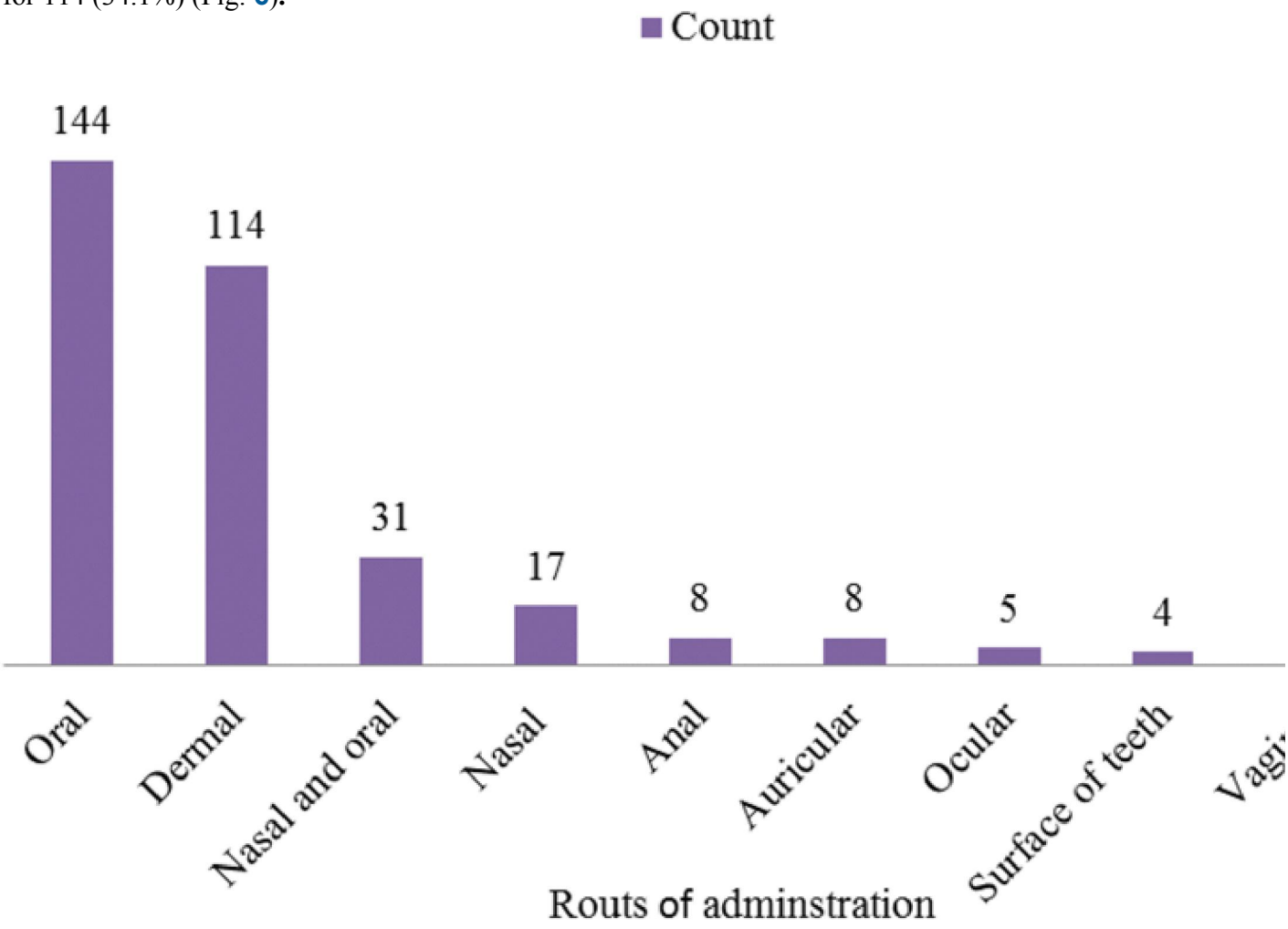

Fig. 6

Route of remedy administration for treatment of human and livestock ailments

Modes of application

The data collected from the study area showed that many of the prepared remedies were taken by drinking that accounted for 24.3% followed by smearing 22.8% (Table **5**).
Table 5

Methods of application of medicinal plants

No.	Modes of application	Frequency	Percentage
1	Drinking	81	24.25

No.	Modes of application	Frequency	Percentage
2	Smearing	76	22.75
3	Eating	35	10.48
4	Fumigation	34	10.18
5	Chewing	19	5.69
6	Tie	17	5.09
7	Swallowing	15	4.49
8	Sniffing	13	3.89
9	Rubbing	13	3.89
10	Dropping	12	3.59
11	Washing	8	2.39
12	Smelling	3	0.89
	Total	334	100

Solvents and ingredients used

The preparation of traditional medicine needs solvents and ingredient. The major solvent was water that accounts for 34.4%, but honey, butter, and cereal oils were also widely used ingredients (Table **6**).

Table 6

Solvents and ingredients used in the preparation of traditional medicines

No.	Solvents and ingredients	Frequency	Percentage
1	Water	43	34.4
2	Honey	28	22.4
3	Butter	19	15.2
4	Cereal oils	7	5.6
5	Tella/teji/brzi	6	4.8
6	Milk/ergo	5	4
7	Tea/coffee	4	3.2
8	Animal fat	4	3.2
9	Animal urine	1	0.8
10	Animal bile	1	0.8
11	others	7	5.6
	Total	125	100

Ailments of humans that can be treated by medicinal plants

In the study area, 74 human ailments were identified to be treated by many medicinal plants (see Additional file **3**: Table S3). It was found that single medicinal plant species can treat a number of human ailments, and single ailments can be treated by many medicinal plant species. For example, wounds can be treated by 20 medicinal plants and febrile illness, abdominal pain, headache, and cough can be treated by 15 medicinal plant species each (Table **7**).
Table 7

Human ailments that can be treated by medicinal plants

No.	Human ailments	No. of medicinal plants used to treat the ailment
1	Wound	20
2	Febrile illness	15
3	Abdominal pain	15
4	Headache	15
5	Cough	15
6	Evil eye	12
7	Evil spirit	11
8	Men impotence	9
9	Tonsillitis	8
10	Bone dislocated	8
11	Hemorrhoids	8
12	Ear infection	8
13	Asthma	8
14	Skin rash	7
15	Toothache	6
16	Tapeworm	6
17	Constipation	6
18	Cutaneous leishmaniasis	6
19	Body swelling	5
20	Paralysis	5
	Other	118
	Total	311

Ailments of livestock that can be treated by medicinal plants

In the study area, 96 medicinal plants were identified for the treatment of 23 livestock ailments (see Additional file **4**: Table S4). Like for humans, one livestock ailment can be treated by several medicinal plants; for instance, leech can be treated by 12 medicinal plants, diarrhea and shivering (locally called halfyen) can be treated by 13 medicinal plants each (Table **8**).
Table 8

Livestock ailments that can be treated by medicinal plants

No.	Livestock ailment	No. of medicinal plants used to treat livestock ailment
1	Leech	12
2	Diarrhea and shivering	13
3	Bloating	11
4	Newcastle disease	7
5	Abdominal pain	7
6	Wound	5
7	Body swelling	5
8	Hornworm	4
9	Evil spirit	4
10	Bone fracture	4
11	Fleas and lice	3
12	Eye diseases	3
13	Anthrax	3
14	Ticks	3
15	Skin rash	2
16	Prolonged delivery	2
17	Fascioliasis	2
18	Blackleg	1
19	Urine retention	1
20	Rabies	1
21	Malaria	1
22	Cough	1
23	Evil eye	1
	Total	96

Medicinal plants used for treatment of both humans and animals

In Ganta Afeshum District, 15 types of human and livestock ailments were recorded and 22 medicinal plants were identified to treat both human and livestock ailments (Table **9**) (see Additional file **5**: Table S5).

Table 9

Human and livestock ailment that can be treated by medicinal plants

No.	Human and livestock ailment	No. of medicinal plants used to treat human and livestock ailment

No.	Human and livestock ailment	No. of medicinal plants used to treat human and livestock ailment
1	Abdominal pain	4
2	Diarrhea	2
3	Bone fracture	2
4	Malaria	2
5	Skin rash	2
6	Wound	1
7	Cough	1
8	Evil spirit	1
9	Evil eye	1
10	Eye diseases	1
11	Urine retention	1
12	Body swelling	1
13	Prolonged delivery	1
14	Rabies	1
15	Dislocated bone	1
	Total	22

Informants' knowledge on traditional medicinal plants

Comparison between sexes

The result for the comparison between men and women in traditional medicinal plant knowledge showed that the difference is not statistically different (Table **10**).

Table 10

Independent sample *t* test to compare men and women knowledge of traditional medicinal plants

Social group	Informants type	*N*	Average	SD	*t* value	df	*p* value
Gender	Men	54	11.70	7.830	− 0.795	76	0.429
	Women	24	13.21	7.431	− 0.812	46.4	0.421

Comparison between married and single informants

The result of independent sample *t* test indicated that there is a significant knowledge difference between married and single informants (Table **11**).

Table 11

Traditional medicinal plant knowledge of married and single informants

Parameter	Group of informants	*N*	Mean	Std. deviation	*t* value	df	*p* value
Marital status	Married	58	12.64	7.357	2.738	76	0.008
	Single	20	7.65	5.923	3.043	40.75	0.004

Comparison between the key and general informants

Analysis using the SPSS computer program showed that there was a significant mean knowledge difference between the key informants and general informants (Table **12**).

Table 12

Traditional medicinal plant knowledge of key and general informants

Parameter	Category of informants	*N*	Mean	Std. deviation	*t* value	df	*p* value
Way of selection	General informants	58	9.6724	5.52947	5.827	76	.000
	Key informants	20	19.4000	8.60477	4.730	24.630	.000

Differences in knowledge depending on educational background

There was a significant negative correlation between the informants' educational level and the number of medicinal plants reported (Pearson correlation coefficient, $r = -0.959$, at $\alpha = 0.05$, $p = 0.041$).

Differences in knowledge depending on age

There was a positive correlation between the age and the knowledge of traditional medicinal plants of the informants, in the study area (Pearson correlation coefficient, $r = 0.339$, $p = 0.780$).

Informant consensus factor

The informant consensus factor (ICF) was calculated. The highest values were obtained for febrile illness and tonsillitis (0.866) followed by abdominal pain, diarrhea, tapeworm, amoeba and gastritis (0.645), and wound, skin rash, cutaneous leishmaniasis, ringworm, irritation, and skin rash (0.458). Ear infection, eye problem, and the category of heart diseases, blood pressure, and Rh factor had lower ICF (Table **13**).

