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Ethnobotanical study of medicinal plants in Akaki district, East Shewa Zone, Oromia regional state, Ethiopia

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Abstract
This study was conducted to assess medicinal plants and associated indigenous knowledge in Akaki District, Oromia, Ethiopia. Forty informants above age 18 were selected from eight kebeles. Out of these, 10 key informants were purposely selected based on the recommendations of elders and local authorities. Other 30 informants were selected randomly. Data were collected using semi-structured interviews and field observations. Informant consensus factor (ICF), preference ranking, paired comparison and fidelity level were calculated. Sixty four plant species belonging to 60 genera and 35 families were collected and identified. Overall, 48 and 16 species were recorded for the treatment of human and livestock ailments respectively. The most frequently used plant parts for human and livestock ailments were leaves and roots respectively. The most widely used method of preparation was crushing (35.95%) of the different plant parts followed by chewing (18.75%) and pounding (17.18%). The common route of administration recorded was oral (53.12%) followed by dermal (18.75%). The most commonly used application of medicinal plant was drinking (43.75%) followed by painting (17.18%) and putting on accounted for 4.68%. The disease categories such as external parasites, as well as the categories of retained urine and placenta have higher ICF values of 0.93, 0.92 and 0.90 respectively. People of the area have preference for Ocimum lamiifolium for the treatment of febrile illness. Paired comparison of five species of plants that were used for the same disease showed that Ruta chalepensis was the most preferred species by traditional healers for the treatment of stomach ache.

Keywords: Medicinal plants, indigenous knowledge, ethnomedicine, Akaki district, traditional healers

Introduction
About 80% of rural population in developing countries depends on the assistance of traditional healers for their health care [25]. In developing countries, people heavily rely on traditional medicine [6]. About 1/4th of higher plant taxa in the world are used at one time or another, by some cultures for medicinal purposes [18]. The recent reports have indicated that about 25% of the modern drugs have been derived from the extract of medicinal plants [20]. About 70-90% of world population, especially from developing countries, use plant remedies for their health care [18, 10]. However, the effort to provide public acceptance and ascertain scientifically, remained too minimum in developing countries [10]. Moreover, the high cost of drugs and the inability of people in many developing countries to purchase modern drugs have forced them to look for inexpensive and culturally accepted medicinal plants [21].
In Ethiopian, medicinal plants are concentrated in the south and southwest of the country, following the concentration of biological and cultural diversity [11]. Medicinal plants and knowledge of their use provide vital contribution to human and livestock health care needs throughout Ethiopia. In Ethiopia, about 80% of human population and 90% of livestock rely on traditional medicine [1]. However, due to population pressure, accelerated urbanization, recurring drought and deforestation, most of the medicinal plants are either destroyed or are on the verge of extinction [20]. Documentation of this indigenous knowledge of healing system still remains at minimum level [15]. Some investigations in certain parts of Ethiopia have indicated that the rate of erosion of both indigenous knowledge and the herbs signals for the need of intervention.
Ethnobotanical studies over the past decades haven't received emphasis in Ethiopia [3, 13]. Recently, the Institute of Biodiversity Conservation of Ethiopia has pledged to include the ethnobotanical studies in its long range strategic research plan. However, there exists an accelerated devastation of plant resources with loss of indigenous knowledge.

Similar to other parts of Ethiopia, our study area (Akaki District) has experienced lack of conservation actions towards medicinal plants. The current plant use trend in the district shows that the environment is facing problems of plant resource depletion and loss of indigenous knowledge. Thus, rigorous ethnobotanical research plays a vital role to draw information on plants and related indigenous knowledge; for identifying the medicinal plants and dealing on their conservation and sustainable utilization.

2. Materials and methods

2.1 Description of the study area

Akaki is one of the districts in Oromia of Ethiopia, part of the Oromia special zone surrounding Finfine (Figure 1). The administrative center of the district is Dukem town located at a distance of 37 km from Addis Ababa. The altitude of this district ranges from 1500-3100 m above sea level. Mountain Yerer on the border with Ada'a Chukala is the highest peak in Akaki District. Rivers include Akaki, Dukem and Hawas. About 72% of the land is arable, 7.6% pasture and the remaining is considered swampy, degraded or otherwise unusable.

