Ethnobotanical Investigation on Medicinal Plants Traditionally Used Against Human Ailments in Ensaro District, North Shewa Zone, Amhara Regional State, Ethiopia

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Abstract

Introduction

People all over the world have been using medicinal plants to treat various ailments and diseases throughout history. It is still common in developing countries. Because is easily accessible, affordable, and trusted by the communities. Although there are several ethnobotanical studies on medicinal plants in Ethiopia, the number of medicinal plant species and indigenous knowledge documented is still low compared to the high diversity of culture and habitats.

Methods

Ethnobotanical data were collected during the 13th of February 2019 and the 26th of October 2020 through Semi-structured interviews, field observation, a guided field walk, and focus group discussions

Result

the study documented 142 medicinal plant species distributed in 125 genera and 56 families which used to treat 52 ailments. Most of these species were collected from wild habitats. The most used plant families were Fabaceae (14) followed by lamiaceae (9) and Solanaceae (9). Most of these medicinal plants were herbs followed by shrubs.

Conclusion

The study revealed a relatively high diversity of medicinal plants that indicated the existence of indigenous knowledge of using medicinal plants to treat ailments and diseases. The findings of this study supported up the idea that indigenous knowledge of using medicinal plants is still alive in highly degraded areas. To make sustainable use of these medicinal plants in the study area, local people must collaborate with natural resource administrators to manage them before they become seriously threatened. Both ex-situ and In-situ conservation strategies should be combined and employed urgently for optimal conservation results

1 Introduction

For generations, the use of medicinal plants to treat and control diseases of humans and livestock is an old practice in many parts of the world. Yet, this tradition is very common in low and middle-income countries for their primary health needs (Ernst, 2000). This is because traditional medicines are used to treat diseases of humans and livestock due to economic affordability, cultural acceptability, and ease of accessibility (Teklehaymanot & Giday, 2007; Chekole, 2017).

A wide range of traditional medicinal materials are used to treat and prevent health problems; medicinal plants, which have been used for the prevention and control of various diseases in humans and livestock since time immemorial, comprise the majority of the total (Giday et al., 2003). The use of medicinal plants is a fundamental component of traditional medicines in the African traditional health care system.

The role of medicinal plants in the traditional health care system of Ethiopia has a long history (Abebe, 1986). Yet, about 80% of the human population and 90% of livestock are dependent on traditional medicines in the country (Bekele, 2007; Assefa et al., 2010). This widespread use of traditional medicines in the country is principally due to ease of accessibility and good trust by the community (Moges & Moges, 2019). The majority of traditional remedies in the country are medicinal plants (Abebe & Ayehu, 1993; Abebe et al., 2001; Lulekal et al., 2008).

Ethiopia is one of the richest African countries in traditional medicines and associated indigenous knowledge which is mainly related to the presence of many ethnic groups and unique cultures in each ethnic (Mesfin et al., 2009). The presence of high diversity of plants in the country is associated with diversified climates and topography that promote diversified plant species (Kelbessa & Demissew, 2014). In Ethiopia, there are about 800 medicinal plants (Deffar, 1998) and the majority of medicinal plants are harvested from the wild (Lulekal et al., 2013). Although the country is rich in plant biodiversity, they are threatened by a range anthropogenic activity (Mebrat & Gashaw, 2013; Getaneh & Girma, 2014; Lulekal et al., 2014). Therefore, the conservation and sustainable utilization of these plant species are vital.

The existence of diverse cultures with different ethnic groups in Ethiopia can contribute a large to local biodiversity conservation (Hartmann, 2008). Moreover, traditional medicinal plant species and their uses are likely to be more abundant in such cultures. However, the number of medicinal plant species and indigenous knowledge documented is still low comparing to the high diversity of culture and habitats (Getaneh & Girma, 2014).

The community of Ensaro district lives in the high land, midland, and low land areas. As the result, the diversity of plants including medicinal plants is expected to be high. However, there has been no scientific record on such resources in Ensaro district yet. If anthropogenic activities are high on the vegetation of the study area, many medicinal plants may be threatened and lost even before documentation. According to Mebrat and Gashaw (2013), important medicinal plants are eliminating from the environment due to deforestation for fuelwood or expansion of agricultural land (Mebrat & Gashaw, 2013). Therefore, the need to conduct ethnobotanical research to document medicinal plants and related indigenous practices is an urgent issue (Hamilton, 2003; Teklehaymanot et al., 2007). The ethnobotanical studies conducted in Ethiopia are very few as compared to the high diversity of ethnic groups with different cultures (Teklehaymanot et al., 2007). Hence, the present study is aimed to document traditional medicinal plants and associated indigenous practices used for the treatment of human diseases in Ensaro district, Amhara Regional State, Ethiopia. This is the first study of its kind in this study area, as far as our literature search. As a result, the medicinal plants used in the study districts, Ensaro district in the Amhara region, Ethiopia, were compiled in this research.

2 Materials And Methods

2.1 Description of the study area and population

Ensaro district is geographically located between 9° 35' - 9° 55'N and 38° 50' - 39° 5'E North Shewa Zone, Amhara Regional State, Ethiopia. The total area of the district is about 44,217.6 ha (Figure 1). Most of the district is lowland (Figure 1) with a mean annual rainfall of 1174mm and a temperature of 17.7°C. The total population is about 74312 (CSA, 2013), out of which 94.7% inhabit rural areas, deriving their livelihood from mixed agriculture (Cherinet & Mekonnen, 2019).

Ensaro district was selected purposively for this study. This district is one of the drought-affected districts in the North Shewa Zone of Amhara Regional State. As reported by Cherinet and Mekonnen (2019), in the district there is a trend of increasing mean annual temperature and decreasing mean annual rainfall for the three decades. This harms the vegetation of the area and initiates this research to check the status of cultural knowledge regarding medicinal plants and the plant taxa in the district. There are 14867 households in the district and the major economic activity of the population is a mixed farming system. Based on the information gathered during the reconnaissance survey, the district has fourteen smaller administrative units at different distances from the administrative center (Lemi Town). All of these units were included in this ethnobotanical investigation.

2.2 Selection of informants

This ethnobotanical survey included 375 informants (271 males and 104 females) from all 13 kebeles of Ensaro district, which is the smallest administrative unit in Amhara Regional State's North Shewa Zone. Systematic random and intentional sampling techniques have been used to obtain representative informants as described by Lulekal *et al.* (2008) and Yineger *et al.* (2007). The age of informants ranged from 22-90 years. Two hundred eighty (280) general informants were systematically selected from total households and 95 key informants (77 male and 18 female) who were traditional healers purposely selected based on the recommendations of elders, local authorities, and religious leaders.

2.3 Methods of data collection

Ethnobotanical data were collected during the 13th of February 2019 and the 26th of October 2020 through Semi-structured interviews, field observation, a guided field walk, and focus group discussions (Martin, 1995; Cotton, 1996). The semi-structured interviews were prepared ahead of time in the English language and translated during the interview that is the mother tongue of informants. Informant interview was conducted individually (Martin, 1995; Alexiades & Sheldon, 1996) to obtain information about medicinal plant species, parts used, preparation techniques, and common human diseases treated, administration routes and dosage. Ethnobotanical data regarding habitat, abundance, and the threat of medicinal plants were also collected. The voucher specimen of all mentioned medicinal plants during the interview were collected from different habitats with the assistance of traditional healers. Essential information such as GPS data, the local name of the plant, habitat and life forms of plant specimens were recorded. Specimens were numbered, pressed, dried, identified, and deposited at the national herbarium of Ethiopia in Addis Ababa University, Ethiopia. Plant identification was performed using the flora of Ethiopia and Eritrea. The accuracy of identification was confirmed by the comparison with the deposited authenticated specimens from Addis Ababa University Herbarium and by the help of supervisors.

