



Research Article

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Long-Standing Herbal Medicinal Traditions from the Prehistoric Harar Town and the Surroundings, Eastern Ethiopia

Negussie F Bussa*¹, Anteneh Belayneh²

¹ Department of Food Science and Post-harvest Technology, Haramaya Institute of Technology, Haramaya University, P. O. Box 138, Dire Dawa, Ethiopia

² School of Biological Sciences and Biotechnology, College of Natural and Computational Sciences, Haramaya University, P. O. Box 282, Dire Dawa, Ethiopia

ABSTRACT

Ethiopia is home to a remarkable diversity of more than 1000 species of medicinal plants. The Harari and Oromo communities living in the prehistoric town of Harar and the surroundings have long history of knowledge and practices of treating human and livestock ailments using medicinal plants. However, this has remained little or no empirically studied. Semi-structured interviews, discussions and guided field walks were used to collect data from 80 randomly and systematically selected informants among who 16 were traditional herbalists. Relative Frequency of Citation (RFC), Cultural Importance Index (CII), Informant Consensus Factor (ICF), Use Diversity (UD), Non-parametric Kruskal Wallis, and Wilcoxon tests were conducted using R software version 3.3.4. A total of 142 wild and cultivated traditional medicinal plant species belonging to 124 genera and 57 families of which leaves are favoured by traditional healers were identified as herbs. Concoction, or filtering, and infusion, or boiling, were the most practiced methods of remedial preparations of the wild and cultivated medicinal plants, respectively. The highest ICF value was recorded for treating toothache and mouth infections (0.93) followed by gastritis, heartburn/pyrosis (0.84). The most culturally important and the highest diversity index were found to be *Ocimum lamiifolium* and *Allium sativum*. There were valuable and diversified wild and cultivated ethno-medicinal plant species associated with indigenous knowledge. The reputability of the indigenous knowledge should be corroborated with phytochemical and pharmacological analyses. Moreover, the status of conservation of these plant species and associated ethnomedicinal knowledge needs further investigations.

Keywords: *Allium sativum*, Ethnomedicine, Ethnospecies, Indigenous knowledge, *Ocimum lamiifolium*.

INTRODUCTION

Traditional herbal medicines continued as inexpensive and easily accessible source of treatment in the primary health care system among varied communities in Ethiopia^[1-6]. Local knowledge of herbal medicines in Ethiopia and their uses provided imperative contribution to human and livestock healthcare needs throughout the country^[7-10]. Out of 6028 species of angiosperms reported in the flora of Ethiopia^[11], about 1000 species were used in the traditional health care system^[1]. About 80% of Ethiopian population relies on traditional medicine to treat different types of human ailments^[3, 8, 12] because of high cultural acceptability of healers, presence of local pharmacopeias, and relatively lower cost of traditional herbal medicine^[1, 5, 13].

Ethnobotanical knowledge and the traditional medical systems contributed a lot in the discovery of modern drugs, for instance, vinblastin and vincristine made from *Catharanthus roseus* L (Apocynaceae), anticholesterol from *Cynaras colymus* L (Asteraceae), and so forth [14,15]. In addition, the preparation procedures indicated in the traditional system suggested better extraction methods for modern drugs [16]. Hence, documenting and safeguarding traditional medicinal plant species and related indigenous knowledge has become crucial subject in the utilization, planning, and management of natural resources such as medicinal plant species^[17-19].

In the Harar town and its vicinities, medicinal plants and their uses are widely practiced, as a part of an ancient and indigenous social epistemology. This adaptive knowledge system of the community has remained integral so far among the elderly people, but it has been little studied^[5, 20]. For example, the most recent study conducted in the area indicated that 38 traditional herbal medicines were utilized to treat cancer, tumors and inflammatory illness^[21]. However, both the medicinal plants and indigenous knowledge system were seriously deteriorated due to the rapid environmental, cultural, land use and socio-economic changes.

***Corresponding author:**

Dr. Negussie F Bussa

Department of Food Science and Post-harvest Technology, Haramaya Institute of Technology, Haramaya University, P. O. Box 138, Dire Dawa, Ethiopia
Email: negussiebussa@yahoo.com

It is believed that the study area harbors useful traditional medicinal plant species used to treat diverse human ailments. It also retains ancient and reputable indigenous knowledge, which potentially attracts interests of phytochemical and pharmacological analysts as well as of conservationists of valuable traditional medicinal plant species and associated ethnomedicinal knowledge. Moreover, the declining of traditional know-how on the identities and uses of herbal medicines between generations could stimulate an urgent ethnomedicinal studies for in-depth investigation and documentation before it is lost.

The Harari Region, with the capital of the ancient prehistoric town of Harar having an age of more than 1000 years [22], was explored for age-old traditional practices of treating diversified human ailments by the Harari and Oromo communities. In this ancient and momentous study site, a typical mountain locally called "Garaa Hakim" (Oromo language) or "Aw Hakim" (Harari language) is the main source of traditional herbal medicines [21]. Due to higher diversity of plant species harboured in the mountains and valley complex of the study area, and the primeval history and civilization of the local people, it was hypothesized that the share of medicinal plant species and the value of related indigenous knowledge are expected to be higher and interesting for researchers.

The intent of this study is to analyse the relationship among the historical epistemology or traditional practices, the diversity of the medicinal plants and the level of informant consensus on these in the specific study area of the prehistoric Harar town, the capital of both of Eastern Hararghe zone of Oromia and the Harari Region. In addition, this study aims at examining the trend of traditional knowledge with respect to the identity and use of herbal medicines [23]. It is believed that a comprehensive ethnomedicinal investigation such as this study shall contribute to not only safeguarding the deteriorating ethnomedicinal knowledge but also for conserving the medicinal plants as well as scaling up the study to phytochemical and pharmacological analyses which might lead to the discovery of newer drugs [24, 25].

MATERIALS AND METHODS

Study area

The age-old, historic town of Harar and its surrounding is situated in eastern part of Ethiopia, 515 km from the capital city, Addis Ababa. Available resources indicated that, Harar town was founded 1000 years ago [22]. The dominant in the town and its vicinities are Oromo and Harari communities. The altitude ranges between 1310 (Erer Valley) to 2250 (Aw-Hakim Mountain) meters above sea level (m.a.s.l.).

Topographic feature of Harar and the surrounding is dominated by mountainous and undulating landforms, including rugged terrain, steeply sloping hills and valley bottoms [26]. In this age-old and historic place, a peculiar mountain locally called Garaa Hakiim (in Afaan Oromo) or Aw Hakim (in Harari language) is abounds with main source of medicinal plants [21]. The Hakim Mountain is located at the southern margin of town forming the highest peak (2250 m.a.s.l.), having a north to south orientations (see Figure 1).

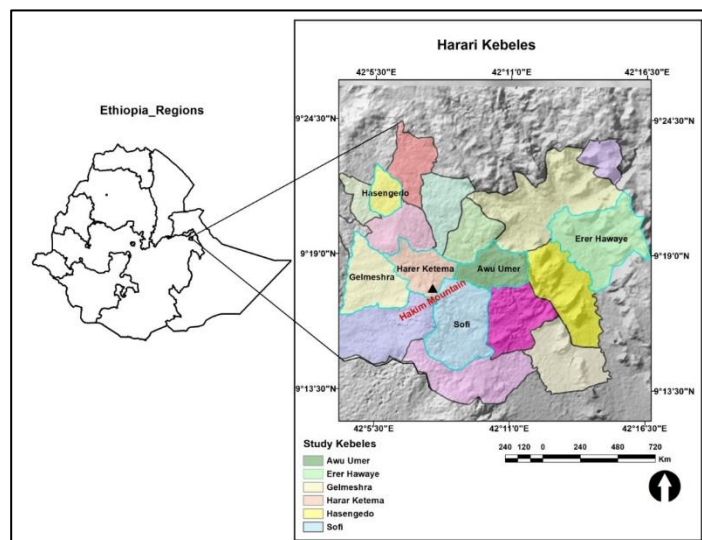


Figure 1: Map of the study area with sampled Kebeles (the smallest administrative units).

The average annual daily temperature of the area is 19.3 °C, while the annual average minimum and average maximum daily temperatures are 13.1 and 25.3 °C, respectively. February to May are the warmest months whereas November to January are the coldest months. The length of crop growing period ranges from 94 to 135 days, with recorded fluctuations of five to ten days in a year. There is high variability of annual rainfall, ranging between 275 to 1000 mm and the average annual rainfall being 669 mm. The rainfall pattern of the area is bi-modal, occurring from February to April (short rainy season) and June to August (long rainy season) [5, 26].

Sampling and data collection methods

Ethnomedicinal data were collected in two different seasons, that is, from April to June 2017 and September to October 2018 following the two rain seasons. Participatory Rural Appraisal (PRA) techniques as recommended by Martin [27] and Cunningham [28] was employed to collect the data from six randomly sampled Kebeles (two town and four rural Kebeles). The Kebeles are Gelmashira and Harar Ketema from town area and Soofi, Awu-Umar, Erer Haweye and Hasengedoo from the rural areas (Figure 1).

Purposive sampling technique was used to select eighty informants (52 men and 28 women) belonging to both the Harari and Oromo communities so that they have been provided their comprehensive ethnomedicinal knowledge of both wild and cultivated plant species. Among these, 16 (10 men and 6 women) key informants (traditional healers) were selected using purposive sampling technique, guided with the community leaders, elderly people and members of local community. The rest of the 64 informants (42 men and 22 women) were selected with stratified random sampling method. Finally, households of the selected study sites were registered and stratified into three age groups, youths (20–35, n=26), adults (36–65, n=36) and elders (above 65, n=18) because one of the key objectives of the study was to find out how the knowledge varies with age.

