Study of plants traditionally used in public and animal health management in Seharti Samre District, Southern Tigray, Ethiopia

Solomon Araya¹, Balcha Abera¹ and Mirutse Giday²*

Abstract

Background: In Ethiopia, medicinal plants have continued to play vital role in fulfilling human and livestock healthcare needs of different communities. However, these valuable resources are being depleted mainly due to agricultural expansion and deforestation. Therefore, immediate action is required to conserve these resources and document the associated knowledge. The purpose of this study was, thus, to document and analyze information associated with medicinal plants that are used in managing public and animal health problems in Seharti Samre District, Southern Tigray, Ethiopia.

Methods: Ethnobotanical data were collected from July 1, 2011 to December 30, 201 mainly using semi-structured interviews with informants sampled using purposive sampling technique and through field observations.

Results: The study revealed the use of 90 medicinal plant species in Seharti Samre District for the treatment of several human and livestock diseases. The plants belonged to 46 families and 82 genera. The majority of the medicinal plants were indicated to be harvested from the wild. Leaf was the most frequently harvested plant part accounting for 44% of the reported plants, followed by roots (16%), whole plants (10%) and seeds (8%). The most widely used method of preparation was crushing (37%), pounding (15%) and chewing (13%). Most medicinal plants were applied internally (64.6%), followed by external application on the skin (35.4%). Febrile illness is the disease group in the study area that scored the highest ICF value (0.97), followed by cardio-vascular problems (0.97) and evil eye (0.95). Different preference ranking exercises were also used to determine the most preferred and potential medicinal plants in the study area.

Conclusion: In Seharti Samre District, medicinal plants are still playing important role in the management of various human and livestock diseases, many of which are harvested for their leaf parts. However, activities of claimed medicinal plants need to be evaluated before recommending them for their wider use. Evaluation priority should be given to medicinal plants with the highest informant agreement as such plants are believed to have better activity.

Keywords: Medicinal plants, Preference ranking, Seharti Samre, Traditional medicine, Ethiopia

Background

The problem of health in African countries, including Ethiopia, is very acute as people have no full access to government and private health services. The absence or inaccessibility of modern healthcare services and other factors such as high cost of modern drugs and services and better curing of herbal remedies against some chronic diseases has caused a large percentage of the population to rely on traditional medicine, and mostly on herbal remedies [1,2], for its primary health-care needs. In Africa, up to 80% of the population relays on traditional medicine to help meet its health care needs [3].

Ethiopia is a land of high variation in landscape, flora and fauna, multiplicity of ethnic groups with complex multicultural diversity, languages, cultures and beliefs.

* Correspondence: mirutseg@yahoo.com

1 Akilu Lemma Institute of Pathobiology, Addis Ababa University, Addis Ababa, Ethiopia

2 Full list of author information is available at the end of the article
which have in turn contributed to the high diversity of traditional knowledge and practices of the people including the use of medicinal plants. In Ethiopia, medicinal plants play important role in fulfilling human and livestock health care needs of different communities. Traditional use of medicinal plants has remained as the main alternative solution for different human and livestock health problems largely due to shortage of pharmaceutical products and modern health service stations, unaffordable prices of conventional drugs and drug resistance [4].

Today, many Ethiopian medicinal plants are facing extinction or severe genetic erosion mainly due to agricultural expansion, deforestation, over exploitation and destructive harvesting. Securidaca longipedunculata and Warburgia ugandensis are among the popular medicinal plants in Ethiopia that are being threatened due to over exploitation and destructive harvesting. Hagenia abyssinica is another medicinal plant that is being depleted as a result of over exploitation [4]. For most of the threatened and endangered medicinal plants, no conservation action has been taken, and there is no even a complete inventory of these plants. Much of the knowledge on the uses of medicinal plants in the country is still held only by traditional societies and is usually transmitted verbally [5]. Unless the plants are conserved and the associated ethnomedicinal knowledge documented, there is a danger that both the valuable medicinal plants and the knowledge could vanish forever. As it is happening elsewhere in the country, medicinal plants of the Seharti Samre District of Tigray are facing the danger of being lost unless appropriate documentation and conservation measures are taken.

A number of ethnobotanical studies have previously been conducted in different parts of Tigray to document the use of medicinal plants [6-14]. For example, studies conducted by Teklay et al. [12], Abdurhman [9] and Zenebe et al. [13] reported the use of 114, 113 and 68 medicinal plants in Kilte Awlaelo, Ofa and Asgede Tsimbila districts, respectively. However, there is no record that indicates the documentation of medicinal plants used by the people of Seharti Samre District. The purpose of this study was, therefore, to document and analyze traditional knowledge of medicinal plants used to manage human and animal health problems in Seharti Samre District, Southern Tigray, Ethiopia.

Methods
Description of the study area
The study was conducted in Seharti Samre District (Woreda) located between 12°30’ and 13°02’ latitude north and 38°59’ and 39°26’ longitude east in southeast of Tigray at about 57 km southwest of Mekelle, the capital city of Tigray Region and 820 km north of Addis Ababa (Figure 1). The District has undulated type of landscape with altitude ranging from 1470 to 2370 meter above sea level (m.a.s.l) (Seharti Samre District Rural Agricultural Office, unpublished data of 2011). The District has warm and hot climate conditions and unimodal rainfall distribution that extends from April to September with the highest peak in July and August.

The great majority of inhabitants in the District belong to Tigray ethnic group. According to unpublished report of 2011 obtained from Seharti Samre District Health Office, the public healthcare coverage of the District reaches 85%. However, there are people who still rely on traditional medicine due to low cost of the service and more preference to the system. A study by Yirga [8] reported the use of 27 medicinal plants in the neighbouring District of Enderta. In the District, there are five health centres and eighteen health posts. Pneumonia, skin diseases, malaria, intestinal parasites infection and diarrhoea, acute respiratory tract infection, gastritis, urinary tract infection, diarrhoea, snake bites and conjunctivitis are the top ten human health problems in the District (Seharti Samre District Health Office, unpublished report, 2011). Anthrax, black-leg, trypanosomiasis, bloat, gland swelling, cough and intestinal diseases are the major livestock diseases in the District (Seharti District Samre Veterinary Health Office, unpublished report, 2011).

Selection of study sites
The study was conducted in Seharti Samre District from July 1, 2011 to December 30, 2012. Prior to conducting this study, proposal approval letter was received from Jimma University Ethical Review Committee (ERC) and verbal informed consent from each informant who participated in the study.

Sampling of informants
Purposive sampling method was employed to select 66 traditional healers and knowledgeable individuals (55 men and 11 women) between the ages of 20 and 76 years for semi-structured interviews. Informants that were involved in preference/priority and direct matrix rankings were selected randomly from those healers and knowledgeable individuals that were already sampled for the interviews.

Collection of data and plant specimens
Semi-structured interviews and field observation [15,16] were employed to collect ethnobotanical data. Individual interviews were held with informants to gather data on medicinal plants with regards to plants parts used, methods of preparation, dosage, route of administration, diseases treated, threats, conservation status, cultivation practice, marketability, acquisition/transfer of indigenous
knowledge and attitudes of people towards using such plants. All communications with informants were held in Tigrigna, the official language of Tigray Region. Specimens of medicinal plans were collected, dried and identified with the help of botanists at Aklilu Lemma Institute of Pathobiology and the National Herbarium, Addis Ababa University (AAU) and were deposited at the Jimma University Herbarium.
Data analysis and presentation
Microsoft Excel spreadsheet software was employed for organizing and analysis of ethnobotanical data. Descriptive statistical analysis was employed to determine the number of medicinal plants used and ailments treated in the study District, the most frequently used plant parts, main routes of remedy administration and to identify popular medicinal plants, main ways of knowledge acquisition/transfer, major habitats of the plants and their marketability.

Informant consensus factor (ICF) was calculated for each ailment group to estimate level of agreement among informants in the selection of plants against a given category. ICF was calculated using the formula 

$$ICF = \frac{\sum_{i=1}^{n} n_i - n}{n^2 - n}$$

where ICF stands for informant consensus factor, \( n_i \) for number of use citations in each category and \( n \) for number of species used.