Table 13

Informant consensus factor for categorized diseases

No.	Diseases category	Nur	Nt	ICF
1	Skin problems such as wound, skin rash, cutaneous leishmaniasis, ringworm, irritation, and skin rash	73	40	0.458
2	Gastrointestinal problems such as abdominal pain, diarrhea, tapeworm, amoeba, and gastritis	94	34	0.645
3	Evil eye, evil spirit, sray/dgam	43	28	0.357

No.	Diseases category	Nur	Nt	ICF
4	Febrile illness, tonsillitis	168	25	0.866
5	Ear infection, eye diseases	19	14	0.277
6	Malaria, snake bite, rabies, scorpion bite	12	8	0.363
7	Men impotence, abortion, fear and dislike of sex in women	21	14	0.35
8	Headache, toothache, dandruff	38	22	0.432
9	Heart disease, blood pressure, Rh factor	7	6	0.166

Fidelity level index

Withania somnifera, *Lagenaria siceraria*, *Nigella sativa*, *Laggera tomentosa*, *Silybum marianum*, *Plectranthus lanuginosus*, *Linum usitatissimum*, *Chenopodium ambrosioides*, *Vernonia amygdalina*, and *Asparagus africanus* had the highest fidelity level values, and this was an indication of their good healing potential in the study area (Table **14**).
Table 14

The relative healing potential of 15 most cited medicinal plants used against human ailments

No.	Scientific name of the plant	Examples of ailment treated	Ip	Iu	FL%
1	*Withania somnifera*	Febrile illness	12	12	100
2	*Lagenaria siceraria*	Wound	2	2	100
3	*Nigella sativa*	Abdominal pain	1	1	100
4	*Laggera tomentosa*	Bleeding	5	5	100
5	*Silybum marianum*	Impotence in men	1	1	100
6	*Plectranthus lanuginosus*	Tonsillitis	1	1	100
7	*Linum usitatissimum*	Constipation	3	3	100
8	*Chenopodium ambrosioides*	Snake bite	1	1	100
9	*Vernonia amygdalina*	Fungal infection	7	7	100
10	*Asparagus africanus*	Evil eye	2	2	100
11	*Citrus limon*	Skin problem	23	24	95.83
12	*Ruta chalepensis*	Cough	19	20	95
13	*Acokanthera schimperi*	Hemorrhoids	11	12	91.66
14	*Euclea racemosa*	Toothache	7	8	87.5
15	*Aloe megalacantha*	malaria	9	11	81

FL% percentage of fidelity level, *Ip* the number of informants who independently indicated the use of a species for the same major ailments, *Iu* the total number of informants who mentioned the plant for any major ailment

Preference ranking

The five most mentioned medicinal plants (Table 15) were reported for the efficient treatment of febrile illness, and they were selected for preference ranking. Ten key informants were asked to rank the given medicinal plants based on their usefulness, 5 for the medicinal plant which they thought is the most successful for the treatment of febrile illness, and 1 for the least effective plant. *Cordia africana* was ranked first (Table 15).

Table 15

Preference ranking of medicinal plants used for the treatment of febrile illness

Scientific name of medicinal plant	Informants (1–10)										Total	Rank
	1	2	3	4	5	6	7	8	9	10		
Cordia africana	5	5	4	5	5	4	5	5	5	5	48	1st
Laggera tomentosa	3	4	1	3	2	4	3	2	1	4	27	4th
Medicago polymorpha	5	1	3	4	5	4	3	3	4	1	33	3rd
Schinus molle	2	1	3	1	3	3	2	3	2	1	21	5th
Vernonia amygdalina	4	5	3	4	3	5	4	2	3	4	37	2nd

Use value and use diversity of medicinal plants in the study area

Of the total 173 medicinal plants documented, 50 (28.90%) had only medicinal importance. The other 123 (71.09%) species had some additional purpose besides medicinal value (Table 16).

Table 16

Use diversity of medicinal plants in the study area

Uses	No. of species	Percentage
Only medicinal role	50	28.90
Medicinal plus other uses	123	71.09
Edible	20	11.56
Forage	10	5.78
Washing “soap/detergent”	5	2.89
Tooth brush	15	8.67
Spices	7	4.04
House construction	13	7.51
Fence	14	8.09
Stick	6	3.46
Fuelwood	9	5.20
Shade	11	6.35

Uses	No. of species	Percentage
Local alcoholic preparation	8	4.62
Glue	5	2.89

The calculated results of use values (UV) showed that *Rhamnus prinoides* scored the highest use values (4.5) followed by *Cordia africana* and *Ruta chalepensis* than other species (Table 17).

Table 17

Use value of the most important medicinal plant species in the study area

Scientific name of medicinal plant	∑*Ui*	*n*	UV
Rhamnus prinoides	18	4	4.5
Cordia africana	60	15	4.00
Ruta chalepensis	15	4	3.75
Allium sativum	11	3	3.66
Schinus molle	25	7	3.57
Vernonia amygdalina	31	9	3.44
Lepidium sativum	85	25	3.40
Withania somnifera	40	12	3.33
Olea europaea	13	4	3.25
Acacia albida	6	2	3.00

Direct matrix ranking

In addition to medicine, the local community used the plants for various purposes such as firewood, charcoal making, for eating as edible fruit, construction, and furniture. The result of direct matrix ranking showed that *Carissa spinarum*, *Acacia etbaica*, *Juniperus procera*, *Cordia africana*, *Olea europaea*, *Mimusops kummel*, *Ziziphus spina-christi*, and *Acacia albida* were ranked first to eighth, respectively. Likewise, the six use values report on eight selected plant species were summed up and ranked, and the result showed firewood, charcoal, medicinal, construction, furniture and farm tools, edible fruit were ranked first, second, third, fourth, fifth, and sixth, respectively (Table 18).

Table 18

Direct matrix ranking of eight plant species by four informants based on six use criteria (5 = best; 4 = very good; 3 = good; 2 = less used; 1 = least used, and 0 = no value)

Plant species	Use categories						Total	Rank
	Medicinal	Furniture and farm tools	Construction	Edible fruit	Charcoal	Firewood		

	Informants (I_1–I_4)				Informants (I_1–I_4)				Informants (I_1–I_4)				Informants (I_1–I_4)				Informants (I_1–I_4)				Informants (I_1–I_4)					
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
Carissa spinarum	5	5	4	5	5	5	5	4	5	5	5	5	5	5	4	5	4	5	5	4	5	5	5	5	115	1st
Cordia africana	4	1	3	5	2	3	3	4	3	4	5	2	5	2	3	4	1	2	3	3	4	4	3	4	77	4th
Olea europaea	2	2	3	3	3	3	3	3	2	1	4	4	0	0	0	0	4	5	4	5	4	3	4	3	65	5th
Ziziphus spina-christi	2	1	3	2	1	2	1	4	2	2	1	3	2	3	3	1	1	2	3	2	1	4	2	3	51	7th
Mimusops kummel	2	2	4	3	1	1	3	3	2	1	1	5	2	2	3	3	2	2	2	4	2	2	3	3	58	6th
Acacia albida	2	2	3	1	1	3	2	2	1	1	2	2	0	0	0	0	2	2	3	3	2	2	2	2	40	8th
Acacia etbaica	5	5	5	5	4	5	5	4	5	5	5	4	0	0	0	0	5	5	5	5	5	5	5	5	97	2nd
Juniperus procera	4	4	5	4	3	3	4	3	5	3	4	2	0	0	0	0	5	5	4	4	5	5	5	5	82	3rd
Total	106				98				101				52				111				117					
Rank	3rd				5th				4th				6th				2nd				1st					

Paired comparison

The disease tonsillitis, locally known as *hanate* commonly attacks children, and it can be treated by using several medicinal plants. The result indicated that *Rhamnus prinoides* and *Achyranthes aspera* were the most preferred and effective treatment (Table **19**).
Table 19

Paired comparison of five medicinal plants for treating tonsillitis

Scientific name of medicinal plants	Informants (I_1–I_{10})										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Rumex nepalensis	0	3	2	4	3	4	2	3	1	4	26	4th
Buddleja polystachya	1	2	3	4	3	0	2	3	4	4	30	3rd
Achyranthes aspera	3	4	3	3	4	3	4	3	3	4	34	2nd
Lycopersicon esculentum	1	3	0	2	1	3	3	4	1	2	21	5th
Rhamnus prinoides	4	4	4	3	4	3	4	4	4	4	38	1st

Comparison with other districts through Jaccard's coefficient of similarity

The highest Jaccard's coefficient of similarity in the composition of medicinal plants was found between the study area and Kilte Awulaelo District, whereas similarity was less with Tahitay Adiyabo and Kafta Humera districts (Table **20**).
Table 20

Jaccard's coefficient of similarity (JCS)

Study area and references	*a*	*b*	*c*	JCS	Percentage
Ganta Afeshum District (the study area)	173	–	–		
Ofla District, Ethiopia [**19**]	120	60	53	0.22	22
Kilte Awulaelo District, Ethiopia [**20**]	116	57	57	0.278	28
Tahitay Adiyabo and Kafta Humera districts, Ethiopia [**46**]	131	73	42	0.171	17
Asgede Tsimbila District, Ethiopia [**18**]	126	21	47	0.24	24

a number of species found only in Ganta Afeshum District, *b* number of species found only in other district, *c* number of species found in both Ganta Afeshum District and other district

The degree of similarity between the study area and other areas might relate to vegetation types as well as soil types and climatic conditions in the region.

Source and transfer of traditional medicinal plant knowledge

The highest traditional medicinal plant knowledge was acquired from family members that is 39.74% from the father and 24.35% from the mother, followed by religious institutions (8.9%), reading books (6.41%), and as a gift from God (5.12%) (Fig. **7**).

