

The role of medicinal plants in traditional medicine in Adwa district, Tigray, Northern Ethiopia

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Abstract

In Ethiopia, medicinal plants had been used since ancient time, and became an important source of health care. Though majority of the people in the study area depend on ethnomedicine to manage different ailments, the indigenous knowledge largely is not documented. As a result, an ethnobotanical survey was conducted with the objective of assessing the role of medicinal plants in traditional medicine. Data was collected by using semi-structured interview and group discussion. Twenty informants were purposefully selected based on indigenous knowledge and gender. Ethnobotanical data was analyzed with descriptive statistics and expressed in tables and flow charts. A total of 25 medicinal plants (22 families) recorded to treat human and livestock ailments. Medicinal plant habit analysis indicates that shrubs occupy the highest proportion (36%), followed by trees and herbs (28% for each) and climbers (8%). The most commonly used plant parts in the study area were leaves and roots. Although medicinal plants play a great role in the society, their sustainability is declining through time in the study area due to the increasing number of users, improper uses of the plants and poor conservation. Therefore, the conservation of these medicinal plants would be important.

Keywords: Ailment, Ethnobotany, Herbalist, Medicinal plant, Traditional Medicine

Background

Traditional medicine is the sum of total knowledge and practices used in diagnosis, prevention and elimination of physical, mental, or societal imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing (WHO, 2017). It incorporates plant, animal and mineral based medicines, spiritual therapies, manual techniques, and trial and errors, applied individually or in combination to treat, diagnose and prevent illness, or maintain wellbeing (WHO, 2003). In Ethiopia, the use of medicinal plants had been practiced since the ancient time and become an important source of health care system (Giday and Teklehaymanot, 2013). Medicinal plants are the main sources of traditional medicine for the rural population. Healers play an important role in the primary health care of the rural people and are of high demand on the population who could not afford the cost of modern medication (Abbink, 1995).

The vast majorities of Ethiopian population live in rural areas where the health care coverage is low and the existing public sector resources are being stretched to the limits and one of the greatest challenges is determining how best to narrow the gap between the existing service and population need (Transitional Government of Ethiopian Health Sector Strategy, 1995). The study of pharmaceutical drug use in Ethiopia showed that about 35% of the patients did not obtain the prescribed drugs due to lack of money (FDRE, 2003). However, most traditional medicine is delivered either free or with relatively low cost which contributes to the use of rural based healers for community primary healthcare (Abebe and Ayehu, 1993). Most of the indigenous knowledge which is still available among traditional medicine practitioners is passed from generation to generation via verbal communication and the existence of medicinal plants is declining through time (Birhanu *et al.*, 2015). Despite the significant role of medicinal plants in national primary healthcare in Ethiopia, (Abebe and Ayehu, 1993), little attempts have been made to document and validate the information. However, this indigenous knowledge is seriously threatened due to various natural and anthropogenic factors. Therefore, this research is aimed to assess and document the role of medicinal plants in Adwa District, Northern Ethiopia.

Materials and methods

Description of the study area

The study was conducted in Adwa district which is situated in the central zone of Tigray National Regional State, Ethiopia. It's found at about 1006 km North of Addis Ababa and is located at 14⁰ north latitude and 38⁰ east longitude. The area is surrounded by highlands and has an elevation of 1650- 1990 meters above sea level. It receives an annual rainfall of 600 - 650 mm and its monthly mean temperature is 22⁰C which ranges from a minimum of 13⁰C to a maximum of 27.2⁰C. (National Metrological Service Agency, Mekelle Branch Office; Adwa district statistical agency, 2013; unpublished data).

Sample size and sampling technique

A total of 20 herbalists were selected based on gender and indigenous knowledge regarding to the medicinal plants plus their full consent. Ethnobotanical data were collected from traditional medicine practitioners by using semi structured interview, and group discussions. The intellectual property rights were discussed and the name of practitioners was not mentioned. No compensation was given to the respondents. From the selected twenty informants, 75% were females which have been done purposely to assess the role of females in traditional medicine in the study area. No pre survey visit was done.

