Ethnobotany of medicinal plants in Ada’a District, East Shewa Zone of Oromia Regional State, Ethiopia

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Abstract

Background: An ethnobotanical study of medicinal plants was conducted in Ada’a District, Eastern Shewa Zone of Oromia Regional State of Ethiopia. The objective of the study was to identify and document medicinal plants and the associated ethnobotanical/ethnomedicinal knowledge of the local people.

Methods: Relevant ethnobotanical data focused on medicinal plants and traditional herbal medicines were collected using guided field walk, semi-structured interview and direct field observation. Informant consensus method and group discussion were conducted for crosschecking and verification of the information. Both descriptive statistics and quantitative ethnobotanical methods were used for data analysis.

Results: We documented 131 species distributed in 109 genera and 54 families based on local claims of medicinal values. Patients who are using traditional drugs and herbalists collect most of these plants from the wild. The leading plant families that encompass large medicinal species were the Lamiaceae (14 species) followed by Asteraceae (13) and Solanaceae (7).

Conclusion: The study reported the existence of a number of medicinal plants, an indication for the presence of plant-based traditional medicinal knowledge transfer that survived through generations. Informants asserted that wild growing medicinal plants are under threat due to increased use pressure coupled with unsuitable harvesting that frequently targets roots and barks for remedy preparations. This calls for urgent and collaborative actions to keep the balance between medicinal plants availability in the wild state and their utilization by the community. Furthermore, the study attempted to prioritize the most efficacious medicinal plants as perceived by the local people for possible pharmacological testing.

Keywords: Ada’a District, Ethnomedicinal knowledge, Scoring and ranking, Traditional medicinal plants

Background

Ethnomedicine studies the traditional medical practice and is concerned with the cultural investigation of health, disease and illness and also addresses the healthcare seeking process and healing practices [1-5]. Traditional methods of healing have been beneficial in many countries with or without access to conventional allopathic medicine. Ethiopia, is extremely heterogeneous ecologically [6-8] being a land of topographic diversities [9] and home of multiple ethnolinguistic groups [10]. Moreover, it is known to be a land for the origin of both human kind [11] and plants including crop species [12]. Thus, no wonder that it has diverse indigenous cultures that are carried over from past generations [9,13]. One aspect of this indigenous knowledge that began since time immemorial and applied for treating various ailments of human beings and domestic animals is herbal medicine. In agreement with this observation, various magico-religious literature sources [14,15] have noted that Ethiopia has a long history of applying traditional medicines for combating various ailments of humans and livestock.

In Ethiopia, traditional medicine is an integral part of the local culture and is a major public health system [16,17]. In addition to its deep cultural rooting, one reason for this is inaccessibility of modern healthcare services.
According to the Health Sector Development Program (HSDP) of the Ethiopian Ministry of Health, the national standard is given as one hospital for 100,000 people; one health centre is for 25,000 people and one health post is for 5,000 people. On top of this, the country faces shortage of allopathic health professionals and the ratio of one doctor is for 10,000 people; one nurse is for 5,000 people, one health extension worker is for 2,500 people [18]. Thus, Traditional medicine (TM) is an important means of primary healthcare for achieving the goal, ‘Health for all’. The various literature sources available also support this fact where more than 70% of human and 90% of livestock population in Ethiopia depend on traditional medicine [19-23]. This tells us that medicinal plants and knowledge of their use provide a vital contribution to human and livestock healthcare throughout Ethiopia.

Similar to elsewhere in Ethiopia, people living in Ada’a District have also traditional practices which they put into effect for generations to take care of themselves and their livestock health. On the other hand, the area has been losing its indigenous flora due to the on-going human and natural causes [24]; and this loss of flora is associated with the missing of important indigenous knowledge on the plants and the traditional medical system. In strengthening this thought, several authors [25,26] noted that intense utilization of forests endangers the revival of the natural vegetation, in general and medicinal plants in particular; thus, studying the ethnomedicine (herbal medicine in particular) could be considered as one of the conservation efforts in addition to other benefits in the context of driving many useful experiences for new scientific findings/innovations.

Though we have these facts, literature survey on the ethnobotanical investigation reveals that there is no previously conducted documentation work in any place in the District. Hence, there is a clear need to conduct ethnobotanical study of medicinal plants in the area, to look into and compile relevant information and to document them before the plants become too scarce to capture the knowledge of the indigenous people; and hence this study was initiated.

**Methods**

**Study area**

This study was conducted in Ada’a District which has a total area of 96,680 hectares. The area is one of the thirteen Districts in East Shewa Zone of Oromia Regional State of Ethiopia (Figure 1) and is located in the Great Rift Valley. The map showing the location of study sites in Ada’a District is provided in Figure 1.
Valley [24]. The relative location of the District is at about 45 km southeast of Addis Ababa, capital of the country. The District’s geographical location as indicated by the Ethiopian Mapping Authority (EMA) satellite image is 08°44’ E latitude and 38°58’ N longitude with an altitudinal range of 1540–3100 m a. s. l. [24,27].

**Sampling design**
Out of the 27 Kebeles (the smallest administrative units) in the District, 15 (Chelebaselase, Dere, Dereshoki, Gerbicha, Godino, Golbo, Hidi, Hidideko, Kajimanadibayou, Kality, Koftu, Kurkuranademb, Tuludimtu, Wajitunadebandebe, Yererselase) (55.6%) were used as sampling kebeles for data collection. The selection of the 15 kebeles was made by purposive sampling based on the availability of traditional healers identified with the assistance of local authorities and elders. Within each kebele localities were identified based on eight habitat criteria (Forest lands, woodlands, grazing lands, fallow land, grasslands, wetlands, cultivated farm land, and home gardens). This procedure gave 140 total localities from which 101 sampling units were selected by taking one locality for each habitat type in each kebele using the lottery method (Table 1). This stratification procedure gave 8 forest land localities, 15 woodlands, 7 wetlands, 11 grasslands, 15 croplands, 15 grazing lands, 15 fallow lands and 15 home gardens that were employed for the collection of relevant data. The selection of localities based on stratification by habitat type was chosen as it is the best representative sample for capturing the medicinal plant and ethnomedicinal knowledge in the District. It is noted that not each kebele was represented by each of the habitat types.

**Informant selection**
Informants whose age ranged from 18 to 85 were chosen both purposively and randomly from among those born or have lived there for most of their lives. A total of 105 informants (69 males and 36 females) were used from 15 kebeles (7 informants per kebele). Sixty of the total informants (4 per kebele) were randomly selected. This was done in various ways. Some of them were chosen by tossing a coin and using him/her as informant whenever head of the coin was up if s/he volunteered to participate. Some others were chosen accidentally during random walk made to houses in the selected areas. The other 45 of the total informants (3 per kebele) were local experts (key informants) that were selected purposively based on recommendations from the local people, local authorities and development agents (DAs) at each study site.

**Ethnobotanical data collection**
For ethical reasons, data were collected in the presence of local administrators and with the consent of each informant for the publication of the research and any accompanying images. Materials used for data collection were mainly plant press for specimen collection, Garmin GPS 72 int'l, digital photo camera and Walkman tape recorder. Ethnobotanical data collection was undertaken during two rounds of field visits during September 2009 to June 2010. The methods employed in the data collection were group discussion, semi-structured interviews, field observation, market survey, scoring and ranking. A checklist of semi-structured questions consisting of issues was prepared in advance. The interviews were done on and around this checklist and some issues were raised depending on responses of informants. During the course of the study, each informant was visited 2–3 times in order to validate the reliability of the ethnobotanical information. The visits were done without planned appointments with the informants. Consequently, the responses of an informant that were not in harmony with each other were considered vague and discarded from the analysis.

Field walk with guides and traditional healer(s) were made during the feasibility study. Group discussions, which were employed in each kebele, were used for cross-checking and verifying the information that has been gathered from individuals by semi-structured interview. The discussions were made with key informants, other traditional healers and the local people sometimes altogether or alone in their categories during field study; and that information was recorded using tape-recorder.

**Plant identification**
Voucher specimens of medicinal plants that were reliably reported two times or more during informant visits were collected with the exception of some very common cultivated plants which were identified in the field. These specimens were gathered from the wild, from home gardens and crop fields and preliminary identification of these specimens was made in the field; and they were dried, deep frozen and identified. The identifications were done first using keys of published volumes of the relevant Flora of Ethiopia and Eritrea, and later supported with identification by comparisons with already authenticated specimen in the Herbarium. At last, they were confirmed with the help of taxonomic experts in Addis Ababa University (AAU); and all these voucher specimens were deposited at the National Herbarium.