2.4 Data analysis

Data were entered into MS Excel spreadsheet for statistical analysis. Both qualitative and quantitative using preference ranking, direct matrix ranking, and fidelity level (species consensus) were analyzed. The results were presented using tables, graphs, and percentages following Martin (1995). Fidelity level values were to determine the relative healing potential of each medicinal plant based on the proportion of informants who agreed on its use against a given disease category (Tardío & Pardo-de-Santayana, 2008).

Fidelity level was estimated using a formula:

$$FL (\%) = \frac{IP}{IU} \times 100,$$
Where FL(%) is fidelity level, IP is the number of respondents who reported the utilization of medicinal plants for a specific main ailment and IU is the total number of respondents who mentioned the same plant for any ailment (Friedman *et al.*, 1986). This technique helps to recommend those medicinal plants having high fidelity levels are more effective that can be further analyzed for their antimicrobial activity and drug formulation (Heinrich, 2000).

Direct matrix ranking exercise was used to compare the use diversity of a given plant species using the methods proposed by Martin (1995), and Cotton (1996). The multipurpose uses of medicinal plant species were selected out of the total medicinal plants. Key informants listed the uses of these species. These key informants were asked to assign use values to each species as follows (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). The average values (scores) given to each medicinal plant species were summed up and ranked. Moreover, the ten key informants were also involved in a priority ranking exercise that was focusing on perceived threatening factors of the medicinal plant species.

In the end, preference ranking from informants' response on ideas related to disease treatment was analyzed following (Martin, 1995). Based on their preferences ranking, they ranked individually those selected medicinal plants in treating the mentioned ailments following previous scholars (Cotton, 1996).

Ethical consideration

The study was carried out after being approved by the Ethiopian public health institute, traditional medicine directorate. Before filling the questionnaires, the participants' consent was obtained and they were assured that their responses would be used only for research purposes, and the information given would be treated with utmost care and confidentiality.

3 Results

3.1 Demographic profiles of respondents

In this study, 375 informants (95 key informants and 280 general informants) were involved. Most of the participants were men (72.3 %) and the rest 27.7 % were women. The age of participants ranges from 22 to 90 with a mean value of 48.5 years. Regarding educational status 60% of the informants were literate and the rest 40% were illiterate. 76% of the respondents were married, 11% were single, 7% were divorced and 6% were widowed.

3.2 Diversity of medicinal plants

The study conducted in Ensaro district recorded 142 medicinal plants (Table 2). These species are distributed across 125 genera and 56 families.

Table 1. List of medicinal plants used for human ailments: scientific name; local name (LN), family; life form (LF); diseases treated (DT); parts use(PU) conditions of use (CU); preparation methods(PM); ingredients added(IA); application methods(AP); routes of administration(RA); not recommended to(NRT) and voucher number

Twenty-nine medicinal plant families were represented by two or more species, while 27 families were represented by only a single species each. Fabaceae was the dominant family contributed by 14 species (9.9%) followed by Lamiaceae and Solanaceae represented by nine species each. Therefore, about 81% of the families are represented by more than one species (Table 2).

Table 2.*Diversity of medicinal plants in each plant family*

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
Trigonella foenum-graecum L.	Abish	Fabaceae	H	Blood pressure	Seeds	Dry	Powdering and soaking in water	Sugar
Dichrostachys cinerea (L.) Wight & Arn.	Ader	Fabaceae	T	Cellulitis	Leaves	F	Crushing	Vaseli butter
Buddleja polystachya Fresen.	Afar	Buddlejaceae	S	Tonsillitis	Shoot tips	F	Crushing	Water
Carissa spinarum L.	Agam	Apocynaceae	S	Snakebite	Leaves	F	unprocessed plant	None
				Evil eye	Root	D	Powdering and smoking	None
Eleusine floccifolia (Forssk.) Spreng.	Akrima	Poaceae	H	Snakebite	Root	F	unprocessed plant	None
Tragia pungens (Forssk.) Müll.Arg.	Aleblabit	Euphorbiaceae	S	Eczema	Leaves	F	Crushing	butter
				Impotence	Root	D	Powdering	Traditi bevera
				Cellulitis	Leaves	F	Crushing	None
				Scorpion bite	Root	F	Crushing	none
Abutilon longicuspe A.Rich.	Amedmado	Malvaceae	S	Wound	Leaves	F	Crushing	None
Cyathula cylindrica Moq.	Arefrafo	Amaranthaceae	H	Bleeding	Leaves	F	Crushing	None
<i>CyphoStemma adenocaulis</i> (Steud. ex A.Rich.) Desc. ex Wild & R.B.Drumm.	Aserkush tebetebkush	Vitaceae	H	Rabies	Root	D	Powdering	Coffee
				Wound	Root	D	Powdering	Butter
Galium aparinoides Forssk.	Ashkit	Rubiaceae	H	Wound	Root	F	Crushing	None
Datura stramonium L.	Astenagrit	Solanaceae	H	Dandruff	Leaves	F	Crushing	None
Verbena officinalis L.	Atuch	Verbenaceae	H	Diarrhoea	Root	F	Crushing	water
Clematis simensis Fresen.	Azo hareg	Ranunculaceae	C	Hemorrhoids	Leaves	D	Powdering	Vaseli
				Cellulitis	Leaves	D	Crushing	Vaseli
				Wound	Leaves	F	Powdering	Salt
				Eczema	Leaves	D	Crushing	Butter
Ficus palmata Forssk.	Beles	Euphorbiaceae	S	Wound	Stem bark	F	Crushing	None
Capsicum annum L.	Berberie	Solanaceae	H	Scorpion bite	Leaves	F	Crushing	None
				Typhoid	Fruits	F/D	Powdering/Crushing	Water
Millettia ferruginea (Hochst.) Bak.	Birbira	Fabaceae	T	Eczema	Seeds	D	Powdering	Butter
				Wound	Leaves	D	Powdering	Vaseli
Croton macrostachyus Hochst. ex Del.	Bisana	Euphorbiaceae	T	Cellulitis	Leaves	F	Crushing	Vaseli
				Evil eye	Root	D	Powdering	None
				Mitch	Leaves	F	Boiling in water	None
Catha edulis (Vahl) Endl.	Chat	Celastraceae	S	Snakebite	Leaves	F	unprocessed plant	none
Premna schimperii Engl.	Checho	Lamiaceae	S	Cellulitis	Leaves	D	Powdering	Vaseli
Sida schimperiana Hochst. ex A.Rich.	Chifrig	Malvaceae	H	“Likft” (devil illness)	Root	D	Powdering and smoking	None
				Cellulitis	Root	F	Crushing	None
Artemisia abyssinica Sch. Bip. ex A. Rich.	Chiqugn	Asteraceae	H	Evil eye	Leaves	D	Powdering and smoking	None