Preference ranking technique [18] was used to identify the most preferred medicinal plants used in the District to treat snake bite based on informants’ personal preference or perception. Snake bite is one of the ten most important human health problems in the District. It is also among the ten diseases with the highest ICF values. The most preferred plant was assigned the highest score (6), while the least effective one was given the lowest value (1). For this purpose, eight individuals were randomly selected from the people that had already served as key informants. Each informant was provided with fresh specimens of six medicinal plants having the highest frequency of report by informants for being used to treat snake bite. The informants were then asked to rank the plants according to their degree of preference.

Priority ranking exercise [18] was also performed by seven informants to rank different factors perceived as threats to medicinal plants in the study area based on level of destructive impacts. During exercises, informants assigned values 1–4, 1 for the least destructive threat and 4 for the most destructive one.

Direct matrix ranking [16,18] was performed for six commonly reported multipurpose medicinal plants. Based on the relative benefits obtained from each plant, a group of five informants were asked to discuss and assign, to each attribute, a value between 1 and 4 (1 for the lowest value and 4 for the highest value). Scores were then added and plants ranked.

Results
Acquisition/transfer of medicinal plants knowledge
Majority (65.6%) of informants reported that transfer of knowledge on medicinal plants in the study District took place along the family line, from parents to children. Some informants (21.2%) reported close relatives as sources of knowledge while other informants (9.1%) indicated transfer of the knowledge on payment (9.1%) and few reported acquisition of knowledge through trial and error methods (6.1%). Results of interviews also revealed that 69.7% of the informants were willing to transfer their knowledge of medicinal plants along the family line verbally and 9.1% reported that they were happy to transfer the knowledge verbally assisted by practical demonstration. Other informants (21.2) reported that they had no interest to transfer their knowledge at all.

Comparison of medicinal plant knowledge between age groups
Analysis was made to compare medicinal plant knowledge among two age groups Result revealed that members belonging to the age group above 40 year reported an average of 2 medicinal plants while those belonging to the age group between 20 and 40 years reported an average of less one medicinal plant. During interviews and field visits, informants above 40 years of age were found to be very conversant on how to collect plants, process remedies and administer them. Besides, older informants had stronger belief in the curative effect of their medicinal plants as compared to the younger generation.

Medicinal plants reported and diseases treated
Ninety medicinal plant species that were used for the treatment of 51 human (Table 1) and 25 animal diseases (Table 2) were reported by the informants in Seharti Samre District. Of the total medicinal plants, 62 were used to treat human diseases only, 25 to treat both human and animal diseases and three to mange animal diseases only. The medicinal plants belonged to 46 families and 82 genera. The family Solanaceae was represented by 9 species, Lamiaceae by 8 species, Fabaceae by 6 species, Asteraceae and Euphorbiaceae by 5 species each, Malvaceae by 4 species, Boraginaceae and Capparidaceae by 3 species each. The families Rutaceae, Asclepiadaceae, Apocynaceae, Brassicaceae, Cucurbitaceae, Oleaceae, Rhamnaceae and Vitaceae contributed 2 species each and the remaining 28 families were represented by one species each. Most of the recorded medicinal plants were shrubs and herbs accounting for 42.2% and 39%, respectively, followed by trees (14.4%) and climbers (4.4%).

Relatively higher numbers of medicinal plants were used to treat intestinal parasites; diarrhoea and stomach ache (26 species), wounds, scabies and leprosy (23 species), respiratory disease (16 species), evil eye, evil spirit, devil sickness (15 species) and rheumatism and arthritis (15 species).

Plant part (s) and methods used in preparation of remedies
Leaves were the most preferred plants parts used in the preparation of remedies (44%), followed by roots (16%),
| Scientific name                  | Family               | Local name | Habit | Parts used | Disease treated | Mode of preparation and administration | Application route | Voucher no |
|----------------------------------|----------------------|------------|-------|------------|----------------|----------------------------------------|-------------------|------------|
| Achyranthes aspera L.            | Amaranthaceae        | mechelo    | Herb  | Root       | Arthritis       | Roots chopped into pieces; seven pieces are put on clean thread and tied on the waist until recovered from the disease | Dermal            | SA01303    |
| Acokanthera schimperi (A.DC.)    | Apocynaceae          | Mebtie (merez) | Tree  | Leaf       | Jaundice        | Leaves are boiled in water for an hour and the patient takes a cup of the solution per day for seven days | oral              | SA01333    |
| Allium sativum L.                | Alliaceae            | Tsa’da shegurti | Herb  | Bulb       | Gastritis       | Bulb is eaten with flatbread locally known as ‘enjera’ | oral              | SA01368    |
| Aloe megalacantha Baker          | Alloaceae            | Ere        | Shrub | Exudate    | Malaria         | Exudate, mixed with honey, is taken orally with coffee cup for three days | oral              | SA01384    |
| Alysicarpus ferrugineus Hochst. & Steud. ex A. Rich. | Fabaceae            | Hambo hambo bita | Herb  | Root       | Jaundice        | Root chewed for five days | oral              | SA01336    |
| Argyemone mexicana L.            | Papaveraceae         | Medafe tilian | Herb  | Leaf       | wound           | Fresh leaves are collected, crushed and paste applied on affected part | Dermal            | SA01381    |
| Artemisia afra Jacq. ex willd.   | Asteraceae           | Chena baria | Herb  | Leaf       | Evil eye        | Aroma of the leaves help in expelling evil eye | nasal             | SA01309    |
| **Asparagus africanus** Lam. | Asparagaceae | Kasta ansti | Shrub | Root | Impotence | Roots are pounded into powder, mixed with meat soup and vegetable and taken every evening for a month. | oral | SA01340 |
| **Bosca salicifolia** Oliv. | Capparidaceae | Shesha | Shrub | Leaf | Ear infection | Leaves are crushed, squeezed and liquid filtered with clean cotton and three drops are applied on infected ear | ear | SA01329 |
| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |
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**Table 1 List of medicinal plants used to treat human diseases (Continued)**

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| **Boscia salicifolia** Oliv. | Capparidaceae | Shesha | Shrub | Leaf | Ear infection | Leaves are crushed, squeezed and liquid filtered with clean cotton and three drops are applied on infected ear | ear | SA01329 |
| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |

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| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |

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| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |

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| **Boscia salicifolia** Oliv. | Capparidaceae | Shesha | Shrub | Leaf | Ear infection | Leaves are crushed, squeezed and liquid filtered with clean cotton and three drops are applied on infected ear | ear | SA01329 |
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| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |

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| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |

**Table 1 List of medicinal plants used to treat human diseases (Continued)**

| **Boscia salicifolia** Oliv. | Capparidaceae | Shesha | Shrub | Leaf | Ear infection | Leaves are crushed, squeezed and liquid filtered with clean cotton and three drops are applied on infected ear | ear | SA01329 |
| **Cadaba rotundifolia** Forsk. | Capparidaceae | Mora | Shrub | Leaf | Toothache | Chew leaves and hold paste on affected tooth | oral | SA01328 |
| **Calotropis procera** (Ait.) Ait. | Asclepiadaceae | Ginda | Shrub | Flower | Kidney stone | Dry flower crushed into powder and mixed with dough of wheat and medicine prepared tablet form is baked on iron plate and three to four tablets are taken for long period of time | oral | SA01375 |
Table 1 List of medicinal plants used to treat human diseases (Continued)