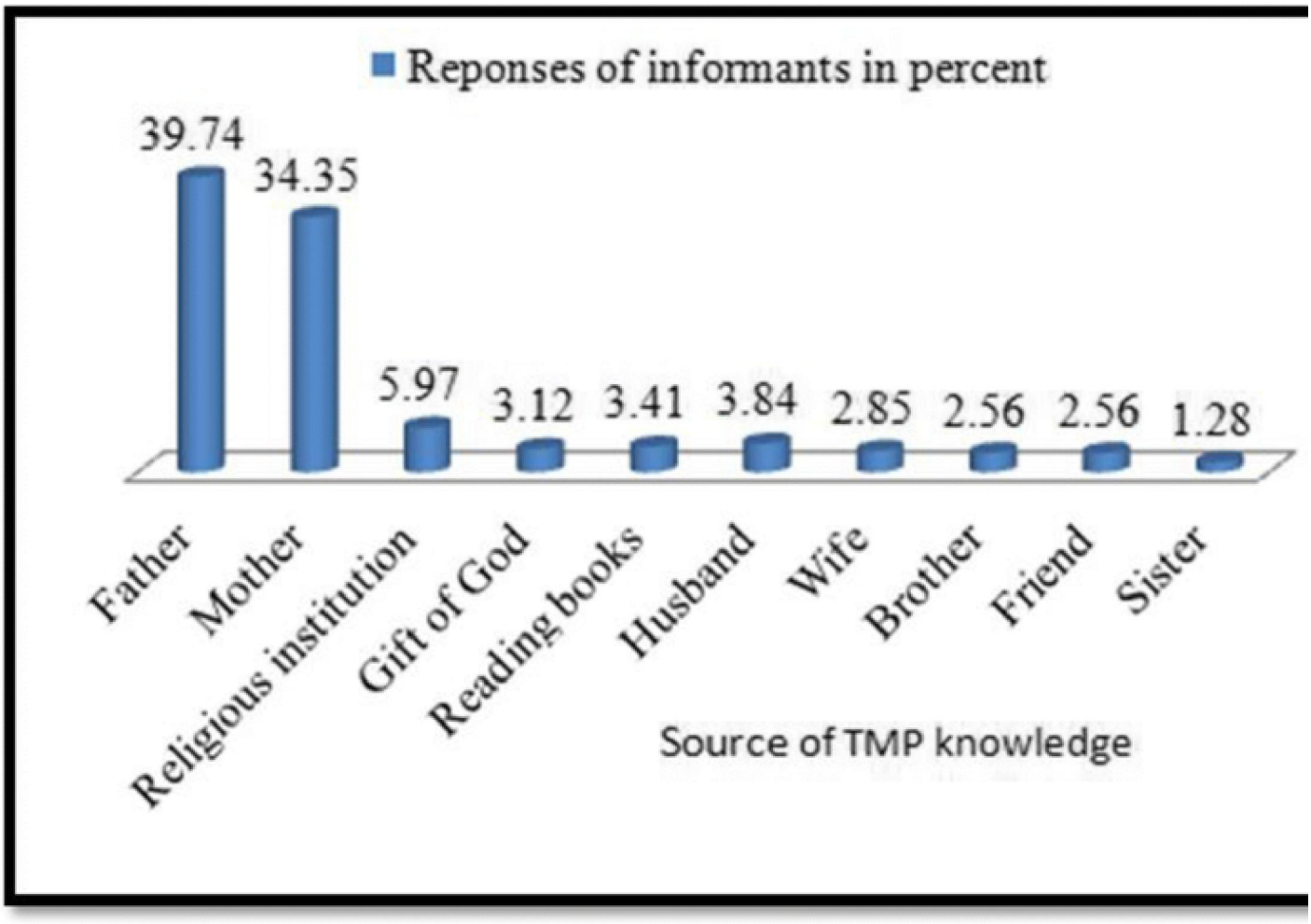

Fig. 7

Source of traditional medicinal plant knowledge in Ganta Afeshum District

Threats to medicinal plants and associated knowledge

Agricultural expansion was mentioned as the main threat to medicinal plants in the study area followed by cutting trees for firewood and for charcoal making (Fig. **8**).

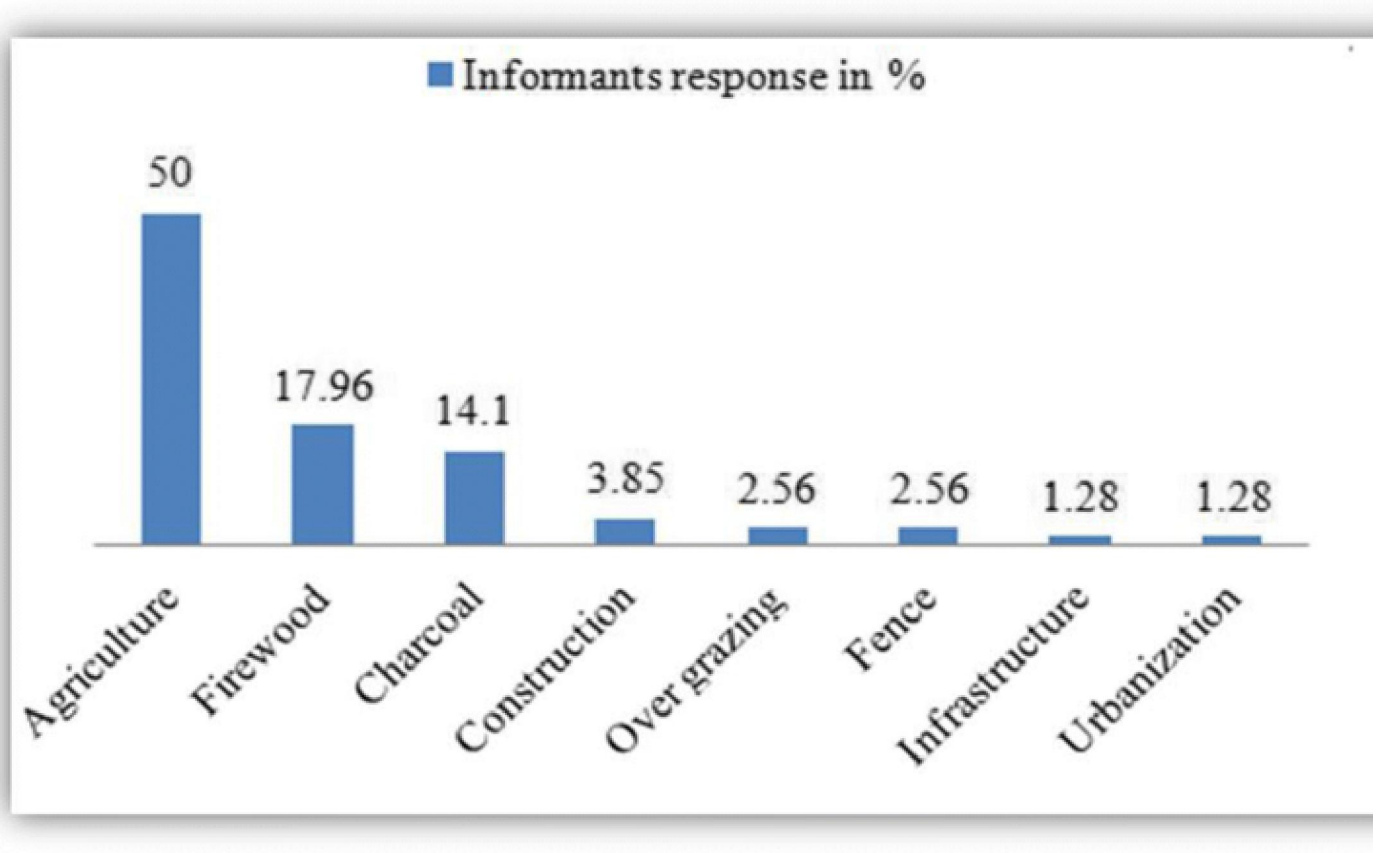

Fig. 8

Threats of medicinal plants in the study area

According to the informants, the indigenous knowledge of medicinal plants was faced with many challenges, and the transmission of this knowledge and practice of traditional medicine was in danger due to the unwillingness of the young generation to gain the traditional medicinal plant knowledge. Also, the traditional healers do not show the medicinal plants freely to anybody (Table **21**).
Table 21

Priority ranking of threats to the knowledge of medicinal plants (values: 1 = least threat, 5 = highest threat)

Threats to MPs knowledge	Informants										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
The traditional healers do not show the medicinal plants	3	5	4	4	3	5	4	4	4	3	39	2nd
Expansion of schools	3	4	3	4	3	4	3	4	3	3	34	3rd
The establishment of health center and posts	3	3	3	3	3	3	3	3	2	3	29	4th

Threats to MPs knowledge	Informants										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Unwillingness of young generation	5	4	5	5	4	4	4	5	4	5	45	1st
Youth moving to urban areas	3	2	2	3	3	2	2	3	2	3	25	5th

Discussion

One hundred seventy-three medicinal plant species were identified for the treatment of human and livestock ailments that distributed across 77 families and 156 genera. From the 77 plant families, Fabaceae stood first by contributing 17 (9.82%) species followed by Lamiaceae and Solanaceae that contain 9 (5.2%) species. Similarly, various studies in Ethiopia [2, 11, 37, 38] showed that Fabaceae was the dominant family among the others, whereas other studies [19, 39, 40, 41, 42, 43, 44] noted that Asteraceae was the dominant one among others.

The result indicates that medicinal plants are unevenly distributed in the four study sites. More of the medicinal plants were found in Tsaedat-Hamlo and Hagereselam due to certain reasons. Tsaedat-Hamlo is a remote part of Ganta Afeshum District about 100 km from Adigrat. This has caused insufficient coverage of modern medicine, unaffordable as well as inadequate health facilities, and medical personnel. Instead, many people there use the accessible, inexpensive, and locally available traditional medicinal plants. The kebeles Hagerselam and Tsaedat-Hamlo also had a better vegetation cover and more traditional healers than Sasun-Bethaweryat and Dbla-Siet. Also, the far remote kebeles were less influenced by modernization and urbanization. Generally, urbanization and modernization negatively affect the knowledge of traditional medicinal plants. There is also a public health concern as modernization alters the practice of traditional medicine. The loss of traditional medicinal plant knowledge of these kebeles' people alters health care-seeking behavior. The residents of Sasun-Bethaweryat and Dbla-Siet were more educated and engaged in commercial activities; as a result, they were seeking modern medication. Less educated people tend to be less acculturated and know more medicinal plants while educated people tend to be more acculturated, know few medicinal plants, and seek Western medical treatment [45].

From the total of 173 medicinal plant species, 116 (67.44%) plants were gathered from the natural vegetation followed by 34 (19.65%) from home gardens. This indicates that the communities of the study area highly depend on the wild source to obtain the medicinal plants; in other words, the habit of cultivating medicinal plants in home gardens was not much developed. Similar studies conducted elsewhere in different parts of Ethiopia [10, 45, 46, 47, 48, 49] also reported that most of the medicinal plants were collected from natural vegetation.

The medicinal plants in the study area had diverse growth form: herbs 69 (39.88%), shrubs 58 (33.52%), trees 37 (21.39), and climbers 5 (2.89). The dominance of herbs and shrubs is in agreement with several studies conducted in Ethiopia [45, 48, 50, 51, 52]. In contrast, Lulekal et al. [2] reported from Mana Angetu District, southeastern Ethiopia, that shrubs there made up the highest proportion of the medicinal plants; the finding of Regassa [38] in Hawassa city, southern Ethiopia, showed that the majority of the collected medicinal plants there were trees, followed by shrubs, herbs, and climbers.