Semi-structured interview and group discussion was employed to collect information from the participants. Following the Oromo and Harari custom, before carrying out the interviews and group discussions,

traditional ceremonies and blessings were conducted. Then, oral Prior Informed Consents (PIC) was confirmed from each informant.

The semi-structured interviews with the 80 respondents and group discussions were administered in the local languages, Harari and Afaan Oromo. For the group discussions, the participants were grouped into four and the discussions were carried out with average of 8 hours per group). A detailed information about the local name(s) and descriptions of the plant species, how and why it is used for treatments, specific types of ailment treated or controlled, medicinally used parts, conditions and methods of preparations, remedial administration routes, and basic drawbacks, were collected. Additionally, field walks guided with key informants were used to collect medicinal plant species for voucher specimens supported with documentation of photographic and field notes. Moreover, interviews with key informants were carried out in the field in order to validate the data and to avoid the likely chance of confusing identities of plant species by repeated inquiries. These activities were done twice or thrice with the same and different respondents to confirm the validity and reliability of the recorded data. Specimens were collected and coded in the field, later identified using volumes of the Flora of Ethiopia and Eritrea for taxonomic keys and through visual comparisons with authenticated plant specimens kept at the Herbarium of Haramaya University (HHU). Two copies of voucher specimens of all the traditional medicinal plant species were kept in HHU.

DATA ANALYSIS

The total number of medicinal plant species, its growth habit, parts used, number of remedies prepared, number of illnesses treated using it, formulation types and routes of administration were all analysed quantitatively [27, 29]. Particularly, the quantitative analyses focused on the degree of agreement among the different respondents concerning the uses of plant species, the benefits, and the importance vis-à-vis to the diverse human ailments it is used to treat. For this, quantitative indices, particularly, the Relative Frequency of Citation (RFC), the Cultural Importance Index (CII), the Informant Consensus Factor (ICF), and the Diversity of Uses (DU), were employed.

The informant consensus factor (ICF)

The ICF of each medicinal plant, the proportion of informants who independently reported its use against a disease category, was calculated using the formula developed by Trotter and Logan [30]:

$$ICF = (nur - nt) / (nur - 1)$$

Where, *nur* refers to the "number of use-reports in each disease category" and *nt* refers to "the total number of species used for that disease category".

The relative frequency of citation (RFC)

The Relative Frequency of Citation (RFC) index, for each medicinal plant species documented, was calculated based on the Frequency of Citation (FC) values [31] as follows:

$$RFC = FC/N.$$

Where, N is the total number of informants while FC was calculated as:

$$FC = (\text{Number of times a particular species was mentioned}) / (\text{total number of informants}) \times 100.$$

Then, the RFC index was calculated by dividing the FC value of each species by the total number of informants participating in the survey (N).

The Cultural importance (CI) and use diversity (UD)

The cultural importance (CI) index refers to the sum within species across all plant-uses of the number of informants reporting a plant-uses over the number of respondents reporting the plant (Tardio and Pardo-De-Santayana, 2008), while diversity of uses (DU) designates the Shannon diversity of uses Index [32].

To evaluate the depth of knowledge with age categories, the nonparametric Kruskal Wallis Test was performed. If there was a significant difference between the informant's gender and knowledge of use of traditional medicinal plants, the non-parametric Wilcoxon test was performed pair wise using R software version 3.3.4 for Windows by using multicompview and r companion packages. P-value of less than 0.05 was taken as statistically significantly different.

RESULTS

Diversity of medicinal plants and their uses

The Table 1 below shows a total of 142 traditional medicinal plant species obtained in this study, all of which were cultivated plants species used for diverse medicinal applications by both the Oromo and Harari communities. These belonged to 124 genera and 57 families. Among these, 47 plant species belonged to 43 genera and 27 Families. Three families, namely Asteraceae, Lamiaceae and Myrtaceae, each belonging to four species, accounted 12 of the cultivated medicinal plant species. However, four families, namely, Apiaceae, Brassicaceae, Rosaceae and Rutaceae had three species each. These seven families consisted of 24 (about 50%) of the total cultivated medicinal plant species.

The cultivated medicinal plant species were neutraceutical (edible and medicinal), among which 48.9% were aromatic and, hence, the most popularly used as spices or condiments. The rest of the cultivated plant species were used as fruits (7 species), vegetables (5 species), stimulants (3 species) and oil (1 species). The most popular non-edible cultivated medicinal plants used by the communities for different human ailments are: *Aloysia triphylla* (L'Herit.) Britton, *Artemisia abyssinica* Sch. Bip. Ex. A. Rich., *Azadirachta indica* A. Juss., *Cymbopogon citratus* (DC.) Stapf, *Echinops kebericho* Mesfin, *Hagenia abyssinica* (Bruce) J.F. Gmel, *Myrtus communis* L., *Ocimum basilicum* L. var. *thrysiflorum* (L.) Benth, *Ocimum lamiifolium* Hochst. Ex Benth, *Vernonia amygdalina* Del, and *Withania somnifera* (L.) Duna.

The growth form or the habitats of the cultivated traditional medicinal plant species are displayed in Figure 2 below. The annual herbs constituted the highest number of species (18 species accounted 38.3%), followed by trees (16 species accounted 34%) and shrubs (10 species of 21.3%). Climber, grass and perennial herbs were represented by one species which accounted 2% each.

The growth form or habits of the wild traditional medicinal plant species is shown in Figure 3. The annual herbs constituted the highest number

of species (49 species accounted 51.6%) followed by shrubs (24 species accounted 25.3%) and trees (12 species accounted 12.6%).

The wild medicinal plant species which are used for diverse medicinal applications (Table 2) accounted for 95 plant species grouped into 81 genera and 44 families. Seven families, namely, Asteraceae (13 species), Fabaceae (10 species), Lamiaceae (10 species), Acanthaceae (4 species), Crassulaceae (4 species), Euphorbiaceae (4 species) and Rubiaceae (4 species), were accounted for 49 (51.6%) of the wild traditional medicinal plant species.

Below, Figure 4 shows the reported cultivated medicinal plant species. According to the obtained data, nine different parts of plants were used for 111 remedial formulations. Leaves were the most utilized parts of plants (45.9%) followed by the seeds (25.2%) and fruits (13.5%) in the formulations (Figure 4).

The obtained data shows 16 different parts of plants were used for 169 remedial formulations. Leaves were the most utilized parts of plants (45.6%), followed by roots (19.5%) and fruits (8.9%) (Figure 5). This figure also shows the use of different wild medicinal plant parts in remedial formulations, the number and percentage of preparations per plant part.

Methods of preparation and routes of administration

The informants reported 155 remedial formulations, which are categorized into 25 use-types from the 95 wild medicinal plant species, while, 100 different remedial formulations, which are categorized into 19 use-types, were reported from the 47 cultivated medicinal plant species (Table 3).

With regards to the depth of knowledge about the traditional medicinal plant species, informants in the youth age category ranging 20–35 years was found relatively lower ($p=.002$), whereas elderly informants in the age category above 65 was rich ($p=.006$). The depth of knowledge for adult informants within the age category 36–65 was found high ($p=.004$). The binomial test ($b= 2.08$, $SD = 34.4$, $p = 1.06e-02$) on the depth of ethnomedicinal knowledge between the young, the adult, and the elderly informants showed significant differences ($p > .05$).

Informant consensus factor (ICF) and frequency of citation

The most common health problematic categories for the population were identified by traditional healers based on their experience on frequency of ailments treatment. In this respect, a total of ten ailments were reported as the most common health problem categories (Figure 4). The FIC value for these most challenging health problems of the area ranges between 0.93 and 0.70. The FIC is higher for toothache and mouth infections (0.93) and relatively lower (0.70) for abdominal disorders, which involves stomach disorder, loss of appetite, stomachache, blown stomach, flatulence and indigestion, and sudden diarrhea.

Cultural importance (CI) and use diversity (UD) indexes

The obtained data shows that the medicinal plants like *Ocimum lamiifolium*, *Allium sativum*, *Osyris quadripartita*, *Hagenia abyssinica*, *Echinops kebericho* and *Moringa stenopetala* scored relatively higher value of both cultural importance (CI) and use diversity (UD) indexes (Table 5).