| Plant Name | Family | Common Name | Part Used | Condition | Application Method | Place of Use |
|------------|--------|-------------|-----------|------------|-------------------|--------------|
| Citrus lemon (L.) Burm. f. | Rutaceae | Lomin | Shrub | Fruit | Haemorrhoids | Fruits and leaves are pounded, mixed with butter and applied on affected area | anal, SA01369 |
| | | | | | Blood pressure | Fruit juice is added into cup of water and drunk every morning | oral |
| | | | | | Cough | Fruit decoction with sugar added into it is taken orally | oral |
| | | | | | Tetanus | Crushed fruit is mixed with butter and applied on affected area and is covered with clean cotton | Dermal |
| Clerodendrum myricoides (Hochst.) Verbenaceae R.Br. Ex Vatke | Verbenaceae | Leaf | Arthritis/rheumatism | Apply butter on patient’s head and let him/her fumigated with leaves of the plant | nasal, SA01347 |
| | | | Conjunctivitis and trachoma | Leaves are crushed and added into boiling water and the patient steam baths himself | ophthalmic |
| | | | Root | Evil eye | Roots are pounded into powder and sprinkled on fire to expel evil eye |
| Coffea arabica L. | Rubiaceae | Buna | Shrub | Seed | Amoebiasis | Seeds are roasted, pounded into powder, mixed with honey and taken orally | oral, SA01397 |
| | | | | | Wound | Seeds are roasted, and pounded into powder and paste applied on affected part | Dermal |
| | | | | | Fire burn | Seeds are roasted, pounded into powder and paste applied on affected area after mixing it with sap of Aloe megalacantha | Dermal |
| Colutea abyssinica Jaub. and Spach. | Fabaceae | Qaqata | Shrub | Leaf | Wound | Leaves are pounded into powder and sprayed on wound | Dermal, SA01342 |
| Commicarpus grandiflorus (A. Rich.) Standl. | Nyctaginaceae | Ezni Tawa | Herb | Leaf | Furunculosis | Leaves are crushed and paste smeared on affected area | Dermal, SA01354 |
| Commiphora schimperi (Berg) Engl. | Burseraceae | Anqa | Tree | Latex | Wound | Latex smeared on wound | Dermal, SA01323 |
| Cordia africana Lam. | Boragentaceae | Awhi | Tree | Leaf | Febrile illness | Leaves are crushed, squeezed and liquid taken with coffee | oral, SA01367 |
| Croton macrostachyus Del. | Euphorbiaceae | Tanbuk | Tree | Leaf | Diarrhoea | Leaves are crushed, squeezed and a cup of juice taken with honey | Oral, SA01373 |
| | | | | | Bark | A bark is dried, pounded into powder and one to two spoons of powder are added into coffee or tea and taken for a week | oral |
| | | | | | Root | Root bark is dried, pounded into powder and two to three spoons of powder are added into a cup containing water. Treatment is taken for 21 days | oral |
| | | | | | Leaf, bark | Dried bark/leaves are pounded into powder, one to two tea spoon of powder are added into skimmed milk and served once | oral |
| | | | | | Leaf | Dried bark is pounded into powder, two to three spoons of powder added into local beer and taken for a week once per day. The medicine could cause diarrhoea and vomiting | oral |
| Plant Name | Family | Part Used | Disease | Preparation and Application |
|------------|--------|-----------|---------|-----------------------------|
| C. ficifolius A. Rich. | Cucurbitaceae | Leaf | Scabies | Leaves are crushed, mixed with butter and dressed on affected part |
| C. ficifolius A. Rich. | Cucurbitaceae | Leaf | Tinea versicolor | Sap of leaves are applied on affected area |
| C. ficifolius A. Rich. | Cucurbitaceae | Leaf | Urine retention | Leaves are added onto boiled water with sugar. Solution is then taken every morning for seven days |
| C. ficifolius A. Rich. | Cucurbitaceae | Leaf | Anthrax | Leaves are either ground into powder or crushed, squeezed, filtered, mixed with coffee and taken with a coffee cup for two days |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Eye disease | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Jaundice | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Stomach ache | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Stomach ache following delivery | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Snake bite | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Fruit | Ear infection | Three drops of fruit juice are applied into ear for five days |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Tuberculosis | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Root | Teeth ache | Roots are chewed |
| C. ficifolius A. Rich. | Cucurbitaceae | Fruit | Asthma | Fruits are washed, dried, ground into powder, added onto boiled coffee and drunk |
| C. ficifolius A. Rich. | Cucurbitaceae | Root, leaf | Eczema | Roots and leaves are ground into powder, mixed with honey and dressed on affected area |
| C. ficifolius A. Rich. | Cucurbitaceae | Fruit/leaf | Tetanus | Fruits and leaves are crushed, mixed with butter, heated on fire and applied on affected area and covered with clean cotton cloth. This is repeated for three days |
| C. pepo L. | Cucurbitaceae | Seed | Tapeworm | Seven roasted seeds are taken orally, followed by three hours of fasting |
| C. pepo L. | Cucurbitaceae | Fruit | Urine retention | Fruits are cooked and taken as soup |
| Cynoglossum coeruleum Hochst. ex A.DC. | Boraginaceae | Leaf | Febrile illness (michi) | Leaves are crushed, squeezed and liquid taken with coffee or its lotion is applied on skin |
| Cyphostemma adenocaule (steud.ex A. Rich) Descoings ex Wild and Drummond | Vitaceae | Root | Skull wound | Dried roots are ground into powder, mixed with butter and dressed on affected area |
| Datura stramonium L. | Solanaceae | Leaf | Dandruff | Leaves are crushed and creamed on shaved head |
| Datura stramonium L. | Solanaceae | Leaf | Tetanus | Fresh leaves are crushed, mixed with butter, heated and smeared on affected area before covering it with clean cotton cloth |
| Datura stramonium L. | Solanaceae | Leaf | Dandruff | Leaves are crushed and creamed on shaved head |