The results showed that the local people of the Ganta Afeshum District use different parts of medicinal plants to prepare remedies. Leaves were the most widely used part, which is an important finding because harvesting leaves does not have detrimental effects on the survival of the medicinal plants, whereas harvesting roots and whole plants has a negative impact on the survival. In the same way, several studies [45, 47, 53, 54, 55, 56] have revealed that the leaves of the medicinal plants were repeatedly used for the treatment of human and livestock ailments. On the other hand, Mesfin et al. [48] and Assefa and Abebe [57] reported that the roots were a widely utilized medicinal plant part to treat different ailments.

Most of the medicinal plants (212, 64%) were prepared to be used in the fresh form, and this indicates that fresh medicinal plants are much easier and quicker to prepare for remedy than the other forms. Abebe [11], Gebeyehu [42], and Chekole [45] reported similar results.

In Ganta Afeshum District, the common method of traditional medicine preparation is direct and immediate/unprocessed use of the medicinal plants followed by grinding and boiling in water. Elsewhere in Ethiopia, similar findings were reported [11, 37, 39, 47, 57, 58], and grinding, pounding, smoking, squeezing, burning, roasting, and powdering are common the methods of preparations of traditional medicines.

Oral administration was the most common way for traditional medicine followed by dermal, nasal, and anal. This discovery is in line with many findings of researchers [2, 16, 19, 39, 43, 58, 59] who reported that the major way of administration was oral. In contrast, Teklay et al. [20] reported that dermal was a common way of administration. Many of the prepared traditional medicines were taken by drinking followed by smearing, eating, fumigation, and chewing. This finding is concurrent with the discoveries of Gebeyehu [42] who reported that prepared remedies were applied by drinking, dropping, creaming (ointment), eating, inhaling/sniffing, and sucking. Similarly, Tamene [53] revealed that the medicinal plants prepared by traditional healers were applied by different methods such as drinking, painting, chewing, swallowing, put on, smelling, and smoking. In addition, traditional medicines of the study area were prepared with solvents and ingredients, such as water, honey, butter, cereal oils like sesame oil, teji/tella (local beer), milk/ergo (yoghurt), and tea/coffee. A similar study was carried out in Chifra District, Afar Region, Northeastern Ethiopia, by Seifu [50] who reported the Afar people and their traditional healers used solvents and additives like water, honey, sugar, and milk of goat and camels during the preparation of traditional medicines.

In Ganta Afeshum District, 74 human, 23 livestock, and15 both human and livestock ailments were recognized. This indicated that the people of the district were suffering from many ailments as compared to other areas such as in Gimbi District, western Wellega, where Tolasa [58] identified 49 human and 19 livestock ailments. In Minjar-Shenkora District, North Shewa Zone of Amhara Region, Alemayehu [43] reported 45 human ailments; in Seru District, Arsi Zone of Oromia Region, Gebrehiwot [39] reported 53 human and 17 livestock ailments; and in Wondo Genet natural forest and adjacent kebeles, Sidama Zone, SNNP Region, Tamene [53] recognized 40 human and 17 livestock ailments. Because of this burden of health problem, the people of Ganta Afeshum District widely used many medicinal plants, and that is why such a large number of medicinal plants were identified. Moreover, a single human ailment was found to be treated by several medicinal plants. This is in agreement with the findings of different scholars [40, 41, 43]

who have reported wounds, headache, febrile illness, evil eye, tonsillitis, evil spirit, hemorrhoids, toothache, earache, and cough to be treated by several medicinal plants.

Men and women informants had equal traditional medicinal plant knowledge in the study area. This result is in line with the findings of Asnake et al. [55] but disagrees with the discoveries of Teklehaymanot and Giday [59] who showed the presence of a significant difference in traditional medicinal plant knowledge between men and women. On the other hand, married informants reported significantly more medicinal plants than single informants. This is because most of the married informants were adults and more experienced with plant contact. They also possess children and livestock, they lead a family, and they are responsible for the family health care and are also the major players in using medicinal plants. Similarly, Beyene [33] reported that married informants had a better knowledge of traditional medicinal plants than single informants.

Key informants cited significantly more medicinal plants than the general informants. This is because the key informants were traditional herbalists with broad, empirical traditional medicinal plant knowledge. They cultivate, collect, process, prepare, administer, and treat patients by using medicinal plants. General informants cited fewer medicinal plants; even though they perform self-medication (homemade remedies), they are not knowledgeable about medicinal plants. Beyene [33] got similar results.

There was a significant negative correlation between the informants' educational level and their knowledge of traditional medicinal plants. This means that with a higher level of education, the knowledge of traditional medicinal plants decreases. Thus, modern education weakens the traditional medicinal knowledge of the young generation. This discovery agrees with the research carried out in Dire Dawa city, eastern Ethiopia, by Kebede et al. [47].

The more aged informants were, the more they were knowledgeable about traditional medicinal plants. Similar results were reported by Kebede et al. [47], Kefalew et al. [60], and Birhanu [61]. In the exercise of preference ranking, *Cordia africana* scored first rank, and *Vernonia amygdalina*, *Medicago polymorpha*, *Laggera tomentosa*, and *Schinus molle* scored second to the fifth rank, respectively, for the efficient treatment of febrile illness. In a study from Ofla wereda, the southern zone of Tigray Region [19], *Cynoglossum lanceolatum* was ranked first. Similarly, a study conducted by Chekole [45] in Gubalafto District showed that *Cynoglossum coeruleum* and *Ocimum latifolium* were preferred by the community to treat febrile illness. On the other hand, *Momordica foetida* was ranked first as the most effective for the treatment of rabies among Guji agro-pastoralists, Bule Hora District of Borana Zone, Oromia Region [54], and *Nicotiana tabacum* was ranked first for the treatment of snake bite in Gimbi woreda, western Wellega [58].

Furthermore, in direct matrix ranking, *Carissa spinarum*, *Acacia etbaica*, and *Juniperus procera* were ranked first, second, and third, respectively, showing multipurpose roles and the most preferred and extensively exploited by the local community. For this reason, they were the most threatened plant species in the study area and need conservation priority for their sustainability. Conversely, *Cordia africana*, *Olea europaea*, *Mimusops kummel*, *Ziziphus spina-christi*, and *Acacia albida* were the least preferred multipurpose medicinal plants and less threatened since they are not widely exploited by local communities. Similar studies were carried out elsewhere in other parts of Ethiopia like in Goma Wereda, Jima Zone of Oromia Region, Ethiopia, by Etana [40]. He used the method of direct matrix ranking and revealed that *Cordia africana* was the

most preferred and first ranked multipurpose plant species. In another study in Seru wereda, Arsi Zone, Oromia Region, Ethiopia, Gebrehiwot [39] indicated that *Acacia abyssinica* was the most preferred multipurpose plant. A related study by Teklay et al. [20] indicated *Cordia africana*, *Eucalyptus globules*, *Opuntia ficus-indica*, and *Dodonia angustifolia* as the most preferred multipurpose plants by the local people in Kilte Awulaelo District which is from the same zone of the study area demonstrating the presence of cultural use difference of community.

In paired comparison, *Rhamnus prinoides* and *Achyranthes aspera* were ranked first and second indicating being the most preferred and effective for treatment of tonsillitis as compared to *Rumex nepalensis* and *Lycopersicon esculentum.* Similarly, Teklay et al. [20] and Chekole [45] showed *Rhamnus prinoides* and *Achyranthes aspera* were used for the same purpose to treat tonsillitis. Moreover, ten medicinal plant species have the highest use values in the study area, indicating that they are more effective to treat ailments. Among the total documented medicinal plant species, *Rhamnus prinoides* followed by *Cordia africana* and *Ruta chalepensis* were used to treat the highest number of diseases. In this sense, a plant with a high use value would theoretically have a correspondingly high cultural consensus [35]. Therefore, to maintain the continuous use of plant resources in the study area, conservation priorities should be given for those multipurpose and more threatened ones.

Conclusions

Ganta Afeshum District is relatively rich in medicinal plant species. One hundred seventy-three medicinal plant species were collected and identified. These medicinal plants were used by the inhabitants to treat 112 human and livestock ailments. Wounds, febrile illness, abdominal pain, headache, cough, evil eye, evil spirit, men impotence, and tonsillitis were frequently occurring human ailments, whereas, leech, bloating, Newcastle, and bone fracture were common livestock ailments. This indicated that the local community depends on using medicinal plant species and the associated indigenous knowledge to prevent diverse human and livestock ailments, although modern health services are expanding.

In the study area, there was no knowledge difference between men and women informants on traditional medicinal plant knowledge, whereas, educational level and knowledge of medicinal plants of informants were negatively correlated. Thus, the age and medicinal plant knowledge of the informants were positively correlated, by which the younger informants showed less concern in sharing, recording, and examining processes of traditional medication. Greater preference ranking, use value scores, and fidelity level values of the documented medicinal plant species would enable the forthcoming phytochemical and pharmaceutical studies and conservation activities.

Natural vegetation was the main source of medicinal plants in Ganta Afeshum District followed by home gardens and farmlands. But nowadays, deforestation, agricultural expansion, overgrazing, drought, and overexploitation are threatening these plant resources and their habitat. Therefore, people of the study area should apply complementary conservation approaches (in situ and ex situ) for sustainable use of these resources and prevent species extinction.

Declarations

Acknowledgements

We would like to express our heartfelt appreciation to the local informants, local administrators, and agriculture extension workers of Tabya Tsaedat-Hamlo, Hagereselam, Dbla-Siet, and Sasun-Bethaweryat for their committed participation, factual and kind response, and sharing their traditional knowledge of medicinal plants. Besides, we would like to thank the Wereda Ganta Afeshum education office, health office, agricultural office, administration office, and plan and finance office for their support and provision of relevant information to conduct the study. We also thank the Department of Biology, College of Natural and Computational Sciences, Mekelle University, for the provision of materials and financial support. Moreover, we are indebted to Professor Ingvar Backeus, Researcher at Department of Ecology and Genetics, Plant Ecology and Evolution, Upsala University, Sweden, for his all-rounded help to develop and revise the paper critically and upgrade grammatical, linguistic, and scientific concepts of the manuscript.

Funding

The Department of Biology, College of Natural and Computational Sciences, Mekelle University, Mekelle, Ethiopia, funded the research.