The district has 85 kilometers of dry-weather and 35 all-weather road, for an average of road density of 210 kilometer per 1000 square kilometers. About 16% of the rural, 100% of the urban and 23% of the total population has access to clean drinking water. The District falls within two agro climatic zones (middle-land (98%) and high land (2%), with annual rain fall of 800-1800 mm and annual temperature of 15°c-27 °c (Unpublished data from EMA).

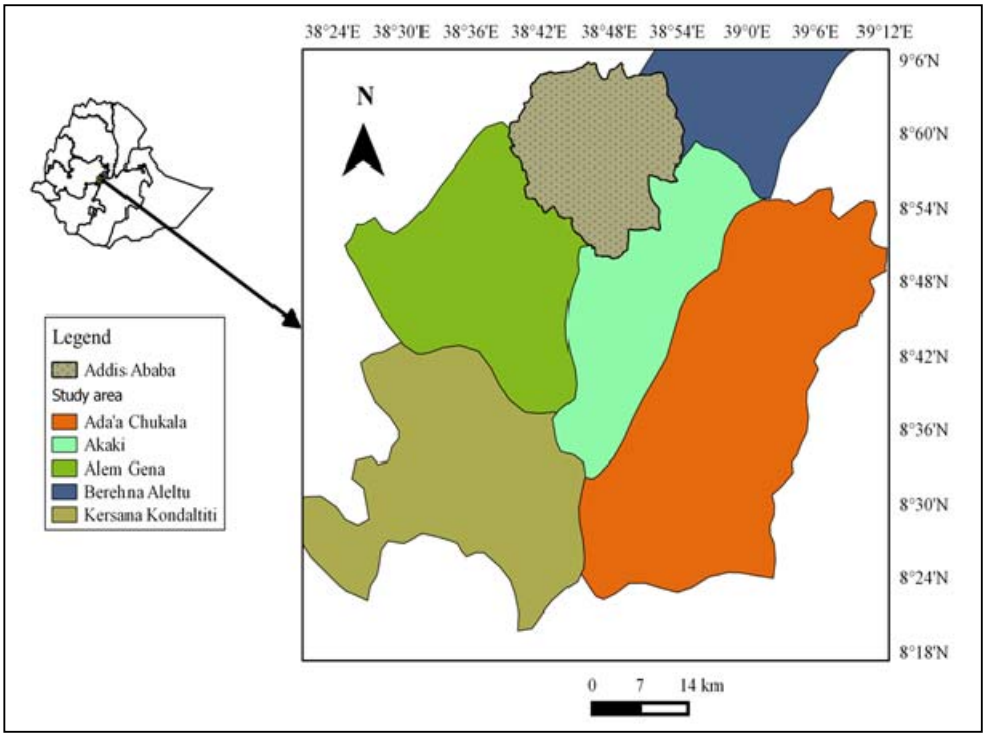

Fig 1: Location of study District (Akaki) and neighboring Districts

According to 2007 National Census report, the total population of Akaki District was 77,836 (40,241 male and 37,595 female [9]. The largest ethnic group in Akaki District is the Oromo (81.24%) followed by Amhara (17.1%) and Werji (0.81%). Afan Oromo is spoken as a first language by 81.42% and 18.14% speak Amharic; the remaining 0.44% speaks all other primary languages.

The number of livestock in the District include: cattle (12, 8758); sheep (19486); goats (14,420); poultry (60,975); mules (3715); horses (9,973) and donkeys (26,775). In the District, livestock make a substantial contribution to the rural economy. Most rural farming, transport and source of income do directly or indirectly link with them. The most important animal diseases in the District include: bacterial infections (Anthrax, Black leg, Pastureolosis, Mastitis, Actinobacillosis and Actinomycosis), Coccidiosis, internal parasites, Ticks, Mangemites, Sheep pox, Goat pox, Newcastle and Rabies.