**Data analysis**
Both qualitative and quantitative analytical tools were used for data analysis following the approaches of Martin [1] and Cotton [3]. Percentage frequency method of data analysis was employed to summarize some of the descriptive ethnobotanical data obtained from the interviews on reported
Table 1 Total number of localities and number of sampling units in Ada’a District

| S/N | Kebeles           | Localities and sampling units for each habitat corresponding to each kebel | Total number of TNL, CNL per kebele |
|-----|-------------------|---------------------------------------------------------------------------|------------------------------------|
|     |                   | Forest land | Woodland | Wetland | Grass land | Crop land | Grazing land | Fallow land | Home gardens |                                      |
|     |                   | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL | TNL | CNL |
| 1   | Tulu Dimtu        | 1   | 1   | 2   | 1   | 1   | 1   | NR  | NR  | 2   | 1   | 1   | 1   | 1   | 1   | 2   | 1   | 1   | 10,7 |
| 2   | Godino            | 1   | 1   | 2   | 1   | NR  | NR  | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 9,7  |
| 3   | Yererselahe       | 2   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 1   | 12,8 |
| 4   | Koftu             | NR  | NR  | 3   | 1   | 1   | 1   | NR  | NR  | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 3   | 1   | 11,6 |
| 5   | Hidideklo         | 1   | 1   | 2   | 1   | NR  | NR  | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 1   | 10,7 |
| 6   | Hidi              | NR  | NR  | 2   | 1   | NR  | NR  | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 1   | 10,6 |
| 7   | Kality            | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 10,8 |
| 8   | Kurkuranade       | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 3   | 1   | 12,8 |
| 9   | Dereshokilo       | NR  | NR  | 2   | 1   | 1   | 1   | NR  | NR  | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 9,6  |
| 10  | Dere              | NR  | NR  | 2   | 1   | NR  | NR  | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 8,6  |
| 11  | Kajimanaidayou    | 1   | 1   | 3   | 1   | NR  | NR  | NR  | NR  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 8,6  |
| 12  | Gerbicha          | NR  | NR  | 3   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 9,7  |
| 13  | Wajitunadedandede | NR  | NR  | 2   | 1   | NR  | NR  | 1   | 1   | 3   | 1   | 1   | 1   | 2   | 1   | 1   | 2   | 1   | 11,6 |
| 14  | Chelebaselu       | NR  | NR  | 1   | 1   | NR  | NR  | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 7,6  |
| 15  | Golbo             | 1   | 1   | 2   | 1   | NR  | NR  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 3   | 1   | 1   | 10,7 |
|     | Total number of Localities | 9  | -   | 32  | -   | 7   | -   | 13  | -   | 23  | -   | 15  | -   | 15  | -   | 15  | -   | 140 |
|     | Total number of sampling units | -  | 8   | -   | 15  | -   | 7   | -   | 11  | -   | 15  | -   | 15  | -   | 15  | -   | 15  | 101 |

N.B: TNL-Total number of localities, CNL-Chosen number of locality, NR-Not represented.
medicinal plants and associated knowledge. Microsoft Excel spreadsheet was employed for organizing some ethnobotanical data. Preference ranking was performed to analyse most popular and preferred medicinal plants (MPs), at least in the context of the people who used them against blackleg, which was one of the most frequently reported livestock disease in the area. Direct matrix ranking was done to rank up medicinal plants reported frequently with various ethnobotanical roles.

Informant consensus factor (ICF) was used to find out most trusted healing plants for those disease categories that are claimed to be more common in the district following the approach of Heinrich and co-workers [28] by using the following formula:

$$ICF = \frac{N_{UC} - N_S}{N_{UC} - 1}$$

where

- $N_{UC} =$ number of use citations (report) in disease category;
- $N_S =$ number of species used for each citations (report)

Other researchers [29] have also shown that this is a good means of assessing the agreements of informants on the common ailment categories, and thus we used it to test the consensus of the people in the District on curing the disease categories for which the plants were claimed to be effective.

Fidelity level/Species consensus has also been employed to rate the comparative curative capacity of reported traditional medicinal plants (TMP); and it was calculated by applying the formula: $$FL = \left( \frac{S_f}{T_f} \right) \times 100$$ where $S_f$ refers to frequency of citations for a specific ailment;

- $T_f$ refers to total number of citations of that species. In this analysis, the consensus report of a species for treating a particular disease is seen with the report of that species for treating any given disease in the district [30,31].

**Results**

**Diversity of medicinal plants (MPs) in the study area**

A total of 131 species of MPs were gathered that were grouped under 109 genera and 53 families (Table 2). Of these plants, shrubs took the highest proportion (39%) whereas lianas took the least proportion (Figure 2).

**Plant parts used for remedy preparation**

Various plant parts were reported for remedial preparation in the District (Figure 3). Roots were found to be the most familiar plant part for remedy preparations (74 species, 38.34%) followed by Leaf (65 species, 33.68%), fruits (12 species, 6.22%) and many other parts (42 species, 32.06%).

| **Table 2** Taxonomic diversity of medicinal plants in Ada’a District |
|-----------------|-----------------|-----------------|-----------------|
| **Families**    | **No. of genera** | **% of genera** | **No. of species** | **% of species** |
| Lamiaceae       | 12              | 11.0            | 14              | 10.6            |
| Asteraceae      | 11              | 10.1            | 12              | 9.2             |
| Solanaceae      | 5               | 4.5             | 7               | 5.3             |
| Euphorbiaceae   | 3               | 2.7             | 5               | 3.8             |
| Fabaceae        | 3               | 2.7             | 5               | 3.8             |
| Apiaceae        | 4               | 3.6             | 4               | 3.1             |
| Other 48 families | 71             | 65.2            | 84              | 64.1            |

Treated ailments and frequently reported medicinal plants

The MPs reported from the study area were used to treat both human and animal ailments. Among the documented MPs, 85 (64%) were those claimed to be used to treat human diseases (Table 3), 19 (15%) to treat livestock ailments (Table 4) and about 27 (21%) to treat both livestock and human diseases (Table 5). Among the medicinal plants, *Allium sativum*, *Rubia cordifolia*, and *Ruta chalepensis* were claimed to be the most frequently used medicinal plants as evidenced by the higher number of informant citations (Table 3, Table 4, and Table 5). Details on the mode of preparations and applications of remedies are given in the appendix (Appendix 1).
Preparation of remedies
Interview carried out with most of the healers of the study area revealed that herbal medications were prepared differently. They often have a preference of mixing two or more MPs so as to avoid or minimize side effect of the remedies. Most of the remedies were prepared in the form of concoction whereas one species (Heteromorpha trifoliata) was served as medicine without processing (Figure 4).

Field observation revealed that healers use debarking, for instance Prunus africana, and uprooting, for example Asparagus africanus, as cases of unfavourable means of herbal collection for remedy preparation (Figure 5).

Routes of application
The herbal drugs following preparation were reported to be administered in diverse routes (Table 6). The routes and method of applications in the study sites varies with the type of disease treated and the actual sites of the ailments.

Conditions of medicine preparation
Most commonly, the local people asserted that they prefer the fresh plant part than the dried part for remedy preparation. Among the total MPs, 110 (57.89%) were used in the fresh form, 77 (40.53%) were used in the dried form. Only three plants (2%) were reported to be used in either form.

Dosages and other related prescriptions
In this study, provisions of doses vary with age. Such cases were not noted for gender variations. Dose of decoction is measured in various ways (see Figure 6) including tea or coffee cups (small for children, and large-sized for young-sters), JOGE (known to be equivalent to a litre), glass for local liquor (locally called YEAREKE MELEKIYA), local alcoholic beverage cup (TELLA cup), and ANKOLA (a traditional cup made of dried fruit of Lagenaria sicer-aria). Powdered herbal materials were measured roughly on the palm described as BETAT (i.e., measured by holding the powders between the thump and next (index) finger). Visual observations during herbal preparations showed that palm sanitation of herbalists and container was not considered. Healers also prescribed a particular dose to be taken once, twice or three times per day after carrying out traditional physical examination like looking to patients palm or eye.

Methods of applying treatments (Forms of therapy)
The documented MPs were used to treat the reported ailments by applying in various ways (Figure 7). Most of the diseases that are inexplicable in the scientific world, like demon possession (GANEN), Evil eye (BLIDA), depressions (EJE SEB) were found to be easily treated by healers; and medications were given in the name of WAAQAYOO/REBBY (a local term to mean the almighty God).

Habitat and sources of medicinal plants
Among the whole MPs, 73 of them (55.72%) were collected from the wild, 28 (21.37%) from home gardens (HG), 20 (15.26%) from both wild and cropland and 9 species (6.87%) from both wild and HGs and the remaining one species, Myrtus communis, was recorded from open market in the District. Those MPs that were obtained from both wild environment (such as forests, grassland, wetlands and so on) and croplands were found as naturally growing plants; and it was observed that they were open for any local people who need to use them. However, those MPs obtained in home gardens were primarily grown for the purpose of foods, as spices, for marketing, as fences, stimulants, and ornaments. In the open market the MPs were usually found in relation to seeds and fruits of spices and herbs.

Most important medicinal plants
Ranking and scoring method is very helpful to compare and judge widely applicable MPs that have been assured through frequent citations. The results of simple preference ranking by key informants on five most cited MPs against blackleg are shown in Table 7 and direct matrix ranking of five most common multi-purpose MPs are given in Table 8.