Availability of data and materials

All data collected and analyzed in this paper are included within the article and attached in the form of “Appendices” as additional files. Voucher plant specimens are deposited in Mekelle University, Mekelle, Ethiopia.

Authors’ contributions

GG collected and analyzed the data and was the major contributor of the study. LK devised the techniques for data collection, performed and analyzed the data, and critically reviewed and organized the paper sequence. TB revised the article and organized the references. All authors read and approved the final manuscript.

Ethics approval and consent to participate

Letters of consent were taken from Mekelle University and Ganta Afeshum woreda Administration offices, prior to the data collections. Oral consents were also obtained from the informants by performing group discussions about the objectives of the study prior to the interviews, and all data were collected through their oral consents. Besides, participants were asked about their view if their name is openly accessed, and they have clearly agreed to have their names and personal data to be published. Finally, Mekelle University certified the research finding after it was presented for the thesis defense.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Additional files

List of medicinal plants used for treating human ailments

List of medicinal plants used for treating livestock ailments

List of medicinal plants used for treating human and livestock ailments:

List of medicinal plants used for treating human ailments

Species name	Local name	Habit	Method of preparation and application; condition of preparation and part used	Ailments treated
Achyranthes aspera	Mchelo	Herb	Fresh leaf and stem is crushed and smear on head.	Tonsillitis
			Fresh root is crushed, mixed with black faeces, filtered and the dropped in eye.	Eye disease
Hypoestes forskaolii	Grbya	Herb	Dry/fresh, root of the medicinal plant is tied on the damaged part of the body.	Dislocated bone
Justicia schimperiana	Shimeza	Shrub	Fresh leaf is crushed, mixed with water, filter and drink.	Jaundice/ Efshwa
Allium cepa	Keyh-shgurti	Herb	Fresh bulb is crushed, mixed with honey; allow staying for seven days and then eating at morning before eating food until recovery.	Asthma
Allium sativum	Tsaeda-shgurti	Herb	Unprocessed fresh bulb eat directly	Impotence in male, Cough and Pain after delivery
			Fresh bulb is crushed, mixed with honey and eat at morning for seven days.	Asthma
			Fresh bulb is crushed, mixed with water, filter and sniff through nose	Head ach
			Fresh leaf is crushed, mixed with butter and smear.	Paralysis
			Chewing fresh bulb is a treatment for teeth ach.	Teeth ach
Aloe camperi	Sandaere	Herb	Fresh latex is directly dropped in eye.	Eye disease
Aloe megalacantha	Ere	Herb	Fresh/dry root is tied on hand/leg/body.	dislocated bone
			Fresh latex is squeezed from young upper part and drink.	Malaria

			Fresh fruit is crushed, mixed with water and smeared in the anus.	Hemorrhoid
Aervaja vanica	Lge-Dmu	Shrub	Fresh latex is directly smeared on the infected part of the skin.	Coetaneous lishmaniasis
Alternanthera nodiflora	Kodo-Gih/Tetem –gih	Shrub	Fresh whole plant is crushed and rubbed at the site of bite.	Snake bite
Amaranthus caudatus	Mendef-Adgi/ Hamli-adgi)	Shrub	Chewing fresh root can treat for teeth ach	Teeth ach
Rhus glutinosa	Tetael	Tree	Fresh leaf is boiled in water and drinks it at morning before eating food.	Ascariasis
Schinus molle	Tkur-berbere	Tree	Fresh leaf is crushed, mixed with water, filtered and drink at the time of pain.	Jaundice, Tape worm,
			Fresh leaf is crushed, mixed with water, filtered and sniff through nose.	Head ach, Evil eye/
			Fresh leaf is crushed, mixed with water, filtered and sniff through nose.	Diarrhea $ vomiting
Conium maculatum	Tsakda	Herb	Chewing unprocessed dry seed is a treatment for abdominal pain	Abdominal pain
Cuminum cyminum	Kemun	Herb	Chewing dry seed is treatment for abdominal pain	Abdominal pain
Dacus carota	Carot	Herb	Fresh leaf is boiled in water and drink as tea.	*Head ach*
Foeniculum vulgare	Shlan	Herb	Fresh leaf is crushed, mixed with water, filter and drink.	Urine retention/ atsre shnti
Heteromorpha arborescens	Seseg –zbe	Herb	Fresh bulb is crushed, mixed with honey and swallow.	Head ach
Trachyspermum ammi	Azmud	Herb	Fresh and dry leaf is boiled in	Asthma

			water and drink	
Acokanthera schimperi	Mebte	Tree	Fresh/dry bark is powdered, heated on oven, mixed with butter smeared on body skin.	Skin rash/hafew
			Fresh $ dry root is burnt $ fumigate by its steam.	Evil eye
			Dry root is powdered, mixed with goat butter and smear on affected body.	Wound
			Fresh leaf is crushed, mixed with honey and smear at anus.	Hemorrhoid
Calotropis procera	Gindae	Herb	Fresh latex is smeared on affected body the body.	Wound
Carissa spinarum	Agam	Tree	Dry root and bark is burnt and fumigate by its smoke.	Evil eye
			Dry and fresh root is burnt and fumigate by its smoke.	Evil spirit
			Fresh leaf is boiled in water and drunk.	Diabetes
Borassus aethiopum	Sye	Tree	Dry fruit is powdered, mixed with sesame oil and then dropped in to ear.	Ear infection.
Dregea abyssinica	Shankuk	Shrub	Fresh leaf is crushed, mixed with water and smear on the affected body.	Mumps
Periploca linearifolia	Moder	Tree	Dry root is burnt in fire and fumigate by its smoke.	Evil spirit
Gomphocarpus fruticosus	Demayto	Herb	Fresh root is chewed and suck the liquid.	Abdominal pain
			Paint and rub the infected body by latex of the plant.	Cutaneous Leshimaniasis

Agave americana	Eka-trmo/eka tlyan	Shrub	Fresh bark is crushed smeared on the infected body.	Cutaenous lishmaniasis & ring worm
Asparagus africanus	Kesta-Ansti	Shrub	Dry and fresh root is burnt in fire and fumigate by its smoke.	Evil eye
			Fresh leaf and root is crushed, mixed with water and smear on to anus.	Hemorrhoid
Artemisia abyssinica	ChenaBarya /wedwado	Herb	Fresh and dry stem is brunt and fumigate by its smoke.	Evil eye.
			Smelling fresh leaf is a treatment for cough.	Cough
Vernonia amygdalina	Grawa	Shrub	Fresh leaf is crushed mixed with water, filter and drink	Fibril illness
			Dry leave is powdered, mixed with honey(brzi) and drink	Impotence in male
			Fresh leaf is crushed, filtered and sniffed through nose.	Evil eye
Guizotia abyssinica	Nihug	Herb	Dry seed is powdered, boiled in honey and drink.	Heart disease
Bidens macroptera	Gelgele-meskel	Herb	Dry flower crushed and smell	Head ach
Carthamus tinctorius	Suf	Herb	Dry seed is crushed and squeezed from it and then drink.	Asthma
Laggera tomentosa	Konshkonsho	Shrub	Fresh leaf is boiled in water and fumigate by its steam	fibril illness

			Dry root is powdered and sniff through nose.	Bleeding /nesri
Silybum marianum	Dander	Shrub	Fresh root is crushed, mixed with honey and swallow.	Impotence in male
Impatiens rothii	Elam	Herb	Fresh bulb crushed and smeared on hands	Arthritis
Stereospermum kunthianum	Adgizana	Shrub	Dry bark is crushed and powdered, mix with honey then smear on affected dermis.	Wound
Cordia africana	Awhi	Tree	Fresh leaf is crushed, mixed with tea/coffee and drink.	Fibril illness
			Fresh bark is crushed, mixed with butter and eat.	Abortion
			Fresh leaf and root is crushed and smeared in anus.	Hemorrhoid
			Fresh fruit is swallowed to release amoeba with faeces.	Amoeba
Lepidium sativum	Shnfae	Herb	Dry seed is powdered, mixed with ergo and the drink.	Bloody diarrhea
			Dry seed is powdered and put on the wound.	Wound
			Dry seed is powdered mixed with butter and smear on affected body.	Paralysis/ gusay
			Dry seed is powdered, mixed with fat of snake and then smear on the skin.	Skin problem; locally called Lmtsi
Brassica carinata	*(*Adri/senafich)	Herb	Dry seed is powdered; mix with water and then drink.	Constipation $ blood pressure
			Fresh seed is crushed; mix with fat of snake and then smear on the	Skin problem; locally called Lmtsi

			skin.	
			Dry seed is crushed, mix with honey and drunk	Cough
Nuxia congesta	Atkaro	Tree	Fresh leaf is crushed and mixed with sesame oil and dropped in to ear.	Ear infection
Opuntia ficus-indica	qulqwalbahri	Shrub	Dry and fresh root is tied on hand/leg	Dislocated bone
Boscia angustifoliae	Kermed	Tree	Dry and fresh bark is cut and ties on body.	Evil spirit
Capparis tomentosa	*Andel*	Tree	Dry root is burnt and fumigate by its steam.	Evil spirit
			Fresh leaf is crushed and smeared on breast.	Breast diseases
Carica papaya	Papaya	Herb	Unprocessed and fresh fruit is eaten.	Constipation
			Fresh leaf is boiled in water and drink.	Gastritis
Calha edulis	Chat	Shrub	Fresh leaf is crushed and smeared on the body.	Irritation
Maytenus senegalensis	Argudi	Shrub	Fresh leaf is crushed, mixed with butter and smeared in and around anus.	Hemorrhoids
			Un processed fresh leaf is chewed.	Scorpion bite
Beta vulgaris	Keysur	Herb	Fresh bulb is crushed, boiled in water and drink at sleep.	Cough
Chenopodium ambrosioides	Etse-farus	Climber	Fresh/dry root is crushed, mixed with honey and swallow	Snake bite
Psiadia punctulata	Alakit	Shrub	Fresh leaf is crushed, mixed with *Allium sativum* and smeared on infected dermis.	Herpes/ Almaz balechra/