*SA01321, SA01390, SA01359, SA01346, SA01312*
| Plant Name                        | Family          | Common Name       | Part Used   | Disease                  | Treatment                                                                 | Route/Location |
|----------------------------------|-----------------|-------------------|-------------|--------------------------|---------------------------------------------------------------------------|----------------|
| Dodonaea angustifolia L. f.       | Sapindaceae     | Tahsos            | Tree/Leaf   | Herpes zoster            | Seeds are roasted, ground into powder, mixed with butter and smeared on affected area | Dermal         |
|                                   |                 |                   |             |                          |                                                                          | SA01327        |
| Erucastrum arabicum Drummond and Hemsely | Brassicaceae   | Hamli gudible     | Herb/Leaf   | Ring worm                | Leaf powder is sprayed on wound                                           | Dermal         |
|                                   |                 |                   |             |                          |                                                                          | SA01317        |
| Erythrina abyssinica Lam. ex DC. | Fabaceae        | Zuwabue, enqui hebeyleaf | Tree/Bark  | Evil eye                 | Leaves are rubbed on skin                                                 | Dermal         |
|                                   |                 |                   |             |                          |                                                                          | SA01322        |
| Eucalyptus globulus Labill.       | Myrtaceae       | Tsada Kelamitose  | Tree/Leaf   | Tinea pedis              | The patient baths himself with steam of boiled leaves                     | Oral/nasal/dermal |
|                                   |                 |                   |             |                          |                                                                          | SA01376        |
| Euclea divinorum Hiern.           | Ebenaceae       | Kuliew            | Shrub/root  | Scorpion bite            | Roots are chewed to relieve pain                                           | Oral           |
|                                   |                 |                   | Root/stem   | Rheumatism and arthritis| The patient spreads animal butter on his/her head, burn roots and stems on fire and baths him/herself with smoke | Dermal         |
|                                   |                 |                   |             |                          |                                                                          | SA01379        |
| Euphorbia cactus Boiss            | Euphorbiaceae   | Kolqual hamat     | Shrub/Latex | Leishmaniasis            | Latex is smeared on affected area                                         | Dermal         |
|                                   |                 |                   |             |                          |                                                                          | SA01386        |
|                                   |                 |                   |             | Gonorrhoea and syphilis  | Add three to four drops of latex on a piece of 'enjera' and eat it. Medicine is taken for five consecutive days. Overdose may cause diarrhoea and vomiting | Oral           |
|                                   |                 |                   |             |                          |                                                                          |                |
|                                   |                 |                   |             | Jaundice                 | Roots are ground into powder, mixed with honey and taken for seven days   | Oral           |
| Medicinal Plant | Family | Genus | Species | Part Used | Condition | Method of Use |
|-----------------|--------|-------|---------|-----------|-----------|--------------|
| *Euphorbia petiolaris* A. Rich. | Euphorbiaceae | Demaito demu | Herb | Latex | Ascariasis | Four drops of latex are mixed with sugar solution and taken once before diet | Oral |
| *Ficus palmata* Forsk. | Moraceae | Beless | Tree | Latex | Leptospirosis | Latex smeared on affected area | Dermal |
| *Foeniculum vulgare* Miller | Apiaceae | shelan | Herb | Whole plant | Ringworm | Latex smeared on affected area | Dermal |
| *Gomphocarpus fruticosus* (L.) Aiton f. | Asclepiadaceae | Demaito bereka | Herb | Latex | Ringworm | Latex smeared on affected area | Dermal |
| *Gossypium herbaceum* L. | Malvaceae | Tut | Shrub | Root | Snake bite | Roots are chewed to detoxify poison | Oral |
| *Hibiscus micranthus* L.f | Malvaceae | Segot Hamat | Shrub | Whole plant | Typhus | House is fumigated with smoke to protect oneself from the disease | Nasal |
| *Hypoestes forskalii* (Vahl) R. Br. | Acanthaceae | Gerbia | Herb | Leaf | Jaundice | Leaves are crushed, squeezed and juice taken orally | Oral |
| *Jasminum granditlorum* L. subsp. *floribundum* (R.Br. ex Fresen.) P.S. Green | Oleaceae | Habitselim | Shrub | Leaf | Ascariasis | Leaves are crushed, squeezed and cup of juice with sugar is taken orally | Oral |
| *Justicia schimperiana* (Hochst. ex A.Nees) T. Anders | Acanthaceae | Shemezala | Shrub | Leaf | Jaundice | Leaves are chewed to stop vomiting | Oral |
| *Klinia odora* Forsk. | Asteraceae | Berier | Shrub | Whole plant | Snake bite, evil eye, evil spirit | House is fumigated to repel snakes and expel evil spirit | Nasal |
| *Leonotis ocymifolia* (Bunn. f.) Iwansson | Lamiaceae | Keyhi Embeba Ketater | Herb | Whole plant | Fibrile illness (michi) | Fumigating oneself with smoke of plant | Nasal |
| *Lepidium sativum* L. | Brassicaceae | Shenfa | Herb | Seed | Amoebiasis and diarrhoea | Seeds are ground into powder, mixed with honey and then taken for three days | Dermal |
| | | | | | | Open swelling/wound, add small amount of sulphur and covered it with seed paste of *L. sativum* and latex of *C. procera* | Dermal |
| Table 1 List of medicinal plants used to treat human diseases (Continued) |
|---------------------------------------------------------------|
| **Evil spirit** | Grind seeds, add powder into water and spray solution indoor to expel evil spirit | Dermal |
| **malaria** | L. sativum seeds are crushed with leaves of R. chalepensis and A. Sativum and then taken orally for seven days | Dermal |
| **Premna oligotricha L.** | Lamiaceae | Sasa hadima | Shrub | Leaf | **Ascariasis** | Leaves are crushed and squeezed and a cup of juice is taken once orally |oral SA01325 |
| **Linum usitatissimum L.** | Linaceae | Entatie | Seed | **Placental retention** | Seeds roasted on iron sheet and grinding into powder, then cooked in the presence of honey and taken for a month before delivery | oral SA01386 |
| **Premna oligotricha L.** | Lamiaceae | Sasa hadima | Shrub | Leaf | **Ascariasis** | Leaves are crushed and squeezed and a cup of juice is taken orally | oral SA01386 |
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| **Lycopersicon esculentum Mill.** | Solanaceae | Tsebhi Awun | Herb | Leaf | **Anthrax** | Leaves are crushed, mixed with honey and swallowed | oral SA01352 |
| **Maesa lanceolata** | Myrсинaceae | Saira | Tree | Leaf | **Scabies** | Leaves are crushed and juice smeared on affected part | Dermal SA01302 |
| **Malva verticillata L.** | Malvaceae | Enkeftih | Herb | Leaf | **Anthrax** | Leaves are crushed, mixed with honey and swallowed | oral SA01330 |
| **Melia azedarach L.** | Meliaceae | Neem | Tree | Leaf | **Tonsillitis** | Crush leaves, filter and drunk the juice | oral SA01382 |
| | | | | Seed, leaf | **Dandruff** | Seeds and leaves are crushed and paste applied on head skin | Dermal |
| | | | | Leaf | **Malaria** | Leaves are crushed and squeezed, and a cup of solution taken orally daily for five days | oral |
| **Meriandra dianthera** | Lamiaceae | Mesaguh | Tree | Leaf | **Blood pressure** | Leaves are boiled in water and solution taken daily for a month by cup of tea until improvement | oral SA01339 |
| (Roth, ex. Roem. & Schult.), Briq. | | | | | **Diarrhoea** | Leaves are ground, powder is mixed with water and a cup of solution taken orally | oral |
| **Nicotiana tabacum L.** | Solanaceae | Tunbako | Herb | Root | **Snake bite** | Roots are chewed or crushed and paste applied on wound | oral SA01308 |
| **Ocimum lamifolium** | Lamiaceae | Dem akher (demekasie) | Shrub | Leaf | **Feverish illness (michi)** (demekasie) | Leaves are crushed and solution drunk with coffee. Juice is also smeared on skin | oral SA01311 |
| Hochst. Ex Benth. | | | | | **Asthma** | Leaves are boiled in water and a cup of solution drunk every evening with skimmed milk to arrest vomiting | oral SA01374 |
| **Olea europaea L. subsp. cuspidata** | Oleaceae | Awlie | Tree | Leaf | **Vomiting** | Leaves are chewed to stop vomiting | oral |
| (Wall. ex G. Don) Cif. | | | | | **Amoebiasis** | Leaves are crushed, squeezed and a cup of taken orally | oral |
| Table 1 List of medicinal plants used to treat human diseases (Continued) |
|---|
| **Eye infection** | Leaves are crushed, squeezed, filtered and two to three drops are added daily into the eye for five days  | ophthalmic |
| **Teeth ache** | Leaves are crushed and paste applied on affected area  | Dermal |
| **Ascariasis** | Leaves are crushed, squeezed and a cup of juice taken orally for one day  | oral |
| **Ormocarpum pubescence (Hochst.) Cuf. ex Gillett** | Fabaceae | Alendia | Shrub | Stem | rheumatism | Stems burned on prepared place at home and females bathing the smoke putting butter on their head | nasal | SA01320 |
| **Orobanche minor Smit.** | Orobanchaceae | Selmi | Herb | Whole plant | Eye disease | Burn the plant on clay dish and let the patient fumigate himself with smoke | nasal | SA01338 |
| **Otostegia integrifolia Benth.** | Lamiaceae | Chendog | Shrub | Leaf | Blood pressure | Leaves are boiled boiling in water and a cup of solution drunk every morning until recovery | oral | SA01357 |
| **Oxalis anthelmintica A. Rich** | Oxalidaceae | Habachego | Herb | Leaf | Heart failure | Leaves are eaten for long period of time (about a year) | oral | SA01318 |
| **Pavonia burchellii (DC.) Dyer.** | Malvaceae | Neger negarito | Shrub | Leaf | Stomach ache | Leaves are crushed, squeezed and a cup of juice taken orally | oral | SA01388 |
| **Phytolacca dodecandra L’Herit.** | Phytolaccaeae | Shebti | Shrub | Root | Rabies | Dried root of the plant is powdered and mixed with local alcohol and a cup of solution drunk daily for twelve days. vomiting is its side effect and, therefore, restricted to children and pregnant women | oral | SA01387 |
| **Plantago lanceolata L.** | Plantaginaceae | Melhas kelbi | Herb | Leaf | Tinea corporis wound | Leaves are rubbed on affected area | Dermal | SA01358 |
| **Plumbago zeylanica L.** | Plumbaginaceae | Aftihi | Shrub | Root | Evil eye, evil spirit, magic | Roots are fumigated in the house | nasal | SA01324 |
| **Polygala abyssinica Fres.** | Polygalaceae | Etselebona | Herb | Root | Snake bite | Roots are chewed | oral | SA01314 |
| | | | | | Sharpen mind | Finger-sized root is chewed. Overdose may causes madness | oral |
| | | | | | Sever stomach ache | Roots are chewed | oral |
| Plant Name | Family | Common Name | Part Used | Disease | Method of Use |
|------------|--------|-------------|-----------|---------|---------------|
| Rhamnus prinoides L’Herit. | Rhamnaceae | Gesho | Shrub | Leaf | Tonsillitis | Mothers chewing the leaves and spitting them into the mouth of their children where as young ones chew it for themselves |
| Rhoicissus tridentata (L. f.) Wild & Drummond | Vitaceae | Hareg temen (etsezewie) | Climber | Root | Snake bite | Leaves crushed, mixed with pure butter and dressing the affected part |
| Rumex abyssinicus Jacq. | Polygonaceae | mokemoko | Herb | Root | Blood pressure | Roots are ground, powder mixed with water and solution drunk with tea every morning until improvement |
| Rumex nervosus Vahl. | Polygonaceae | Huhot | Shrub | Stem | Gastritis | Young stems are chewed with salt and swallowed |
| | | | | Root | Snake bite | Roots are chewed to detoxify poison |
| | | | | Leaf | Skin rash | Leaves are crushed and paste rubbed on affected area |
| | | | | | Breast cancer | Leaves are crushed and paste applied on affected area |
| Ricinus communis L. | Euphorbiaceae | Gulie | Shrub | Seed | Amoebiasis | Crushed seeds are mixed with water and taken with a cup of tea once |
| Ruta chalepensis L. | Rutaceae | Chena adam | Herb | Leaf | Evil eye | Rub the leaves and Smell |
| | | | | | Cough | Leaves boiled in milk are taken orally |
| | | | | | Malaria | Crushed the leaves of the plant with bulb of A. sativum in by adding and take medicine orally for three days |
| | | | | | Flue | Leaf of R. chalepensis is pounded with bulb of A. Sativum, mixed with soup and used as a drink |
| Sansevieria erythraeae Mattei | Dracenaceae | Eka termo | Shrub | Leaf | Ear infection | Leaves are heated on fire, juice squeezed into tea cup and three to four drops are added into the infected ear |
| Schinus molle L | Anacardiaceae | Tselim berbere | Tree | Stem | Blood pressure | Chewing the stern |
| | | | | Leaf | Eye infection | Boil leaves in water and let the patient bath himself with steam |
| Solanum hirtulum Steud. ex A. Rich. | Solanaceae | Alalemo kelbi | Herb | Root | Stomach ache | Chewing the root |
| Solanum incanum L. | Solanaceae | Neshtey engule | Shrub | Leaf | Anthrax | Seven leaves are crushed, mixed with honey and taken orally |
| | | | | Root | Arthritis | Roots are ground, powder mixed with animal butter and cream applied on affected body part and let the patient expose himself to sun light for five days |
| Plant Name                  | Family          | Common Name | Part Used           | Disease             | Treatment Method                                                                 | Route  | Code   |
|----------------------------|-----------------|-------------|---------------------|---------------------|---------------------------------------------------------------------------------|--------|--------|
| Solanum marginatum L. f.   | Solanaceae      | Abyiengule  | Shrub, Seed         | Stomach ache        | Chewing the root                                                                 | Dermal | SA01313|
|                            |                 |             |                     | Gonorrhoea          | Roots are ground, powder mixed with honey and paste taken for five days          | oral   |        |
|                            |                 |             |                     | Tuberculosis        | Seeds are dried, crushed and added into milk or coffee and solution taken every morning for 21 days | oral   |        |
| Solanum nigrum L.          | Solanaceae      | Alalemo Wezero | Shrub, Leaf        | Epistaxis           | Leaves crushed and pasted on the nasal openings                                  | Dermal | SA01360|
|                            |                 |             |                     | Bleeding after delivery | Leaves are crushed and inserted into vagina                                  | Dermal |        |
| Tagetes minuta L.          | Asteraceae      | Etsefaruos  | Herb, Whole plant   | Evil eye            | Smoking the plant and let the patient fumigate himself                          | Nasal  | SA01389|
| Tragia uncinata M. Gilbert | Euphorbiaceae   | Amae        | Herb, Root          | Impotence           | Roots are ground and taken orally with local soup for a week                    | Oral   | SA01361|
| Trigonella foenum-graecum L.| Fabaceae        | Abake       | Herb, Seed          | Urticaria           | Grind seeds, mix powder with butter and apply cream on affected part             | Dermal | SA01392|
| Verbascum sinaticum Benth. | Scrophulariaceae | Trnaka     | Herb, Leaf          | Stomach ache        | Boil powder in water, add sugar and given to babies                              | Oral   |        |
|                            |                 |             |                     | Bleeding            | Leaves are crushed and paste applied on affected area                           | Dermal | SA01366|
|                            |                 |             |                     | Haemorrhoids        | Leaves are crushed, packed in a piece of cloth and inserted through rectum       | Rectal |        |
|                            |                 |             |                     | Fire burn           | Leaves are crushed, squeezed and juice applied on the damaged part using clean cotton | Dermal |        |
|                            |                 |             |                     | Swelling            | Rub the swelling using fresh leaves                                             | Dermal |        |
| Verbena officinalis subsp. africana R. Fernandes & Verdc. | Verbenaceae | Atush | Herb, Whole plant | Ascariasis           | Plant is crushed, squeezed and juice taken with cup of coffee for three days   | Oral   | SA01307|
|                            |                 |             |                     | Diarrhoea           | Plant is crushed, squeezed and juice taken with cup of coffee for two to three days | Oral   |        |
|                            |                 |             |                     | Ear infection       | Leaves are crushed, squeezed, juice filtered with clean cotton cloth, juice mixed with goat butter and three drops are added into the infected ear | Auricular |        |
|                            |                 |             |                     | Herpes zoster       | Leaves are crushed and paste applied on affected area                           | Dermal |        |
|                            |                 |             |                     | Snake bite          | Chewing the root                                                               | Oral   |        |
|                            |                 |             |                     | Tonsillitis         | Adults chew the root and spit paste into the mouth of their sick child          | Oral   |        |
|                            |                 |             |                     | Whole plant         | Plant is crushed, squeezed and solution taken with the cup of tea                | Oral   |        |
| Vernonia amygdalina Del.   | Asteraceae      | Grawa       | Tree, Leaf, root    | Devil sickness      | Rub body with crushed leaves or smoke root and inhale the smoke. Crushed young twigs and leaves may also be spread in a house | Dermal/nasal | SA01306|
|                            |                 |             |                     | Malaria             | Crushed leaves of this plant and R. Chalpensis are boiled and three tablet- sized medicine prepared by | Oral   |        |
Table 1 List of medicinal plants used to treat human diseases (Continued)