2.2. Methodology

A reconnaissance survey was conducted before the actual data collection to get sufficient information about the study site and population.

2.2.1 Selection of study sites and Informants

Eight kebeles were randomly selected for the study. In general, 40 informants (32 males and 8 females) ≥18 age were selected. Out of these, 10 key informants (all males) were selected using purposive sampling technique based on the recommendations of local authorities, knowledgeable elders and development agents. The other 30 informants (22 males and 8 females) were selected randomly from the local people.

2.2.2 Data collection

Ethnobotanical data were collected in April and May 2016 from the study sites on four field trips following the methods developed by different authors [8, 14, 17]. Semi-structured interviewees, observations and guide field walks with informants were used to obtain data on indigenous knowledge about the medicinal plants of a local community.

2.2.3 Specimen collection and identification

Based on ethnobotanical information provided by informants, medicinal plants were collected from wild, croplands and homegardens. The local names, habits, habitats and associated indigenous plant knowledge were recorded. The collected

specimens were numbered, pressed and dried for identification. The collected voucher specimens were taken to the National Herbarium (Addis Ababa University). The identification of species was done from June 1 – November 30/ 2016 by comparison with illustrations and taxonomic keys at National Herbarium.

2.2.4 Data analysis

2.2.4.1 Descriptive statistics

Descriptive statistics like percentage and frequency were employed to analyze and summarize the data on medicinal plants and associated knowledge. The most useful information gathered on medicinal plants reported by local people: medicinal value, application, methods of preparation, route of application, ailment treated, dosage, part and habit used were analyzed through descriptive statistical analysis. Facilities in MS Excel spread sheet were utilized to make simple calculations, determine proportions and draw bar graphs.

2.2.4.2 Informant consensus factor

The informant consensus factor was analyzed using the following formula:

$ICF = (N_{ur}-N_t)/ (N_{ur}-1)$

Where: ICF = informant Consensus Factor,

N_{ur} = number of use citations and

N_t = number of species used.

2.2.4.3 Preference ranking

Preference ranking was computed following [17] for six most important medicinal plants used in treating febrile illness. Eight key informants were selected to assess the degree of effectiveness of these six medicinal plants against the disease. The medicinal plant believed to be most effective to treat the illness has got the highest value (6), and the one with the least effective got the lowest value (1). The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the most effective medicinal plants used by the community to treat the disease.

2.2.4.4 Paired comparison

This analytical tool was used for evaluating the degree of preferences or levels of importance of certain selected plants/parts of plants [19]. Paired comparisons to indicate the efficacy and popularity of five medicinal plant species used to treat stomach ache were employed as described by previous work [17]. Seven key informants were randomly selected by flipping coins and allowed to show their responses independently for pairs of five traditional medicinal plants that were noted for treating the disease. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses recorded, total value summarized and rank made based on the report of the informants.

2.2.4.5 Fidelity level

The fidelity level was calculated for those frequently reported diseases by informants in order to identify the most important medicinal plant species used to treat. The following formula is used to calculate fidelity level:

$$FL = (N_i/N) \times 100$$

Where, N_i is the number of informants that claim use of a plant species to treat a particular disease and N is the number of informants that use the plant as a medicine to treat any given disease [5].

3. Results and Discussion

3.1 Medicinal Plants of the Study Area

In this study, 64 medicinal plant species, belonging to 60 genera and 35 families were collected and identified to the species level (Annex 1). Of these, 48 (75%) and 16 (25%) were used to treat human and livestock ailments, respectively (Annnex 1). About 72% of the medicinal plants were collected from the wild, 20% from homegardens and 8% from cropland. This result indicates that the local communities mostly depend on medicinal plants collected from the wild than those from the homegardens. The number of medicinal plants collected from the homegarden is also promising. This finding agrees with different ethnobotanical studies conducted in Ethiopia [24, 6, 27]. Twelve plant families were composed of ≥ 2 medicinal plants.