Data analysis

The collected data were analyzed by using simple descriptive statistics and expressed in the form of graphs and tables.

Result and discussion

Medicinal plant distribution

A total of 25 medicinal plants which belongs to 22 families were recorded in the study area. Out of these, 16 are used to treat human, 10 for treating livestock and 12 for treating both human, and livestock ailments.

The growth form analysis result shows that shrubs occupy the highest proportion (36%), followed by tree and herbs constituting 28% each, and climbers constitute 8% (Figure 1). Similar to our finding, a relatively higher number of shrubs and herbs were previously reported elsewhere in Ethiopia; western Ethiopia (Amenu, 2007) and southwestern Ethiopia (Hailemariam *et al.*, 2009). Similarly, other studies undertaken in Boosat sub-district, central eastern Ethiopia (Hunde *et al.*, 2006), Gimbi, western Ethiopia (Tolossa, 2007), Wonago district, southern Ethiopia (Mesfin *et al.*, 2009), and Mana Angetu district, southeastern Ethiopia (Leulekal *et al.*,

2008) showed that shrubs followed by herbs and trees are the most frequently used growth forms. Such higher proportion of shrubs use in the study area and in other locations is indicative of over utilization and hence needs special conservation measures to assure longevity. The higher proportion of shrubs in this study will be associated with the demographic condition of the study area suitable for shrubs and the society engagement towards shrubs. This study was also found to be different from other studies (Bizuayehu and Assefa, 2017; Maryo *et al.*, 2015; Tilahun, 2009; Amenu, 2007) where herbs occupy the highest proportion. The reason why herbs are being investigated by many researchers as widely utilized is the use of herbaceous medicines seems valuable since they can replace themselves easily and they are ubiquitously easily accessible given a reasonable climatic condition. Generally, such variations could be attributed to agro-ecological diversity of the country that favors different plant forms, and socio-cultural factors determine specific knowledge in different communities (Bekele, 2011).

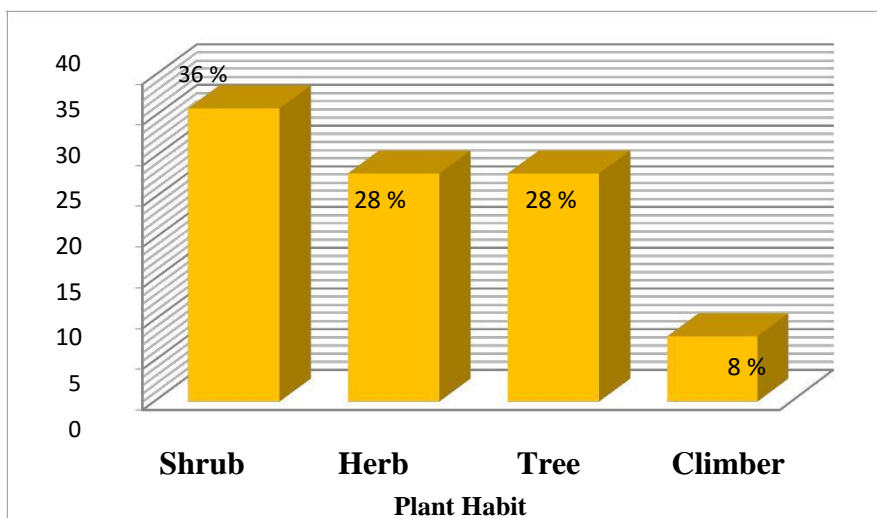


Figure 1: Habit of medicinal plants in the study area.

The most commonly used plant parts are leaves (52%) followed by root (24 %) and seed (8 %), respectively (Figure 2). This is consistent with the finding of Gidey (2001), Amenu (2007), Hailemariam *et al.*, (2009), Rangunathan and Solomon (2009), Samuel (2011), Zewdinesh (2016) where leaves occupy the leading rank among the harvested plant parts. Given that leaves constitute the most frequently sought plant parts in this study; the threat to the destruction of medicinal plants due to plant part extraction appears reasonably reduced. However, the dependence on roots, rhizomes, bulbs, barks, stems or whole parts of plant results in consequences from both ecological point of view and from the survival of the medicinal plant species (Yirga *et al.*, 2011).