| Plant                          | Family     | Part Used | Disease          | Preparation                                                                 | Route     | Code   |
|--------------------------------|------------|-----------|------------------|-----------------------------------------------------------------------------|-----------|--------|
| Withania somnifera (L.) Dunal  | Solanaceae | Root      | Snake bite       | Chewing the root                                                           | oral      |        |
|                               |            | Leaf      |                  |                                                                            |           |        |
|                               |            | Teeth ache |                  | mixing paste with honey is served every morning for seven days             |           |        |
| Zehneria scabra (Linn.f.) Sond.| Cucurbitaceae | Leaf, stem | Teeth ache      | Leaves are chewed with bulbs of A. sativum                                 | oral      | SA01356|
|                               |            | michi     |                  |                                                                            |           |        |
| Zingiber officinale Rosc.     | Zingiberaceae | Herb     | Febrile illness  | The plant together with E. globulus and J. schimperiana is boiled in water and patient takes steam nasally | Nasal     | SA01305|
| Ziziphus spina-christi (L.) Desf. | Rhamnaceae | Shrub     | Dandruff         | Leaves are crushed and paste applied on head skin                           | Dermal    | SA01370|
| Scientific name               | Family          | Local name     | Habit   | Parts used | Disease treated          | Animal treated | Mode of preparation and administration                                      | Application route | Voucher no |
|------------------------------|-----------------|----------------|---------|------------|--------------------------|----------------|-------------------------------------------------------------------------------|-------------------|------------|
| *Aloe megalacantha* Baker    | Aloaceae        | Ere            | Shrub   | Exudate    | Anthrax                  | Cattle         | Crush leaves, squeeze the exudate, mix it with cold water let the animal drink one cup of the solution | Oral              | SA01384    |
|                              |                 |                |         |            | Trypanosomiasis          | Cattle         | Exudate is mixed with poultry faeces is smeared on affected body parts       | Dermal            |            |
|                              |                 |                |         |            | Root                     | Cattle         | Roots are cut into pieces, tied by thread and tied on damaged part of the body | Dermal            |            |
|                              |                 |                |         |            | Exudate                  | Cattle         | Exudate is smeared on affected body part of the animal                       | Dermal            |            |
|                              |                 |                |         |            |                          | Equine         |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Sheep          |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Goat           |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Scabies        | Crush leaves and apply exudate on the infected skin                         | Dermal            |            |
| *Achyranthes aspera* L.      | Amaranthaceae   | Muchelo        | Herb    | Root       | Thelaziasis (eye disease)| Cattle         | Roots are chewed and juice spitted into the affected eye of cattle           | Eye               | SA01303    |
|                              |                 |                |         |            |                          | Equine         |                                                                               |                   |            |
| *Allium sativum* L.          | Alliaceae       | Tsada shugurti | Herb    | Bulb       | Thelaziasis (eye disease)| Cattle         | Bulbs are crushed, squeezed, filtered, mixed with soot and paste inserted into affected part | Eye               | SA01368    |
|                              |                 |                |         |            |                          | Equine         |                                                                               |                   |            |
|                              |                 |                |         |            | Aspergillosis            | Cattle         | Crush bulb with leaves of *Lecuzz* sp., squeezed it, add salt and administer a cup of the juice | Nasal             |            |
|                              |                 |                |         |            |                          | Equine         |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Sheep          |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Goat           |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Sheep          |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Goat           |                                                                               |                   |            |
|                              |                 |                |         |            |                          |                |                                                                               |                   |            |
| *Argemone mexicana* L.       | Pappavaraceae   | Medafe tilian  | Herb    | Leaf       | Sore                     | Camel          | Allium sativum is crushed, mixed with honey and apply paste on affected part | Dermal            | SA01381    |
|                              |                 |                |         |            |                          | Equine         |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Cattle         |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Sheep          |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Goat           |                                                                               |                   |            |
| *Calpurnia aurea* (Alt.) Benth. | Fabaceae     | Hetsawets     | Tree    | Seed       | Salmonellosis            | Cattle         | A cup of seeds are ground, powder mixed with salted cold water and solution given orally administered | Oral              | SA01345    |
|                              |                 |                |         |            |                          | Sheep          |                                                                               |                   |            |
|                              |                 |                |         |            |                          | Goat           |                                                                               |                   |            |
| Plant Name                        | Family          | Genus                     | Part | Disease          | Animal(s) | Treatment Description                                                                 | Route |
|----------------------------------|-----------------|---------------------------|------|------------------|-----------|---------------------------------------------------------------------------------------|-------|
| *Calotropis procera* (Ait.) Ait. | Asclepiadaceae  | Ginda                    | Shrub| Sore             | Cattle    | Leaves are crushed, rubbed on the skin until cure                                       | Dermal|
| *Croton macrostachyus* Del.     | Euphorbiaceae   | Tanbuk                    | Tree | Scabies          | Cattle    | Leaf of *C. macrostachyus* is crushed and rubbed on the affected skin three to four days consecutively | Dermal|
| *Cucumis ficifolius* A. Rich.   | Cucurbitaceae   | rambo Rambo               | Shrub| Sore             | Equine    | Roots is crushed into powder, mixed with cold water and a cup of solution is given orally | Oral  |
| *Cyphostemma adenocaule* (steud.ex A. Rich) Descoings ex Wild and Drummond | Vitaceae        | Aserkuka fetahkuka        | Climber| Pack sore        | Equine    | Root is crushed, mixed with ‘tella’, decanted and paste applied on affected part         | Dermal|
| *Dodonaea angustifolia* L. f.  | Sapindaceae     | Tahsos                    | Shrub| Sore on cattle and equine | Equine    | Leaves are dried on hot iron plate, ground and powder spread on affected part            | Dermal|
| *Eucalyptus globulus* Labill.   | Myrtaceae       | Tsada kelamitos           | Tree | Leaf             | Poultry   | Leaf of *E. globulus* is ground, powder boiled in water, solution added onto barely soup и fed to chicken | Oral  |