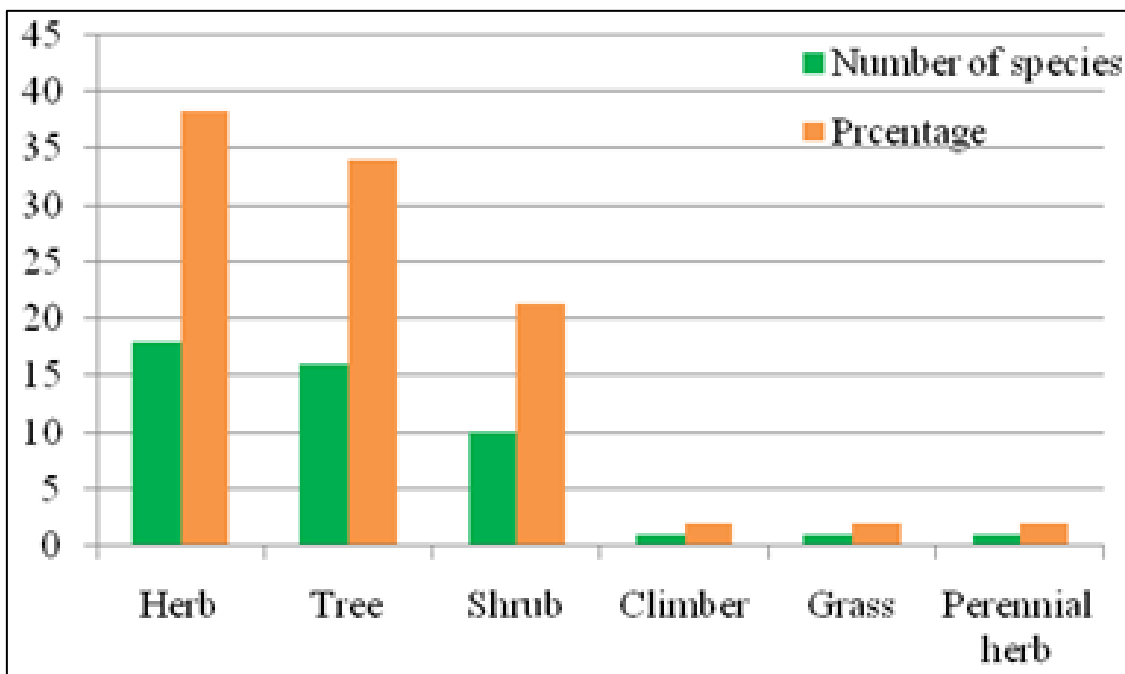


Figure 2: Distribution and growth habitats of cultivated traditional medicinal plant species in Harar town and the surroundings

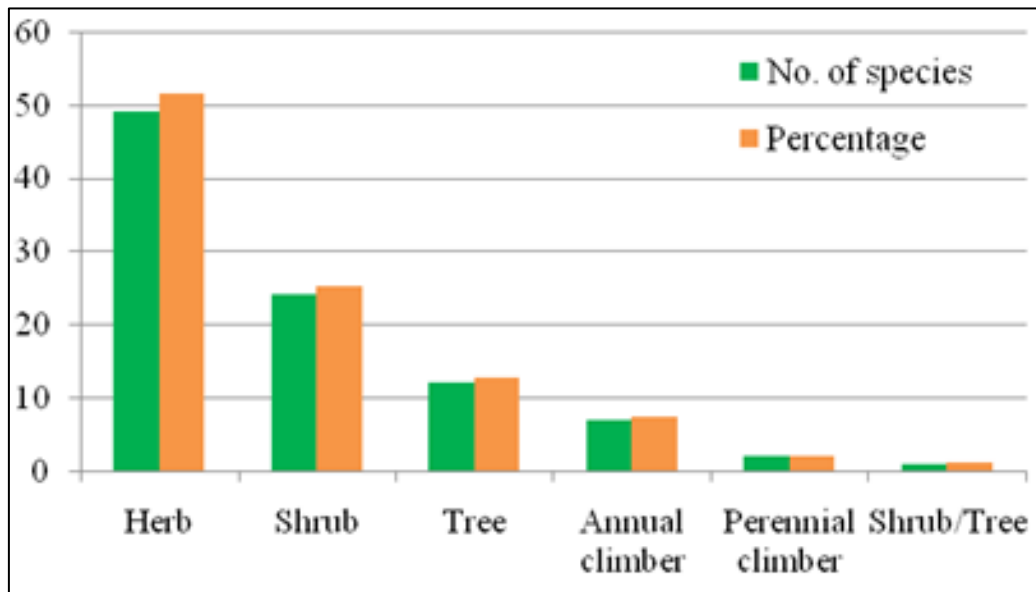


Figure 3: Distribution and growth habitats of wild traditional medicinal plant species in Harar town and the surroundings

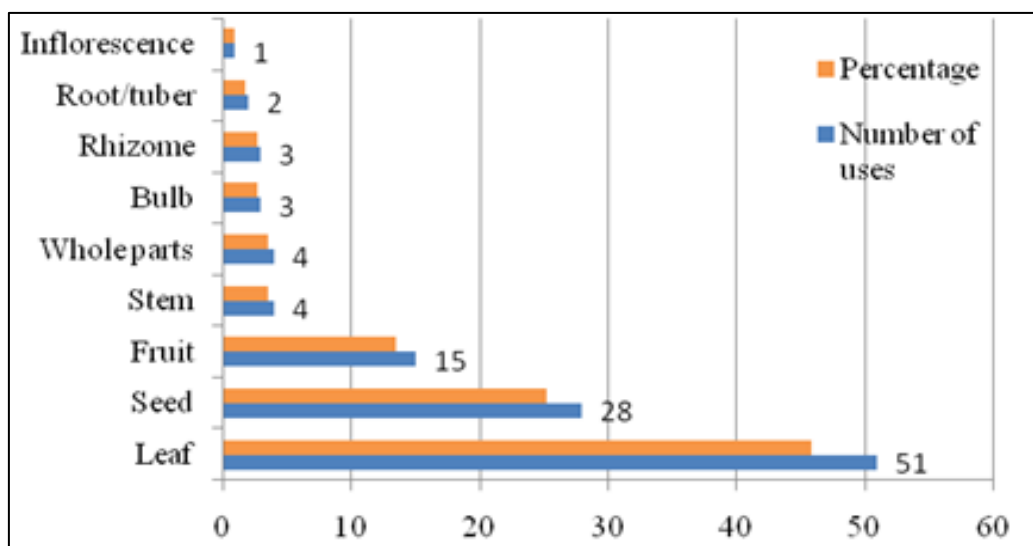


Figure 4: The number and percentage uses of different cultivated plant parts in remedial preparations

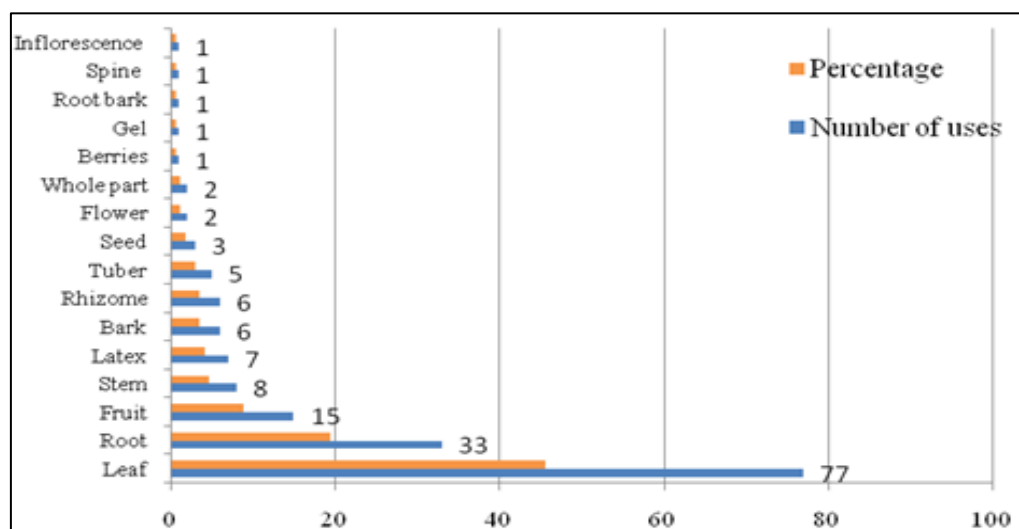


Figure 5: The number and percentage uses of different wild plant parts in remedial preparations

DISCUSSION

For both cultivated and wild medicinal plant species, the herbaceous plant species accounted for higher number and percentage. A number of research reports indicated herbaceous plant species were more preferred than woody plants for traditional medicinal purpose due to comparative ease of collection, and easiness of remedial formulations, which could have relatively little impact on the natural vegetation, hence good for conservation of source, especially when the plant is wild [8, 33, 34]. As was also reported by different authors [21, 35-37], most of these wild plant species were used to treat similar health problems which this finding reveals. Moreover, the finding indicates that Hakim-Gara/Aw-Hakim mountain, harbours high levels of floristic diversity and ideal site for collection of traditional medicinal plant species [21]. Indeed, among the 95 wild traditional medicinal plant species, sixty-two of medicinal plant species (65.3%) were collected from this mountainous landscape. As was reported by 88% of the informants, the name 'Hakim-Gara' itself literally means 'the Mountain of Healing', or 'the Healing Mountain' in Afaan Oromo. It comes from *hakim* which means 'physician, healer', itself from *hakkama/akkama* 'to live healthy life', and *gaara* 'mountain, peak'.

Nevertheless, the largest proportion of younger generation in the study area was found to be less knowledgeable about the types and values of the traditional medicinal plant species. This might be attributed to the current expansion of modern education and health care facilities. It is believed that this situation made the young generation to focus on modern medicines at the expense of the traditional wisdom. Similarly, the decline of indigenous knowledge on medicinal plant species and associated indigenous knowledge throughout the generations was reported in some other cultural groups in Ethiopia [2, 3, 38].