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
<i>Plectranthus cylindraceus</i> Hochst. ex Benth.	Dachet	Lamiaceae	H	wound	Leaves	F	Heating	None
<i>Ocimum lamiifolium</i> Hochst. ex Benth.	Damakessie	Lamiaceae	S	Mitch	Leaves	F	Boiling in water	None
<i>Euclea divinorum</i> Hiern	Dedeho	Ebenaceae	S	Wound	Root	D	Powdering	Vaseli
<i>Solanum villosum</i> Mill.	Derekus	Solanaceae	S	Eye disease	Leaves	F	Crushing and squeezing	None
<i>Acacia etbaica</i> Schweinf.	Derie	Fabaceae	T	Scabies	Leaves	F	Crushing	Water
<i>Calpurnia aurea</i> (Ait.) Benth.	Digita	Fabaceae	S	Jaundice	Seeds	D	Powdering and baking with <i>Eragrostis tef</i>	None
				Diarrhea	leaves	F	Crushing and boiling	Water
				Rabies	Seeds	D	Powdering and baking	Eragro
<i>Coriandrum sativum</i> L.	Dinbilal	Apiaceae	H	Blood pressure	Seeds	D	Powdering and boiling	Coffee
<i>Taverniera abyssinica</i> A. Rich.	Dingetegna	Fabaceae	H	"Megagna" (unidentified gastrointestinal disorder)	Root	D	Powdering and smoking	None
<i>Ferula communis</i> L.	Dog	Apiaceae	H	Diarrhoea	Root	F	Crushing	Water
<i>Syzygium guineense</i> (Wild.) DC.	Doqima	Myrtaceae	T	Evil eye	Root	D	Powdering and smoking	None
<i>Rumex nervosus</i> Vahl	Embuacho	Polygonaceae	S	Circumcise infection	Leaves	F	Crushing	None
				Delayed placenta	Leaves	F	Crushing	Water
				Evil eye	Shoot tips	F	unprocessed plant	None
				Cellulitis	Leaves	F	Crushing	None
<i>Kalanchoe marmorata</i> Baker	Enchibchubit	Crassulaceae	H	Tumor	Leaves	F	Heating	None
<i>Kalanchoe petitiiana</i> A. Rich.	Endahahula	Crassulaceae	H	Tumor	Leaves	F	Heating	None
<i>Phytolacca dodecandra</i> L' Her.	Mekan endod	Phytolaccaceae	S	Rabies	Root	F	Crushing	Milk
				Abortion	Leaves	F	Crushing	Water
				Leprosy	Leaves	F	Crushing and soaking in water	Salt
				Jaundice	Root	D	Powdering	"Injera
				Syphilis	Leaves	F	Crushing	water
<i>Ximenia americana</i> L.	Enkoy	Olacaceae	T	Jaundice	Leaves/stem bark	F /D	Crushing /powdering	Water
<i>Foeniculum vulgare</i> Mill	Ensilal	Apiaceae	H	"Mognbagegn" (Anthrax)	Leaves	F	Crushing	Water
<i>Leonotis ocymifolia</i> (Burm.) Iwarsson var. <i>raineriana</i>	Eras kebdo	Lamiaceae	S	Cellulitis	Leaves	D	Powdering	Vaseli
<i>Securidaca longipedunculata</i> Fresen	Este-menahie	Polygalaceae	S	"Megagna" (unidentified gastrointestinal disorder)	Root	D	Powdering and smoking	None
				Mitch	Root	D	Powdering and smoking	None

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
Andrachne aspera Spreng.	Este-tekezie	Euphorbiaceae	H	Eczema	Root	F/D	Powdering	Vaseli
				Tonsillitis	Root	F/D	unprocessed plant	None
				Evil eye	Root	D	Powdering and smoking	None
				Snakebite	Root	F/D	unprocessed plant	None
Emilia sonchifolia (L.) DC. ex DC.	Etse hayu este yikestil	Asteraceae	H	Impotence	Root	F	unprocessed plant	None
Polygala abyssinica R.Br. ex Fresen.	Etse libona	Polygalaceae	H	Snakebite	Leaves	F	unprocessed plant	None
Lepidium sativum L.	Feto	Brassicaceae	H	Mitch	Seeds	D	Powdering and boiling	Coffee
Clutia abyssinica Jaub. and Spach.	Fyelefech	Peraceae	S	Diarrhoea	Leaves	F	Crushing	Coffee
				Dandruff	Leaves	F/D	Crushing/powdering	Butter,
Ziziphus spina-christi (L.) Desf.	Geba	Rhamnaceae	T	Abdominal pain	Stem bark	F	unprocessed plant	None
				scorpion bite	Leaves	F	Crushing	None
				Snakebite	Stem bark/Root bark	F	unprocessed plant	None
				Diarrhoea	Stem bark	F	unprocessed plant	None
Solanum marginatum L. f.	Geber embuay	Solanaceae	S	Scabies	Fruit	F	unprocessed plan	None
Otostegia fruticosa (Forssk.) Schweinf. ex Penzig	Geram tunjit	Lamiaceae	S	Abdominal pain after birth	Leaves	F	Crushing	Water
Kedrostis foetidissima (Jacq.) Cogn	Gim hareg/yewusha fes/	Cucurbitaceae	C	Wound	Leaves	F	Crushing	Lemor
				Evil eye	Root	D	Powdering and smoking	None
				Delayed placenta	Leaves	F	Crushing	Water
Psydrax schimperiana (A.Rich.) Bridson	Gimie seged	Rubiaceae	S	Snakebite	Leaves	F	Crushing	Water
CyphoStemma cyphopetalum (Fresen.) Desc. ex Wild & R.B.Drumm.	Gindosh	Vitaceae	H	Snakebite	Stem/root barks	F	unprocessed plant	None
Withania somnifera (L.) Dunal	Gizewa	Solanaceae	H	Evil eye	Root	D	Powdering and smoking	None
				"Megagna"(unidentified gastrointestinal disorder)	Root	D	Powdering and smoking	None
				Mitch	Root	D	Powdering and smoking	None
Inula confertiflora A. Rich.	Gobez teqes	Asteraceae	S	Eye disease	Leaves	F	Crushing and squeezing	None
				Rabies	Leaves	F	Crushing	Water
				Evil eye	Root	D	Powdering and smoking	None
				Jaundice	Leaves	F	Crushing	Water
Vernonia amygdalina Del.	Grawa	Asteraceae	S	"Megagna" (unidentified gastrointestinal disorder)	Leaves	F	Crushing	Water
Senna singueana (Del.) Lock	Gufa	Fabaceae	S	Jaundice	Seeds	D	Powdering	Water

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
				Abdominal pain	Stem bark	F	unprocessed plant	None
				Snakebite	Stem bark	F	unprocessed plant	None
				Cellulitis	Leaves	F	Crushing	Water
Ricinus communis L.	Gulo	Euphorbiaceae	H	Eye disease	Root	F	Crushing	Water
				Wound	Root	D	Powdering	Vaseli
				Infant dysentery	Leaves	F	Crushing	Water
Acacia oerfota (Forssk.) Schweinf.	Gumero	Fabaceae	S	Evil eye	Root	D	Powdering and smoking	None
				Excessive bleeding of menstruation	Leaves	F/D	Powdering	Water
Zehneria scabra Sond.	Hareg eresa	Cucurbitaceae	C	Cellulitis	Leaves	F	Crushing	Vaseli
				Scabies	Leaves	D	Powdering	Vaseli
				Excessive bleeding of menstruation	Leaves	F	Crushing	Water
				Likft (devil illness)	whole part	D	Powdering and smoking	None
				Mitch	Leaves	F	Crushing	None
Salvia nilotica Jacq.	Hulgeb	Lamiaceae	H	Mitch	whole part	F	Crushing	None
				Tonsillitis	Root	F	unprocessed plant	None
				When insects entered ears	Leaves	F	Crushing and squeezing	None
				Abdominal pain	whole part	F	Crushing	Water
				Cellulitis	Leaves	F	Crushing	None
				Excessive bleeding of menstruation	Root	F	Crushing	None
				Wound	Leaves	F	Crushing	None
				Diarrhoea	Root	F	Crushing	Lemor
Solanum dulcamara L.	Karya mesel yekusil medhanit	Solanaceae	H	Wound	Leaves	F	Crushing	None
Myrsine africana L.	Kechemo	Myrsinaceae	S	Taeniasis	Leaves	F	unprocessed plant	None
Euphorbia tirucalli L.	Kinchib	Euphorbiaceae	S	Wound	Epiphyte	F	Crushing	None
				Evil eye	Root	D	Powdering and smoking	None
				Hemorrhoids	Latex	F	Squeezing	None
Dodonaea angustifolia L. f.	Kitkita	Sapindaceae	S	Eczema	Leaves	D	Powdering	Vaseli
				Fire burn	Leaves	D	Powdering	Vaseli
Pterolobium stellatum (Forssk.) Brenan	Kontir	Fabaceae	S	Evil eye	Root	D	Powdering and smoking	Other plants
Urera hypselodendron (Hochst. ex A. Rich.) Wedd.	Lanquso	Utricaceae	S	Wound	Stem bark	F	Crushing	None
Grewia ferruginea Hochst. ex A. Rich.	lenquata	Malvaceae	S	Dandruff	Stem bark	F	Crushing	None
				Wound	Stem bark	F	Crushing	None
Adenia cissampeloides (Planch. ex Hook.) Harms	Leslasa hareg	Passifloraceae	C	Cellulitis	Leaves	F	Crushing	None
Malva parviflora L.	Lut nechhu	Malvaceae	H	Abdominal pain	Root	F	Crushing	Water
Rumex nepalensis Spreng.	Lut qeyu	Polygonaceae	H	Snakebite	Root	F	unprocessed plant	None