ICF and FL values
Calculation of ICF values showed the most effective medicinal plants against the common illness category of the
| S/N | Scientific name                      | Family         | Local name (Afan Oromo/Amaric) | Coll. from | Ha. | UT | TNC | Alt. Range          | Coll. No |
|-----|--------------------------------------|----------------|--------------------------------|------------|-----|----|-----|---------------------|----------|
| 1   | Acacia seyal Del.                    | Fabaceae       | Wachoo/Wachu                   | W/CL       | T   | Hu | 3   | 1500-2200           | AK 186   |
| 2   | Achyranthes aspera L.                | Amaranthaceae   | Derguu/Etse-tekeze             | W          | H   | Hu | 20  | 1600-2500           | AK 003   |
| 3   | Acetella cauliflora Del.             | Asteraceae      | Guticha                        | W          | H   | Hu | 7   | 2100-2500           | AK 150   |
| 4   | Ageratum houstonianum Mill           | Asteraceae      | Q/Merzi/Yemzer Medanit         | W          | H   | Hu | 5   | 1800-2500           | AK 265   |
| 5   | Ajuga integrifolia Buch. Ham.        | Lamiaceae       | Harmmaguusa/Aqorarache         | W/CL       | H   | Hu | 21  | 1900-2600           | AK 004   |
| 6   | Allium cepa L.                       | Alliaceae       | Shunkurtidilmia/Keyshinkurt    | HG         | H   | Hu | 8   |                     | AK 185   |
| 7   | Allium sativum L.                    | Alliaceae       | Qullubbi adli/Nech shinkurt    | HG         | H   | Hu | 32  |                     | AK 005   |
| 8   | Alternanthera pungs Kunth.            | Asteraceae      | *****                          | W/CL       | H   | Hu | 3   | 1400-1900           | AK 228   |
| 9   | Artemisia absinthium L.              | Asteraceae      | Harritta/Aritii                | HG         | H   | Hu | 8   |                     | AK 184   |
| 10  | Artemisia abyssinica Schtz. Bip. ex Rich | Asteraceae | Tirico/Chikugne               | W          | H   | Hu | 27  | 2400-2700           | AK 144   |
| 11  | Asparagus africanus L.               | Asparagaceae    | Seriti/Seriti                  | W          | S   | H  | 7   | 1500-2700           | AK 064   |
| 12  | Asparagus racemosus Wild.             | Asparagaceae    | Seriti/Seriti                  | W          | S   | H  | 9   | 1600-2700           | AK 227   |
| 13  | Asplenium monanthus L.               | Aspleniaceae    | *****                          | W          | H(F)| Hu | 2   | 1600-2600           | AK 009   |
| 14  | Bidens pilosa L.                     | Asteraceae      | Chogogiti/Chogogit             | W/CL       | H   | Hu | 5   | 1500-2500           | AK 066   |
| 15  | Caparis tomentosa L.                 | Capparidaceae   | Goora/Gurnero                  | W          | CL  | H  | 9   | 1600-2100           | AK 243   |
| 16  | Capsicum annuum L.                   | Solanaceae      | Qara/Qariya                    | HG         | H   | Hu | 5   |                     | AK 012   |
| 17  | Carissa spinarum (Vahl.) Forsk. ex Endl. | Apocynaceae | Agarmla/Agam                  | W          | S   | H  | 5   | 1650-2600           | AK 180   |
| 18  | Catha edulis (Vahl.) Forsk. ex Endl.  | Celastraceae    | Caati/Chat                     | HG         | T   | H  | 3   |                     | AK 223   |
| 19  | Centella asiatica (L.) Urban.        | Apiaceae        | *****                          | W          | H   | Hu | 4   | 1800-2400           | AK 179   |
| 20  | Citrus aurantifolium (L.) Burn. f.   | Rutaceae        | Loomii/Lomi                    | HG         | S   | H  | 5   |                     | AK 222   |
| 21  | Clausena anisata (Wild.) Benth.      | Rutaceae        | Ulunnaa/Limich                | W          | S   | H  | 7   | 2000-2400           | AK 140   |
| 22  | Clerodendrum myricoides (Hochst) Vatke | Lamiaceae     | Maraasissia/misirich           | W          | S   | H  | 4   | 2000-2500           | AK 221   |
| 23  | Colocasia esculenta (L.) Schott      | Araceae         | Godaree/Godore                | HG         | H   | Hu | 4   |                     | AK 067   |
| 24  | Croton macrostachyus Del.            | Euphorbiaceae   | Bakanisa/Bisana               | W          | T   | H  | 11  | 1600-2500           | AK 017   |
| 25  | Cucumis dipsaceus Ehrenb.            | Cucurbitaceae   | Buqee seexanaa/Yesetan kil     | HG         | CL  | H  | 8   |                     | AK 068   |
| 26  | Cucumis ficifolius A. Rich.          | Cucurbitaceae   | Holoo/Yemdir enbuay            | W          | CL  | H  | 14  | 1600-2000           | AK 219   |
| 27  | Cyathula cylindrica Moq.             | Ageratum        | Derguu/Yemogne Fikir           | W          | H   | Hu | 4   | 1700-2600           | AK 137   |
| 28  | Cymbopogon citratus                  | Poaceae         | Xajisaara/Tej sar              | HG         | H   | Hu | 4   |                     | AK 069   |
| 29  | Datura stramonum L.                  | Solanaceae      | Atsefaris/Astenagir            | W          | H   | Hu | 5   | 2000-2500           | AK 217   |
| 30  | Dombeya torrida( J. F. Gmel) Bamps  | Sterculiaceae   | Daanisa/Wolkefa               | T          | H   | 3   | 2500-2700           | AK 175   |
| 31  | Dregea schimperi(Decne.) Bullock     | Asclepiadaceae  | Hida/Yeregna missa             | W          | Li  | H  | 4   | 1900-2400           | AK 021   |
| 32  | Ekebergia capensis Sparrm.           | Meliaceae       | Sombo/Sombo                    | W          | T   | H  | 6   | 2000-2700           | AK 022   |
| 33  | Eleusine floricifolia Forssk.        | Poaceae         | Coqorsa/Akerma                 | W/CL       | H   | Hu | 7   | 2100-2500           | AK 214   |
Table 3 List of traditional medicinal plant (MP) species used to treat human ailments in Ada’a District (Continued)