Most of the medicinal plants were herbaceous species, while the lianas were composed of few species (Figure 2A). Similar to other studies in Ethiopia [6, 16, 21], most of the medicinal plants in this study were herbaceous species. Some of the medicinal plants collected and identified in this study were also reported by other authors from other parts of Ethiopia [4, 12, 24]. Such widespread use of these medicinal plants by different groups of people in different parts of Ethiopia could be due to cultural overlap among different ethnic groups.

3.2 Medicinal plants used to treat human ailments

Overall, 48 plant species belonging to 44 genera and 24 families were used to treat human ailments. Of these, 33 species were collected from the wild, 11 from homegardens 4 from croplands. Similar findings were reported by other authors in Ethiopia [4, 6, 16]. Lamiaceae contributed eight species, Poaceae five, Asteraceae, Euphorbiaceae, Fabaceae, Rutaceae and Solanaceae were composed of three species each, Myrsinaceae and Polygonaceae comprised two species each and the rest 15 families were composed of one species each.

Most of the medicinal plants used for treatment of human ailments were herbaceous species (43.75%), while the least was contributed by the woody climbers (2.08%) (Figure 2B). This could be due to the fact that naturally there are more herbs than woody plants and woody plants are overused because of their diverse use values. The study also showed that the majority of medicinal plants in the homegardens were herbs. Similar finding was reported in earlier works in Ethiopia [6].

3.3 Parts of medicinal plants used to treat human ailments

The most frequently utilized plant part was leaf followed by root and seed (Figure 2D). The preference for leaves could be due to ease of preparation and the chemical constituents of leaf for the treatment of diseases. Remedy preparation that involves roots, rhizomes, bulbs, barks, stems or whole plant have effects that pose a lasting danger to the continuity of an individual plant compared to leaves. In this study area, the fear of high threat of medicinal plants due to plant parts used for the purpose of medicine is minimal as leaves were the most harvested plant parts used in the area which has little effect on the survival of mother plant. This finding is similar to the results of other ethnomedicinal studies across Ethiopia [6, 24, 26].

3.4 Method of preparation

Remedy preparations vary based on the type of disease treated and the actual site of the ailment. According to the respondents, crushing (22.14%), squeezing and chewing (20.83%) each, pounding (12.50%), boiling (6.25%) and the remaining proportion were accounted for methods like, cooking, grinding, splitting and warming (2.08%) each (Table 1).

3.5 Routes of administration

Oral administration was the dominant route with 28 (58.33%) of the cases followed by dermal 10 (20.83%) and nasal five (10.41%) and others accounted the remaining percent (Figure 2C). Similar results were obtained by other authors [6, 16, 24, 26].

Table 1: Method of preparation of remedy from plants for treatment of human ailments

Ways of preparation	Percentage
Crushing	31.25
Chewing	20.83
Squeezing	20.83
Pounding	12.50
Boiling	6.25
Cooking	2.08
Grinding	2.08
Splitting	2.08
Warming	2.08

3.6 Dosage

People of the study area used various units of measurements and the duration of administration to determine the dosage. Local units such as finger length (e.g., for bark, root, stem), pinch (e.g., for pounded plant medicine) and numbers (e.g., for leaves, seeds, fruits, bulbs and flowers) were used to estimate and fix the amount of medicine. Recovery from the disease, disappearance of the symptoms of the diseases, fading out of the disease sign and judgment of the healer to stop the treatment were some of the criteria used in determining duration in the administration of the dosage.

However, from the interview made during the study, it was found that there was disagreement among the healers concerning the dosage. For example, some informants suggested that three or four leaves of *Rhamnus prinoides* was used to treat tonsillitis, while others suggest two or three leaves for the same problem. Still some others suggested that they applied the leaves number up to seven randomly without such measuring system. Although the full dose determination is varying from healer to healer, the dose given depends on age, physical strength and health conditions. The healers never administer treatments that are taken internally to pregnant women. This finding indicates us that there is lack of precision in the determination of doses in the area. This is the real drawback of medicinal plants. Similar finding was reported from other parts of Ethiopia [2].