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
				"Megagna" (unidentified gastrointestinal disorder)	Root	F	unprocessed plant	None
				Abdominal pain	Root	F	Crushing and squeezing	Water
Rumex abyssinicus Jacq.	Meqmeqo	Polygonaceae	H	Asthma	Rhizome	D	Powdering and boiling	Honey
				Blood pressure	Rhizome	D	Powdering and boiling	Tea
Embelia schimperi Vatke	Meterie	Myrsinaceae	S	Taeniasis	Fruit	D	Powdering	Guizot abyssini "injera
Arisaema schimperianum schott	Milas golgul	Araceae	C	Snakebite	Root	F	unprocessed plant	None
Acokanthera schimperi (A. DC.) Benth. & Hook.f. ex Schweinf.	Mirez	Apocynaceae	S	Evil eye	Root	D	Powdering	None
				Epilepsy	Root	F/D	unprocessed plant	None
				Jaundice	Leaves	F	Crushing	Water
Clerodendrum myricoides (Hochst.) R.Br. ex Vatke	Misirich	Verbenaceae	S	Jaundice	Leaves	F	Crushing and squeezing	Water
				Circumcise infection	Leaves	F	Crushing	None
				Cellulitis	Leaves	F/D	Powdering	Vaseli
Duranta erecta L.	Muatosh	Verbenaceae	S	Wound	Leaves	F	Crushing	Salt
Snowdenia polystachya (Fresen.) Pilg.	Muja	Poaceae	H	Retained placenta	Root	F	Crushing	Water
				Wound	Aerial part	F	Crushing	None
Albizia anthelmintica Brongn.	Musina	Fabaceae	S	Taeniasis	Stem bark	D	Powdering	Sesari "injera
Maytenus senegalensis (Lam.) Exell	Nech atat	Celastraceae	S	dog bite	Leaves	F	Crushing	None
				Cellulitis	Leaves	F	Crushing	Water
Eucalyptus globulus Labill.	Nech bahir zaf	Myrtaceae	T	Mitch	Leaves	F	Boiling	None
				Cough	Leaves	F	Boiling	None
Allium sativum L.	Nech shinkurt	Amaryllidaceae	H	Malaria	Bulb	F/D	unprocessed plant	None
				Scabies	Bulb	F/D	Crushing	Salt a
				"Mognbagegn" (disease anthrax)	Bulb	F/D	unprocessed plant	None
				Blood pressure	Bulb	F/D	unprocessed plant	None
				Typhoid	Bulb	F/D	Cutting in to pieces	Soakir
				Abdominal pain	Bulb	F/D	Unprocessed plant	None
				Hemorrhoids	Bulb	F/D	unprocessed plant	None
Echinops kebericho Mesfin	Qebericho	Asteraceae	H	Evil eye	Root	D	Powdering and smoking	None
Calotropis procera (Ait) Ait. f.	Qebo	Asclepiadaceae	S	Wart	Latex	F	unprocessed latex	None
Kanahia laniflora (Forssk.) R.Br.	Qechinie	Apocynaceae	S	Snakebite	Root	F	unprocessed root	None
Allium cepa L.	Qey shinkurt	Amaryllidaceae	H	Blood pressure	Bulb	F/D	Crushing	Water
Lagenaria siceraria (Molina) Standl.	Qil	Cucurbitaceae	C	Dandruff	Leaves	F	Crushing	Water
				Jaundice	Leaves	F	Crushing	None
				Dysentery in infants	Leaves	F	Crushing	None

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
Euphorbia abyssinica J.F.Gmel.	Qulqual bale demu	Euphorbiaceae	S	Herpes zoster	Stem juice	D	Heating and Powdering	None
				Malaria	Stem juice	F	Baking	traditi (injera)
				Leishmaniasis	Stem juice	F	unprocessed plant	None
Schinus molle L.	qundo berberie	Anacardiaceae	T	Ascariasis	Root	F	Crushing	None
				“Mognbagegn”(Anthrax)	Seeds	D	Powdering and boiling in water	None
Urtica simensis Hochst. ex A.Rich.	Sama	Utricaceae	H	Stomach-ache	Leaves	F	Roasting	Water
Justicia schimperiana (Hochst. ex Nees) T. Anderson	Sensel	Acanthaceae	S	Hemorrhoids	Leaves	F	Crushing	Water
				Likft (devil illness)	Root	D	Powdering and smoking	None
				Jaundice	Leaves	F	Crushing	Lemor
Cynodon dactylon (L.) Pers. var. dactylon	Serdo	Poaceae	H	Rh-factor	Root	D	Powdering	Bread
Aloe pulcherrima Gilbert & Sebsebe	Setie eret	Aloaceae	H	Eye disease	Latex	F	unprocessed plant	None
				Malaria	Leaves	D	Powdering	Traditi bevera
				Wound	Leaves	F	unprocessed plant	None
				Stomach-ache	Leaves	F	Crushing	Traditi bevera
				Snakebite	Leaves	F	unprocessed plant	None
Entada abyssinica A.Rich.	Sheferie	Fabaceae	T	Cellulitis	Leaves	F	Crushing	Vaseli
				Snakebite	Leaves	F	unprocessed plant	None
Arundo donax L.	Shembego	Poaceae	H	Snakebite	Root	F	unprocessed root	None
Moringa oleifera Lam.	Shiferaw	Moringaceae	T	Blood pressure	Leaves	F/D	Crushing and boiling	Tea
Pennisetum thunbergii Kunth	Sindedo	Poaceae	H	Rh-factor	Root	D	Powdering and baking with bread	None
Rhus natalensis Bernh. ex C.Krauss	Taqima	Anacardiaceae	S	Scabies	Leaves	F	Crushing	Vaseli
				Cellulitis	Leaves	F	Crushing	Vaseli
Jasminum abyssinicum Hochets. Ex DC.	Tebelel	Oleaceae	S	Snakebite	Leaves	F	Crushing	Water
				Hemorrhoids	Stem	F	Heating	None
				Jaundice	Leaves	F	Crushing	Milk
				Taeniasis	Leaves	F	unprocessed plant	None
				Eye disease	Root	F	Crushing and squeezing	None
Eragrostis tef (Zucc.) Trotter	Tef	Poaceae	H	Rabies	Seeds	D	Powdering	Baking sativu
Cymbopogon citratus (DC.) Stapf	Tej sar	Poaceae	H	“Mognbagegn” (Anthrax)	Leaves	D	Powdering	Water
Linum usitatissimum L.	Telba	Linaceae	H	Diarrhoea	Seeds	D	Powdering	Water
				Intestinal strangulation	Seeds	D	Powdering	Water
Achyranthes aspera L.	Telenj	Amaranthaceae	S	Wound	Leaves	F	Crushing	None
Ruta chalepensis L.	Tenadam	Rutaceae	H	Abdominal pain	Leaves/fruits	F	unprocessed plant	Tea