| No. | Species                           | Family        | Genus/Species                      | Habitat | District | Growth Habits | Temperature | AMI |
|-----|-----------------------------------|---------------|-----------------------------------|---------|----------|---------------|-------------|-----|
| 34  | Embelia schimperi Vatke           | Myrsinaceae   | Hanqu/Enqoqo                      | W       | S        | Hu            | 8           | 1800-2700 | AK 134 |
| 35  | Eucalyptus globulus Labill.       | Myrtaceae     | Nech bahir zaf                    | HG      | T        | Hu            | 11          | AK 212 |
| 36  | Euca racemosa subsp. schimperi    | Ebenaceae     | Me’essaa/Dedeho                  | W       | S        | Hu            | 5           | 1500-2600 | AK 173 |
| 37  | Euphorbia abyssinica J. F. Gmel.  | Euphorbiaceae | Adamii/Kulkual                   | HG      | T        | Hu            | 6           | AK 073 |
| 38  | Euphorbia ampliphilla             | Euphorbiaceae | Adamii/Kulkual                   | HG      | T        | Hu            | 6           | AK 025 |
| 39  | Euphorbia tricalli L.             | Euphorbiaceae | Cadaa/Kinchib                    | HG S    | T        | Hu            | 3           | 1500-2000 | AK 132 |
| 40  | Ferula communis L.                | Apiaceae      | Dog                               | W       | H        | Hu            | 6           | 2500-2700 | AK 074 |
| 41  | Foeniculum vulgare Mill.          | Apiaceae      | Insialaee/Ensial                 | W       | H        | Hu            | 23          | 2000-2600 | AK 075 |
| 42  | Grewia ferruginea Hochst ex . A . Rich. | Tiliaceae | Dhoqonuu/Lenquata              | W       | S        | Hu            | 4           | 1700-2300 | AK 209 |
| 43  | Guizotia scabra(Vis) Chiov.       | Asteraceae    | Adaa/Mech                        | W       | H        | Hu            | 2           | 1700-2400 | AK 030 |
| 44  | Heteromorpha trifoliata (Wendel.) Eckl. & Zeyh. | Apiaceae | Demheee/Yejib merkuze               | W S     | S        | Hu            | 5           | 2200-2500 | AK 207 |
| 45  | Hypericum quartinianum A. Rich.   | Hypericaceae  | Muke fonii                       | W       | S        | Hu            | 4           | 2000-2500 | AK 034 |
| 46  | Impatiens ethiopica Grey-Wilson   | Balsaminaceae | Yeheeshohilaa zer             | HG      | H        | Hu            | 2           | AK 206 |
| 47  | Impatiens rothii Hook. f.         | Balsaminaceae | Buri/Gesherit                   | W       | H        | Hu            | 2           | 2400-2600 | AK 080 |
| 48  | Impatiens tinctoria subsp. abyssinica | Balsaminaceae | Ensosilla                        | W S     | S        | Hu            | 2           | 1900-2400 | AK 035 |
| 49  | Jasminum grandiflorum L.          | Oleaceae      | Qamaxee/Tembelel                | W       | S        | Hu            | 6           | 1700-2500 | AK 235 |
| 50  | Juniperus procera Endle           | Cupressaceae  | Gaatrara/Yehabesha Tid           | W/HG    | T        | Hu            | 4           | 2100-2800 | AK 081 |
| 51  | Lagerana siceraria (Melina) Standl. | Cucurbitaceae | Buqkee/Kil                    | HG      | H        | Hu            | 3           | AK 238 |
| 52  | Lagerra tomentosa (Sch. Bip. ex A. Rich.) Oliv. & Hiern | Asteraceae | Kekseso                        | W H     | H        | Hu            | 3           | 1700-2500 | AK 166 |
| 53  | Lantana camara L.                 | Verbenaceae   | Yewof kolo                       | HG      | L        | Hu            | 2           | AK 038 |
| 54  | Leucas martinicensis (Jacq.) R. Br. | Lamiaeae | Bokkololu adi/Ras kimir          | W       | S        | Hu            | 8           | 1900-2400 | AK 039 |
| 55  | Lippia adoensis Hochst. ex Walp.   | Verbenaceae   | Kusaayeey/Kese                  | W/HG    | S        | Hu            | 3           | 1800-2800 | AK 084 |
| 56  | Mentha spicata                    | Lamiaeae      | Nana                             | HG      | S        | Hu            | 4           | AK 224 |
| 57  | Myrica salicifolia A. Rich.       | Myricaceae    | Kataba/Shinet                   | W       | T        | Hu            | 4           | 2200-2800 | AK 232 |
| 58  | Myrtus communis                    | Myrtaceae     | Adasii/Ades                      | M       | S        | Hu            | 6           | AK 088 |
| 59  | Nicotiana tabacum L.              | Solanaceae    | Tamboosh/Tembaho                | HG      | H        | Hu            | 3           | AK 044 |
| 60  | Ocimum basilicum L.               | Lamiaeae      | Besobilla                        | HG      | H        | Hu            | 5           | AK 122 |
| 61  | Ocimum gratissimum L.             | Lamiaeae      | Q/Michio/Mech medanit           | W       | H        | Hu            | 15          | 1700-2500 | AK 161 |
| 62  | Ocimum lamifolium Hochst. ex Benth. | Lamiaeae | Demakesie                    | W/HG    | S        | Hu            | 24          | 1600-2600 | AK 045 |
| 63  | Olea europaea subsp. Cupidata      | Oleaceae      | Ejersa/Weyra                    | W/HG    | T        | Hu            | 4           | 1900-2600 | AK 090 |
| 64  | Olinia rochetiana A. Juss.        | Oliniaeae     | Dalecho                          | W       | S        | Hu            | 6           | 2200-2600 | AK 245 |
| 65  | Oxyyn quadrpartita Decn.          | Santalaceae   | Waato/Qeret                      | W       | S        | Hu            | 3           | 1900-2500 | AK 160 |
| 66  | Otostegia integrifolia Benth.      | Lamiaeae      | Tungiiti/Tungit                 | W       | S        | Hu            | 12          | 1800-2500 | AK 047 |
| No. | Plant / Species                  | Family         | Common Names / English Names | Genus | Species | Common Names / English Names | Collectors | Collection Levels | Harvested Period | Place of Storage |
|-----|---------------------------------|----------------|------------------------------|-------|---------|------------------------------|------------|-------------------|-----------------|-----------------|
| 67  | *Plantago major* L.             | Plantaginaceae | Qorxobbii/Yekura weseife     | W     | H       | Hu                          | 6          | 2000-2500         | AK 120          |                 |
| 68  | *Premna schimperi* Engl.        | Lamiaceae      | Urgessa/Chchoho              | W     | S       | Hu                          | 4          | 2000-2500         | AK 051          |                 |
| 69  | *Prunus persica* (L.) Batsch    | Rosaceae       | Kokkii/Kok                   | HG    | S       | Hu                          | 2          | 2000-2500         | AK 119          |                 |
| 70  | *Pterolobium stellatum* (Forssk.) Brenan | Fabaceae | Harengeemmaa/Kontir            | W     | S       | Hu                          | 5          | 1800-2400         | AK 098          |                 |
| 71  | *Ricinus communis* L.           | Euphorbiaceae  | Qobooy/Gulo                  | HG    | T       | Hu                          | 6          | 2000-2500         | AK 118          |                 |
| 72  | *Rosmarinus officinalis* L.     | Lamiaceae      | Siga metsebesha              | HG    | S       | Hu                          | 13         | 2000-2500         | AK 055          |                 |
| 73  | *Rumex nervosus* Vahl           | Polygonaceae   | Dhangaggoo/Embuacho          | W     | H       | Hu                          | 5          | 1800-2600         | AK 103          |                 |
| 74  | *Ruta chalepensis* L.           | Rutaceae       | Xeenaadama/Tsenadam          | HG    | H       | Hu                          | 9          | 1700-2500         | AK 112          |                 |
| 75  | *Salix mucronata*               | Salicaceae     | Alaletu/Ahaya                | W     | T       | Hu                          | 6          | 1700-2500         | AK 153          |                 |
| 76  | *Salvia nilotica* Jacq.         | Lamiaceae      | Hulegebe                      | W/CL  | H       | Hu                          | 3          | 1600-2800         | AK 104          |                 |
| 77  | *Schinus molle* L.              | Anacardiaceae  | Kundoberbere zaf             | HG    | T       | Hu                          | 3          | 1700-2200         | AK 152          |                 |
| 78  | *Snowdenia polystachya* (Fresen.) Pig. | Poaceae | Muja                         | W     | H       | Hu                          | 2          | 1700-2200         | AK 114          |                 |
| 79  | *Solanum marginatum* Linn. f.   | Solanaceae     | Hiddii/Tileku Enbuay         | W/CL  | S       | Hu                          | 5          | 1900-2600         | AK 107          |                 |
| 80  | *Thunbergia alata* Sims.        | Acanthaceae    | Hareg                        | W     | CL      | Hu                          | 3          | 2200-2500         | AK 256          |                 |
| 81  | *Thymus schimperi* Ronniger     | Lamiaceae      | Xoosanyii/Tosigne            | W     | S       | Hu                          | 8          | 2500-2800         | AK 108          |                 |
| 82  | *Urtica simensis* Steudel       | Urticaceae     | Dobii/Sama                   | W     | H       | Hu                          | 2          | 2200-2700         | AK 057          |                 |
| 83  | *Verbena officinalis* L.        | Verbenaceae    | Atuch                        | W/CL  | H       | Hu                          | 9          | 2000-2400         | AK 109          |                 |
| 84  | *Vernonia amygdalina* Del.      | Asteraceae     | Ebicha/Grawa                 | HG    | T       | Hu                          | 13         | 2400-2600         | AK 230          |                 |
| 85  | *Withania somnifera* (L.) Dunal. | Solanaceae    | Gizaawaa/Gizawa              | W     | S       | Hu                          | 6          | 2400-2600         | AK 110          |                 |
| 86  | *Zehneria scabra* L.            | Cucurbitaceae  | Daaymii/Areg resa            | W     | CL      | Hu                          | 9          | 1900-2500         | AK 197          |                 |
District. Accordingly, seven disease categories that turned out ICF values greater than 0.78 were noted to be the more prevalent health problems in the District (Table 9). The highest plant use citation was recorded for the diseases categorized as gastro-intestinal disorders.

FL is an important means to see for which ailment a particular species is more effective; and accordingly this study found ten plants (Table 10) having higher healing potential (FL > 55%) in the context of the local people to treat ailments.

Discussion and conclusion
Medicinal plants and their occurrences in the study area
The study area yielded 131 MPs used in the traditional medical lore of the people in Ada’a District. Some of the MPs recorded from the study area were also reported by other studies to be used in the medicinal lore of other areas in Ethiopia, and it is summarized in the table below (Table 11).

The finding of such a large number of MP species in this study area is an indication that there has been a continued transfer of plant-based traditional knowledge for generations. Moreover, highest level of shared documentation of this study was observed with [32] sharing 80 herbas in common. This is perhaps because Jeldu [32] and Ada’a district are parts of Shewa highland of Ethiopia and the people belong to the same oromo community known as Tulema where it is highly likely that they have shared norms, cultural beliefs and traditional practices.

The leading plant families that were found to encompass more numbers of medicinal plant species were the Lamiaceae, Asteraceae and Solanaceae in that order. These families are among the top plant families in the flora area, Ethiopia and hence expected to contain widely distributed species in the District [36].