The findings of this study have indicated that both internal and external routes were used for herbal applications. For cultivated medicinal plant species, 72% were internal application whereas 28% were for external (topical) application, but, 40% of the wild medicinal plants were prepared for internal and 60% for external applications. The oral route of administration accounts the highest percentage for the cultivated traditional medicinal plants since most of these cultivated plant species are edible and might have minimum effect on the dose and precision. Likewise, some previous studies indicated that oral route of

administration was the most common [2, 21, 39, 40]. However, the percentage of preparation for internal (oral) use is much less than that of external use for wild traditional medicinal plant species. Nonetheless, there was no harmony on the prescribed amount used and frequency of medication among the traditional healers. Most of them reported that the dose given to patients depended on age, physical and health conditions. Lack of accuracy and standardization were mentioned as a global drawback of traditional healthcare system [41].

What's more, the higher values of FIC for toothache and mouth infections and gastritis heartburn/pyrosis disease categories indicated that there was high agreement on the treatment of these major health problems of the study area. The highest consensus goes for toothache and mouth infections. This will attract pharmacologists for further pharmacological exploration of the traditional plant species in this rich ethnomedicinal knowledge and practices area. It has been reported that pharmacologically effective antidotes are expected to have greater FIC value and vice versa [30]. Therefore, the FIC results could be useful in prioritizing medicinal plant species for further pharmacological studies since efficacy of traditional medicinal plant is strongly correlated with FIC value [8, 42].

The Relative Frequency of Citation (RFC) values for both cultivated and wild medicinal plant species identified in this study ranged from 0.86 to 0.04. The highest RFC, above 0.50, was recorded for *Allium sativum*, *Ocimum lamiifolium*, *Linum usitatissimum*, *Osyris quadripartita*, *Hagenia abyssinica*, *Echinops kebericho*, *Lepidium sativum*, *Withania somnifera*, *Phytolacca dodecandra*, *Moringa stenopetala*, *Rumex abyssinicus*, and *Azadirachta indica*. The RFC values indicated that, there was a considerable level of harmony on the therapeutic value of traditional medicinal plant species used in the study area. The higher RFC values of ethnomedicinal plants species indicated the profuse application and widespread knowledge of them among the local communities [42].

In general, this study indicated that in most parameters of importance matrix, similar set of traditional medicinal plant species ranked top except that some disorder in their rank, between measurable indices was detected. When the ethnospecies have high importance values in all/most indices, it could explain the importance of those plant species for the respective applications by the local communities [43].

Table 1: The diversity of cultivated plant species used for traditional medicine with their frequency of citation

Scientific name/ Voucher No.	Family	Common name	Vernacular names/Language	Ha bit	PU	Disease treated	Method of preparation/Part administered	FC %
<i>Allium porrum</i> L./ AHU165	Alliaceae	Leek	Alangelo/O	H	Wp	Haemorrhage	Concoct & wash a part daily with cold filtrate	91.5
<i>Allium sativum</i> L./	Alliaceae	Garlic	Qulubii/O	H	B	Haemorrhage	Crush & apply at anal tip	95.2
AHU191		Garlic	Qulubii/O	H	B	Blood pressure	Crush and eat	61.5
		Garlic	Qulubii/O	H	B	Mouth infections	Crush & apply on it	96.5
<i>Aloysia triphylla</i> (L'Herit.) Britton/	Verbenaceae	Lemon Verbena	Shaayee/O	Sh	L	Counter depression	Prepare like tea & drink	73.3
AHU168		Lemon Verbena	Shaayee/O	Sh	L	Digestive disorders: flatulence & indigestion	Prepare like tea & drink	67.8
<i>Artemisia abyssinica</i> Sch. Bip. Ex. A. Rich.*/ AHU180	Asteraceae	Artemisia	Chikun/H	H	L	Skin allergy/ Children	Crush & apply on skin	70.8
		Artemisia	Chikun/H	H	L	Tonsillitis	Squeeze & drop on throat	44.4
<i>Artemisia absinthium</i> L./ AHU190	Asteraceae	Wormwood	Arrittii/O	H	L	Insect repellent	Fumigation	84.4
		Wormwood	Arrittii/O	H	L	Sexual desire	Prepared like tea & drink	44.4
<i>Azadirachta indica</i> A. Juss./AHU213	Meliaceae	Neem	Neem/	T	S & L	Malaria	Pulverize & drink	77.8
<i>Beta vulgaris</i> L./ AHU218	Chenopodiaceae	Swiss chard	Kosta/O	H	L	Constipation	Cook and eat	98.8
<i>Brassica carinata</i> A. Br./AHU219	Brassicaceae	Ethiopian kale	Raafuu/O	H	L	Constipation/Demulcent	Cook and eat	55.8
<i>Brassica nigra</i> (L.) Koch/AHU220	Brassicaceae	Mustard	Senafich	H	S	Urinary retention/Ischuria	Powder & solution taken oral	62.2
		Mustard	Senafich	H	S	Back pain	Powder & solution taken oral	61.1
		Mustard	Senafich	H	S	Cough suppressant	Paste eaten with honey	75.5
<i>Carica papaya</i> L./ AHU221	Caricaceae	Papaya	Papaya/A	T	S	Indigestion	Paste eaten	61.1
		Papaya	Papaya/A	T	F	Burn, irritation	Paste apply topical	54.4
<i>Casimiroa edulis</i> La Llave/AHU222	Rutaceae	White sapota	Abuka/O	T	F	Kidney infection/Nephropathy	Ripen fresh fruit eaten	38.8
<i>Catha edulis</i> (Vahl.) Forssk. Ex Endl./ AHU223	Celastraceae	Khat	Jima/O	Sh	L	Loss of memory	Chew with fresh rhizom of ginger	82.2
<i>Citrus aurantifolia</i> (Christm.) Swingle/ AHU224	Rutaceae	Lemon	Lomi/A	T	FJ	Stomach disorder	Pound with seeds of <i>Lepidium sativum</i> and <i>Nigella sativa</i> , lemon juice, boil & drink	63.8
		Lemon	Lomi/A	T	Fc	Insect repellent/Mosquito, Dengi	Dry & fumigate houses	84.4

<i>Coffea arabica</i> L./ AHU225	Rubiaceae	Coffee	Bunaa/H/O	T	S	Wound	Roast & pound applied topical	94.4
<i>Coriandrum sativum</i> L./ AHU226	Apiaceae	Coriander	Debo/O	H	L	Haemorrhage	Crush & apply at anal tip	74.4
<i>Cucurbita pepo</i> L./ AHU227	Cucurbitaceae	Pumpkin	Duba/O	Cl	F	Gastritis	Cook and cool, eat before meal in morning	47.8
		Pumpkin	Duba/O	Cl	S	Intestinal parasite	Lightly roast & eat before meal in morning	78.8
<i>Cymbopogon citratus</i> (DC.) Stapf/ AHU228	Poaceae	Lemon grass	Chita sheikh hussien/O	G	L	Skin fungus	Crush & apply topical	67.8
<i>Echinops kebericho</i> Mesfin*/ AHU78	Asteraceae	Kebericho	Kebericho/A	Sh	T	Tonsillitis	Pound, mix with honey & take oral	62.2
		Kebericho	Kebericho/A	Sh	St	Toothache	Smoke bath on painful teeth	74.2
<i>Euclayptus globules</i> Labill/ AHU229	Myrtaceae	Tasmanian blue-gum	Bahirzaf adii/O	T	L	Tonsillitis	Crush and filtrate drop on throat	55.6
			Bahirzaf adii/O	T	L	Common cold	Steam bath	98.4
<i>Foeniculum vulgare</i> Miller/ AHU230	Apiaceae	Fennel	Kamona/O	PH	L	Kidney infection/Nephropathy	Pulverize and solution taken oral	92.3
<i>Fragaria vesca</i> L./ AHU231	Rosaceae	Strawberry	Enjorii/A	T	F	Kidney problem	Fruit eaten	72.3
<i>Gossypium arboreum</i> L./ AHU232	Malvaceae	Cotton	Jibrii/O	Sh	IF	Ear infections/Otitis externa & media	Warmth the fruit with water & drop in ear while lightly warm	70.7
<i>Hagenia abyssinica</i> (Bruce) J.F. Gmel./ AHU233	Rosaceae	African redwood	Hexoo/O	T	I	Tapeworm	Powder mixed with water stay a night & drink	96.9
<i>Lanthana camara</i> L./ AHU234	Verbenaceae	Tickberry	Beke-arkete/O	Sh	L	Skin itches on head	Crush & rub the part	56.1
<i>Lepidium sativum</i> L./ AHU235	Brassicaceae	Garden cress, pepper grass	Feto/A	H	S	Stomach disorder	Make powder with <i>Nigella sativa</i> seed, mix with lemon juice, boil and drink	87.6
<i>Lepidium sativum</i> L./ AHU235	Brassicaceae	Garden cress, pepper grass	Feto/A	H	S	Sudden diarrhea	Swallow some seeds	90.7
			Feto/A	H	L & S	Colon cleaner	Immerse in water for a day & drink filtrate	54.4
			Feto/A	H	L & S	Blood pressure	Immerse in water for a day & drink filtrate	61.4
			Feto/A	H	L	Intestinal parasite	Immerse in water for a day & drink filtrate	52.8
<i>Linum usitatissimum</i> L./AHU236	Linaceae	Linseed, Flax	Konter/H	H	S	Ulcer	Roast, pound and take oral	86.1
			Konter/H	H	S	Constipation	Roast, pound, make soup and drink	90.7
			Konter/H	H	S	Amoebic dysentery	Immerse in water for 12 hours take oral	70.7
			Konter/H	H	S	Gastritis	Immerse in water for 12 hours take oral	67.6
<i>Mentha spicata</i> L./ AHU213	Lamiaceae	Spearmint	Naanaa kuti/O	H	L	Stomach disorder	Infusion taken oral	86.1