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
Symphytum officinale L.	Tenkul	Boraginaceae	H	Eye disease	Leaves	F	Squeezing	None
				Excessive bleeding of menstruation	Leaves	F	Crushing	Water
Nicotiana tabacum L.	Tinbaho	Solanaceae	H	Snakebite	Leaves	F	Crushing	Water
				Leech	Leaves	F	Crushing	Water
Otostegia integrifolia Benth.	Tinjut	Lamiaceae	S	Evil eye	Leaves	D	Powdering and smoking	None
				"Megagna" (unidentified gastrointestinal disorder)	Leaves	D	Powdering and smoking	None
				Snakebite	Leaves	F	Crushing	Water
Euphorbia cactus Boiss.	Tinshuwa qoleqol	Euphorbiaceae	S	Leishmaniasis	Latex	F	Squeezing	Mixing dough
Maytenus arbutifolia (A. Rich.) Wilczek	Tiqur atat	Celastraceae	S	Abdominal pain	Stem bark	F	unprocessed plant	None
Solanum nigrum Acerbi ex Dunal	Tiqur awut	Solanaceae	H	Wound	Leaves	F	Crushing	None
Nigella sativa L.	Tiqur azmud	Ranunculaceae	H	Cough	Seeds	D	Powdering	Boiling butter
Prunus africana Hook. f. Kalkm.	Tiqur enchet	Podocarpaceae	T	Evil eye	Root	D	Powdering and smoking	None
Cordia Africana Lam.	Wanza	Boraginaceae	T	Fire burn	Leaves	D	Crushing	Vaseli
Ficus vasta Forssk	Warka	Moraceae	T	Evil eye	Stem bark	D	Powdering and smoking	None
Silene macrosolen A. Rich.	Wogert	Caryophyllaceae	H	Evil eye	Root	D	Powdering and smoking	None
Olea europaea L. subsp. cuspidata (Wall. ex G.Don) Cif.	Woirra	Oleaceae	T	Hemorrhoids	Leaves	F	Crushing	None
				Vomiting	Leaves	F	Crushing	Mixing with L. sativu water
Citrus aurantiifolia (Christm.) Swingle	Yabesha lomi	Rutaceae	S	Cellulitis	Root	F	Crushing	None
Juniperus procera Hochst. ex Endl.	Yabesha tid	Cupressaceae	T	Vomiting	Leaves	F	Crushing	Tea
Verbascum sinaiticum Benth.	Yahya joro	Scrophulariaceae	H	Snakebite	Root	F	unprocessed plant	None
				Evil eye	Root	D	Powdering and smoking	None
				Wound	Root	F	Crushing	Water
				Tropical ulcer	Root	F	Crushing	Water
				Wart	Leaves	F	Heating	None
Impans tinctoria A.Rich.	Yebereha shimbra	Balsaminaceae	H	Snakebite	Root	F	Unprocessed plant	None
Brucea antidysenterica J.F.Mill.	Yenebir tafir	Simaroubaceae	S	Leishmaniasis	Seeds	D	Powdering	Baking dough
Xanthium oriental L.	Yejema qitel	Asteraceae	H	Wound	Leaves	D	Powdering	Butter
				Scabies	Leaves	D	Powdering	Butter
Commicarpus plumbagineus (Cav.) Standl.	Yejib chama	Nyctaginaceae	H	Snakebite	Leaves	F	Unprocessed plant	None
Cucumis ficifolius A. Rich	Yemdir embuay	Cucurbitaceae	C	Abdominal pain	Root	F	Crushing	Water
				Swelling on the body	Root	F	Crushing	Water

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
				Snakebite	Root	F	unprocessed plant	None
				Rickets	Root	F	Crushing	None
				Infant dysentery	Root	F	Crushing	None
				Vomiting	Root	F	unprocessed plant	None
				Retained placenta	Root	F	Crushing	None
				Cellulitis	Root	F	Crushing	Water
Plectranthus amboinicus (Lour.) Spreng.	Yequsil medhanit	Lamiaceae	H	Wound	Leaves	F	Crushing	None
Berberis holstii Engl.	Yeset af	Berberidaceae	S	Evil eye	Leaves	D	Powdering and smoking	None
Solanecio gigas (Vatke) C. Jeffrey	Yeshikoko gomen	Asteraceae	S	Diarrhoea	Leaves	F	Crushing	None
Sorghum bicolor Moench	Zengada	Poaceae	H	Diarrhoea	Seeds	D	Powdering	Boiling coffee
Solanum anguivi Lam.	Zerch embuay	Solanaceae	S	Blemish	Leaves	D	Powdering	Vaseli
				Wound	Fruit	F	Crushing	None
				Impotence	Root	F	Crushing	Traditi bevera
Zingiber officinale Roscoe	Zinjibil	Zingiberaceae	H	Cough	Root	F/D	Crushing and boiling	Water
Satujeja punctata R.Br.	Este-meaza/lomi kesie	Lamiaceae	H	Snakebite	Root	F	unprocessed plant	None
				Diarrhoea	Root	F	unprocessed plant	None
				Evil eye	Whole part	D	Powdering and smoking	None
Asparagus africanus Lam.	Seriti	Asparagaceae	S	Impotence	Root	D	Powdering	Traditi bevera
Chenopodium ambrosioides L.	Sinign	Amaranthaceae	H	"Mognbagegn"(Anthrax)	Leaves	D	Powdering	Water
Carica papaya L.	Papaya	Caricaceae	S	Ascariasis	Seeds	D	Powdering	Water
Guizotia abyssinica (L.f.) Cass.	Nug	Asteraceae	H	Cough	Seeds	D	Powdering	Boiling butter
Lens culinaris Medik.	Misir	Fabaceae	H	Herpes zoster	Seeds	D	Roasting in water	None
Veronica anagallis-aquatica L.	Leteqatele sewunet	Scrophulariaceae	H	Fire burn	Whole part	F	Squeezing	None
Rhamnus prinoides L'Hér.	Geshe	Rhamnaceae	S	Scabies	Seeds	D	Powdering	Vaseli
				Rickets	Shoot tips	F	Crushing	Mixing Leave: Vernor amygd mixing water
Lippia adoensis Hochst.	Yelam kessie	Verbenaceae	S	Eye diseases	Leaves	F	Crushing	Water
Debregeasia saeneb (Forssk.) Hepper & Wood	Wonz admiq	Urticaceae	S	Jaundice	Leaves	F	Crushing	Baking injera
Heteromorpha arborescens (Spreng.) Cham. & Schtdl.	Yejib mirkuz	Apiaceae	S	Diarrhoea	Leaves	F	Crushing	Water
Salix mucronata Thunb.	Akeya	Salicaceae	S	Tooth-ache	Stem	F	Unprocessed plant	None
				Rabies	Leaves	F	Crushing	Water

Scientific name	LN	Family	LF	DT	PU	CU	PM	IA
<i>Pterolobium stellatum</i> (Forssk.) Brenan	Qentefa	Fabaceae	S	Circumcision wound	Leaves	F	Crushing	None
<i>Rubus steudneri</i> Schweinf.	Enjori	Rosaceae	S	Swelling on the body	Leaves and fruits	F	Crushing	None
<i>Scorpiurus muricatus</i> L	Worteb	Fabaceae	H	Wound	Leaves	F	Crushing	None