With regard to the growth form of medicinal plants, shrubs were found to be the widely used form followed by herbs, trees and climbers. This pattern of growth form was also reflected in other studies conducted elsewhere in Ethiopia [32,33,35,37-40]. The higher frequency of using shrubs and herbs may be due to the fact that the area is part of the wooded grassland ecosystem of the Rift Valley [41] where shrubs and herbs are leading growth forms than trees. This study also showed that most of the medicinal plants are collected from the wild environments (55.72%) and only one species, Myrtus communis, was recorded from open market place in the District. The wild habitats as a main occurrence site of medicinal plants are also reported in other ethnomedicinal researches conducted elsewhere in Ethiopia [33-35,38-40,42,43]. This shows that the people largely

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### Table 4 List of traditional medicinal plant (MP) species used to treat livestock ailments in Ada’a District

| S/N | Scientific Name         | Family       | Local Name (Oromifa/Amarigna) | Coll. from | Ha. | UT | TNC | Alt.Range | Coll. No |
|-----|-------------------------|--------------|-------------------------------|------------|-----|----|-----|-----------|----------|
| 1   | Acacia abyssinica Hochst. ex Benth. | Fabaceae     | Lafafoo/Girar                 | W/CL       | T   | An | 3   | 1500-2500 | AK 147   |
| 2   | Acacia albida Del.       | Fabaceae     | Garbii/Gerbi                 | W/CL       | T   | An | 5   | 1500-2200 | AK 001   |
| 3   | Agave sisalana Perrineex Engel. | Agavaceae   | Qacha/Qacha                  | W/CL       | T   | An | 3   | 1500-2300 | AK 062   |
| 4   | Bersama abyssinica Fresen. | Melianthaceae | Loliichisa/Azamir           | W          | T   | An | 4   | 1700-2600 | AK 242   |
| 5   | Buddlejia polyschachya Fresen. | Buddlejaceae | Qawissa/Anfar                | W/CL       | T   | An | 12  | 2000-2500 | AK 142   |
| 6   | Dodonaea angustifolia L. f. | Sapindaceae  | Etacha/Kiftka                | W          | S   | An | 3   | 1800-2450 | AK 216   |
| 7   | Gamphocarpus abyssinicus Decne. | Asclepiadaceae | Rebu Hunda                | W          | H   | An | 9   | 2300-2500 | AK 028   |
| 8   | Hypericum revolutum Vahl | Hypericaceae  | Hindhee/Ameja                | W          | S   | An | 3   | 2000-2500 | AK 226   |
| 9   | Malva verticillata L.    | Malvaceae    | Liiti/Lit                   | W          | H   | An | 2   | 2000-2700 | AK 040   |
| 10  | Pentas schimperiana (A. Rich.) Varke | Rubiaceae | Dasie                       | W          | S   | An | 11  | 2100-2600 | AK 049   |
| 11  | Plantago lanceolata L.   | Plantaginaceae | Qorxobbii/Yehaheya Kote     | W/CL       | H   | An | 4   | 1900-2500 | AK 195   |
| 12  | Protea gaguedi J. F. Gmel. | Proteaceae   | Dasie                       | W          | S   | An | 11  | 1900-2200 | AK 241   |
| 13  | Rhus retinorhoea         | Anacardiaceae | Tilem                      | W          | S   | An | 4   | 2000-2700 | AK 155   |
| 14  | Rhus vulgaris Meikle     | Anacardiaceae | Dabobechaai/Kimmo          | W          | S   | An | 3   | 1900-2800 | AK 100   |
| 15  | Rosa abyssinica Lindley  | Rosaceae     | Gora/Kega                   | W/CL       | S   | An | 7   | 2100-2700 | AK 192   |
| 16  | Sida schimperiana Hochst. ex A. Rich. | Malvaceae | Chefreg                   | W          | H   | An | 4   | 2100-2400 | AK 191   |
| 17  | Tagetes minuta L.        | Asteraceae    | Tiro                        | W          | S   | An | 4   | 1600-2300 | AK 255   |
| 18  | Xanthium strumarium L.   | Asteraceae    | Yemogne Fikir               | W/CL       | S   | An | 3   | 1700-2500 | AK 187   |

Key: Coll- Collected; Coll. No – Collection number; Ha-Habit; UT-Used to treat; Alt. Range-Range of Altitudes distribution in meters; W-Wild; CL-Cropland; HG- Home Garden; M-Market; F-Fern; Hu-Human; An-Animal; Bo-Both human and animal; ****- Local name not known; TNC-Total number of citations

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| S/N | Scientific name                      | Family        | Local name (Oromifa/Amarigna) | Coll. from | Ha. | UT | TNC | Alt. Range | Coll. No |
|-----|--------------------------------------|---------------|-------------------------------|------------|-----|----|-----|------------|----------|
| 1   | Aloe macrocarpa Tod.                 | Aloaceae      | Argiisa/Ret                   | W/CL       | H   | Bo | 6   | 1850-2150  | AK 145   |
| 2   | Bruea antidysenterica J. F. Mill.    | Simaroubaceae | Qumegno/Abalo                 | W          | S   | Bo | 15  | 1900-2700  | AK 182   |
| 3   | Calpurnia aurea (Ait.) Benth.        | Fabaceae      | Ceekaa/Digita                | W          | S   | Bo | 6   | 1600-2750  | AK 225   |
| 4   | Clematis simensis Fresen.            | Ranunculaceae | Fitti/Enderifa               | W          | LI  | Bo | 12  | 1800-2700  | AK 178   |
| 5   | Cyphostemma adenocaule               | Vitaceae      | Melas golgul                | W          | CL  | Bo | 14  | 2000-2450  | AK 060   |
| 6   | Ficus sur Forssk.                    | Moraceae      | Harbu/Sholla                 | W          | T   | Bo | 5   | 1750-2200  | AK 210   |
| 7   | Fuerstia africana Th. Fries          | Lamiaceae     | Eje Admek                    | W          | H   | Bo | 11  | 1600-2200  | AK 083   |
| 8   | Hygrophila schulli (Hamilt.) M. R. & S. M. Almeida | Acanthaceae | ***** | W/CL     | H   | Bo | 3   | 1900-2400  | AK 079   |
| 9   | Inula confertiflora A. Rich.         | Asteraceae    | Mognoree/Weynageft          | W          | S   | Bo | 5   | 2200-2600  | AK 253   |
| 10  | Justicia schimperiana (Hochst. ex Nees) T. Anders | Acanthaceae | Dhmuuugaa/Sensel   | HG         | S   | Bo | 27  |           | AK 167   |
| 11  | Kalanchoe petriiana A. Rich.         | Crassulaceae  | Bosoqee/Endahula            | W          | H   | Bo | 24  | 1900-2600  | AK 257   |
| 12  | Leonotis raineriana Vis.             | Lamiaece      | Bokkolu dImma/Ras kimir      | W          | S   | Bo | 25  | 2400-2700  | AK 125   |
| 13  | Maesa lanceolata Forsk.              | Myrsinaceae   | Abbaayii/Kelewa            | W          | S   | Bo | 5   | 2100-2800  | AK 202   |
| 14  | Melia azedarach L.                   | Meliaceae     | *****                       | HG         | S   | Bo | 9   | 2200-2600  | AK 163   |
| 15  | Myrsine africana L.                  | Myrsinaceae   | Qacama/Kechem               | W          | S   | Bo | 9   | 2200-2600  | AK 043   |
| 16  | Pavetta abyssinica Fresen.           | Rubiaceae     | Muke-buniti                  | W          | S   | Bo | 5   | 2000-2500  | AK 027   |
| 17  | Phytolacca dodecandra L’ Herit       | Phytolaccaceae | Handoode/Endod                | W/WHG      | S   | Bo | 19  | 2000-2700  | AK 095   |
| 18  | Prunus africana (Hook. f.) Kalms     | Rosaceae      | Hoomii/Tikur Enchet          | W/WHG      | T   | Bo | 14  | 2100-2600  | AK 097   |
| 19  | Rubia cordifolia L.                  | Rubiaceae     | Enchibir                     | W          | H   | Bo | 31  | 1800-2600  | AK 111   |
| 20  | Rubus steudneri Schweinf.             | Rosaceae      | Agopolu                     | W          | H   | Bo | 4   | 2500-2800  | AK 082   |
| 21  | Rumex abyssinicus Jacq.              | Polygonaceae  | Meqmeqo                      | W          | H   | Bo | 9   | 2000-2800  | AK 154   |
| 22  | Rumex nepalensis Spreng.             | Polygonaceae  | Shuultii/Tulet               | W          | H   | Bo | 19  | 1700-2600  | AK 231   |
| 23  | Solanecia gigas (Vatke.) C. Jeffrey  | Asteraceae    | Gommana osoloe              | HG         | S   | Bo | 7   |           | AK 115   |
| 24  | Solanum anguivi Lam.                 | Solanaceae    | HiddiWorabessa/ZerchEnbuay  | W/CL       | S   | Bo | 8   | 1600-2700  | AK 247   |
| 25  | Solanum incanum L.                   | Solanaceae    | Hiddii/Yehabesha Enbuay     | W/CL       | S   | Bo | 6   | 1500-2400  | AK 151   |
| 26  | Stephania abyssinica (Dillon ex A. Rich.) Walp. | Menispermaceae | Kalala/Engochit           | W          | LI  | Bo | 26  | 2000-2800  | AK 189   |
| 27  | Verbascum sinaticum Benth.           | Scrophulariaceae | Guraa Haree/Yahaya joro     | W/CL       | H   | Bo | 6   | 1900-2600  | AK 149   |
rely on wild plants; which consequently indicates the existence of higher pressure/threats on the wild medicinal plants. Thus it is a wake-up call for urgent and more collaborative study to maintain the balance between their availability in the wild state and utilization by the community.

Plant part used for remedy preparation, forms of preparation and route of provision

Among the MPs documented in this study, it is proven that majority of them are used to treat human ailments. This finding aligns with other studies elsewhere in Ethiopia [9,13,34,38,42,44,45] that reported the use of large number of medicinal plants for treating human diseases rather than domestic animals. For treating human and livestock ailments, the local people have acquainted with immense knowledge of remedy preparations.