3.7 Applications

The prepared traditional medicines were applied in a number of methods, drinking accounted for 17 (35.41%), followed by painting 10 (20.83%), chewing seven (14.58%), sniffing six (12.50%), eating three (6.25%), dropping and putting on each accounted two (4.16%) and blowing in accounted one (2.08%) (Figure 2D). Internal ailments were commonly treated by making the patient drink herbal preparations; tooth infections were treated by warming and put on the remedial plant part on the tooth surface; skin infections such as ringworm were treated by painting herbal preparations on an infected skin. Some plants do have different applications for different disease types. This preparation was used for different diseases by diverse application techniques. For instance, drinking squeezed leaves of *Ocimum lamiifolium* was used to treat cough, while sniffing it was used to treat febrile illness.

3.8 Major human diseases and plant species used by local people

Though more than 33 different diseases of humans were recorded as human health problems that are treated by 48 plant species (Table 2), one species can treat a single disease or a number of diseases. The practitioners of the area commonly diagnose each health problem by an interview and visual inspection of the patient. This shows that certain diseases have got solution by traditional medicine in the study area compared to different investigations in Ethiopia. For example, 47 human diseases were treated by 48 plant species [18] and 77 plant species were used to treat 49 diseases of humans [19]. According to the informants, about 15% of the medicinal plants were used to treat febrile illness, followed by stomach ache (ca. 7%) and tonsillitis (ca. 8%).

Table 2: Human diseases and number of plant species used

Disease treated	Total Species	Percent
Febrile illness	8	15.38
Stomach ache	5	9.61
Tonsillitis	4	7.69
Malaria	3	5.76
Cough	2	3.84
Rabies	2	3.84
Skin rash	2	3.84
Sudden sickness	2	3.84
Asthma	1	1.92
Ascaris	1	1.92
Wound	1	1.92
Broken bone	1	1.92
Common cold	1	1.92
Tenia pedis	1	1.92
Tooth ache	1	1.92
Diarrhoea	1	1.92
Ear disease	1	1.92
Tape worm	1	1.92
Scabies	1	1.92
Swelling part of body	1	1.92
Influenza	1	1.92
Cold	1	1.92
Heart problem	1	1.92
Hepatitis	1	1.92
Head ache	1	1.92
Skin cut	1	1.92
Snake bite	1	1.92
Ring worm	1	1.92
Evil eye	1	1.92
Snake sight	1	1.92
Spider urine	1	1.92
Dandruff	1	1.92