			Naanaa kuti/O	H	L	Vomiting (Emesis)	Infusion taken oral	63.1
<i>Moringa stenopetala</i> (Bak. F.) Cuf./ AHU237	Moringaceae	Cabbage tree	Moringa	T	L	Diabetics	Cook and eat	93.8
			Moringa	T	L	Blood pressure	Infusion taken oral	96.9
<i>Myrtus communis</i> L./ AHU238	Myrtaceae	Myrtle	Koddo/O	Sh	L	Hair fungus	Mix with butter & apply topical	61.5
		Myrtle	Koddo/O	Sh	L	Hemorrhoid	Crush and apply at anal tip	55.6
<i>Myrisica fragrans</i> Houltt./ AHU239	Myristicaceae	Nutmeg	Gewz/A	T	F & S	Heart muscle disease	Powder with honey taken oral	54.5
<i>Nicotiana tabacum</i> L./ AHU240	Solanaceae	Tobacco	Tambo/O	H	L	Insect stings	Paste topical	67.6
<i>Nigella sativa</i> L./ AHU241	Ranunculaceae	Black cumin	Abesuda guraacha/O	H	F & S	Heart muscle disease	Powder with honey taken oral	70.7
<i>Ocimum basilicum</i> L. var. <i>thyrsiflorum</i> (L.) Benth*/ AHU179	Lamiaceae	Fragrant basil	Rehan/H	Sh	L	Stomach disorder & loss of appetite	Mix together with equal proportion and boil like tea	63.1
		Fragrant basil	Rehan/H	Sh	L	Gastritis	Boil like tea and drink	58.4
		Fragrant basil	Rehan/H	Sh	L	Blood pressure	Pulverize & filtrate taken oral	66.1
<i>Ocimum lamiifolium</i> Hochst. Ex Benth./ AHU140	Lamiaceae	-	Damakese/A	Sh	L	Stomach disorder	Pulverize & filtrate taken oral	80
			Damakese/A	Sh	L	Coughs and colds	Squeeze & juice sniff	84.6
			Damakese/A	Sh	L	Eye infection	Pulverize with little water, put on clean bandage to squeeze and drop in eye to rinse	81.5
			Damakese/A	Sh	L	Sudden fever	Squeeze & drink	92.3
			Damakese/A	Sh	L	Sudden Fever with headache/Mitch	Squeeze & drink also and apply to topical	95.4
<i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. & G.Don) Cif./ AHU242	Oleaceae	African olive	Ejersa/O	T	L	Headache	Crush & tie on head	72.3
		African olive	Ejersa/O	T	St & L	Insect repellent	Fumigation	86.1
<i>Piper capense</i> L./ AHU244	Piperaceae	Wild pepper	Timiz/A	H	F	Toothache	Powder put on painful teeth	89.2
<i>Prunus persica</i> (L.) Batsch/ AHU151	Rosaceae	Peach	Kuki/O	T	L	Giardiasis	Infusion taken oral	72.3
		Peach	Kuki/O	T	L	Sudden illness locally called <i>dingetegna</i>	Infusion taken oral	70.7
		Peach	Kuki/O	T	L	Bacterial infection	Infusion taken oral	81.5
		Peach	Kuki/O	T	L	Colon cleaner	Pulverize & filtrate taken oral	56.4
<i>Psidium guajava</i> L./ AHU245	Myrtaceae	Guava	Zeytunaa/O	T	L	Giardiasis	Infusion taken oral	63.1

			Zeytunaa/O	T	L	Sudden illness locally called <i>dingetegna</i>	Infusion taken oral	61.5
			Zeytunaa/O	T	L	Bacterial infection	Infusion taken oral	58.2
<i>Punica granatum</i> L./ AHU208	Lythraceae	Pomegranate	Ruman/A	T	L	Stomach disorder	Pulverize & filtrate taken oral	83.1
				T	UF	Diarrhea	Pulverize & filtrate taken oral	81.5
				T	St	Toothache	Use as toothpick	64.6
				T	S	Blood pressure	Eat fresh seeds	56.4
				T	S	Diabetics	Eat fresh seeds	44.5
				T	S	Amoebic dysentery	Eat fresh seeds	90.7
<i>Ruta chalepensis</i> L./ AHU246	Rutaceae	Rue	Xalatom/O	Sh	L & F	Stomach disorder & loss of appetite	Infusion of concoction drink like a tea	98.6
			Xalatom/O	Sh	L & F	Intestinal parasite	Chew & taken	78.5
<i>Syzygium aromaicum</i> (L). Merr. & Perry/ AHU248	Myrtaceae	Clove	Kurunfud/A	T	F & S	Heart muscle disease	Powder with honey taken oral	64.6
			Kurunfud/A	T	F & S	Toothache	Crush & put on painful teeth	56.2
<i>Thymus schimperi</i> Ronninger/ AHU217	Lamiaceae	Thyme	Xesinii/O	H	L	Stomach disorder & loss of appetite	Infusion taken oral	66.5
				H	Wp	Blood pressure	Infusion taken oral	95.4
				H	Wp	Throat infection and tonsillitis	Infusion taken oral	87.6
				H	Wp	Cough	Infusion taken oral	72.3
<i>Trachyspermum ammi</i> (L.) Sprague ex Turrill/ AHU249	Apiaceae	Ethiopian caraway, white cumin	Kemun/H	H	S	Kidney infection/Nephropathy	Pound, immerse in clean water, keep a day & filtrate taken oral	44.5
			Kemun/H	H	S	Kidney stone	Pound, immerse in clean water, keep a day & filtrate taken oral	56.8
<i>Trigonella foenum-graecum</i> L./ AHU211	Fabaceae	Fenugreek	Hulbet/H	H	S	Diabetics	Powder immersed in water, mix with Aloe exudate and taken oral	63.1
		Fenugreek	Hulbet/H	H	S	Back pain	Powder immersed in water, stay overnight and juice made taken oral	83.1
		Fenugreek	Hulbet/H	H	S	Bone fracture	Powder immersed in water, stay overnight and juice made taken oral	89.2
		Fenugreek	Hulbet/H	H	S	Uric acid	Powder added in stew	86.1
<i>Vernonia amygdalina</i> Del./ AHU156	Asteraceae	Bitter leaf	Ebicha/O	T	L	Heart disease	Pulverize & drink filtrate	67.6
		Bitter leaf	Ebicha/O	T	L	Stomachache	Pulverize & drink filtrate	69.2

		Bitter leaf	Ebicha/O	T	L	Headache	Crush & tie on head	64.6
<i>Withania somnifera</i> (L.) Dunal/ AHU50	Solanaceae	Ashwagandha, Indian ginseng	Hide-budei/O	Sh	St	Evil eye	Smoke bath	90.7
			Hide-budei/O	Sh	L & Rt	Anti-stress effects	Concoction taken oral	86.1
<i>Zingiber officinale</i> Rosc./ AHU193	Zingiberaceae	Ginger	Gingini/H	H	R	Common cold	Pound, boil & take oral	96.9
		Ginger	Gingini/H	H	R	Kidney infection/Nephropathy	Powder immerse in water for a day & filtrate taken oral	69.2
		Ginger	Gingini/H	H	R	Loss of memory	Chew & take oral	42.8

* Endemic plant species

O=Oromo language; H=Harari language; H=herb; Sh=shrub; T=tree; Cl=climber; G=grass; B=bulb; F=fruit; Fc=Fruit cover; Fj=fruit juice; I=inflorescence; Immature fruit; L=leaf; Rt=root; R= rhizome; S=seed; St=stem; T=tuber; UF=unripened fruit; Wp=whole part

Table 2: The diversity of wild plant species used for traditional medicine with their frequency of citation.