This study also revealed that mixing of two or more MPs are common practices in remedy preparation. This is in agreement with other findings in Ethiopia [9,13,38,42] where most traditional remedies were prepared by mixing components of two or more plants. Such practices may add the healing potential and minimize the side effect it may inflict on the patient. Similar inference has also been stated in the study outputs of different ethnomedicinal researchers [9,13,33,34,38,42,44,45]. On the contrary, this current finding indicates that only few remedies were made from single plant preparations which deviate from the findings of other reports [37,46] where most of the traditional drugs in Bahirdar Zuria and Ada’ar districts respectively were made from single plant preparations. Most often, the local people of Ada’ar district prefer the fresh plant part over the dried part for remedy preparation. Similar findings were reported in other areas of Ethiopia [32-35,37,38,42-44] and elsewhere [52-57]. This practice agrees with the scientific fact that the healing potentials of the plant are greater when fresh plant material is used for medicine preparation because the important chemicals are expected to be more and unchanged to other forms as they do when dead and dry resulting in the decline or disappearance of the active principles, usually intermediate metabolites [58].

This study reported the routes and methods of applications in the study sites varied with the type of disease treated and the position where it occurred. The most common route of applications found in this study was oral followed by dermal. This may tell us that the widespread diseases are those that are occurring internally than on the external parts of the body. Similar finding were also noted in other studies [32-35,37-40,42,43,46,50,51,53] among many others

As in most other studies, for example [33,35,43,50], roots were found to be the most familiar plant part for remedy preparations followed by leaves and fruits. Since the root is the most utilized part for remedy preparation, under intensive utilization mode it may attribute to the death of the mother plants and to the loss of the natural vegetation of the area in more severe cases. Moreover,

| Routes of application | Number of MPs | % of MPs |
|-----------------------|---------------|---------|
| Oral                  | 90            | 49.4    |
| Dermal                | 70            | 38.4    |
| Nasal                 | 9             | 4.9     |
| Auricular             | 6             | 3.2     |
| Dental                | 4             | 2.1     |
| Ocular                | 3             | 1.6     |
| Nasal & auricular     | 2             | 1.1     |
| Vaginal               | 1             | 0.5     |
this current finding also noted that the total above ground part (2.1%) and the whole plant (1.6%) are also parts of MPs used for remedy preparation. For example, the entire above ground part of Eleusine floccifolia was used to treat snake bite. Moreover, above ground part of Foeniculum vulgare was reported to treat urine retention. Powder made from the above ground part of Foeniculum vulgare was reported to treat stomach trouble. Planting whole plant of Heteromorpha trifoliate at the back and front yard of the house by a diviner (METSEHAF GELACH) was reported to save them against warding of sorcery and attack by magical thieves (SELABI). The whole plant body of Rumex abyssinicus was reported to treat animal scabies (EKEK). Burning the whole plant of Artemisia abyssinica and fumigating with the smoke was reported to treat itching eyes.

Local diagnosis, dosages and other related prescriptions
For some diseases like stomach trouble, cough, stabbing pain and the likes local people easily diagnose, and treat them using self-prepared conventional medicines. But mostly they visit herbalists for some chronic ailments in a similar manner as reported by Kassa [32]. The also showed that the herbalists in the study area made diagnosis like that of the modern physicians that is accompanied first with case-history taking followed by physical examination. Some physical examination includes looking to the patient’s eye, or patient’s palm. Then they relate the examinations with their work experience, and infer the type of ailments and prescribe the medicine. This may at times result in wrong conclusion of ailment types and provision of local drugs that are uncalled-for.

In this study area, provision of doses varies with ages and ailment condition of the patient. Dose is not measured with standardized cylinder or balance. For instance, the root of Achyranthes aspera would be cut to parts simultaneously saying ‘cut the blood of so, i.e, the name of the patient’, and infused with brown tef (Eragrostis tef), black malt and Rhamnus prinoides and provided to the patient to drink the infusion for three days to treat RH case (SHOTELAY); and the dose is measured by local containers (JOG or ANKOLA) and taken per day. A concoction of the root and leaf of Justicia schimperiana ground together with the roots of Prunus persica, Nicotiana tabacum and phytolacca dodecandra is drunk for at least a week to treat rabies. Here one tea cup per day was reported to be enough. Root and fruit of Lagenaria siceraria pounded together and drunk with the first boiled coffee (ABOL BUNA) using coffee cup may be enough to treat impotency (SINFET WOSIB). Leaf of Hygrophila schulli was reported to be powdered and the powder will be held between the thump and next (index) finger and dispersed on the wound to treat wound poisoning. Lack of consistency was also reported elsewhere in Ethiopia [33-35,44,48,49] as a serious weakness in the delivery of traditional herbals.

This study also revealed that palm sanitation of herbalists and container was not considered which could
expose the drugs to contamination and thus may result in some other complications when the treatments are particularly given orally. Healers recommended not only the doses but also prescribe in how long the remedies have to be taken. Some medicines were recommended to be taken only when the patient feels the pain, or twice or three times (equivalent terms in allopathic medicine are TRN, BID and TID, respectively) in a day or days [59] and still others for a week or weeks. Some of these local drugs may be taken in the early morning before getting meal or after; some are taken early morning before urination and still others before beginning any conversation with people. Herbalists also have antidotes that are given if the herbals inflict side effects. Similar findings were reported in other studies [9,22,45,48].

The most important MPs

Those plant species obtained through ranking by key informants have been placed in the category of priority species for any further action. *Cyphostemma adenocaule* was reported to be the most widely used plant for treating blackleg. The reasons for showing preferences may be linked with their indigenous knowledge and availability of the plants in close vicinity of the villages in the study area. Among the very common medicinal plants direct matrix showed that *Olea europaea* subsp. *cuspidata* was found to be most important in its multiple utility value similar to the findings of Lulekal et al. [38].

From the preference ranking it could be understood that the most favoured species is usually most efficacious at least in the context of the local people and may indicate the occurrence of bioactive chemicals responsible to ward off the causative agents, and it shall be further screened in scientific works for its pharmacological potentials.

**Degree of consensus on herbal medicines**

ICF values are important guides to identify more efficacious plants; and through that way they also tell the level of prevalence of diseases in the District. This is because the traditional healing practices normally focused on the most frequent health problems. Accordingly, retained placenta, skeleto-muscular disorders, febrile illness and general malaise, circulatory disorders, gastrointestinal disorders, urinary disorders, and gynaecological disorders, which turned up the highest ICF values (1.00-0.78) and hence these are the most prevalent ailment categories in the area. This finding deviates from the results obtained by Kassa [32] who found retained placenta among the least incident diseases while sudden illness and general malaise came among the most prevalent diseases. More prevalence could be linked with economic poverty and poor sanitation problems. Moreover, the dominance of retained placenta may show the lack of awareness and distribution of allopathic contraceptive methods in the District. Those plant species reported to be efficacious for the common health problems of the District are expected to be an input for pharmacologists to check the efficacy *in vitro*.

**FL is an important means to see for which ailment a particular species has more healing power and accordingly those species with high FL are supposed to be**

### Table 8 Results of direct matrix ranking for five multi-purpose MPs in Ada’a District

| Use category | Plant species | Medicine | Food | Firewood | Charcoal | Construction | Share | Total | Rank  |
|--------------|--------------|----------|------|----------|----------|--------------|-------|-------|-------|
|              | Juniperus procera | 4        | 0    | 3        | 1        | 4            | 2     | 14    | 5th   |
|              | Acacia albida   | 4        | 0    | 3        | 4        | 3            | 1     | 15    | 4th   |
|              | Croton macrostachyus | 5       | 0    | 2        | 3        | 3            | 4     | 16    | 3rd   |
|              | *Olea europaea* subsp. | 4       | 2    | 2        | 3        | 3            | 4     | 18    | 3rd   |
|              | *Prunus africana* | 4        | 2    | 2        | 3        | 3            | 3     | 17    | 2nd   |

N.B. Number in the table shows average scores of four key informants given to each medicinal plants based on their multipurpose use categories.
more curative for the respective ailments. Thus, those traditionally used MPs with high FL can be a focus for further pharmacological tests.

Threats of medicinal plants in the study area
Some of the MPs reported by the local people to be threatened are also included in the IUCN Red lists [60]. *Inula confertiflora*, which is under the near threatened (NT) category and *Otostegia integriglora*, which is under the vulnerable (VU) category of the IUCN Red List are the common ones. Among those in the least concern (LC) category, *Solanecio gigas* and *Lippia adoensis* are the MPs recorded from the study area. Other MPs of Ada’a District including *Acacia abyssinica*, *Impatiens rothii*, *Jasminum stans*, *Laggera tomentosa* and *Urtica simensis* are endemic species [60-63], which are among the common threatened MPs in the study area. *Juniperus procera*, *Olea europaea subsp. cuspidata*, *Dodonaea angustifolia*, *Embelia schimperi* were reported to be locally threatened MPs in need of conservation efforts even if they are not under IUCN Red Lists.