			Fresh leaf is crushed and smeared on the affected skin.	Fire burn-wound
			Fresh and dry leaf is burnt and fumigate by its smoke.	fibril illness
Ipomoea batatas	sekuar dinch	Herb	A fresh bulb is boiled in water and then eats the bulb.	Heavy tiredness
Kalanchoe schimperiana	Dekaeta	Herb	Fresh leaf is heated in fire and press on the breast.	breast disease
Cucumis ficifoilus	Enkefta	Shrub	Fresh leaf is crushed, mixed with tella/milk and drink.	Jaundice/ Efshwa
Zehneria anomala	Hareg-resa	Climber	Fresh leaf is boiled in water and drink.	Head ach
Zehneria scabra	Hafaflo	Shrub	Fresh leaf is boiled in water and fumigate by its smoke.	fibril illness$ cough
			Chewing fresh leaf is a treatment for Bud smelling of mouth	Bud smelling of mouth
Lagenaria siceraria	Amham	Herb	Fresh leaf is crushed, mixed with water and honey and drink.	Fear $dislike of sex in females
			Fresh leaf is crushed, filtered by cotton and dropped in to ear.	Ear infection
Cucurbita pepo	Duba	Herb	Dry seed is roasted and eat as kolo.	Tape worm
			Fresh fruit cooked and eat as food.	Constipation
Juniperus procera	Tshdi-habesha	Tree	Dry seed is powdered, mixed with water and honey and drink.	Fear $dislike of sex in females
Cyperus dichroostachyus	Hazhaz-Anchewa	Climber	Fresh leaf is crushed and smear on infected body	Cutaneous Leshimaniasis
Sansevieria ehrenbergii	Eka	Shrub	Fresh bark is heated in fire and press on the affected body.	Nasal disease
Euclea racemosa	Kliaw	Shrub	Dry root is powdered, mixed in water and swallow.	*Tonsillitis*

			Chewing fresh and dry root is a treatment for teeth ach.	Teeth ach
			Fresh and dry root is crushed, mixed with butter and smear on face.	black spot on face/ Madyat
Tragia pungens	Am-a	Shrub	The infected skin is rubbed by fresh leaf	*Ring worm*
Croton macrostachyus	Tanbuk	Tree	Fresh leaf is crushed mixed with tella/milk and drink.	Jaundice
Euphorbia tirucalli	Knchib	Shrub	Fresh latex is smeared on the affected body.	Wound
Clutia abyssinica	Tish bealalti	Shrub	Dry and fresh of the whole plant is burnt and fumigate by its smoke to vagina during pregnancy and after birth.	Vaginal infection
Acacia albida	Momona	Tree	Fresh and dry bark is crushed, mixed with bile of sheep and smear on affected area of the skin.	Wound
Acacia etbaica	Seraw	Tree	Dry leaf is powdered, mixed with butter and smear on head.	Head wound
			When dry/fresh stem is burnt latex produced and the smear by the latex on affected area of the skin.	Fungal infection/ tewsas
Acacia mellifera	kerets	Tree	Dry root is powdered, mixed with honey and eat.	Leprosy
			Fresh leaf is crushed, mixed with honey and swallow.	Rhfactor/ Mengegna
Acacia polyacantha	Gemero	Tree	Dry and fresh root crushed, burnt and fumigate by its smoke.	Evil spirit
Acacia lahai	Lehay	Tree	Fresh fruit is crushed and smeared on face.	Granule/ Begur/ Fetsega

Albizia gummifera	Sasa	Shrub	Fresh leaf is boiled in water and fumigate by its steam.	Fibril illness
Arachis hypogea	Acholoni	Herb	Dry seed is powdered, mix with tea and then drink	Heart disease
Calpurnia aurea	Htsawts	Shrub	Fresh leaf is crushed with water, filter by using cotton and dropped in sick eye.	Eye disease
Cicer cuneatum	shmbra-gwasot	Herb	Chewing fresh root is a treatment for abdominal pain	Abdominal pain
Cicer arietinum	Shmbra	Herb	Dry seed is boiled in water and the drink at sleep.	Impotence in male
Colutea abyssinica	Kokaeta	Herb	Unprocessed fresh leaf directly is eaten.	Tuberculosis
Lens culinaris	Brsn	Herb	Dry seed is boiled in water and drink the liquid portion..	Impotence in male
Medicago polymorpha	Teneg (Tsaeda)	Herb	Fresh leaf is crushed, mixed with tea/coffee and drink.	Fibril illness
Pterolobium stellatum	Konteftefe	Shrub	Dry and fresh root is burnt and fumigate by its smoke.	Evil eye
Senna baccarinii	Hanbahanbo	Shrub	Dry root is powdered, mixed with butter and smear on the body.	Skin rash/ hafew
Vicia faba	Balenga	Herb	Dry seed is crushed and smeared on the swelled skin.	Wound / Megli-anchwa
Trigonella foenumgraecum	Abaeke	Herb	Dry seed is powdered, mix with honey and eat.	Asthma and Cough
			Dry seed is powdered, mixed with butter and smear on the affected dermis.	Wound, locally called Megli anchwa
Dovyalis abyssinica	Mengolats	Shrub	Fresh leaf is crushed, mixed with the oil of *Guizotia abyssinica* and eat	Tape worm

Hypericum annulatum	Hndkudkuk	Herb	Fresh leaf is crushed, mixed with water and drink.	Gonorrhea
Becium grandiflorum	Tebeb	Shrub	Dry stem is burnt and fumigate by its smoke.	Evil eye and evil spirit
Mentha polegium	Setisemhal	Herb	Chewing fresh leaf and stem is treatment for teeth ach.	Teeth ach
Meriandra dianthera	Meseguh	Shrub	Fresh leaf is crushed, filter and drink.	Abdominal pain
Ocimum lamiifolium	Dem-kasea	Shrub	Fresh leaf is crushed, filtered, drink alone/with tea/with coffee.	Fibril illness
Thymus schimperi	Tosign	Herb	Fresh and dry leaf is mixed with honey and boiled and then drink.	Abdominal pain
Plectranthus ornatus	Endfdf	Herb	Fresh and dry root is tied on hand/ leg/body with cotton that never soaked in water before.	Dislocated bone
			Fresh root is crushed, mixed with water and smear on head.	Tonsillitis
Otostegia integrifolia	Chendog	Shrub	Fresh leaf is crushed, mixed with water and drink.	Amoeba
			Chewing fresh leaf is a treatment for throat infection.	Throat infection
Linum usitatissimum	Entatie	Herb	Dry seed is powdered, mixed with water, boil and drink.	Constipation
			Dry seed is soaked in water for three days and then swallow	Amoeba
Lobelia giberroa	Grhan	Shrub	Dry leaf is powdered and sniffed through nose.	Evil eye
Buddleja polystachya	Metere	tree	Fresh leaf is crushed, filter and drink.	Tonsillitis

Hibiscus ludwigii	Sgot	Shrub	Fresh leaf is crushed, mixed with honey and smear.	Body swelling locally called Megerem.
Sida schimperiana	Tfrerya	Shrub	Chewing fresh root at time of pain is a treatment for	Abdominal pain
Malva verticillata	Lhtit	Herb	Fresh leaf is crushed, filtered and dropped in to ear.	Ear infection
			Fresh leaf is crushed and sniffed through nose.	Head ach
Ekebergia capensis	Kot	Tree	Fresh bark is boiled in water and wash at morning.	Skin disease
Melia azedarach	Niem	Tree	Fresh leaf is crushed, mixed with water and drink.	Malaria
Ficus sur	Kodo	Tree	Fresh bark is boiled in water and wash. After washing not expose on the sun.	Skin disease
Ficus vasta	Daero	Tree	Fresh is crushed, filtered and dropped in eye.	Eye disease
			Fresh bark is boiled in water and wash at morning. After washing not allowed exposing on sun.	Skin disease
Ficus palmata	Beles/dema y	Tree	Fresh and dry root is heated in fire and pressed on affected skin.	Body swelling
			Dry and fresh stem is tied around the body.	Abortion
			The latex of the plant is directly dropped in to the ear.	Ear infection
			The infected dermis is rubbed by fresh leaf.	Ring worm
Moringa oleifera	Shefraw	Shrub	Fresh root is crushed, mixed with the oil of *Carthamus tinctorius* and	Asthma

			the drink.	
			Fresh leave is crushed, mixed with water and drink.	Blood pressure
Musa paradisiaca	Muz	Herb	Fresh bark is crushed, mixed with butter and smear at anus.	Hemorrhoid
Myrica salicifolia	Nebi	Tree	Dry bark is powdered and sniff through nose.	Tumor/ Menkersa and head ach.
Maesa lanceolata	Sewerya	Tree	Dry fruit is powdered, heat on oven, mix with butter and smear on the body.	Skin rash
Eucalyptus globulus	Tsaeda-kelamitos	Tree	Fresh leaf is boiled in water and fumigate by its steam.	Febrile illness and Cough
Syzygium guineense	Liham	Tree	Fresh bark is boiled in water and drink at morning before eating food.	Diarrhea
Jasminum abyssinicum	Habitselim	Shrub	Fresh leaf is grind, filtered by using cotton and dropped in eye.	Eye disease
Olea europaea	Awlie	Tree	Fresh leaf is boiled in water and drink before eating food.	Abdominal pain $ Head ach
			Fresh leaf is crushed, mixed with butter and smeared in anus.	Hemorrhoids
Oxalis anthelmintica	Habichego	Herb	Fresh bulb of *Oxalis anthelmintica* is crushed mixed with *Barleria grandicalyx and* swallow.	Tapeworm
Argemone mexicana	medafe-t'ilian	Herb	Cut the apex part of the plant and smear by latex to the wound.	Wound
Phytolacca dodecandra	Shbti	Shrub	Fresh leaf is crushed, mixed with honey and eat. Drinking tella and eating meat is not allowed.	Body swelling locally called megrem
			Fresh root is crushed, mixed with tella and drink.	Rabies