Scientific name/ Voucher No.	Family	Vernacular name	Habit	PU	Disease treated	Method of preparation/part administered	FC%
<i>Acacia brevispica</i> Harms/ AHU122	Fabaceae	Hameyssaa/O	Sh	L	Diarrhea of children	Concocted & filtrate taken oral	41.2
<i>Ageratum houstonianum</i> Mill. / AHU250	Asteraceae	Tofor/O	H	L	Head infection called qoroqor	Crush & put on infected head part	55.4
<i>Aloe megalacantha</i> Baker subs. <i>megalacantha</i> / AHU162	Asphodelaceae	Hargessaa dheraa/O	Sh	Lt	Colon cleaner/Aperient/Cathartic/Purgative	A teaspoon of dried powder in water taken oral early morning	90.5
<i>Aloe megalacantha</i> Baker subs. <i>megalacantha</i>	Asphodelaceae	Hargessaa dheraa/O	Sh	Lt	Diabetics	Powder called sibrii dissolve in water taken oral	56.5
<i>Aloe trichosantha</i> subsp. <i>longiflora</i> Gilbert & Sebsebe/ AHU05	Asphodelaceae	Hargessaa/O	Sh	L	Snake bite poison	Drop exudate after small cut of poisoned part	23.8
<i>Alysicarpus rugosus</i> (Willd) DC./ AHU251	Fabaceae	Unkown	H	L	forofor and qoroqor	Crushed & rub on head	61.8
<i>Anagallis arvensis</i> L./ AHU252	Primulaceae	Ayne-nur/H	H	L	Eye infections	Crushed & drop filtrate in infected eye	50.8
<i>Anethum graveolens</i> L./ AHU170	Apiaceae	Kemuna/H/O	Sh	F & Rt	Kidney problem	Concocted, mixed with honey & taken oral	74.6
			Sh	F	Asthma	Concocted with honey & taken oral	44.4
			Sh	Rt & L	Kidney infection/Nephropathy	Concocted with root of <i>Cyphostemma adenocaula</i> & filtrate taken oral	66.2
			Sh	Rt & L	Urinary retention/Ischuria	Concocted together & filtrate taken oral	57.8
			Sh	L	Kidney infection/Nephropathy	Prepared like tea with leaves of <i>Ruta chalepensis</i> & <i>Mentha spicata</i> & drink	68.8
			Sh	L	Urinary retention/Ischuria	Pulverized & filtrate taken oral	57.8
<i>Asparagus leptocladodius</i> Chiov./ AHU14	Asparagaceae	Seriti/O	H	Rt	Paralysis due to cold	Crushed root, aromatic oil boiled, & use for massage	62.2
<i>Barbeya oleoides</i> Schweinf./ AHU253	Barbeyaceae	Gerii/O	T	L & St	Headache	Boiled, cooled & drop in nose morning and evening	61.1
<i>Becium ellenbeckii</i> (Gürke) Cufod./ AHU254	Lamiaceae	Hariti/O	H	L	Itching on skin	Crushed and rub on skin	75.5
<i>Blepharis edulis</i> (Forssk.) Pers./ AHU255	Acanthaceae	Qooree gaalaa/O	H	L	Eye infection	Concocted, mixed with goat milk & drop in infected eye	52.1
<i>Blepharis maderaspatensis</i> (L.) Rot/ AHU70	Acanthaceae	Boke/O	H	L	Skin fungus on neck and face called quaqucha	Crushed and rub on skin	54.4

<i>Brucea antidysenterica</i> JF. Mill./ AHU256	Simaroubaceae	Haxaawi/O	Sh	St	Broken teeth	Chew fresh stem	36.2
<i>Calpurnia aurea</i> (Ait.)	Fabaceae	Chekaa/O	Sh	F	Intestinal parasite	Solution made taken oral	72.2
Benth./ AHU257		Chekaa/O	Sh	L	Dysentery	Concocted & filtrate taken oral	62.8
		Chekaa/O	Sh	L	Snake bite poison	Crush & tie on poisoned part	24.4
<i>Canarina abyssinica</i> Engl./	Campanulacea	Harmel/O	AC	T	Heart problem	Concocted & filtrate taken oral	44.2
AHU71	e	Harmel/O	AC	T	Blown/inflated stomach	Concocted & filtrate taken oral	40.4
<i>Carissa spinarum</i> L./	Apocynaceae	Agamsaa/O	Sh	Ba	Infection after birth	Smoke bath after delivery	47.8
AHU154		Agamsaa/O	Sh	Rt	Sudden abdominal pain called kurtet	Concocted & filtrate taken oral	58.8
		Agamsaa/O	Sh	Ba	Difficulty of blood clotting	Crushed & tie on bleeding part	67.8
		Agamsaa/O	Sh	Sp	Ear piercing	Greenish spine used to pierce ear and prevent infection	82.2
<i>Cissampelos mucronata</i> A.	Menispermaceae	Bal-toke/O	AC	Rt	Heart problem	Concocted & filtrate taken oral	44.2
Rich./ AHU258	ae	Bal-toke/O	AC	L	Heart problem	Concocted & filtrate taken oral	44.2
		Bal-toke/O	AC	Rt	Heart pain due to long distance travel	chew and swallow strongly bitter root	42.4
<i>Clerodendrum myricoides</i> (Hochst.) Vatke/ AHU260	Lamiaceae	Tiro/O	Sh	L	Skin fungus on neck and face called quaqucha	Crushed and rub on skin	62.3
	Lamiaceae	Tiro/O	Sh	Rt	Back pain	Concocted & use for massage	72.3
	Lamiaceae	Tiro/O	Sh	St	Toothache	Used as tooth stick	70.7
<i>Commelina stephaniniana</i> Chiov./ AHU261	Commelinaceae	Hola gebis/O	H	Gel	Skin fungus called chirt	Use as an ointment	96.9
<i>Craterostigma pumilum</i> Hochst./ AHU262	Scrophulariaceae	Robaan Jireytii/O	H	L	Eye infection	Concocted & drop filtrate in infected eye	56.1
<i>Crotalaria</i> sp./ AHU263	Fabaceae	Faaroolaa/H/O	H	L	Irritation while urinating	Concocted & filtrate taken oral	37.6
	Fabaceae	Zobingo/O	H	Rt	Eye infection	Concocted & drop filtrate in infected eye	30.7
<i>Croton macrostachyus</i> Del./	Euphorbiaceae	Bekenisa/O	T	L & St	Toothache	Chewed	54.4
AHU158			T	Lt	kintarot on skin	External on skin	81.8
<i>Cucumis dipsaceus</i> Ehrenb. ex Spach/ AHU18	Cucurbitaceae	Hare Gogee/O	AC	Rt	Snake bite poison	Crushed & tie on poisoned part	52.8
			AC	Rt	Wound	Crushed & tie on infected part	46.1
<i>Cyphostemma adenocaula</i> (Steud. ex A. Rich.) Desc. ex Wild & Drummond/ AHU76	Vitaceae	Harmal addi/O	PC	Rt/T	Heart pain	Chew & swallow filtrate	20.7
<i>Cyphostemma</i> sp./ AHU264	Vitaceae	Bal-toke/O	AC	Rt	Heart problem	Concocted & filtrate taken oral	22.2
<i>Datura stramonium</i> L./	Asteraceae	Qamaxari/O	H	F	Toothache	Warmer fruit put on tooth	57.6
AHU149		Qamaxari/O	H	L	Haemorrhage	Crush & apply on hemorrhoid	63.1
<i>Delphinium dasycaulon</i> Fresen./ AHU318	Ranunculaceae	Saqamonya/O	H	Rt	Sever stomach problems	Concoct & filtrate taken oral	32.2
<i>Dichrostachys cinerea</i> (L.) Wight & Arn./ AHU266	Fabaceae	Jirmee/O	T	St	Gastritis	Burns stem, make solution from ash and taken oral	53.8
<i>Dodonea angustifolia</i> L.f. / AHU26	Sapindaceae	Edecha/O	Sh	F	Small swelling with oozing pus on skin	Crush & tie on swollen part to pull out pus	34.2
<i>Dorstenia barnimiana</i> Schweinf/ AHU267	Moraceae	Bal-toke/O	H	Rt/T	Heart problem	Chew & swallow filtrate	21.5
<i>Dyschoriste radicans</i> Nees/ AHU268	Acanthaceae	Dhaw-dhaw/O	H	L	Skin fungus	Crush & rub infected part	55.6
<i>Erythrina brucei</i> Schweinf./ AHU269	Fabaceae	Welensu/O	T	Ba	Malaria	Decoction taken oral while cool	34.5
<i>Ethulia gracilis</i> Del./ AHU270	Asteraceae		H	Wp	Sudden stomachache called Kurtet	Immers in water to stay some hours and drink very bitter filtrate	32.6
<i>Euclea racemosa</i> Murr. ssp. <i>schimperi</i> A. DC/ AHU21	Ebenaceae	Mieysa/O	Sh	L	Kidney infection with irritation while urinating	Decoction taken oral while cool	40.7
<i>Euclea racemosa</i> Murr. ssp. <i>schimperi</i> A. DC/ AHU21	Ebenaceae	Mieysa/O	Sh	L	Gonorrhoea	Concocted & filtrate taken oral	53.1