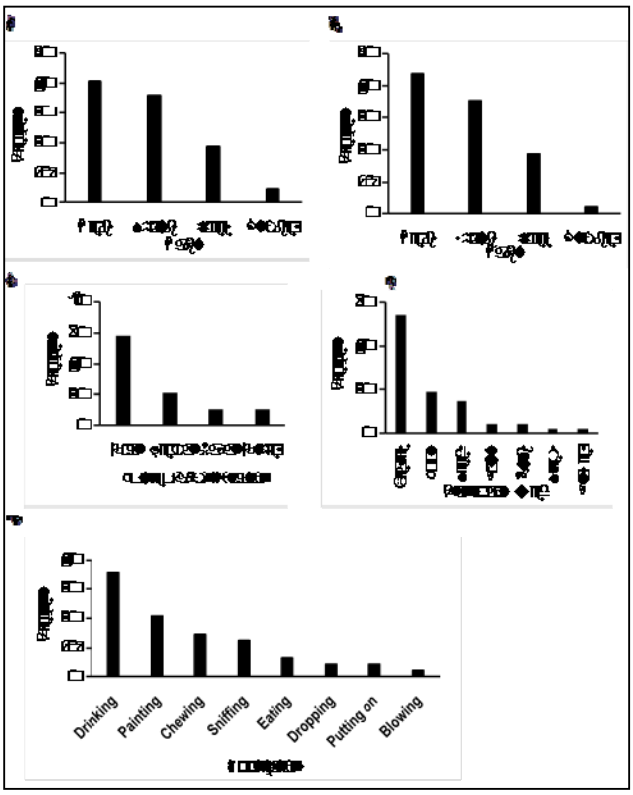

Fig 2: Habits, routes of administration, parts used and application of medicinal plants of Akaki District, East Shewa Zone (A and B = habits, C =route of application for human ailments, D = plant parts used, E = route of administration for livestock ailment, F and G = application of the remedicies)

3.9 Medicinal plants used to treat livestock diseases

From the collected medicinal plants, 16 species were used for treatment of livestock ailments. They were grouped under16 genera and 15 families. Regarding their habitats; 12 (75%) species were collected from the wild, three (18.75%) species from homegardens and one (6.25%) species was collected from cropland. More species for livestock treatment were collected from the wild. Planting medicinal plants in the homegardens is not common practice among the people in Akaki District. As most informants agree, even though the area has high number of livestock population, the local people do not have enough knowledge about ethnoveterinary medicinal plants compared to those used for treatment of human ailments.

Most of the ethnoveterinary medicinal plants were shrubs followed by herbs, while climbers were the least in medicinal plant composition (Figure 3A). In this study, shrubs like *Calpurnia aurea, Carissa spinarum, Dodonaea angustifolia, Gossypium barbadense, Osyris quadripartita* and *Rhus retinorrhoea;* herbs like *Aloe pubescens, Foeniculum vulgare, Linum usitatissimum, Nicotiana tabacum* and *Verbascum sinaiticum;* trees like *Acacia albida, Bersama abyssinica* and *Ficus vasta;* climber species like *Cucumis ficifolius* and *Stephania abyssinica* were used for the treatment of only livestock ailments in the study area. This finding agrees with the result of Ethnoveterinary study in other part of Ethiopia [19].

3.10 Plant parts

The mostly harvested plant part for treatment of livestock ailments in the study area were roots, while the least used plant part was the seed (Figure 3B). Unlike that of human medicine, roots were the most harvested plant part of remedy preparation for livestock ailments. Other Ethnobotanical study also showed similar result [6].

3.11 Method of preparations and route of administration

The local people used different forms of remedy preparations and applications to treat livestock diseases. The technique of preparations used involves crushing, pounding, chewing and warming. For instance, the roots of *Foeniculum vulgare* was crushed, mixed with little water and then added through the mouth by using bottle. This remedy was used to treat the common disease in the area known as retained urine. Harvested and crushed dried leaves of *Nicotiana tabacum* was used to treat cattle from leech disease by ejecting the leech from under side of tongue. Based on the nature of the ailment the remedies were applied through different routes. Oral application of remedies was found to be the highest (37.50%), followed by nasal and optical (18.75%) each (Figure 3C). This finding agrees with other works in Ethiopia [6, 22].

3.12 Application

Application of remedies made from ethnoveternary medicinal plants involved drinking (68.75%), spitting into eyes (12.50%) and painting, putting on and adding into eyes accounted 6.25% each (Figure 3D). For example, if roots of *Dodonaea angustifolia* pounded and mixed with one litter of water, is given orally to cattle, it could cure the animal from Anthrax. Crushing and adding the leaves of *Calpurnia aurea* to the skin of cattle kills external parasites.