Plumbago zylanica	Aftuh	Shrub	Dry and fresh root is burnt and fumigate by its smoke.	The diseases is locally called Sray/dgam
			Fresh leaf is crushed, mix with water and wash every morning for seven days.	Evil eye
Eleusine floccifolia	Rghe	Herb	Dry and fresh root is tied by new cotton.	Dislocated bone
Hordeum vulgare	Sgem/bukuli	Herb	Dry seed is roasted and eat as food.	Gastritis
Podocorpus falcatus	Zgba	Tree	Fresh root is crushed, mixed with butter and smear.	black spot on face/ Madyat
Oxygonum sinuatum	Chew-murakut	Herb	Fresh bulb is mixed with kolo and eat	Tape worm
Rumex nepalensis	Shenbwaeta	Shrub	Fresh leaf is crushed, mixed with water and drink.	Tonsillitis
			Fresh leaf is heated in fire and the rub by the heated leaf on infected part of leaf.	Ring worm
Rumex abyssinicus	Mekmoko	Herb	Fresh $ dry bulb is crushed, mixed with oil of *Guizotia abyssinica* and drink.	Prolonged delivery
Rumex nervosus	Hihot	Shrub	Dry leaf is powdered and tied on the body.	Evil spirit
			Fresh root is crushed, add to teji and drink	Impotence in male
			Fresh /dry stem is crushed, mixed with water and wash at morning for seven days.	Sray/dgam
Dichrostachys cinerea	Gonek	Shrub	Fresh bark is tied on damaged part of the body with cotton that never	Dislocated bone

			washed before.	
Clematis simensis	Hareg	climber	Fresh bark is crushed, mixed with water and smear on affected body part	Cutaneous Leshimaniasis
Nigella sativa	Awesda/tkur azmud	Herb	Dry seed is powdered, mixed with honey and swallowed.	Abdominal pain $ cough
Ziziphus spina-christi	Gaba	Tree	Fresh leaf is crushed, mixed with water and wash by removing the hairs before.	Dandruff/ Forefor
Rhamnus prinoides	Gesho	Shrub	Chewing fresh, young part of the medicinal plant is treatment for tonsillitis	Tonsillitis
Rosa richardii	Tsgereda	Shrub	Fresh flower is boiled in water, dropped in ear	Ear infection.
Prunus persica	Kuk	Shrub	Fresh fruit is heated and press by heated fruit on head.	Head ach
Hagenia abyssinica	Habi	Tree	Fresh leaf is crushed, filtered and drink.	Tapeworm
Coffea arabica	Buna	Shrub	Dry seed is crushed and smeared on the wound.	Wound
			Fresh leaf is boiled in water and drink.	Head ach
Citrus limon	Lemin	Shrub	Fresh fruit is squeezed and rubbed on affected skin.	Skin problem
			Chewing dry root is a treatment for the disease locally called Sray /dgam	Sray /dgam
			Fresh fruit boiled and cooked and then eat before eating food.	Pain after delivery/ hmam dehar
			Fresh and dry bark is crushed,	Rabies

			mixed with butter and eat.	
Citrus medica	Trngi	Shrub	Unprocessed fresh fruit eat directly.	Constipation
Citrus sinensis	Brtukan	Shrub	Fresh leaf is boiled in water and drink as tea.	Head ach
Ruta chalepensis	Chena-Adam	Herb	Fresh leaf is directly added in tea, coffee, milk and drink.	Cough
Dodonaea angustifolia	Tahses	Shrub	Fresh leaf is crushed and the smear on the affected skin.	Herpes/ Almaze balchera
			Fresh bark is powdered, mixed with water and the drink.	Ascariasis
			Fresh fruit is crushed mixed with honey and swallow.	Malaria
Mimusops kummel	Kumel	Tree	Fresh fruit is crushed, mixed with new milk and drink.	Measles
Sideroxylon oxyacanthum	Seroro	Tree	Dry fruit is powdered, heat on oven, mixed with butter and finally smear.	Skin rash
Verbascum sinaiticum	Trnaka	Tree	Fresh root is crushed, mixed with water, filtered and drink.	Retained placenta
			Fresh root is crushed, mixed with water, filtered and drink.	Jaundice/ Efshwa
Brucea antidysenterica	Maleta	Shrub	Fresh fruit is crushed, mixed with honey and smear on the affected body.	Leprosy
Datura stramonium	Astenagr	Herb	Fresh leaf is crushed and smeared on skin.	Wound
			Dry fruit is roasted on oven with butter and fumigate by its smoke.	Teeth ach
Nicandra physalodes	Hamli –kbo	Herb	Dry leaf is powdered; mixed with	Fire Burn Wound

			water, smear on the damaged skin.	
Solanum incanum	Engule	Shrub	Dry fruit is crushed, mixed with water and smeared on the body.	Itching
			Dry root is crushed, mixed with honey and eat.	Leprosy
			Fresh root is chewed and liquid is sucked.	Abdominal pain
			Dry and fresh root powdered, burnt in fire and fumigate by its smoke.	Sray/dgam
			Fresh root is crushed, mixed with water, filter and drink	Male impotence
Nicotiana tabacum	Tnbako	Herb	Dry leaf is powdered; mixed with water, smear on the damaged skin.	Fire Burn Wound
Withania somnifera	Agol	Shrub	Fresh leaf is boiled in water and fumigate by its steam	fibril illness
			Fresh and dry leaf and root is burnt and fumigate by its smoke.	Evil spirit
			Fresh leaf is crushed, mix with butter then smeared on skin	Paralysis locally called gusay
Lycopersicon esculentum	Kumedre	Herb	Fresh leaf is crushed and smeared on head.	Tonsillitis
			Fresh root crushed, soak in water and wash the body at morning.	Evil spirit
			Fresh leaf is boiled in water and then drink	Urine retention
Dombeya torrida	Tsnkuya	Shrub	Fresh bark is crushed and smear on affected body.	Fire Burn Wound
Verbena officinalis	Atuch	Shrub	Dry root is crushed and sniffed through nose.	Sray/dgam
Clerodendron	Surbetry	Shrub	Fresh leaf and stem is burnt in fire	Feberileillne

myricoides			and fumigate by its smoke.	
Cissus petiolata	Alke	Climber	Fresh and dry, leaf and root is crushed and eaten.	Cough
			Fresh whole plant is crushed and soaked in cattle urine and wash for seven days.	Body swelling locally called Mendaeti
Vitis vinifera	Weyni	Climber	Fresh fruit is squeezing and drink.	Blood pressure, eye $heart diseases
			Fresh fruit is squeezing, mixed with egg, boil and drink.	Cough
Zingiber officinale	Zngbl	Herb	Chewing fresh bulb is a treatment for teeth ach.	Teeth ach
Curcuma domestica	Erdi	Herb	Unprocessed dry seed is chewed.	Abdominal pain
Aframomum corrorima	Korerima	Herb	Dry bulb is powdered, mixed with milk and drink.	Urine retention/ atsre-shnti

List of medicinal plants used for treating livestock ailments

Scientific name	Local name	Habit	Method of preparation, application and part used	Ailments treated
Heteromorpha arborescens	Seseg–zbe	Herb	Fresh leaf is crushed and smear on the body.	Ticks, fleas, lice
Ceropegia convolvuloides	Merkah	Herb	Fresh whole plant is crushed and allows swallowing.	Antrax /Tafya
Ceropegia vignaldiana	Mshko	Herb	Fresh whole plant is crushed and allows swallowing.	Abdominal pain
Kniphofia isoettfolia	Ashenda	Herb	Fresh leaf is crushed, mixed with ergo and allow to drink.	Fasciolosis/effel
Cynoglossum lanceolatum	Teng-Begie	Shrub	Fresh leaf is crushed, mixed with honey and smear on affected part of the body.	Wound
Gloriosa simplex	Tslal-enymariam	Herb	Fresh leaf is crushed, mixed with water and smear on the skin of livestock.	Ticks, fleas, lice
Euphorbia abyssinica	Kulkale	Shrub	Fresh latex is smear on the affected body.	Body swelling/ zgage
Ricinus communis	Guli	Herb	Fresh leaf is crushed and smear on the affected body.	Wound
Vigna unguiculata	Adagura	Herb	Dry seed is powdered, dissolve in milk and allow drinking.	Fasciolosis /effel
Crotalaria incana	Hawwi-leyti	Shrub	Fresh leaf is crushed and allow eating	Diarrhea & shivering /halfyen
Acacia abyssinica	Chiea	Tree	Fresh fruit is crushed, mixed with butter and smear on affected body.	Wound
Ocimum basilicum	Seseg	Herb	Fresh leaf is crushed and allows eating.	Abdominal pain
Becium obovatum	Tehag	Herb	Fresh grass is crushed, mixed with	Diarrhea

			malt and allow swallowing.	
Bersama abyssinica	Asha-om	Shrub	Fresh leaf is crushed, mixed in water and smear on cattle bodies.	Ticks, fleas, lice
Ficus glumosa	Chekente	Tree	Dry seed is powdered, dissolve in water and allow dinking.	Newcastle disease
Sorghum bicolor	Mashla	Herb	Dry seed is powdered, mixed with aloe and allow swallowing.	Antrax /Tafya
Nicotiana tabacum	Tnbako	Herb	Fresh leaf is crushed, mixed with water, filter and sniff through nose	Leech
Discopodium penninervium	Gaeta	Shrub	Fresh leaf is crushed and allows eating.	Diarrhea & shivering /halafyen/
Capsicum frutescens	Mitmita	Herb	Fresh fruit is crushed and allow swallowing.	Bloating
Capsicum annuum	Berber	Herb	Dry seed is powdered, dissolve in water and allow drinking.	Bloating/ kebdi mnfah

List of medicinal plants used for treating human and livestock ailments:

(Hu-human, Liv-livestock)

Scientific name	Local name	Uses	Method of preparation and application; condition of preparation and part used	Ailments
Justicia schimperiana	Shimeza	Hu	Fresh leaf is crushed, mixed with water, filter and drink.	Jaundice/ Efshwa
		Liv	Fresh leaf is boiled in water and allowed to drink.	Cough
Allium sativum	Tsaeda-shgurti	Hu	Fresh bulb is crushed, mixed with honey and eat at morning for seven days.	Asthma
		Liv	Fresh bulb is crushed, mixed with water, filter and sniff to the nose.	Horn worm & leech
Aloe camperi	Sandaere	Hu	Fresh latex is directly dropped in eye.	Eye disease
		Liv	Fresh latex is smeared to affected skin of oxen especially on the neck.	Wound
Aloe megalacantha	Ere	Hu	Fresh fruit is crushed, mixed with water and smeared in the anus.	Hemorrhoid
		Live	Fresh latex is allowed to drink	Malaria & Newcastle disease
			Fresh latex is smear on the body of livestock.	Ticks
			Dry bark is burnt in fire and fumigate by its smoke.	Evil spirit/zarti
Amaranthus caudatus	Mendef-Adgi/ Hamli-adgi)	Hu	Chewing fresh root can treat for teeth ach	Teeth ach
		Liv	Fresh leaf is crushed, adds to water, filter and dropped in ear.	Evil spirit/zarti
Schinus molle	Tkur-berbere	Hu	Fresh leaf is crushed, mixed with water, filtered and drink at the time of pain.	Jaundice, Tape worm,
		Liv	Fresh leaf is crushed, mixed with water, filter and sniff through nose	Leech
Foeniculum vulgare	Shlan	Hu	Fresh leaf is crushed, mixed with water, filter and drink.	Urine retention
		Liv	Fresh stem is crushed, adds to water and allowed to drink.	Urine retention