*Note: SA01375, SA01373, SA01321, SA01346, SA01327, SA01376*
| Plant Name                  | Family       | Common Name          | Part Used | Disease | Animal | Treatment Description                                                                                                                                                                                                 |
|----------------------------|--------------|----------------------|-----------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *Euphorbia cactus* Boiss   | Euphorbiaceae| Kolqual hamat        | Shrub     | Latex   | Cattle | Apply latex on the swollen part to protect the spread of the disease. Latex is also given in small amount with ‘enjera’                                                                                                    |
| *Justicia schimperiana* (Hochst. ex A.Nees) T. Anders | Acanthaceae  | Shemeza              | Shrub     | Leaf, root | Cattle | Leaf and root of *J. schimperiana* is pounded with dried fruit of *Ricinus communis*. One bottle of the solution is given to sick animal                                                                                   |
| *Lepidium sativum* L.     | Brassicaceae | Shenfa               | Herb      | Seed    | Cattle | Seeds are crushed, powder mixed with finger milt bread and orally administered                                                                                                                                         |
| *Leucas abyssinica* (Benth.) Briq. | Lamiaceae | Sewa Kerni           | Shrub     | Leaf    | Sheep  | Leaves are crushed and squeezed, mixed with crushed bulb of *Allium sativum*, solution is then filtered and applied nasally                                                                                         |
| *Premna oligotricha* L.   | Lamiaceae    | Sasa hadima          | Shrub     | Leaf    | Sheep  | Leaves are crushed, squeezed and given to sick animal                                                                                                                                                                 |
| *Linum usitatissimum* L.  | Lineaceae    | Entatie              | Herb      | Seed    | Sheep  | Leaves are pounded with bulb of *A. sativum*, squeezed and solution given to sick animal                                                                                                                             |
| *Melia azedarach* L.      | Meliaceae    | Nim                  | Tree      | Leaf    | Cattle | Seeds of *L. usitatissimum* are powdered and half a glass of powder is dissolved in water and given to cattle                                                                                                       |
| Plant Name                      | Family         | Common Name | Part(s) Used | Disease(s) Treated                           | Preparation and Administration                                                                 | Mode | Code |
|--------------------------------|----------------|-------------|--------------|---------------------------------------------|-----------------------------------------------------------------------------------------------|------|------|
| Nicotiana glauca R. Grah.      | Solanaceae     | Tenbishi/  | Leaf          | External parasites                          | Leaves crushed and rubbed on the skin of the animal                                            | Dermal | SA01391 |
|                               |                | charged     |              |                                             | Cattle Sheep Goat                                                                              |       |      |
| Nicotiana tabacum L.           | Solanaceae     | Tumbako     | Leaf, root    | Plant toxin (toxicosis)                     | Leaves and root are dried, powdered, mixed with salted water and a cup of the solution is given for one day the poisoned animal | Oral  | SA01308 |
|                               |                |             |              |                                             | Cattle Goat Sheep                                                                              |       |      |
|                               |                |             | Leaf          | Leech infestation                           | Leaves are crushed, squeezed and a cup of solution is nasally applied                           | Nasal |       |
|                               |                |             |              |                                             | Cattle                                                                                         |       |      |
|                               |                |             | Leech infestation |           | Crushed and baked leaves are pounded, added on half litre of water and given to affected animal | Oral  |       |
|                               |                |             |              | Trypanosomiasis                             | Leaves are crushed and baked, mixed with water and solution given to sick animal                | Oral  |       |
| Otostegia integrifolia Benth.  | Lamiaceae      | Cheendog    | Shrub Whole  | Ecto- parasites infestation                  | Fumigate the plant in the house where the animals are kept                                      | Dermal | SA01357 |
|                               |                |             | plant         |                                             | Cattle Equine Poultry Goats Shep                                                               |       |      |
| Phytolacca dodecandra L’Hert.  | Phytolaccaceae | Shebti      | Shrub Leaf    | Rabies                                       | Leaves are crushed with leaves of C. mycrostachyus, squeezed and a cup of juice mixed with ‘tella’ is given to the animal | Oral  | SA01387 |
|                               |                |             |              |                                             | Cattle Equine Sheep Goats                                                                        |       |      |
|                               |                |             | Scabies and external parasite infestation | | Leaves are crushed with little water and paste rubbed on the skin. The skin is then washed after thirty minutes | Dermal |       |
|                               |                |             |              |                                             | Cattle Sheep                                                                                  |       |      |
| Rhoicissus tridentata (L. f.)  | Vitaceae       | Hareg temen | Root/ Stem    | Snake bite                                  | Root /stem is crushed, squeezed, mixed with cold water and a cup of solution is given only once to the animal | Oral  | SA01344 |
| Wild & Drummond               |                |             |              |                                             | Cattle Goats                                                                                  |       |      |
| Ricinus communis L.            | Euphobiaceae   | Gulie       | Shrub Root    | Sudden Sickness                             | Roots of R. communis and Justica schimpeniana are pounded, mixed with cold water and a cup of the solution is to the sick animal | Oral  | SA01377 |
|                               |                |             |              |                                             | Cattle Sheep                                                                                  |       |      |
|                               |                |             | Fruit Anthrax |             | Dried fruits are ground, powder mixed with cold water and a cup of solution is given the sick animal | Oral  |       |
| Plant Name | Family | Type | Part | Disease | Treatment Details | Route |
|------------|--------|------|------|---------|--------------------|-------|
| Rhamnus prinoides L’Herit. | Rhamnaceae | Shrub | Leaf | Plant toxin (toxicosis) | Leaves are crushed into powdered and mixed with malt of barley or oil or dissolved soap and one or two cups of the solution is given to the poisoned animal | Oral SA01350 |
| Ruta chalepensis L. | Rutaceae | Herb | Leaf | Coccidiosis | Whole plant of R. chalepensis and bark of C. mycrostachyus are pounded together and paste given to chicken by mixing it 'enjera' or water | Oral SA01380 |
| Salvia schimperi Benth. | Lamiaceae | Herb | Leaf | Foot and mouth disease | Leaves are crushed, mixed with honey and dressed on the affected part of the animal | Dermal SA01355 |
| Solanum marginatum L. f. | Solonaceae | Shrub | Fruit | Urinary retention | Fruits are crushed, pounded, two to three spoons of powder is mixed with cold water and a cup of solution is given to the sick animal | Oral SA01313 |
| | | | | Tuberculosis | Fruits are crushed, pounded, two to three spoons of powder is mixed with cold water and a cup of solution is given to the sick animal until recovery | Oral |
whole plants (10%) and seeds (8%) (Figure 2). Crushing (37%), pounding (15%) and chewing (13%) were dominantly used in the preparation of remedies (Figure 3). Substances such as cold water, honey, coffee, butter, salt, sugar, soap, ash and milk were mixed with the plant materials during remedies preparations. The majority (60%) of remedies were prepared from fresh plant materials. Some (21.1%) were prepared from either dry or fresh materials and others (18.9%) from dry parts only.