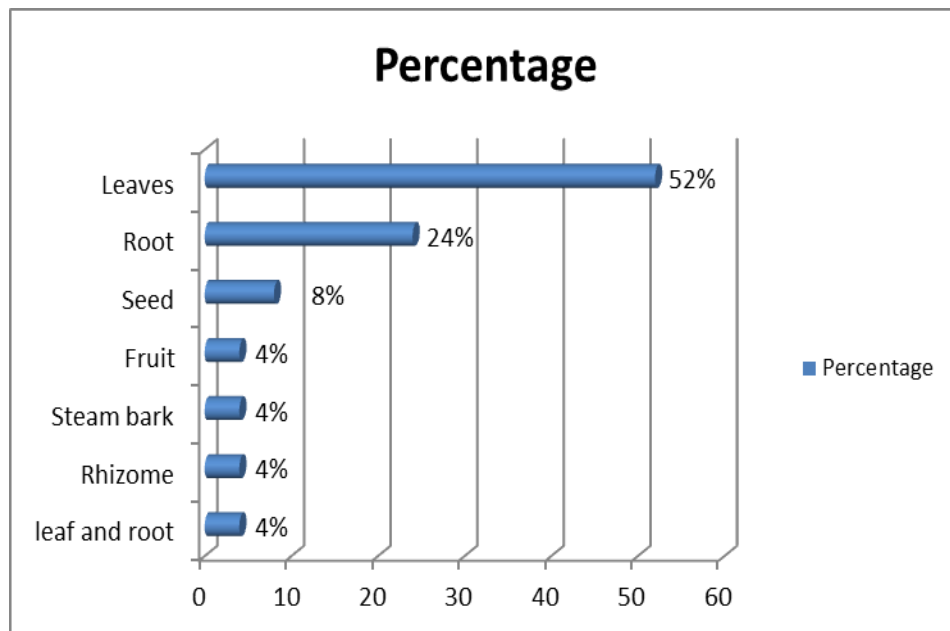


Figure 2: Medicinal plant parts used by traditional healers for medicinal preparation.

In this study, most of the medicinal plants were prepared in the form of crushed/grinded and homogenized with ingredients such as water, cheese, honey and coffee. The route of administration includes drinking, eating/chewing, inhalation, smearing, tying in some body parts and smelling. These use methods are usually common and widely used and the ingredients may vary among the type of plants and the nature of diseases (Girmay and Teshome, 2017)

Medicinal plants used for the treatment of human diseases

According to the information obtained from healers, the most widely distributed human disease in the study area includes hypertension, asthma, abdominal pain, common cold, skin infection and others (Table 1). Herbalists use different diagnosis and treatment methods depending on the type of ailment. Patient or their attendants are commonly asked for symptoms observed and the duration of the health problem and accordingly the prescription is ordered. Practitioners informed that abdominal pain is serious and frequently occurring due to the lack of hygiene, that is associated with the lack of proper and continuous awareness to the society and economic problems.

The use-value (UV) index was calculated as: $Uvc = \frac{\sum U}{ns}$; where U is the sum of the total number of use citations by all informants for a given species, divided by the total number of informants (ns) (Andrade *et al.*, 2011). The result is illustrated in Table 2.

Table 1: Medicinal plants used for treatment of human disease.