No.	Families	Number of species	Percentage
1	Fabaceae	14	9.9
2	Lamiaceae	9	6.3
3	Solanaceae	9	6.3
4	Asteraceae	8	5.6
5	Euphorbiaceae	8	5.6
6	Poaceae	8	5.6
7	Apiaceae	4	2.8
8	Cucurbitaceae	4	2.8
9	Malvaceae	4	2.8
10	Verbenaceae	4	2.8
11	Amaranthaceae	3	2.1
12	Apocynaceae	3	2.1
13	Celastraceae	3	2.1
14	Polygonaceae	3	2.1
15	Urticaceae	3	2.1
16	Amaryllidaceae	2	1.4
17	Anacardiaceae	2	1.4
18	Boraginaceae	2	1.4
19	Crassulaceae	2	1.4
20	Myrsinaceae	2	1.4
21	Myrtaceae	2	1.4
22	Oleaceae	2	1.4
23	Polygalaceae	2	1.4
24	Ranunculaceae	2	1.4
25	Rhamnaceae	2	1.4
26	Rubiaceae	2	1.4
27	Rutaceae	2	1.4
28	Scrophulariaceae	2	1.4
29	Vitaceae	2	1.4
30	The rest	27	19
Total		142	100.0

3.3 Life forms and habitats of medicinal plants

The majority of medicinal plants (122) were collected from wild habitats (85.9%) and with herbs accounted (42.3%) followed by shrubs (41.5%), trees (11.3%), and least represented by climbers (6%). The rest of the 20 medicinal plants were cultivated in the home garden (Figure 2).

3.4 Parts of medicinal plants used for remedy preparation

The study revealed that diverse types of plant parts were used to treat various ailments either in combination or alone. The analysis of collected information showed that leaves were the widely used plant parts that accounted for 119 (45.4%) followed by root 74 (28.2), Seed (6.9) and the rest all accounted 19.5%, epiphytes, and whole parts are the least used for remedy preparation (Table 3).

Table 3. *Medicinal plant parts used to prepare traditional medicines in Ensaro district*

No	Parts used	Frequency	Percentage
1	Leaves	119	45.4
2	Root	74	28.2
3	Seeds	18	6.9
4	Stem bark	14	5.3
5	Bulb	8	3.1
6	Fruit	6	2.3
7	Whole part	5	1.9
8	Latex	4	1.5
9	Shoot tips	3	1.1
10	Stem juice	3	1.1
11	Rhizome	2	0.8
12	Root bark	2	0.8
13	Stem	2	0.8
14	Aerial part	1	0.4
15	Epiphyte	1	0.4
	Total	262	100.0

3.5 Plant conditions for preparation

Medicines were prepared in fresh, dry, or both dry and fresh conditions of plant parts. The Marjory of traditional herbal medicines prepared in fresh form (63%), followed by dry form (30%) (Figure 3).

3.6 Methods of medicine preparation

Table 4 Depicts the different types of traditional remedy preparations from medicinal plant parts. The main preparation method was crushing of the fresh or dried plant materials that accounted for 43.6%, followed by unprocessed plant 17.4 % and powdering (16.2 %).

Table 4. *Traditional healers use different ways to prepare medicines from medicinal plants*

No	Preparation methods	Frequency	Percentage
1	Crushing	113	43.6
2	Unprocessed	45	17.4
3	Powdering	42	16.2
4	Powdering and smoking	27	10.4
5	Crushing and squeezing	6	2.3
6	Heating	5	1.9
7	Powdering and boiling	5	1.9
8	Boiling	4	1.5
9	Powdering and baking	4	1.5
10	Squeezing	4	1.5
11	Roasting	2	0.8
12	Heating and Powdering	1	0.4
13	Powdering and soaking in water	1	0.4
	Total	259	100.0

3.7 Methods of treatments

This study reported a wide range of traditional remedy applications. Smearing was the most common, accounting for 85 (32.9 percent), followed by drinking (26.0 percent) (Table 5)

Table 5. *Methods of applications*

No	Methods of applications	Frequency	Percentage
1.	Smearing	85	32.9
1.	Drinking	67	26.0
1.	Chewing	33	12.8
1.	Inhaling	32	12.4
1.	Eating	16	6.2
1.	Wrapping	10	3.9
1.	dropping	8	3.1
1.	Washing	3	1.2
1.	Heating	2	0.8
1.	Holding on teeth	1	0.4
1.	Sniffing	1	0.4
	Total	258	100.0

3.8 Routes of administration and dosage

The current study indicated the different routes for the applications of traditional herbal medicines for the treatment of various types of human ailments and diseases. Oral administration is the most used route 117(45.3%) which followed by the dermal application while the optical route is the least used organ 101 (39.1%) Figure 4.

3.9 Human diseases treated by medicinal plants in the study area

In the present study district, 52 human diseases being treated by traditional herbal medicines. Table 6 indicates that most ailments are treated by more than one medicinal plant species. For example, cellulitis (contact dermatitis) treated by *Dichrostachys cinerea*, *Premna schimperii*, *Zehneria scabra*, *Maytenus senegalensis* and *Rhus natalensis*.

Table 6. Human diseases treated by medicinal plants in Ensaro district

No	Ailments	Frequency	Number of medicinal plants used to treat
1..	Cellulitis	90	18
1.	Snakebite	79	23
1.	Evil eye	77	21
1.	Scabies	63	7
1.	"Likft"(devil illness)	56	3
1.	Mitch	47	8
1.	Scorpion bite	43	3
1.	Herpes zoster	41	2
1.	Leishmaniasis	33	3
1.	Epilepsy	31	1
1.	Dandruff	30	4
1.	Taeniasis	29	4
1.	Abdominal pain	24	10
1.	Wound	23	25
1.	Eczema	23	5
1.	Diarrhea	21	11
1.	Blemish	20	1
1.	Jaundice	19	11
1.	"Megagna" (unidentified gastrointestinal disorder)	19	6
1.	Dysentery in infants	17	3
1.	Tumor	15	4
1.	Delayed placenta	15	2
1.	Retained placenta	15	2
1.	Rickets	13	2
1.	Hemorrhoids	9	6
1.	Intestinal strangulation	8	1
1.	Rabies	7	6
1.	Cough	7	4

No	Ailments	Frequency	Number of medicinal plants used to treat
1.	Tonsillitis	7	3
1.	Impotence	6	4
1.	Circumcise infection	6	3
1.	Stomach-ache	6	2
1.	Bleeding	6	1
1.	Rh-factor	5	2
1.	Abortion	5	1
1.	"Mogbagegn" (Anthrax)	4	5
1.	Dog bite	4	1
1.	Blood pressure	3	6
1.	Excessive bleeding of menstruation	3	4
1.	Malaria	3	3
1.	Wart	3	2
1.	Leech	3	1
1.	Eye disease	2	7
1.	Typhoid	2	2
1.	Asthma	2	1
1.	Leprosy	2	1
1.	Syphilis	2	1
1.	Fire burn	1	3
1.	Vomiting	1	3
1.	Ascariasis	1	2
1.	Tooth-ache	1	1
1.	Tropical ulcer	1	1

1. Preference ranking

The five most reported medicinal plants for effective treatment of cellulitis that reported frequently in the study area were selected for preference ranking exercise. Ten key informants were asked to rank the given medicinal plants based on their usefulness. They were also asked to give numbers 5 for effective and 1 for the less effective medicinal plants. As the result, *Dichrostachys cinerea* was ranked first and *Zehneria scabra* ranked second whereas *Rhus natalensis* was ranked last (

Table 7).