**Route of remedy administration and dosage**

Most medicinal plant preparations were applied internally (64.6%), out of which drinking took the lead (44.5%). Some are applied externally on the skin (35.4%), of which 42.5% are smeared on the skin (42.5%) (Table 3). Informants reported that dosages differed among traditional medicine practitioners even in treating the same health problem as remedies are prescribed with units of local measurement such as pinch, tea spoon (powder), tablet size of seed (semisolid), coffee cup, tea cup and water cup (liquid), finger length (root) and fist (leaves).

### Table 3 Route of administration of remedies

| Main route of application | Mode of application | Percent applied |
|---------------------------|---------------------|-----------------|
| Internal application      | drinking            | 44.5            |
|                           | chewing and swallowing | 17             |
|                           | swallowing           | 12              |
|                           | Smoke bath           | 9.6             |
|                           | nasal                | 6               |
|                           | auricular            | 3               |
|                           | ophthalmic           | 2               |
|                           | Steam bath           | 2               |
|                           | anal                 | 1.4             |
|                           | Buried               | 1.4             |
|                           | Total                | 100             |
| External application     | Smearing             | 42.5            |
|                           | pasting              | 20              |
|                           | rubbing              | 12.5            |
|                           | spraying             | 7.5             |
|                           | Chewing and spitting  | 7.5             |
|                           | washing              | 6               |
|                           | tying                | 3.8             |
|                           | Total                | 100             |

**Figure 2** Plant part(s) used in the study area for remedies preparations.

**Figure 3** Preparation methods of remedies.
Popularity of reported medicinal plants
Cucumis ficifolius is the most popular medicinal plant in the study area, cited by 81.8% of the informants, followed by Allium sativum (77%). Each of the medicinal plants Croton macrostachyus, Ruta chalepensis and Vebena officinalis were cited by 75.8% of the informants (Table 4).

Informant consensus factor
Febrile illness is the disease group in the study area that scored the highest ICF value (0.97), followed by cardiovascular problems (0.97), evil eye (0.95), hepatitis (0.95), warts and haemorrhoids (0.94), infectious wounds and scabies (0.92), snake and scorpion bites (0.92), fungal diseases (0.91) and intestinal parasites infection, diarrhoea and stomach ache (0.91) and malaria (0.91) (Table 5).

Informants’ preference on medicinal plants used to treat snake bite
Preference ranking exercises of six selected informants indicate that Rhoicissus tridentata was the most preferred plant in treating snake bite, followed by Nicotiana tabacum (Table 6).

Multipurpose medicinal plants
The people in the study district relied on locally growing plant species for various purposes such as construction,

Table 4 Medicinal plants with highest informants’ consensus

| Botanical name                      | Number (%) of informants who cited the plant |
|-------------------------------------|----------------------------------------------|
| Cucumis ficifolius                  | 54 (81.8)                                    |
| Allium sativum                      | 51 (77)                                      |
| Croton macrostachyus                | 50 (75.8)                                    |
| Ruta chalepensis                    | 50 (75.8)                                    |
| Vebena officinalis subsp. africana  | 50 (75.8)                                    |
| Aloe megalocantha                   | 48 (72.7)                                    |
| Calotropis procera                  | 48 (72.7)                                    |
| Datura stramonium                   | 48 (72.7)                                    |
| Ocimum lamifolium                   | 48 (72.7)                                    |
| Solanum incanum                    | 48 (72.7)                                    |
| Phytolacca dodecandra               | 47 (71)                                      |
| Eucalyptus globulus                 | 46 (69.7)                                    |
| Olea europea subsp. cuspidata       | 46 (69.7)                                    |
| Plumbago zeylanica                  | 46 (69.7)                                    |
| Rhoicissus tridentata               | 46 (69.7)                                    |
| Zehneria scabra                     | 46 (69.7)                                    |
| Cynoglossum coeruleum               | 45 (68)                                      |
| Lepidium sativum                    | 45 (68)                                      |
| Withania somnifera                  | 45 (68)                                      |

Table 5 Informant consensus factor (ICF) values for ailments categories

| Disease categories                              | No. of species | Species (%) | No. of use citations | Use citations (%) | ICF  |
|------------------------------------------------|----------------|-------------|----------------------|-------------------|------|
| Abdominal irritation and vomiting               | 4              | 4.4         | 23                   | 1                 | 0.86 |
| Bleeding and epistaxis                          | 3              | 3.3         | 17                   | .8                | 0.88 |
| Cardiovascular problems                         | 5              | 5.6         | 85                   | 3.7               | 0.95 |
| Evil eye                                        | 15             | 16.7        | 287                  | 12.6              | 0.95 |
| Fungal diseases                                 | 14             | 15.6        | 138                  | 6                 | .91  |
| Head and tooth aches                            | 8              | 8.9         | 60                   | 2.6               | 0.88 |
| Hepatitis                                       | 7              | 7.8         | 122                  | 5                 | 0.95 |
| Infectious wounds and scabies                  | 23             | 25.6        | 260                  | 11                | 0.92 |
| Intestinal parasites infection, diarrhoea and stomach ache | 26             | 28.9        | 281                  | 12                | 0.91 |
| Malaria                                         | 8              | 8.9         | 79                   | 3.5               | 0.91 |
| Febrile illness                                 | 8              | 8.9         | 231                  | 10                | 0.97 |
| Non infectious swelling                         | 10             | 11.1        | 87                   | 3.7               | 0.89 |
| Respiratory disease                             | 16             | 17.8        | 136                  | 6                 | 0.89 |
| Rheumatism and arthritis                        | 15             | 16.7        | 105                  | 4.6               | 0.87 |
| Sensorial disease                               | 11             | 12.2        | 102                  | 4                 | 0.90 |
| Snake and scorpion bites                        | 8              | 8.8         | 91                   | 4                 | 0.92 |
| Urinary and placental retention                 | 6              | 6.7         | 50                   | 2.2               | 0.90 |
| Venereal disease and reproductive organ problems | 12             | 13.3        | 72                   | 3                 | 0.86 |
| Warts and haemorrhoids                          | 8              | 8.9         | 111                  | 4.9               | 0.94 |
firewood, medicine, charcoal, fencing, agricultural tool and furniture. Direct matrix ranking exercise performed on five commonly reported multipurpose medicinal plants shows that *Olea europaea* subsp. *cuspidata* was the most useful multipurpose plant, followed by *Cordia africana* (Table 7).