S.No	Disease treated	Local name of Medicinal plant	Scientific Name/Family	Habit	Part used	Method of usage	Preparation method
1	Hypertension	Lemon	<i>Citrus aurantifolia</i> (Rutaceae)	T	L	drinking	Crush and mix with water
2	Wen	Adaaho	<i>Rumex nepalensis</i> (Polygonaceae)	H	R	Drinking and smear	Grind and mix with water
3	Dental disease	Zingibel	<i>Zingiber officinal rosca</i> (Zingiberaceae)	H	Rh	Drinking/Chewing	Dissolve the powder with water
4	Abortion	Shibti	<i>Phytolacca dodecandra</i> L. Herit (Phytolaccaceae)	Sh	L	Drinking	Mix with water and coffee
5	Abdominal pain	Awesda	<i>Nigella Sativa</i> L. (Ranunculaceae)	H	Se	Drinking	Grind and homogenize with water
		Shinfea	<i>Lepidium sativum</i> L. (Brassicaceae)	H	Se	Drinking	Crush the seed & mix with water
6	Helmints, abdominal pain	Hambaha mbo	<i>Senna singueana</i> (Fabaceae)	Sh	R	Drinking	Grind and mix with water
7	Asthma	Tikurberbere	<i>Schinus molle</i> L. (Anacardiaceae)	T	L	Smell	Grinding
8	Common cold	Nech bahairzaf	<i>Eucalyptus camaldulensis</i> . Dehnh (Myrtaceae)	T	L	Steam bath inhalation	Grind the leaf and Boil with water
9	Vaginal bleeding	Demakese	<i>Ocimum lamifolium Hochst</i> (Lamiaceae)	Sh	L	smearing	Crush and smear in the vaginal part
10	Nephritis, tapeworm	Duaba	<i>Cucumis melo</i> (Cucurbitaceae)	Cl	Fr	Eating	Boil with water
11	Bone fracture	Gerbya	<i>Hypoestes forskali (vahl) R.Br</i> (Acanthaceae)	Sh	R	Tie	Cut the root parts and tie the damaged part
12	Snake bite	Mekmeko	<i>Rumex abyssinicus</i> Jacq. (Polygonaceae)	H	R	Chew and swallow	Crush the root parts and mix with honey
13	Bone disease	Tsedidima	<i>Juniperus procera</i> (Cupressaceae)	T	Stb	Amulet	Crush the stem bark and amulet
14	Malaria	Neem	<i>Azadirachta indica</i> A. Juss. (Meliaceae)	T	L	Drinking	Crush the leaf and mix with Water
15	Quaqucha	Bsana	<i>Croton macrostachyus</i> (Euphorbiaceae)	T	L	Painting	Take the leaf bud and paint the fluid on the skin

Foot note: Growth Habit: Cl= Climber, H=Herb, Sh= Shrub, T=Tree; Plant part: Fr=Fruit, L=Leaf, R= Root, Rh= Rhizome, Se=Seed, Stb- Stem bark.

Table 2: Use-value (UV) index of medicinal plants in the study area.

S.No	Name of Medicinal plant	Number of Citation by informants	Total number of Informants	UV Index
1	<i>Azadirachta indica</i> A. Juss	15	20	0.75
2	<i>Cadia purpurea</i> (picc.) Ait	13	20	0.65
3	<i>Calpurnia aurea</i> (Aiton) Benth	7	20	0.35
4	<i>Citrus aurantifolia</i>	20	20	1
5	<i>Cucumis dipsaceus</i> Ehrenb.	20	20	1
6	<i>Cucumis melo</i>	16	20	0.8
7	<i>Croton macrostachyus</i>	18	20	0.9
8	<i>Eucalyptus camaldulensis</i> . Dehnh	5	20	0.25
9	<i>Euclea natalensis</i> L	9	20	0.45
10	<i>Hypoestes forskali</i> (vahl) R.Br	13	20	0.65
11	<i>Jasminum abyssinicum</i> Hochst. ex DC.	20	20	1
12	<i>Juniperus procera</i>	19	20	0.95
13	<i>Lepidium sativum</i> L.	20	20	1
14	<i>Nigella Sativa</i> L.	20	20	1
15	<i>Ocimum lamifolium</i> Hochst	20	20	1
16	<i>Phytollacca dodecandra</i> L. Herit	20	20	1
17	<i>Rumex abyssinicus</i> Jacq.	19	20	0.95
18	<i>Rumex nepalensis</i>	19	20	0.95
19	<i>Ruta chalepensis</i> L.	20	20	1
20	<i>Schinus molle</i> L.	18	20	0.9
21	<i>Senna singueana</i>	17	20	0.85
22	<i>Silene macrosolen</i> .A.Rich	10	20	0.5
23	<i>Solanum incanum</i> L.	20	20	1
24	<i>Ximenia americana</i> L.	14	20	0.7
25	<i>Zingiber officinal</i> roscal	20	20	1

Medicinal plants used for the treatment of livestock diseases

The herbalist use different herbal preparations to treat livestock health problems. Abdominal pain, skin infection, leg inflammation and dry cough are the most popular livestock ailments in the study area (Table 3). Most of the medicinal remedies are prepared from single medicinal plants either crushed/grinded or powdered. These remedies administered orally.