		Mieysa/O	Sh	Rt	Loss of appetite in children	Concocted & filtrate taken oral	28.4
		Mieysa/O	Sh	RB	Throat infection	Boil like tea, cool & taken oral	56.1
		Mieysa/O	Sh	R	Intestinal parasite	Concocted & filtrate taken oral	68.3
		Mieysa/O	Sh	L	Nephropathy/ Kidney infection	Decocted and filtrate taken oral	24.6
<i>Euphorbia abyssinica</i> Gmel./ AHU75	Euphorbiaceae	Dharkena/O	T	Lt	Kintarot on skin	External on skin	71.5
<i>Euphorbia grantii</i> Oliv./ AHU272	Euphorbiaceae		Sh	Lt	Sever skin fungus	Use as an ointment	62.3
<i>Euphorbia schimperiana</i> Scheele/ AHU273	Euphorbiaceae	Buri/O	H	Lt	Bugur	External on skin	45.6
			H	Lt	Bugunj	External on skin	45.6
<i>Gardenia ternifolia</i> Schumach. & Thonn./ AHU274	Rubiaceae	Gambelo /O	T	F	Eye infection	warmth a bit, cut the fruit and drop fluid in infected eye	81.5
<i>Glycine wightii</i> (Wight & Am) Verde./AHU275	Fabaceae	Mukaa Onee/O	AC	L	Heart problem	Concocted & filtrate taken oral	33.1
<i>Gomphocarpus fruticosus</i> (L.) Ait.f/ AHU79	Asclepiadaceae	Harmel hari/O	Sh	L	Ecto-parasites like lies, tick	Crushed & rub on skin	61.5
<i>Grewia ferruginea</i> Hochst. ex A. Rich/AHU276	Tiliaceae	Bururi/O	Sh	F	Blown/inflated stomach	Ripen fruit eaten	39.2
<i>Heliotropium aegyptiacum</i> Lehm./AHU277	Boraginaceae	Mederis/O	H	L	Skin infection/wound	Powder apply on infected part	52.3
<i>Heteromorpha arborescens</i> (Spreng.) Cham. & Schlecht./ AHU80	Apiaceae	Ali-hanqaa/O	Sh	S & L	Cough	Concocted & filtrate taken oral	70.7
<i>Hibiscus micranthus</i> L.f./ AHU278	Malvaceae	Korbo/O	H	L	Heartburn/Pyrosis	Concocted & filtrate taken oral	51.5
<i>Indigofera ellenbeckii</i> Bak. f.*/ AHU279	Fabaceae	War/O	Sh	St	Toothache	Used as a tooth stick	56.4
<i>Indigofera</i> sp. / AHU176	Fabaceae	Kero/O	Sh	L	Kintarot on skin	Crushed and tie on skin	63.1
<i>Jasminum grandiflorum</i> L.subsp. <i>floribundum</i> (R.Br. ex Fresen.) P.S. Green/ AHU281	Oleaceae	Bilu/O	PC	L	Intestinal parasite	Concoction stay for 12 hrs & filtrate taken oral early morning	62.5
		Bilu/O	PC	St	Toothache	Used as a tooth stick	58.2
			PC	L	Tonsillitis	Concoction drop in ear	43.1
<i>Kalanchoe</i> sp./ AHU282	Crassulaceae	Bitu jeldesa/O	H	L	Ear infections/Otitis externa & media	Concoction drop in throat	61.5
<i>Kalanchoe citrina</i> Schweinfurth/AHU283	Crassulaceae	Buchi Ar'ras/H	H	L	Bugunj	Crushed and tie	64.6
<i>Kalanchoe lanceolata</i> (Forssk.) Pers./AHU284	Crassulaceae	Bixuu/O	H	L	Nephropathy/ Kidney infection	Concocted and filtrate taken oral	66.1
<i>Kalanchoe marmorata</i> Bak./ AHU285	Crassulaceae	Bixu/O	H	L	Abdominal disorder	Concocted & filtrate taken oral	44.5
		Bixu/O	H	L	Eye infection	Concoction drop in eye	70.7
<i>Kleinia abyssinica</i> (A. Rich.) A. Berger/AHU286	Asteraceae	Harmel/O	H	T	Skin infection/wound	Crushed, mixed with butter & use as ointment	69.2
<i>Kleinia odora</i> (Forssk.) DC./ AHU287	Asteraceae	Luqoo/O	Sh	L	Alati jollee	Concocted & taken oral	58.5
<i>Laggera crispata</i> (Vahl) Hepper & Wood/AHU288	Asteraceae	Lafin fedho/O	H	L	Paralysis	Decoction & Massage while warm having aromatic oil	61.5
	Asteraceae	Ebj/O	H	L	Itching skin	Crushed for body wash	64.6
<i>Leucas martinicensis</i> (Jacq.) R. Br./AHU289	Lamiaceae	Mata sadii/O	H	L	Difficulty of blood clotting	Crushed & tie on bleeding part	76.9
<i>Leucas minimifolia</i> Chiov./ AHU290	Lamiaceae	Muka adi/O	H	L	Urinary retention/Ischuria	Concocted & filtrate taken oral	56.8
<i>Matricaria chamomilla</i> L./ AHU291	Asteraceae	Arsamay/H	H	L	Mouth infection	Crushed & apply fluid on infected mouth eye	84.6
		Arsamay/H	H	L	Eye infection	Crushed & apply fluid on infected	56.4
		Arsamay/H	H	L	Child vomiting (Emesis)	Concocted & filtrate taken oral	72.3
<i>Maytenus arbutifolia</i> (A. Rich.) Wilczek/AHU298	Celasteraceae	Sibilu/O	Sh	F	Gonorrhoea	Concocted & filtrate taken oral	44.5
<i>Melhania</i> sp./AHU292	Sterculiaceae	Bulbil/O	H	L	Itching skin	Crushed & rub on skin	56.8
<i>Myrsine africana</i> L./ AHU293	Myrsinaceae	Qacu/O	Sh	S	Backpain	Crushed, boiled with goat meat & served as a soup	63.1
<i>Myrsine africana</i> L./ AHU293	Myrsinaceae	Qacu/O	Sh	S	Intestinal parasite	Solution from powder taken oral	83.1
		Qacu/O	Sh	F	Back pain	Powdered, mixed with honey or soup and taken oral	69.2
		Qacu/O	Sh	F	Tapeworm	Solution from powder taken oral	83.1
<i>Oncoba spinosa</i> Forssk./ AHU13	Flacourtiaceae	Hargora/H, Jilbo/O	T	F	Gastritis	Its juice stay for a day taken oral	67.6

<i>Osyris quadripartita</i> Decn./ AHU295	Santalaceae	Watoo/O	T	Ba	Infection after birth	Smoke bath delivery canal after birth	89.2
	Santalaceae	Watoo/O	T	Rt	Shrink uterus after birth	Smoke bath to shrink the uterus after birth	89.2
<i>Otostegia fruticosa</i> (Forssk.) Schweinf ex Penzig / AHU296	Lamiaceae	Suke/O	Sh	L	Rabis of both human and dog	Crushed and concocted, filtrate taken through the nose and oral	50.2
<i>Ozoroa insignis</i> Del./ AHU49	Anacardiaceae	Rukeylu, Garri/O	T	Rt	Tropical ulcer	Crushed and apply dermal	66.1
<i>Parthenium hysterophorus</i> L./ AHU297	Asteraceae	Dhimbil/O	H	L	Sudden nose bleeding	Crushed and immerse in the nose	23.9
<i>Pentania ouranogyne</i> S Moore/ AHU299	Rubiaceae	Harmel/O	H	L	Indigestion	Concocted & filtrate taken oral	39.2
<i>Phytolacca dodecandra</i> L'Herit./ AHU243	Phytolaccaceae	Endodee/O	Sh	L & Fl	Gonorrhoea	Concocted & oral	63.1
<i>Pimpinella</i> sp./AHU319	Apiaceae	Harmel/O	H	Rt	Anti-parasites	Concocted & oral	61.5
<i>Plectranthus</i> sp./AHU301	Lamiaceae	Qayubes/O	H	L	Kintarot	Chew and swallow	42.8
<i>Plectranthus barbatus</i> Andrews/AHU302	Lamiaceae	Berberisha/O	H	L & Rt	Itching skin	Crushed & rub on skin	32.3
<i>Plectranthus</i> sp./ AHU303	Lamiaceae	Berberisha/O	H	Rt	Infection after birth	Dried & smoke bath for mother and infant	63.1
<i>Polygala sphenoptera</i> Fresen./ AHU304	Polygalaceae	Harmel/O	H	Rt	Stomachache	Concocted & filtrate taken oral	26.9
		Harmel/O	H	Rt	Paralized part due to cold	crushed, boiled & massage with infusion	76.9
<i>Portulaca oleracea</i> L. subsp. <i>oleracea</i> / AHU122	Portulacaceae	Merere/O	H	L	Paralysis due to cold	crushed, boiled & massage with infusion	76.9
		Merere/O	H	L	Intestinal parasite	Cooked as stew & served as vegetable food	90.7
<i>Premna schimperii</i> Engl./ AHU305	Lamiaceae	Urgessaa/O	Sh/T	L	Constipation	Cooked as stew & served as vegetable food	92.3
		Urgessaa/O	Sh/T	L	Sudden illness called Dingetegna	Concocted & filtrate drop in nose	61.5
		Urgessaa/O	Sh/T	L	Common cold	Dried leaf tie with clean bandage to inhale	52.8
<i>Psychotria orophila</i> Petit/ AHU306	Rubiaceae	Ulaagaa/O	Sh	L	Sinus	Inhale the powder in bandage & concocted filtrate drop in nose	52.8
		Ulaagaa/O	Sh	L	Sudden nose bleeding	Crushed and smell/inhale	67.6
<i>Pupalia lappacea</i> (L.) A. Juss./ AHU172	Amaranthaceae	Kontomme/O	H	F	Skin burn due to fire	Crushed & tie on burned part	70.7
<i>Rhoicissus tridentata</i> (L. f) Wild & Drummond/ AHU92	Vitaceae	Buri guraa sedi/O	AC	L	Cough	Put in boiling soup & eaten	47.6
<i>Rhus vulgaris</i> Meikle/ AHU307	Anacardiaceae	Tateysa/O	T	F	Snake bite poison	Concocted & taken oral	66.1
<i>Rhynchosia erlangeri</i> Hams/ AHU308	Fabaceae	Harmal kubra/O	H	Rt	Nephropathy/ Kidney infection	Concocted & filtrate taken oral	43.4
<i>Rosa abyssinica</i> Lindley/ AHU309	Rosaceae	Gorra/O	Sh	Rt	Mental problem/disorder	Concocted & filtrate taken oral	64.8
<i>Rubia cordifolia</i> L./AHU83	Rubiaceae	Laleeysaa/O	AC	Rt	Intestinal parasite	Pulverized with root of <i>Rumex nervosus</i> , boiled & cold filtrate is taken oral	81.5
<i>Ruellia patula</i> Jacq./ AHU310	Acanthaceae	Sheksheke/O	H	L	Hemorrhage	Crushed and prepared like a tea to drink	61.5
<i>Rumex abyssinicus</i> Jacq./ AHU90	Polygonaceae	Maymaqoo/O	H	R/Rt	Head fungus called forofor	Crushed & put in hair/head skin	55.6
		Maymaqoo/O	H	R/Rt	diabetes	Concocted & taken oral	54.5
		Maymaqoo/O	H	R/Rt	Wound	Crushed & apply external	67.6
		Maymaqoo/O	H	R/Rt & I	Constipation	Concocted & taken oral	40.7
<i>Rumex nervosus</i> Vahl./ AHU311	Polygonaceae	Dhangago/O	Sh	L	Intestinal parasite	Powder solution taken oral	83.1
		Dhangago/O	Sh	R	Skin fungus specific to neck and face parts(Quaqucha)	Crushed & rub the skin	58.4
<i>Satureja abyssinica</i> (Benth.) Briq./ AHU312	Lamiaceae	Hari/O	H	Wp	Intestinal parasites	Crushed with root of <i>Rosa abyssinica</i> , boiled & cold filtrate is taken oral	66.1
		Hari/O	H	L	Improve honeybee colony	Smoke bath the bee hive	35.4
<i>Senecio lyratus</i> Forssk. / AHU84	Asteraceae	Bal-kutal/H	H	L & Fl	Hair fungus	Crushed & apply external	58.4
		Bal-kutal/H	H	L	Healthy drink	Prepared like a tea with tea or coffee hust/ashara or coffee leaf/kuti & taken oral as healthy drink	100
		Bal-kutal/H	H	L	Abdomenal disorder	Boiled and drink like a tea	81.5
		Bal-kutal/H	H	L	Loss of apitite	Boiled and drink like a tea	81.5