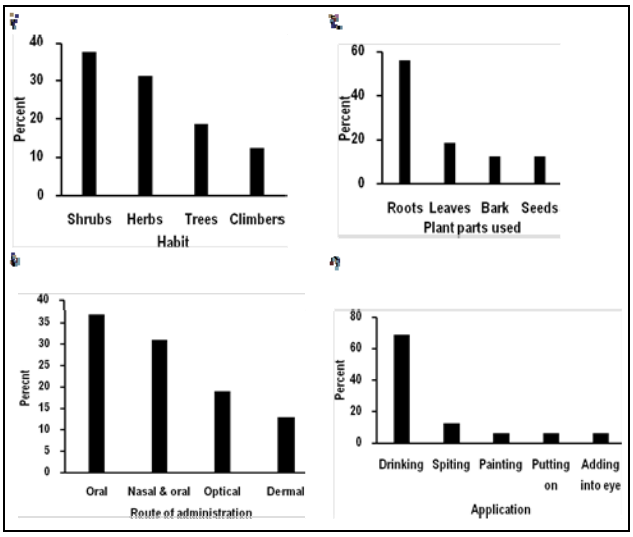

Fig 3: Habit, plant parts used, route of administration and application of ethnoveterinary medicinal plants in Akaki District, Ethiopia

3.13 Major livestock diseases and number of plant species used by local people

In comparison to human diseases, livestock diseases were treated with a few number of plant species in the study area. A total of 12 livestock ailments were identified that treated by medicinal plants in the area. Common diseases affecting livestock health's in the study area were anthrax which was treated by six (31.57%) species, eye disease by three (15.78%) species and the remaining diseases were treated by one (5.26%) species each (Table 3). This finding agrees with other work in Ethiopia [6, 24].

Table 3: Common diseases of livestock and number of species used

Disease treated	Total species	Percent
Anthrax	6	31.57
Eye disease	3	15.78
Ecto-parasite	1	5.26
Leech	1	5.26
Wound	1	5.26
Retained urine	1	5.26
Retained placenta	1	5.26
Pasturolosis	1	5.26
Scabies	1	5.26
Diarrhoea	1	5.26
Stomach ache	1	5.26
Swollen neck	1	5.26

3.15 Informant consensus factor (ICF)

Table 4: Informant consensus factor (ICF)

Category	Species	Use citation	ICF
External parasites	2	16	0.93
Ascaris and tape worm	2	14	0.92
Retained urine and retained placenta	2	12	0.90
Heart problem and Hepatitis	2	10	0.88
Rabies and snake bite	3	15	0.85
Tooth ache and tonsillitis	4	19	0.83
Eye disease and ear disease	5	24	0.82
Asthma, common cold, cough and influenza	6	29	0.82
Malaria and leech	4	18	0.82
Swollen part of body and wound	4	16	0.80
Skin rash, *Tenia pedis,* scabies and ring worm	6	27	0.80
Febrile illness, sudden sickness and head ache	11	32	0.67
Broken bones	2	8	0.66
Stomach ache, diarrhea and anthrax	14	32	0.58

In this study, all cited human and livestock diseases were grouped into 14 categories based on the site of occurrence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. The informant consensus factors have been calculated for each category (Table 4). The informant consensus of medicinal plant usage resulted in ICF ranging from 0.58 to 0.93 per illness category. The factor provides a range of 0 to 1, where a high value acts as a good indicator for a high rate of informant consensus. Those disease categories having high ICF value (e.g., > 0.67) may be the ones that commonly occur in the study area so that more number of people communicates on their remedy. Medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values [23]. A high ICF value close to 1 indicates that the informants rely most on the same taxa to manage specific disease conditions, while a low value indicates that the informants disagree on the taxa to be used in the treatment of a given ailments.

3.16 Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. *Ocimum lamiifolium* scored 42, ranked first indicating that it is the most effective in treating febrile illness followed by *Ocimum gratissimum* and the least effective was *Leonotis ocymifolia* (Table 5A).

3.17 Paired comparison

A paired comparison made to determine the most preferred medicinal plants among the five species that were used to treat stomach ache in the study area, the responses of seven informants, showed that *Ruta chalepensis* ranked first followed by *Rumex nepalensis* **(**Table 5B). Therefore, this result indicated that *Ruta chalepensis* was the most preferred while *Carica papaya* was the least favored over the other plant species cited in treating the disease.

3.18 Fidelity level index (Fl)

Ocimum lamiifolium and *Allium sativum* were reported by many informants to treat febrile illness and cough and hence had the highest FL value (Table 5C). High FLs could also be indicator of efficacy of the reported plants to cure specific ailments.