Table 3: Medicinal plants for treatment of livestock disease.

S.No	Disease treated	Local name of Medicinal plant	Scientific Name/Family	Habit	Part used	Method of usage	Preparation method
1	Spleen	Shelen	<i>Cadia purpurea</i> (picc.) Ait (Leguminosae/Papilionoideae)	Sh	L	Drinking	Grind and mix with water
2	Depression, lice, bloating, dry cough, Abdominal pain	Digita (Hitsawutse)	<i>Calpurnia aurea</i> (Aiton) Benth. (Fabaceae)	Sh	L	Drinking	Grind and mixing with water
3	Belly ache, Snake bite, Insect bite, stomach pain/ diarrhoea, dry cough, Abdominal pain	Hafafelo	<i>Cucumis dipsaceus</i> Ehrenb. (Cucurbitaceae)	Cl	R	Drinking	Grind and mix with water
4	Rabies	Kuliaw	<i>Euclea natalensis</i> L (Ebenaceae)	T	R	Eating	Crushing the root parts of the plant and mixing with cheese.
5	Eye disease, Tape worm, vomiting	Habi-tselim	<i>Jasminum abyssinicum</i> Hochst. ex DC. (Oleaceae)	T	L	Stain/drinking	Grind and mix with water
6	Halafin	Shinfae	<i>Lepidium sativum</i> L. (Brassicaceae)	H	Se	Drinking	Grind and mixing with water
7	Skin infection	Adahon	<i>Rumex nepalensis</i> (Polygonaceae)	H	L	Smearing	Grind and mix with water
		Sersaero	<i>Silene macrosolen</i> .A.Rich (Caryophyllaceae)	Sh	L	Smoking	Grinding and smoke
8	Abdominal pain	Engule	<i>Solanum incanum</i> L. (Solanaceae)	H	R	Drinking	Crushed and mixing with water
9	Vomiting, leech infestation, tonsillitis	Mileo	<i>Ximenia americana</i> L.(Ximeniaceae)	Sh	L	Drinking	Grinding the leaf part of the plant and mixing with water

Foot note: Growth Habit: Cl= Climber, H=Herb, Sh= Shrub, T=Tree; Plant part: L=Leaf, R= Root, Se=Seed.

Medicinal plants for the treatment of both human and livestock disease

According to this study, medicinal plants listed in Table 4 were recorded to treat both human and livestock health problems. The data obtained from the traditional medicinal practitioners revealed that about 48% of the medicinal plants cure and prevent both ailments. This implies that, those medicinal plants have higher risk of sustainability due to repeated and continuous use than single used ones. Therefore, as indicated by Figure 3, the medicinal plants of having medicinal value for both ailments occupy 48% and it indicates the medicinal plants providing curative and preventive role for both human and livestock health problems have frequent chance of utilization and so do the medicinal plants against human ailments. So, sustainable conservation and use approaches of those medicinal plants have to be seriously considered.

Table 4: Medicinal plants used for treatment of both human and livestock disease.