Table 7. Preference ranking of medicinal plants used for the treatment of cellulitis (skin contact dermatitis)

Name of medicinal plants	Informants from (A-J)										Total	Rank
	A	B	C	D	E	F	G	H	I	J		
<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	4	5	4	5	5	4	4	5	5	5	46	1 st
<i>Clematis simensis</i> Fresen.	3	5	3	4	2	1	3	2	1	2	26	4 th
<i>Premna schimperii</i> Engl.	5	3	2	4	3	3	4	5	2	3	34	3 rd
<i>Zehneria scabra</i> Sond.	5	3	4	4	3	2	1	4	5	4	35	2 nd
<i>Rhus natalensis</i> Bernh.	2	4	2	3	2	1	2	3	3	3	25	5 th

1. Fidelity level

To identify the most preferred medicinal plant species used to treat certain ailments in the study area. Hence, *Ocimum lamiifolium*, *Albizia anthelmintica*, *Phytolacca dodecandra*, *Dichrostachys cinerea*, *Andrachne aspera* Spreng, *Psydrax schimperiana*, *Emilia sonchifolia*, *Clematis simensis*, *Calpurnia aurea*, *Silene macrosolen* and *Securidaca longipedunculata* Fresen had the highest fidelity level values that used as a sign of their healing potential in the study area (Table 8).

Table 8. The relative healing potential of the 14 most cited medicinal plants used against human diseases

Disease categories	Species	lp	lu	Fidelity level
Mitch	<i>Ocimum lamiifolium</i> Hochst. ex Benth.	6	6	100
Taeniasis	<i>Albizia anthelmintica</i> Brongn.	23	23	100
Rabies	<i>Phytolacca dodecandra</i> L' Her.	26	27	96.3
Cellulitis	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	21	22	95.5
Snakebite	<i>Andrachne aspera</i> Spreng	17	18	94.4
Impotence	<i>Emilia sonchifolia</i> (L.) DC. ex DC.	12	14	85.7
Haemorrhoids	<i>Clematis simensis</i> Fresen.	21	25	84
Jaundice	<i>Calpurnia aurea</i> (Ait.) Benth.	31	37	83.8
Likfit	<i>Silene macrosolen</i> Steud. ex A. Rich.	15	18	83.3
Evil eye	<i>Securidaca longipedunculata</i> Fresen	12	15	80
Diarrhoea	<i>Cucumis ficifolius</i> A. Rich.	19	25	76
Tonsillitis	<i>Salvia nilotica</i> Jacq.	38	50	76
Wound	<i>Achyranthes aspera</i> L. var. procera Fiori	13	18	72.2

1. Direct matrix ranking

In addition to food values, the local people used the plants for other different purposes such as fuelwood, fence, house construction, medicine, farm implements, and furniture. The result of direct matrix ranking revealed that *Cordia Africana*, *Ziziphus spina-christi*, *Olea europaea subsp. cuspidata*, *Juniperus procera*, *Millettia ferruginea*, *Eucalyptus globulus*, *Rubus apetalus*, *Carissa spinarum*, *Dichrostachys cinerea* were ranked first to ninth, respectively. Similarly, the seven use-values reported on six selected plant species were summed up and ranked and, the result showed that fuelwood collection, fence, farm implements, house construction, medicine, fodder, food were ranked first, second, third, fourth, fifth, sixth and seventh, respectively (Table 9).

Table 9. Direct matrix ranking of six plant species by twelve informants based on seven use criteria (5= best; 4= very good; 3=good; 2= less used; 1=least used and 0= no value)

Species	Use diversity								
	Medicine	Fuelwood	Fence	Farm implements	House construction	Fodder	Food	total	Rank
<i>Dichrostachys cinerea</i>	3	2	4	1	1	1	0	12	9 th
<i>Carissa spinarum</i>	3	1	4	0	0	2	3	13	8 th
<i>Millettia ferruginea</i>	3	3	1	5	5	1	0	18	5 th
<i>Rubus apetalus</i>	2	3	2	0	0	4	3	14	7 th
<i>Ziziphus spina-christi</i>	3	4	5	4	1	3	4	25	2 nd
<i>Eucalyptus globulus</i>	1	4	1	2	3	0	0	11	6 th
<i>Cordia Africana</i>	3	4	4	5	5	3	3	27	1 st
<i>Olea europaea subsp. cuspidata</i>	4	5	3	5	5	0	0	22	3 rd
<i>Juniperus procera</i>	1	5	3	5	5	0	0	19	4 th
Total	23	30	28	27	25	14	13		
Rank	5 th	1 st	2 nd	3 rd	4 th	6 th	7 th		

4 Discussion

4.1 Medicinal plant species composition

The present study showed that Ensaro district has a relatively high diversity of medicinal plants. this high diversity of plant species may be related to the existence of different topography and climatic conditions of the study area. According to Asefa et al. (2020), the presence of high plant diversity in Ethiopia is mainly linked with the existence of different topography and climate.

Although the modern health center is widely distributed and accessible to the inhabitants of the study area, the results of this study demonstrated that indigenous knowledge of using medicinal plants is still rich now. On the one hand, this could be related to a cultural attitude regarding medicinal plant efficacy (Lulekal et al., 2013) while on the other hand, it could be due to a lack of or unaffordable pricing of modern pharmaceuticals (Zerabruk & Yirga, 2012).

The number of medicinal plants collected from the current study area is comparable with study results reported in different parts of Ethiopia (Lulekal et al., 2013; Fenetahun et al., 2017; Kebede et al., 2018; Kelemu & Wolde, 2018; Yohannis et al., 2018). Even though most medicinal plants recorded in the present study were mentioned by several authors in the country (Teklehaymanot et al., 2007; Yirga et al., 2012; d'Avigdor et al., 2014; Alemayehu et al., 2015), few medicinal plant species (*Polygala abyssinica*, *Otostegia fruticosea*, *Psydrax schimperiana*,) reported in the present study were not reported as medicine elsewhere in Ethiopia.

Seven medicinal plant species of this study such as *Aloe pulcherrima* Gilbert & Sebsebe, *Echinops kebericho* Mesfin, *Millettia ferruginea* (Hochst.) Bak., *Solanecio gigas* (Vatke) C. Jeffrey, *Taverniera abyssinica* A. Rich., *Urtica simensis* Steudel, and *Eragrostis tef* (Zucc.) Trotter were identified as endemic plants to Ethiopia (Awat, 2009) while *Inula confertiflora*, *Taverniera abyssinica*, *Satureja punctata*, *Solanecio gigas*, *Lippia adoensis* and *Millettia ferruginea* are red list medicinal plants (Vivero et al., 2005) .

In this study, in agreement with the investigation conducted in Ankober district (Lulekal et al., 2013), Kilte Awulaelo District (Teklay et al., 2013), and Libo Kemkem District (Chekole et al., 2015) of Ethiopia, the dominant medicinal plant families documented were Fabaceae, Lamiaceae, Solanaceae, Euphorbiaceae, Asteraceae, and Poaceae. This could be related to the fact that these families are the most prevalent in Ethiopian and Eritrean flora (Tesfaye et al., 2020). Furthermore, recent chemical screening investigations revealed that the greatest number of plant species in these families have bioactive chemicals having a strong physiological impact against diseases causing microorganisms (Gazzaneo et al., 2005; Gebrelibanos et al., 2008).

4.2 Plant life forms, parts used, mode of preparation and administration

Many medicinal plants used in this study area were herbs. This could be due to the reason that herbs are more readily available in the nearby areas than trees and shrubs, which are usually picked from distant forests (Lulekal et al., 2013). According to Hailemariam et al. (2009), herbaceous plants are found more abundantly than other life forms of plants, especially during the wet season. This finding is aligned with most ethnobotanical studies of medicinal plants in Ethiopia (Teklehaymanot & Giday, 2007; Mesfin et al., 2009; Lulekal et al., 2013).