Table 5: Preference ranking (A), Paired comparisons (B) and Fidelity level (C) for the medicinal plants used by the people in Akaki District, East Shewa Zone, Oromia, Ethiopia

Medicinal plants	Informants (R_1—R_8)								Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8		
Eucalyptus globulus	3	4	2	1	2	3	2	3	20	3rd
Ocimum gratissimum	6	3	2	6	6	5	3	2	33	2nd
Ocimum lamiifolium	6	6	5	5	4	5	6	5	42	1st
Leonotis ocymifolia	2	1	1	2	1	2	1	3	13	6th
Lepidium sativum	1	2	4	3	3	1	1	1	16	5th
Echinops kebericho	4	1	4	2	2	1	2	2	18	4th

A. Preference ranking of medicinal plants used for treating febrile illness

Medicinal plants	Informants (R_1- R_7)							Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7		
Ruta chalepensis	2	2	4	4	4	3	3	22	1st
Ajuga integrifolia	1	1	0	0	1	2	3	8	4th
Cymbopogon citratus	3	2	4	3	3	1	2	18	3rd
Rumex nepalensis	4	3	3	2	4	2	3	21	2nd
Carica papaya	2	0	2	0	1	2	0	7	5th

B. Paired comparisons of five medicinal plants used to treat stomach ache

Medicinal Plants	ailments treated	N_i	N	FL	FL%
Ocimum lamiifolium	Febrile illness	17	18	0.94	94.44
Allium sativum	Cough	15	16	0.93	93.75
Ruta chalepensis	Stomach ache	14	16	0.87	87.50
Croton macrostachyus	Ring worm	12	15	0.80	80.00
Vernonia amygdalina	Malaria	11	14	0.78	78.57
Acmella caulirhiza	Tonsillitis	10	13	0.76	76.92
Justicia schimperiana	Rabies	10	14	0.71	71.42

C. Fidelity level of some medicinal plants in Akaki District

4. Conclusion

Despite the environmental degradation and recurrent drought, medicinal plants are still playing significant role in the management of various human and livestock diseases in Akaki District and the District is relatively rich in medicinal plant diversity. Sixty four medicinal plants were recorded. Of these, 48 and 16 species were noted to treat human and livestock ailments, respectively. The medicinal plant species collected and identified were largely from the wild (46 species were from the wild vegetation), 13 species from homegardens and five species from cultivated field areas. There are locally preferable treatments by traditional healers for some diseases in the area like febrile illness, cough, ringworm and tonsillitis. Overall, 42 ailments of human and livestock were reported to be treated by medicinal plants of the area. Herbs constituted the main source of traditional remedies followed by shrubs and tree species. Leaves were also found to be the most frequently used plant parts followed by roots for preparation of human and livestock remedies. Traditional medicine preparation mostly involved single plant and mainly by crushing the part used. Route of administration was mainly internal in which oral administration was the common route followed by dermal (external application).

5. Recommendations

We recommend the following for the sustainable use of medicinal plants:

1. Identifying effective medicinal plants and encouraging the local people to grow them in homegardens, mixing with crops in farm lands and as live fences of their residential areas is crucial.
2. Medicinal plants are central to the indigenous cultures and material needs. Therefore, formal and non-formal education systems should be designed to create positive attitude among the young by integrating in to the curricula about the traditional use of plants in general and medicinal plants in particular.
3. Recognitions and intellectual property rights should be given to traditional healers, either through certification or through organizing them at community or district level, which popularizes their indigenous knowledge and medicinal plants value.
4. Attention should be given to standardization of measurement and hygiene of the traditional medicines made from plants by training the healers.
5. The overall analysis reveals that major uses of medicinal plants for treatment of different diseases ranges from simple to fatal diseases. These traditional remedies indeed, need to be confirmed through scientific investigations to identify those that may provide alternatives for modern drugs.

6. Acknowledgement

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