<i>Solanecio</i> sp./ AHU313	Asteraceae	Jin haras/H, Din-Haras/O)	H	L	Paralysis due to cold	Concocted, boiled with olive oil & massage and ointment	72.8
		Jin haras/H, Din-Haras/O)	H	L	Sleeping problem	Concocted leaf mixed with butter	55.4
		Jin haras/H, Din-Haras/O)	H	L	Headache	Concocted, mixed with butter & tie on head	72.3
<i>Solanum incanum</i> L./ AHU314	Solanaceae	Hidi/O	H	Rt	Blown stomach called bokoke	Chewed & swallowed	46.1
<i>Solanum nigrum</i> L./AHU85	Solanaceae	Hidi/O	H	Rt	Snake repellent	Dry root in place	63.1
<i>Tagetes minuta</i> L./AHU315	Asteraceae	Ilili dubra/O	H	L	Paralized body part due to cold	Concocted, boiled with fat & massage	61.5
<i>Terminalia brownii</i> Fresen./ AHU155	Combretaceae	Bireysa/O	T	Ba	Infection after birth	Dried with <i>Osyris quadripartita</i> & smoke bath delivery canal after birth	89.2
		Bireysa/O	T	St	Skin care/beautification	Dried & smoke bath for women	92.3
		Bireysa/O	T	Ba	Liver problem	Concocted & drink filtrate	32.3
<i>Toddalia asiatica</i> (L.) Lam./ AHU86	Rutaceae	Geedaa/O	Sh	Rt	Improve honeybee colony	Smoke beehive to improve bee colony	75.4
		Geedaa/O	Sh	F	Toothache	Crushed and hold on painful teeth	72.3
		Geedaa/O	Sh	F	Common cold	Dried, crushed and tie in clean bandage to inhale	66.1
<i>Vernonia galamensis</i> (Cass.) Less./AHU316	Asteraceae	Gofere/O	H	L	Burning head	Crushed & tie on head	63.1
<i>Xanthium strumarium</i> L./	Asteraceae	Sendersa/O/H	H	L	Dysentery	Concocted & filtrate taken oral	61.5
AHU317		Sendersa/O/H	H	L	Skin fungus on neck and face parts called Quaqucha	Crushed & rub on skin	69.2
		Sendersa/O/H	H	L	Urinary retention/Ischuria	Concocted & filtrate taken oral	32.3
<i>Ziziphus spina-christi</i> (L.) Desf./ AHU104	Rhaminaceae	Kurkura/O/H	T	L	Skin fungus called forofor	Concoction & use as an ointment on hair	78.5
		Kurkura/O/H	T	L	Head infection called Korokor	Concoction & use as an ointment on hair	78.5

O=Oromo language; H=Harari language; H=herb; Sh=shrub; T=tree; Cl=climber; G=grass; AC=Annual climber; Perennial climber; Be= Berries; Fl= Flower; Lt=Latex; F=fruit; I=inflorescence; G=gel; sp=Spine; L=leaf; Rt=root; R= rhizome; S=seed; St=stem; T=tuber; Ba=Bark; Wp=whole part; RB=root bark

Table 3: Methods of remedial preparations of wild and cultivated traditional medicinal plants by the users and traditional healers and number of their preparations under each formulation

Wild medicinal plants		Cultivated medicinal plants	
Method of preparation	Number of preparations	Method of preparation	Number of preparations
Concoct+filter	45	Infusion/boiling	19
Crush/external use	28	Crush/external use	11
Ointment	11	Pulverize	10
Chewing	7	Pound+solution	8
Smoke bath	7	Concoction	7
Infusion/boiling	6	Eating	6
Pound+solution	5	Cooking	4
Paste	5	Paste	7
Crush+boil/external use	5	Pound/external use	4
Crush/internal use	4	Squeeze/juice	4
Decoction	4	Chewing	3
Toothstick/pierce	4	Fumigation	3
Concoction	3	Roast+ pound	4
Cooking	3	Pound+boil	3
Pound+inhale	3	Crush/internal use	2
Crush+ boil/internal use	2	Smoke bath	2
Eating	2	Steam bath	1
Pound/external use	2	Toothstick	1
Pulverize	2	Warmth	1
Warmth	2		
Burn+solution	1		
Dry and place	1		
Fluid extract	1		
Fumigation	1		
Squeeze/juice	1		

Table 4: Major types of human health problems of the study area, number of plant species used and informant consensus factor values

Major health problems of the study areas	Number of species used	Total no. of use citation	Fic value
Toothache and mouth infections	6	68	0.93
Gastritis heartburn/pyrosis	10	59	0.84
Eye and ear infections	10	52	0.82
Constipation and Haemorrhage	14	64	0.79
Kidney infections and gal stone,	13	58	0.79
Blood pressure and Diabetics	10	42	0.78
Heart diseases	12	44	0.74
Skin hair fungus and Skin infections/wounds	16	62	0.72
Intestinal parasite	18	61	0.71
Abdominal disorders (Stomach disorder, loss of appetite, Stomach-ache, Blown stomach, flatulence & indigestion, Sudden diarrhoea)	24	78	0.7

Table 5: Cultural importance and use diversity matrix of top 15 ranked cultivated and wild traditional medicinal plants

TMP species	CI	UD(H')
<i>Ocimum lamifolium</i> Hochst. Ex Benth.	1.98	1.84
<i>Allium sativum</i> L.	1.84	1.62
<i>Osyris quadripartita</i> Decn.	1.58	1.08
<i>Hagenia abyssinica</i> (Bruce) J.F. Gmel.	1.51	1.12

<i>Echinops kebericho</i> Mesfin	1.49	0.88
<i>Moringa stenopetala</i> (Bak. F.) Cuf.	1.32	0.92
<i>Lepidium sativum</i> L.	1.11	0.84
<i>Rumex abyssinicus</i> Jacq.	1.03	0.74
<i>Azadirachta indica</i> A. Juss.	1.03	0.72
<i>Phytolacca dodecandra</i> L'Herit.	0.85	0.58
<i>Withania somnifera</i> (L.) Dunal	0.81	0.60
<i>Artemisa abyssinica</i> Sch. Bip. Ex. A. Rich.	0.63	0.42
<i>Linum usitatissimum</i> L.	0.57	0.58
<i>Thymus schimperi</i> Ronninger	0.53	0.42
<i>Aloe megalacantha</i> Baker subs. <i>megalacantha</i>	0.51	0.28

CONCLUSION

Overall, this comprehensive ethnomedicinal study has shown that the Oromo and Harari communities of the study area relied on substantial number of traditional medicinal plant species to treat wide spectrum of human ailments and are knowledgeable about the characteristics and applications of medicinal plant species. The majority of medicinal plant species were harvested for their leaves pose no significant threat to the natural vegetation of the study area. This study revealed that varieties of plant species are playing important role for treating different human diseases. Indeed, the traditional healers have accumulated a stock of ancient indigenous knowledge on usage of plant medicine, a vital knowledge and skills inherited through and over generations. Besides, the therapeutic use of the documented plants will provide basic data for further research that focus on pharmacological studies and the conservation of the most important medicinal plants.

The binomial test on the depth of ethnomedicinal knowledge between younger and elderly informants showed a significant difference. Many young people have acquired little or none of their fore-parents' knowledge. This shows the high level of deterioration of ethnomedicinal knowledge in this ancient historic society. It is, therefore, crucial to preserve this indigenous knowledge on traditional medicinal plant species through proper documentation, identification of plant species, herbal preparation and dosage, and also to train the new generation and incorporation of such important indigenous knowledge in formal school curricula. In addition, phytochemical and pharmacological analyses are advised in order to give scientific ground to the existing ethnomedicinal knowledge.

Author Contributions

Both NB and AB prepared the conceptualization of the manuscript, AB prepared the original draft of the manuscript, NB carried out editing and proof reading the manuscript.

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Conflict of Interest

The authors declare that they do not have conflicting interests.

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