### Table 9 Results of informants consensus factor (ICF) for more prevalent health problems of the District

| Disease category                   | List of plant species used and number of citation in the bracket                                                                 | Total no. of species | Total no. of citation | ICF  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------|------|
| Retained placenta                 | Solanecio gigas (7)                                                                                                                                                                       | 1                    | 7                     | 1.00 |
| Skeleto-muscular disorder         | Ajuga integrifolga (4), Pterolobium stellatum (5)                                                                                                                                          | 2                    | 9                     | 0.88 |
| Febril illness & General malaise   | Allium sativum (3), Croton macrostachyus (6), Eucalyptus globulus (7), Fuerstia africana (1), Lantana camara (2), Leonotis raineriana (1), Leucas martinicensis (8), Myrtus communis (3), Ocinum gratissimum (15), Ocinum lamiifolium (24), Oostegia integriglora (12) | 11                   | 82                    | 0.87 |
| Circulatory disorder              | Allium cepa (6), Nicotiana tabacum (3), Thymbus schimperi (8)                                                                                                                           | 3                    | 17                    | 0.87 |
| Gastro-intestinal disorder        | Achyranthes aspera (11), Ajuga integrifolga (8), Allium sativum(5), Aloe macrocarpa (3), Artemisia abyssinica (12), Asparagus africanus (7), Asparagus racemosus (9), Capiscum annuum (5), Carissa spinarium (3), Cirrus x limon (5), Clerodendrum myricoides (4), Croton macrostachyus (5), Cucumis ficoifolus (14), Cyathula cylindrica (4), Embelia schimperi (8), Eucalyptus globulus (4), Foeniculum vulgare (5), Grewia ferruginea (4), Lippia adoensis (4), Myrica saliciflora (4), Ruta chalepensis (29), Vernonia amygdalina (3), Rumex nepalensis (3) | 23                   | 159                   | 0.86 |
| Urine Retention                   | Foeniculum vulgare (6), Rumex nepalensis (4), Zehnteria scabra (3)                                                                                                                     | 3                    | 13                    | 0.83 |
| Gynaecological disorder           | Achyranthes aspera (4), Solanum marginatum (3), Stephania abyssinica (3)                                                                                                                 | 3                    | 10                    | 0.78 |

### Table 10 FL values for some medicinal plants in Ada’a District

| Healing plants | Ailments claimed to be cured | Tf | Sf | FL value (%) |
|----------------|------------------------------|----|----|--------------|
| *Acacia albida* | Cattle eye bruise            | 5  | 5  | 100          |
| *Acmella caulirhiza* | Loose tooth              | 7  | 7  | 100          |
| *Gamphocarpus abyssinicus* | Blackleg                  | 9  | 9  | 100          |
| *Kalanche petiana* | Swelling                    | 24 | 24 | 100          |
| *Leucas martinicensis* | General malaise         | 8  | 8  | 100          |
| *Ocinum lamiifolium* | General malaise           | 24 | 24 | 100          |
| *Ruta chalepensis* | Abdominal pain             | 29 | 29 | 100          |
| *Leonotis raineriana* | Leech                     | 25 | 15 | 60           |
| *Verbena officinalis* | Tonsillitis              | 9  | 5  | 56           |
| *Mysine africana* | Taeniasis                  | 9  | 5  | 55           |

### Table 11 Number of MP species of Ada’a District reported from studies in other parts of Ethiopia

| Part of Ethiopia | Number of MP species | % of MP species found in Ada’a |
|------------------|----------------------|-------------------------------|
| Gemad, northern Ethiopia | 18                  | 13.7                          |
| Kite Awulaelo, northern Ethiopia | 52                  | 39.6                          |
| Lake Zway Island, southern Ethiopia | 15                  | 11.4                          |
| Wonago, southern Ethiopia | 43                  | 32.8                          |
| Babile, eastern Ethiopia | 9                   | 6.8                           |
| Harla and Dengego, eastern Ethiopia | 23                  | 17.5                          |
| Assosa, western Ethiopia | 14                  | 10.6                          |
| Wayu Tuka, western Ethiopia | 33                  | 25.2                          |
| Bahirdar-zuria, Northwestern Ethiopia | 10                  | 7.6                           |
| Zegie Peninsula, Northwestern Ethiopia | 27                  | 20.6                          |
| Ada’ar, north eastern Ethiopia | 5                   | 3.8                           |
| Sekoru, southwestern Ethiopia | 31                  | 23.6                          |
| Mana Angetu, southeastern Ethiopia | 27                  | 20.6                          |
| Ankober, north shewa | 36                  | 27.4                          |
| S/N | Scientific name | Local name (Oromifa/Amarigna) | UT | AT (English/Amaric) | PU | MP A | IC | FP | MT | RA | CP |
|-----|-----------------|--------------------------------|----|--------------------|----|------|----|----|----|----|----|
| 1   | *Acacia abyssinica* Hochst. ex Benth | Laaftoo/Girar | An | Horse scabies (Yeferse ebitet) | RB | Root and bark grounded together and wash the animal with the solution | 3 | G | W | Ex. | D |
| 2   | *Acacia albida* Del. | Garbii/Gerbi | An | Eye bruise (Bli) | Ba | Fresh bark masticated and spitted out on the eye | 5 | C | S | Ea | F |
| 3   | *Acacia seyal* Del. | Wachoo/Wachu | Hu | Headache (Ras mitat) | RF | Root and Fruit grounded, boil in water and breathin the smoke | 3 | Co | Fu | N | D |
| 4   | *Achyranthes aspera* L. | Derguu/Etse-tekeze | Hu | Stomach trouble (Yehod hemem) | RL | Powder of root and leaf concocted with root powder of *Allium sativum* and drunk once. | 11 | Co | E | Or. | D/F |
|     |                  |                        | Hu | Abdominal pain in woman after birth (Kurtet) | L | Leaf powdered and drink the water solution | 5 | P | Dr. | Or. | D |
|     |                  |                        | Hu | RH case (Shotelay) | R | Root dig out with horn handled knife wearing silver ring, cut it simultaneously saying ‘cut the blood of so and so, i.e. the name of the patient’, infused with brown tef (*Eragrostis tef*), black malt and *Rhamnus prinoides* and drink the infusion for three days. A glass is taken per day | 4 | If | Dr. | Or. | F |
| 5   | *Acmella caulirhiza* Del. | Guticha | Hu | Loose tooth | L | Leaves chewed and placed it between the aching tooth | 7 | C | Ho | T | F |
| 6   | *Agave sisalana* Perrine ex Engel. | Qachaa/Qacha | An | Tick | S | Stem grounded with fruit of *Solanum incanum* and polishing the bitten area | 3 | G | Po | Ex. | F |
| 7   | *Ageratum houstonianum* Mill. | Q/Merzi/Yemerz Medanit/ | Q/Merzi/Yemerz Medanit/ | Poisoning (Merzenet) | R | Root powder is mixed with butter and put on the affected part | 5 | P | Pa | Ex. | D |
|     | *Ajuga integerifolia* | Harmmaguusa | Hu | Stomach trouble | RL | Powder of root and leaf mixed with root powder of *Allium sativum* and eaten once. | 8 | P | E | Or. | D/F |
| 8   | Buch. Ham | /Aqrararache/ | Hu | Cold (Bried) | L | Leaf boiled with tea and a cup of it is drunken | 3 | De | Dr. | Or. | F |
|     |                  |                        | Hu | Gout (Rihi) | R | Root with the root of *Solanecio gigas*, *Leonotis rainerihana* powdered together and mixed with oil from fruit of *Olea europaea* subsp. *cupidata* and *Datura stramonium*. Concoted them in water and drink the solution for three consecutive days. One cup only once | 4 | Co | Dr | Or. | D |
|     |                  |                        | Hu | Hypertension (Dem bizat) | RL | Root and leaf boiled with tea and a cup of the solution is taken in | 6 | Co | Dr | Or. | F |
| 9   | *Allium cepa* L. | Shunkurtii diimaa/Key shinkurt/ | Hu | Poisoning | R | Tie up the root powder with the leaf concoction of *Veronica amygdalina*, *Premna schimperi*, and root powder of *Verbascum sinaticum* | 7 | Co | Pa | Ex. | F |
| 10  | *Allium sativum* L. | Qullubbi adii | Hu | Ascariasi | R | Root powder with the root powder of *Ajuga integerifolia*, *Allium sativum*, and *Rumex nepalensis* concocted together and drunk once before breakfast | 5 | Co | E | Or. | D |
|     |                  | (Wosfat) | Hai | General malaise (Mich) | R | Smelling roots of a young grown plant | 3 | Sm | N | F |
**Table 12 Lists of MPs collected from Ada’a District (Detail descriptions on the mode of preparations and applications) (Continued)**