S.No	Disease treated	Local name of Medicinal plant	Scientific Name/Family	Habit	Part used	Method of usage	Preparation method
1	Skin infection, termite bite, Petriasis Versicolor, Leech infestation, Poultry disease, Epilepsy	Nim	<i>Azadirachta indica</i> A. Juss. (Meliaceae)	T	L	Drinking	Crush the leaf and mix with water
2	Headache	Shelen	<i>Cadia purpurea</i> (picc.) Ait (Leguminosae/Papilionoideae)	Sh	L	Drinking	Grind and mix with water
3	Malaria, anthrax and Abdominal pain	Hafafelo	<i>Cucumis dipsaceus</i> Ehrenb. (Cucurbitaceae)	Sh	R	Drinking	Grind and mix with water
4	Skin infection	Gerbiya	<i>Hypoestes forsakaoli</i> (Vahl) R.Br (Acanthaceae)	Sh	L	Tie	Cut the root parts and tie the damaged part
5	Abdominal pain, tonsillitis, diarrhoea	Shinfea	<i>Lepidium sativum</i> L. (Brassicaceae)	H	Se	Drinking	Grind and mix with water
6	Wen	Mekmeko	<i>Rumex abyssinicus</i> Jacq. (Polygonaceae)	H	R	Smearing	Crush the root parts and mix with honey
7	Snake bite	Adahon	<i>Rumex nepalensis</i> (Polygonaceae)	H	R	Chew and swallow	Grind and mix with water
8	Common cold/ Evil sprit	Tenadam	<i>Ruta chalepensis</i> L. (Rutaceae)	H	L	Drinking/ Stem Inhalation	Grind and mixed with water/ Garlic
9	Abdominal pain, Asthma, diarrhoea	Tikurberbere	<i>Schinus molle</i> L. (Anacardiaceae)	T	L	Smell	Grinding

10	Amoeba, abdominal pain, snake bite	Hambahambo	<i>Senna singueana</i> (Fabaceae)	Sh	R	Drinking	Grind and mix with water
11	Abdominal pain	Engule	<i>Solanum incanum</i> L. (Solanaceae)	H	R	Drinking	Crushed and mixing with water
12	Sneezing and dry cough	Zingibel	<i>Zingiber officinale</i> roscal (Zingiberaceae)	H	Rh	Drinking	Dissolve the powder with water

Foot note: Growth Habit: H=Herb, Sh= Shrub, T=Tree; Plant part: L=Leaf, R= Root, Rh= Rhizome, Se=Seed.

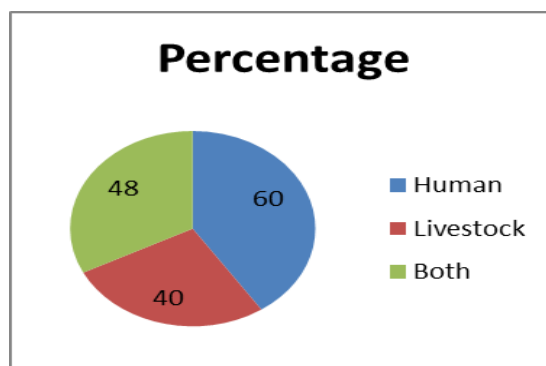


Figure 3: Percentage distribution of medicinal plants to treat human, livestock and both ailments.

Gender based Medicinal plant knowledge

Gender significantly predicts medicinal plant knowledge (Kidane *et al.*, 2014). Scholars reported males and elders have comparatively higher proportion of medicinal plant knowledge than females and young people (Mekuanent *et al.*, 2015). This is due to their personal experiences using these plants and exposure to the field (Tewelde *et al.*, 2017). In this study 75% of the medicinal practitioners were females, even if purposefully selected to assess their role in traditional medicine and of course found to be stakeholder to field. This showed that females in their ethnic groups have a great role in transferring and seeking indigenous knowledge on traditional medicine. Therefore, gender based indigenous knowledge is not exactly biased that both males and females have their own contribution. It may be varied in different ethnic societies. The Fidelity level (FL), the percentage of informants who mentioned the uses of certain plant species to treat a particular ailment in a study area, was calculated as; $FI = \frac{N_p}{N} \times 100$; where N_p is the number of informants that reported a use of a plant species to treat a particular disease, and N is the number of informants that used the plants as a medicine to treat any given disease (Andrade *et al.*, 2011) and illustrated in Table 5.

Table 5: Fidelity level (FL) of medicinal plants for human, livestock and both ailments.