### Habitats of and threats to medicinal plants

The majority (60.2%) of medicinal plants were collected from the wild. Some (29%) were also collected from both farmlands and roadsides (Figure 4).

According to reports of informants, agricultural expansion is considered as number one threat to the survival of medicinal plants in the study area, followed by, cutting of trees for charcoal and fire wood consumption (Table 8).

### Marketed medicinal plants

Local market survey carried out in three towns of the District, namely Samre, Wenberta Adekeala and Fina Rewa revealed that plants were not sold in the markets for their sole medicinal purpose. The medicinal plants *Klinia odora*, *Lepidium sativum*, *Allium sativum*, *Rumex abyssinicus*, *Plumbago zeylanica*, *Linum usitatissimum* and *Ruta chalepensis* were sold primarily for their uses as species and food.

### Discussion

It is encouraging to find out that a high number of medicinal plants (90 species) are still being used by people in Seharti Samre District of Tigray Region, northern Ethiopia, to treat several human and livestock diseases. Ethnobotanical studies conducted in Ofila and Raya-Azebo districts of the same Region [6] came up with comparable numbers of medicinal plants, 83 and 60 species, respectively.

Several of the medicinal plants that were recorded from Seharti Samre District, were also mentioned in reports of studies previously conducted in Ethiopia, some of which (e.g. *Aloe* sp, *Ficus palmata*, *Justica schimperi ana*, *Lepidium sativum*, *Linum usitatissimum*, *Nicotiana tabacum*, *Otostegia integrifolia*, *Ricinus communis*, *Rumex abyssinicus*, *Ruta chalepensis* and *Zehneria scabra*) [6,19] were exactly used for same medicinal purposes, which could be an indication of their pharmacological effectiveness.

Analysis of the data revealed Solanaceae, Lamiaceae and Fabaceae as the highest contributors of medicinal plants in the Seharti Samre District, which could be a reflection of their dominance in the flora of Ethiopia and Eritrea [20,21] in terms of their species richness. The study also showed that people in the study District use a relatively high number of shrubs and herbs, which is in agreement with studies conducted elsewhere in the country [22].

It was found out that two-third of medicinal plants in the study District were harvested from the wild, which is in agreement with reports of many studies conducted in the country [6,23,24]. Medicinal plants growing in the wild are highly exposed to different anthropogenic factors such as agricultural expansion, deforestation for

### Table 7 Results of direct matrix ranking on selected multipurpose medicinal plants

| Use category   | Species                  | Firewood | Construction | Charcoal | Fencing | Agricultural instrument | Furniture | Medicine | Income source | Total | Rank |
|----------------|--------------------------|----------|--------------|----------|---------|------------------------|-----------|----------|---------------|-------|------|
|                | *Croton macrostachyus*   | 2        | 3            | 3        | 4       | 2                      | 4         | 3        | 4             | 21    | 4th  |
|                | *Cordia africana*        | 3        | 3            | 3        | 3       | 3                      | 3         | 4        | 3             | 21    | 4th  |
|                | *Maesa lanceolata*       | 3        | 3            | 3        | 3       | 3                      | 3         | 4        | 3             | 21    | 4th  |
|                | *Olea europaea* subsp. *cuspidata* | 4 | 4            | 4        | 4       | 4                      | 4         | 4        | 4             | 21    | 4th  |
|                | *Acokanthera schimperi*  | 3        | 3            | 3        | 3       | 3                      | 3         | 4        | 3             | 21    | 4th  |
charcoal and fire wood consumption, grazing, and harvesting for timber production and construction [22]. *Olea europaea* subsp. *cuspidata*, *Maesa lanceolata*, *Cordia africana*, *Croton mycrostachyus*, *Acokanthera schimperi*, *Phytolacca dedocandra* are among the medicinal plants that were reported to be highly affected by the aforementioned factors.

Leaves and root were the most commonly used plant parts in the preparation of remedies in the study District. Many studies conducted in different parts of Ethiopia also showed that leaves are used more frequently than any other parts [6,25,26]. As compared to other parts, damage inflicted on medicinal plants due to harvest of leaves is very minimal [27].

Most of the medicinal plant species were reported to be processed through crushing followed by pounding and chewing. Ethnobotanical studies conducted in different parts of the country [9,25,26] reported similar results. Majority of the remedies in the study District were reported to be taken internally/orally followed by smearing on the skin. Several studies conducted in different parts of the county [28] also revealed that oral followed by dermal were the principal routes of remedy administration.

One of the major problems in traditional medicine is lack of standard dosages and precised measurements [5]. According to informants in the study District, the amount of dosage prescribed for same/similar health problems vary as remedies are prescribed with different units of local measurement. Inconsistency of doses has also been reported in studies conducted elsewhere in Ethiopia [6,29,30].

The study revealed that informants above the age of 40 years had relatively better knowledge of medicinal plants as compared to the younger ones (20 to 40 years old). Similar study conducted among the Zay community in Ethiopia [24] revealed that 90% of the elders above 40 years of age had rich medicinal plant knowledge. Study conducted in Nigeria [31] reported that the highest percentage of younger generation had no any knowledge of traditional medicine practice due to more exposure to modern life style. This may demonstrate the impact of modernization on medicinal plant use and transfer of the associated knowledge to the younger generation. The fact that most of the knowledge on traditional medication is kept with elders for the sake of secrecy, gaining respect and generating income is believed

| Table 8 Priority ranking of factors perceived as threats to medicinal plants |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------|--------|
| Factors            | R1 | R2 | R3 | R4 | R5 | R6 | R7 | Total | % | Rank |
| Agricultural expansion | 4  | 4  | 4  | 3  | 4  | 3  | 4  | 26    | 17.8 | 1st  |
| Charcoal and fire wood consumption | 4  | 3  | 4  | 4  | 3  | 3  | 3  | 24    | 16.4 | 2nd  |
| Grazing            | 3  | 3  | 3  | 3  | 3  | 4  | 4  | 23    | 15.8 | 3rd  |
| Settlement         | 2  | 2  | 3  | 2  | 2  | 3  | 2  | 16    | 11   | 6th  |
| Timber and construction | 2  | 3  | 4  | 3  | 3  | 1  | 4  | 20    | 13.7 | 4th  |
| Drought            | 2  | 1  | 3  | 4  | 2  | 3  | 3  | 17    | 11.6 | 5th  |
| Total              |    |    |    |    |    |    |    | 126   |      |      |

Key: Values 1–4 were given: 1 is the least destructive threat and 4 is the most destructive threat.
to contribute towards depletion of the same as generation passes by.

Conclusion
A total of 90 medicinal plants were reported by informants from the study District. As most of the medicinal plants were harvested from the wild, appropriate conservation measures are required to ensure their sustainable harvesting besides to efforts of awareness creation among the community by concerned bodies regarding the usefulness of their medical plants. The efficacy and safety of the claimed medicinal plants need to be evaluated before recommending them for their wider use. Priority should be given to medicinal plants with the highest informant agreement as such plants are believed to have better activity.

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

Authors’ contributions
The three authors had significant intellectual contribution towards the design of the study, data collection and analysis and write-up of the manuscript. The authors read and approved the final manuscript.

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Author details
1Department of Biology, Jimma University, Jimma, Ethiopia. 2Aklilu Lemma Institute of Pathobiology, Addis Ababa University, Addis Ababa, Ethiopia.

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