			Fresh leaf is crushed and allowed to eat.	Abdominal pain
Achyranthes aspera	Mchelo	Hu	Fresh leaf and stem is crushed and smear on head.	Tonsillitis
		Liv	Fresh leaf and stem is crushed, add water, filter by using cotton and dropped in to eye.	Eye disease
Asparagus africanus	Kesta-Ansti	Hu	Dry and fresh root is burnt in fire and fumigate by its smoke.	Evil eye
		Liv	Fresh root is crushed, and smear on the affected body.	Body swelling
Artemisia abyssinica	ChenaBarya/ wedwado	Hu	Fresh and dry stem is brunt and fumigate by its smoke.	Evil eye.
		Liv	Fresh leaf is crushed, mixed in water, filter and sniff through nose.	Evil spirit/zarti
Vernonia amygdalina	Grawa	Hu	Dry leave is powdered, mixed with honey(brzi) and drink	Impotence in male
		Liv	Fresh leaf is crushed, mixed in water and allowed to drink.	Bloating
Laggera tomentosa	Konshkonsho	Hu	Fresh leaf is boiled in water and fumigate by its steam	fibril illness
		Liv	Fresh leaf is crushed, mixed in water and sniff through the nose.	Leech
Stereospermum kunthianum	Adgizana	Hu	Dry bark is crushed and powdered, mix with honey then smeared on affected dermis.	Wound
		Liv	Dry whole plant is crushed, burnt in fire and fumigate by its smoke.	Black leg/ /Wekei/
Cordia africana	Awhi	Hu	Fresh leaf is crushed, mixed with tea/coffee and drink.	Fibril illness
		Liv	Fresh leaf is crushed, mixed in water, filter and sniff through nose.	Leech
Brassica carinata	Adri/senafich	Hu	Dry seed is powdered; mix with water and then drink.	Constipation & blood pressure

		Liv	Dry seed is powdered; mix with water and then allow drinking.	Newcastle disease
Lepidium sativum	Shnfae	Hu	Dry seed is powdered, mixed with ergo and the drink.	Bloody diarrhea
		Liv	Dry seed is powdered, adds to water and allowed to drink.	Newcastle disease
Maytenus senegalensis	Argudi	Hu	Fresh leaf is crushed, mixed with butter and smeared in and around anus.	Hemorrhoids
		Liv	Fresh leaf is crushed, mixed in water and allow drinking	Newcastle disease
Psiadia punctulata	Alakit	Hu	Fresh leaf is crushed, mixed with *Allium sativum* and smeared on infected dermis.	Herpes/ Almaz balechra/
		Liv	Fresh leaf and stem used to tie in bone fracture.	Bone fracture.
Zehneria scabra	Hafaflo	Hu	Fresh leaf is boiled in water and fumigate by its smoke.	fibril illness & cough
		Liv	Fresh leaf is crushed, mixed in water and allowed to drink.	Bloating
Juniperus procera	Tshdi-habesha	Hu	Dry seed is powdered, mixed with water and honey and drink.	Fear & dislike of sex in females
		Liv	Fresh leaf is crushed, mixed in water and allowed to drink	Diarrhea& shivering
Sansevieria ehrenbergii	Eka	Hu	Fresh bark is heated in fire and press on the affected body.	Nasal disease
		Liv	Fresh bark is crushed and smear on affected body.	Wound
Euclea racemosa	Kliaw	Hu	Fresh and dry root is crushed, mixed with butter and smear on face.	black spot on face/ Madyat
		Liv	Fresh leaf is crushed, mixed in water and sniff through the nose.	Leech
Acacia mellifera	kerets	Hu	Dry root is powdered, mixed with honey and eat.	Leprosy
		Liv	Fresh root is crushed, mixed with water and sniff through nose.	Leech
Albizia	Sasa	Hu	Fresh leaf is boiled in water and fumigate	Fibril illness

gummifera			by its steam.	
		Liv	Fresh leaf is crushed, adds to water and sniff through nose.	Horn worm/ haseka resi
Calpurnia aurea	Htsawts	Hu	Fresh leaf is crushed with water, filter by using cotton and dropped in sick eye.	Eye disease
		Liv	Fresh leaf is crushed and smear on the body.	Fleas & lice
Cicer cuneatum	shmbra-gwasot	Hu	Chewing fresh root is a treatment for abdominal pain	Abdominal pain
		Liv	Fresh root is crushed, mixed with water, filter and sniff through the nose.	Evil eye
Otostegia integrifolia	Chendog	Hu	Fresh leaf is crushed, mixed with water and drink.	Amoeba
		Liv	Fresh leaf is crushed and smear on the skin of cattle.	Ticks
Meriandra dianthera	Meseguh	Hu	Fresh leaf is crushed, filter and drink.	Abdominal pain
		Liv	Fresh leaves are crushed, add water and allowed to drink.	Abdominal pain
Linum usitatissimum	Entatie	Hu	Dry seed is powdered, mixed with water, boil and drink.	Constipation
		Liv	Dry seed is soak in water for three days and allowed to eat at the delivery time.	Prolonged delivery
Lobelia giberroa	Grhan	Hu	Dry leaf is powdered and sniffed through nose.	Evil eye
		Liv	Fresh leaf is crushed, mixed in water and allowed to drink.	Diarrhea & shivering
Malva verticillata	Lhtit	Hu	Fresh leaf is crushed, filtered and dropped in to ear.	Ear infection
		Liv	Dry and fresh of the whole plant is burnt in fire and fumigate by its smoke.	Evil spirit/zarti
Sida schimperiana	Tfrerya	Hu	Chewing fresh root at time of pain is a treatment for	Abdominal pain
		Liv	Unprocessed fresh and dry root tie on the affected part of body.	Bone dislocated

Melia azedarach	Niem	Hu	Fresh leaf is crushed, mixed with water and drink.	Malaria
		Liv	Fresh leaf is crushed, adds to water and allowed to drink.	Bloating
Ficus palmata	Beles/demay	Hu	Fresh and dry root is heated in fire and pressed on affected skin.	Body swelling
		Liv	Fresh latex is allowed to drink.	Newcastle disease
Myrica salicifolia	Nebi	Hu	Dry bark is powdered and sniff through nose.	Tumor and head ach.
		Liv	Fresh bark is boiled in water and allowed to drink.	Diarrhea
Syzygium guineense	Liham	Hu	Fresh bark is boiled in water and drink at morning before eating food.	Diarrhea
		Liv	Fresh bark is boiled and cooked and then allowed to eat.	Diarrhea
Jasminum abyssinicum	Habitselim	Hu	Fresh leaf is grind, filtered by using cotton and dropped in eye.	Eye disease
		Liv	Fresh leaf is crushed mixed in water, filter and dropped into eye	Eye disease
Phytolacca dodecandra	Shbti	Hu	Fresh root is crushed, mixed with tella and drink.	Rabies
		Liv	Fresh leaf is crushed, mixed in water and allowed to drink.	Leech
Plumbago zeylanica	Aftuh	.Hu	Fresh leaf is crushed, mix with water and wash every morning for seven days.	Evil eye
		Liv	Fresh root is crushed and smear on the affected body.	Body swelling
Hordeum vulgare	Sgem/bukuli	Hu	Dry seed is roasted and eat as food.	Gastritis
		Liv	Dry seed is allowed to soak in water for three days and then allowed to eat.	Bloating
Rumex nervosus	Hihot	Hu	Fresh root is crushed, add to teji and drink	Impotence in male
		Liv	Fresh is crushed mixed in water and	Abdominal pain

			allowed to drink.	
Rumex nepalensis	Shenbwaeta	Hu	Fresh leaf is heated in fire and the rub by the heated leaf on infected part.	Ring worm
		Liv	Fresh root is crushed and allowed to eat.	Diarrhea &shivering
Dichrostachys cinerea	Gonek	Hu	Fresh bark is tied on damaged part of the body with cotton that never washed before.	Dislocated bone
		Liv	Fresh bark is tied on fractured bone to repair it.	Bone fracture
Rhamnus prinoides	Gesho	Hu	Chewing fresh, young part of the medicinal plant is treatment for tonsillitis	Tonsillitis
		Live	Fresh leaf is crushed, mixed in water, filter, and sniff through nose.	Leech
			Fresh leaf is crushed, mixed with butter and allowed to swallow.	Diarrhea & shivering
Ruta chalepensis	Chena-Adam	Hu	Fresh leaf is directly added in tea, coffee, milk and drink.	Cough
		Liv	Fresh leaf is crushed, mixed in water, filter and sniff through nose.	Horn worm/ haseka resi
Citrus limon	Lemin	Hu	Fresh fruit is squeezed and rubbed on affected skin.	Skin problem
		Liv	Fresh and dry bark is crushed, mixed with butter and then allowed to eat.	Rabies
Sideroxylon oxyacanthum	Seroro	Hu	Dry fruit is powdered, heat on oven, mixed with butter and finally smear.	Skin rash
		Liv	Fresh leaf is crushed, mixed with water and allowed to drink.	Horn worm
Verbascum sinaiticum	Trnaka	Hu	Fresh root is crushed, mixed with water, filtered and drink.	Retained placenta
		Liv	Fresh root is crushed and smear on affected body.	Body swelling
Withania somnifera	Agol	Hu	Fresh leaf is boiled in water and fumigate by its steam	fibril illness
		Liv	Fresh leaf is crushed, mixed in water and	Bloating

			allowed to drink.	
Nicandra physalodes	Hamli –kbo	Hu	Dry leaf is powdered; mixed with water, smear on the damaged skin.	Fire Burn Wound
		Liv	Fresh leaf is crushed, mixed with butter and allowed to swallow.	Diarrhea & shivering
Solanum incanum	Engule	Hu	Dry root is crushed, mixed with honey and eat.	Leprosy
		Live	Fresh leaf is crushed, mixed in water allowed to drink.	Diarrhea & shivering
			Fresh fruit is crushed, squeezed-add to water and allowed to drink.	Leech
			Fresh fruit is allowed to eat.	Abdominal pain
Lycopersicon esculentum	Kumedre	Hu	Fresh leaf is crushed and smeared on head.	Tonsillitis
		Liv	Fresh leaf is crushed, mixed in water and sniff through the nose.	Leech
Datura stramonium	Mezerbae	Hu	Dry fruit is roasted on oven with butter and fumigate by its smoke.	Teeth ach
		Liv	Fresh leaf is crushed, mixed with butter and allowed to eat.	Diarrhea & shivering
Dombeya torrida	Tsnkuya	Hu	Fresh bark is crushed and smear on affected body.	Fire Burn Wound
		Liv	Fresh leaf is boiled in water and allowed to drink.	Prolonged delivery
Clerodendron myricoides	Surbetry	Hu	Fresh leaf and stem is burnt in fire and fumigate by its smoke.	Feberileillne
		Liv	Fresh stem is crushed and smear on affected body.	Body swelling