S.No	Disease treated	Local name of Medicinal plant	Scientific Name of the Medicinal plant	Target treated			FL
				Human	Livestock	Both	
1	Hypertension	Lemon	<i>Citrus aurantifolia</i>	✓			0.006
2	Wen, Skin infection, Snake bite	Adaaho	<i>Rumex nepalensis</i>	✓	✓		0.0095
3	Dental disease, Sneezing, dry cough	Zingibel	<i>Zingiber officinal roscal</i>	✓		✓	0.01
4	Abortion	Shibti	<i>Phytolacca dodecandra L. Herit</i>	✓			0.01
5	Abdominal pain, Halafin, tonsillitis, diarrhoea	Awesda	<i>Nigella Sativa L.</i>	✓			0.01
		Shinfea	<i>Lepidium sativum L.</i>	✓	✓	✓	0.01
6	Helmints, Amoeba, Abdominal pain, Snake bite	Hambahambo	<i>Senna singueana</i>	✓		✓	0.0085
7	Asthma	Tikurberbere	<i>Schinus molle L.</i>	✓		✓	0.009
8	Common cold	Nech bahairzaf	<i>Eucalyptus camaldulensis. Dehnh</i>	✓			0.0025
9	Vaginal bleeding	Demakese	<i>Ocimum lamifolium Hochst</i>	✓			0.01
10	Nephritis, tapeworm	Duaba	<i>Cucumis melo</i>	✓			0.008
11	Bone fracture, Skin infection	Gerbiya	<i>Hypoestes forskaoli (vahl) R.Br</i>	✓		✓	0.0065
12	Skin infection, Wen	Mekmeko	<i>Rumex abyssinicus Jacq.</i>	✓		✓	0.0095
13	Bone disease	Tsedidima	<i>Juniperus procera</i>	✓			0.0095
14	Malaria, Skin infection, termite bite, Petriasis Versicolor, Leech infestation, Poultry disease, Epilepsy	Neem	<i>Azadirachta indica A. Juss.</i>	✓		✓	0.0075
15	Quaqucha	Bsana	<i>Croton macrostachyus</i>	✓			0.009
16	Headache	Shelen	<i>Cadia purpurea (picc.)</i>		✓	✓	0.0075
17	Depression, lice, bloating, dry cough, Abdominal pain	Digita (Hitsawutse)	<i>Calpurnia aurea (Aiton) Benth</i>		✓		0.0035
18	Malaria, anthrx, Abdominal pain, Belly ache, Snake bite, Insect bite, diarrhoea, dry cough	Hafafelo	<i>Cucumis dipsaceus Ehrenb.</i>		✓	✓	0.01
19	Rabies	Kuliaw	<i>Euclea natalensis L</i>		✓		0.0045
20	Eye disease, Tape worm, vomiting	Habi-tselim	<i>Jasminum abyssinicum Hochst</i>		✓		0.01
21	Skin infection	Sersaero	<i>Silene macrosolen.A.Rich</i>		✓		0.005

22	Abdominal pain	Engule	<i>Solanum incanum L.</i>		✓	✓	0.01
23	Vomiting, leech infestation, tonsillitis	Mileo	<i>Ximenia americana L.</i>		✓		0.007
24	Common cold, Evil sprit	Tenadam	<i>Ruta chalepensis L.</i>			✓	0.01
25	Abdominal pain, Asthma , diarrhoea	Tikurberbere	<i>Schinus molle L.</i>			✓	0.009

Conclusion and recommendations

This research founded 25 medicinal plants providing curative and preventive role for human, (60%), livestock (40%) and both (48%). Generally, this finding indicates that medicinal plants play a crucial role in traditional medicine to address the health of the society via indigenous knowledge. This research reveals the traditional medical practitioners treat both human and livestock health problems in their ethnicity which is an indicative of traditional medicine is practiced by different societies. Moreover, the study investigates the role of females in traditional healing system. This is because indigenous knowledge is not biased on gender, race, religion and others. But its transfer to generations has limited the outstanding status of the field due to verbal communication. Therefore, the government has to design a strategy to better develop the sector and conserve the medicinal plant species and the skill of practitioners because it is the corner stone for modern drug development innovations.

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Authors' Contribution

The work presented here was carried out in collaboration between all authors. Temesgen Assefa designed the methods and all authors interpreted the results and wrote the paper. All authors have attributed to, seen, and approved the paper contributed equally to this work.

Conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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