The wild habitats of the Ensaro district were identified as the major reservoir of plants providing approximately 86% of reported medicinal plants. However, the study showed that these habitats are exposed to anthropogenic influences, which is a result of the ever-increasing human interference, leading to the threatening of numerous wild medicinal plants along with associated indigenous practices. This finding is consistent with the findings of several ethnobotanical studies conducted in Ethiopia (Birhanu, Abera, et al., 2015; Fenetahun et al., 2017; Tuasha et al., 2018; Tefera & Yihune, 2019), in Karnataka (Prashanth Kumar & Shiddamallayya, 2016), Iran (Hosseini et al., 2021) and Sudan (Adam et al., 2020). This indicated that the effort attempted to cultivate medicinal plants in the home garden is very low in many countries.

Leaves are the most used plant part for the preparation of traditional herbal remedies in the study district. Many ethnobotanical investigations carried out in different parts of Ethiopia documented that leaves are the mainly used part (Teklehaymanot & Giday, 2007; Tefera & Yihune, 2019). This could be because the leaves of most plant species produce secondary metabolites especially flavonoids that can induce the desired biological action (Agisho et al., 2014; Yang et al., 2020). Moreover, most studies have recommended the use of leaves rather than roots, because utilizing roots results in the extinction of medicinal plant species permanently (Kiringe, 2006; Pascaline et al., 2011; Chowdhury et al., 2015).

Results of this study also showed that freshly harvested parts were extensively used in the preparation of traditional remedies to treat various ailments. Several recent studies showed that fresh parts have been used for remedial preparations (Lulekal et al., 2013; Chekole, 2017; Tuasha et al., 2018). The preference of freshly harvested plant materials to dry by traditional healers might be due to the presence of a high concentration of bioactive secondary metabolites in the fresh parts than dry parts (Lulekal et al., 2013; Agisho et al., 2014).

In the current study, Crushing is reported as the main remedies preparation method which is seen similarly in other ethnobotanical studies (Kidane et al., 2018; Abebe & Chane Teferi, 2021; Assen et al., 2021). This is probably since crushing increases the surface area of the plant for the availability of all secondary metabolites to be contacted with the diseases causing germs (No, 2014).

The present study documented various ways of administration and applications of herbal treatments used by traditional healers of the study area. In the study area, plant powder was mainly taken with water and rarely with traditional beverages, coffee, milk, and tea orally. This could be due to the high prevalence of internal disorders. This finding is similar to results reported by various researchers in Ethiopia and elsewhere (Lulekal et al., 2013; Birhanu, Endale, *et al.*, 2015; Aziz et al., 2017).

4.3 Fidelity level values, preference, and direct matrix ranking exercises

The calculation of fidelity level of medicinal plants revealed that *Ocimum lamiifolium*, *Albizia anthelmintica*, *Phytolacca dodecandra*, *Dichrostachys cinerea*, *Andrachne aspera*, and *Psydrax schimperiana* had high fidelity levels. According to Trotter and Logan (1986), fidelity level is a measure of the healing potential of medicinal plants. Thus, medicinal plants having a high-fidelity level indicates that they are supposed to be effective in their curing ability.

The preference ranking exercise helped in determining which medicinal plant species are most used to treat cellulitis (contact dermatitis). As the result, *Dichrostachys cinerea* (L.) Wight & Arn., *Clematis simensis* Fresen, *Premna schimperii* Engl. *Zehneria scabra* Sond. and *Rhus natalensis* Bernh. had the highest scores and were identified as the most effective treatments for this disease. Future research on the bioactive components of these species against cellulitis can lead to good outcomes.

Due to factors related to 'modernization,' the younger generation of Ensaro district showed a lack of interest in traditional treatments. Similar findings have been observed for other Ethiopian cultural groups (Lulekal et al., 2013). It was also shown that traditional healers maintain the highest level of secrecy when dealing with medicinal plant information. Furthermore, they make every effort to keep the information within the family circle secret. These facts, combined with the lack of any written documentation on medicinal plants in the study area, indicated a threat to the future use of medicinal plants.

The outcome of the direct matrix ranking exercise revealed the highest-ranking values for *Cordia Africana*, *Ziziphus spina-christi*, and *Olea europaea subsp. Cuspidata* for their non-medicinal purposes. Overexploitation for timber production, farm implements, construction, and fuelwood are the main factors for the threatening of these medicinal plant species in the study area. The result indicated, therefore, urgent remedial measures should be required to save the rapidly eroding medicinal plants of the study area. In Ankober district of Ethiopia, Lulekal et al. (2013) found a similar pattern of maximum utilization of medicinal plants for other non-medicinal purposes.

4.4 Comparative review results from similar studies

In this study, all known medicinal plant species were searched in published research articles from Ethiopia (Gedif & Hahn, 2003; Giday et al., 2003; Giday et al., 2007; Teklehaymanot et al., 2007; Lulekal et al., 2008; Giday et al., 2009; Mesfin et al., 2009; Lulekal et al., 2013; Chekole, 2017; Tefera & Yihune, 2019), Kenya (Jeruto et al., 2008; Okello et al., 2010; Muthee et al., 2011; Nyang'au et al., 2017; Orech & Schwarz, 2017; Lako et al., 2020; Omara, 2020), Burkina Faso (Nadembega et al., 2011) and South Sudan (Lako et al., 2020). From this review, 133 recorded medicinal plant species in this study are likely also to be found in other parts of Ethiopia and other countries with similar uses, parts use, conditions of preparation, diseases treated. Sixty-one of them have similar functions and 72 have different functions. The rest 9 reported medicinal plant species (*Abutilon longicuspe* Hochst. ex A.Rich, *Adenia cissampeloides* (Planch. ex Hook.) Harms, *Duranta erecta* L., *Emilia sonchifolia* (L.) DC. ex DC., *Psydrax schimperiana* (A.Rich.) Bridson, *Snowdenia polystachya* (Fresen.) Pilg., *Solanum dulcamara* L., *Symphytum officinale* L., and *Veronica anagallis-aquatica* L.) Wedd.) are reported only by this study as far as our literature search.

5 Conclusions

This is the first ethnobotanical report on medicinal uses of plants by the communities of Ensaro district, North Shewa Zone, Amhara Regional State, Ethiopia. According to the findings of this study, the residents of Ensaro district have deep knowledge about which plants to collect for the treatment of common human ailments and diseases, as well as where they grow. The findings of this study supported up the idea that indigenous knowledge of using medicinal plants is still alive in highly degraded areas. This finding is also revealed that traditional healers in Ensaro district collected medicinal plants from wild habitats. Several researchers have documented many of these plants, but a few are new for Ethiopia and other countries. This study provides baseline data to warrant further studies on the actual plants being used, and has prioritized plants for further biological and toxicological screening as well as promoting their conservation and sustainable use. To make sustainable use of these medicinal plants in the study area, local people must collaborate with natural resource administrators to manage them before they become seriously threatened. Both ex-situ and In-situ conservation strategies should be combined and employed urgently for optimal conservation results.

Declarations

Ethics approval and consent participant

Permission to conduct the ethnobotanical study was obtained from the district administration and village administrators in the study area. The purpose of the study was explained to all participants, and they agreed to provide information

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Availability of data and materials

The authors declare that all other data supporting the findings of this study are available within the article and its supplementary information files.

Competing interest

The authors have not declared any conflicts of interest.

Authors' contributions

Asaye Asfaw conceived the idea of doing this research, conducted the interviews, collected samples, outlined and wrote the manuscript. Ermias Lulekal was involved in the identification of collected plant materials and searching for the fund. Asfaw Debella, Aby Abebe and Sileshi Degu participated in the planning and preparation of semi-structured questions. Tamrat Bekele was revising it critically for important intellectual content. All authors have made substantial contributions to the analysis, interpretation of data and writing of the manuscript. All authors read and approved the final manuscript.

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Figures

Figure 1

A Map of Ethiopia showing Amhara Region and the study district

Figure 2

The life forms of wild and cultivated medicinal plants in the study area.

Figure 3

Conditions of traditional herbal medicines preparation

Figure 4

Showing the frequency percentage of administration route