| No. | MP | Preparation | Mode of preparation | Application | Dosage | Route | Ex. |
|-----|-----|-------------|---------------------|-------------|--------|-------|-----|
| 11  | Hu Flu (Gunfan) | Root and leaf crushed in to pieces, boiled with honey and take in the liquid in a cup of tea | RL | 8 | Co Dr Or. | F |
| 12  | Hu Toothache (Tirse himem) | Root, chewed and hold between the aching tooth | R | 9 | C Ho T | F |
| 13  | Hu Malaria (Woba) | Root with leaf of Vernonia amaglidina pounded and drunk the extracted solution | R | 8 | Pu Dr Or. | F |
| 14  | Aloe macrocarpa Tod. | Leaf chewed and swallow the juice | L | 3 | C Sw Or. | F |
| 15  | Hu Intestinal parasite | Leaf warmed up on a fire and paste on the swelling | L | 3 | He Pa Ex. | F |
| 16  | Alternanthera pungens | Fresh root boiled together with Ocimum gratissimum leaf and cup of the extract given to drink | R | 8 | G Sw N | F |
| 17  | Artemisia absinthium L. | Both root and leaf grounded together with root powder of Verbena officinalis and the solution sipped in | RL | 8 | Co Dr Or. | F |
| 18  | Artemisia abyssinica | Grounded leaf boiled with the leaf powder of Ruta chalepensis, honey or butter and taken once a day orally | L | 6 | Co Dr Or. | D |
| 19  | Asparagus africanus Lam. | Leaf boiled with leaf of Solanecio gigas and stephania | L | 3 | Co Po Ex. | F |
| 20  | Asparagus racemosus Wild. | Root powder mixed with honey and butter and eaten for three consecutive days before breakfast | R | 7 | P E Or. | D |
| 21  | Asplenium monanthes L. | Root crushed, boiled and wash the itching part with the decoction | R | 2 | De W Ex. | F |
| 22  | Bersama abyssinica Fresen. | Concotion of the bark with root and fruit of Capparis tomentosa is prepared. Then half of the concotion is given to drink, and the remaining half is for polish affected areas after washing | Ba | 4 | Co W Ex F | Dr |
| 23  | Bidens pilosa L. | Root with root and leaf of Zehneria scabra boiled and fumigate the smoke | R | 5 | Co Fu Ex F | |
| 24  | Brucea antidysenterica | Root powder burns in a fire and inhales the smoke | R | 9 | Bu Fu N D | |
| 25  | Buddlejia polystachya Fresen. | Inflorescence with the leaf of Phytolacca dodecandra is given in nose and ear to expel the parasite | Fl | 12 | Co dr. NE | |
| 26  | Calpurnia aurea (Ait.) | Leaf boiled with leaf of Solanecio gigas and stephania abyssinica and drink cup of concotion twice a day. | L | 3 | Co Po Ex. | F |
| 27  | Caparis tomentosa Lam. | Root powder mixed with latex of Euphorbia tirucallii and pasted on the wound | R | 9 | P Pa Ex. | E |
| No. | Plant Name | Method | Application or Use |
|-----|------------|--------|--------------------|
| 24  | Capsicum annuum L. | Qaara/Qariya | Hu | Amoebiasis | Fr | Fruit dried, powdered and eaten with bread baked of Zea mays |
| 25  | Carissa spinarium (Vahl) Forssk. ex Endl. | Caatii/Chat | Hu | Intestinal worms | R | Root grounded, dissolve in water and drunk |
| 26  | Catha edulis (Vahl) Forssk. ex Endl. | Ulumaa/Limich | Hu | Tooth infection | RS | Cutting root or stem, chew, place and hold on the aching tooth |
| 27  | Centella asiatica (L.) Urban. | Fitiitii/Enderifa | Bo | Wound | L | Leaf powdered and carefully sprinkled on the wound, It irritates if dropped on different area |
| 28  | Citrus aurantiifolium (L.) | Loomii/Lomi | Hu | Abdominal pain (Kurtet) | Fr | Fruit pounded and sip the extracted liquid after meal. |
| 29  | Clausena anisata (Wild.) Benth. | Ullumaa/Limich | Hu | Toothache | R | Root is burned and breathe in the smoke |
| 30  | Fresen. | Buqee seexanaa/Yesetan kil/ | Hu | Depression (Eje seb) | Fr | Leaf cut either Tuesday, Thursday or Saturday early without having any conversation would be collected, pounded with leaf of Justicia schimperiana, and fruit of Cucumis ficifolius, altogether infused for three days and wash the patient with the infusion for three consecutive days |
| 31  | Clerodendrum myricoides (Hochst) Vatke | Maraasisaa/misirich | Hu | Diaeehae | R | Root powder solution taken orally |
| 32  | Colocasia esculenta (L.) Schott | Godaree/Godore | Hu | Swelling | L | Leaf warmed and applied on the swelling |
| 33  | Croton macrostachyus Del. | Bakanisaa/Visana | Hu | Febrii illness (Megagna) | L | Leaf pounded, brush lips with it and kept in pocket if any one move out after meal particularly during mid sun |
| 34  | Clausena anisata (Wild.) Benth. | Ulumaa/Limich | Hu | Toothache | R | Root is burned and breathe in the smoke |
| 35  | Cucumis dipsacus Ehrenb. | Buqee seexanaa/Yesetan kil/ | Hu | Depression (Eje seb) | L | Leaf cut either Tuesday, Thursday or Saturday early without having any conversation would be collected, pounded with leaf of Justicia schimperiana, and fruit of Cucumis ficifolius, altogether infused for three days and wash the patient with the infusion for three consecutive days |
| 36  | Cyathula cylindrica Moq. | Derguu/Yemogn fikir | Hu | Swelling | L | Leaf warmed and applied on the swelling |
| 37  | Cymbopogon citratus | Xajasaa/Tej sar | Hu | Cough (Sal) | L | Blow up the leaf and inhale the smoke |
| 38  | Cyphostemma Wild & Drummond | Melas golgul | An | Blackleg | R | Root pounded and boiled with root powder of Verbascum sinatricum, Rumex abyssinicus and Rumex nepalensis and drunk to the animal |
| 39  | Del. | Fitiitii/Enderifa | Bo | Swelling | L | Warm up the leaf and paste on the swelling |
| No. | Plant Name                  | Common Name  | Part Used | Mode of Preparation                                                                 | Mode | Country | Ref.  |
|-----|---------------------------|--------------|-----------|------------------------------------------------------------------------------------|------|---------|-------|
| 39  | Datura stramonium L.       | Atsefaris/Astenagir | Hu        | Snake bite L Leaf pounded and creaming all the body to avoid snake bite              | Pu   | Po      | Ex. F |
| 40  | Dodonaea angustifolia L. f.| Etacha/Kitkita | An        | Wound L Leaf is powdered and sprinkle on the wound                                 | Pu   | Po      | Ex. D |
| 41  | Dombeya torrida (J. F. Gmel) | Daanisa/Wolkefa | Hu        | Antidot for snake bites Ba Powder a piece of bark and sprinkle on the bitten part  | Pu   | Po      | Ex. D |
| 42  | Dregea schimperi (Decne.)  | Hida/Yeregna missa | Hu        | Eczema (Chiffia) Se Seed powdered, mixed with spike powders of SENEDDO (Pennisetum sp.) and honey, greasing the lesion at least two times daily after washing | Pu   | Po      | Ex. D |
| 43  | Ekebergia capensis Sparrm. | Sombo/Sombo   | Hu        | Syphilis (Kitgn) Ba Fresh bark infused with root of Cucumis ficifolius for three days and the infusion drunk for a week. Amount taken per day shouldn’t go beyond the floorboard of a small coffee cup | Pu   | Po      | Ex. D |
| 44  | Eleusine floccifolia       | Coqorsa/Akerma | Hu        | Snake bit Ag Above ground part pounded and paste on the skin                      | Pu   | Pa      | Ex. F |
| 45  | Forssk.                   | Hu Poisoning  | R         | Root powder mixed with root powder of Achyranthes aspera and fruit of Solanum incanum and paste on the spot | Pu   | Pa      | Ex. R |
| 46  | Embelia schimperi Vatke    | Hanquu/Enqoqo | Hu        | Tape worm (Kosso) Fr Fruit is powdered, dissolve in water, decant out the decoction and drunk early morning before meal | Pu   | Po      | Ex. D |
| 47  | Euclea racemosa Subsp. schimperi | Me’essaa/Dedeho | Hu        | Tonsillitis (Entil siwored) RL Root and leaf together with fruit of Hagenia abyssinica boiled together and drink only once in a cup | Pu   | Dr      | Or. F |
| 48  | Euphorbia abyssinica J. F. Gmel. | Adamii/Kulkual | Hu        | Haemorrhage S White milky sap of the plant carefully dripped on haemorrhage        | Ex   | dr.     | Ex. F |
| 49  | Euphorbia ampliphylla      | Adamii/Kulkual | Hu        | Haemorrhage S White milky sap of the plant carefully tapped on haemorrhage         | Ex   | dr.     | Ex. F |
| 50  | Euphorbia tirucalli L.     | Cadaa/Kinchib | Hu        | Haemorrhage S White milky sap of the plant carefully tapped on haemorrhage         | Ex   | dr.     | Ex. F |
| 51  | Ferula communis L.         | Dog          | Hu        | cough R Root pulverized, burned and inhale the smoke                              | Bu   | In      | N     |
| 52  | Ficus sur Forssk.          | Harbuu/Sholla | Hu        | Wart on hand/Kintarot L Leaf grounded, warmed on fire and tie on the swelling       | G    | Pa      | Ex. F |
| 53  | Mill.                      | Insilaalee/Ensilal | Hu    | Urinary Retention Ag Above ground part is grounded, and the water solution        | G    | Dr      | Or. F |
| No. | Species                                      | District | Mode of Preparations                                                                 | Application                                      |
|-----|---------------------------------------------|----------|--------------------------------------------------------------------------------------|--------------------------------------------------|
| 54  | *Fuerstia africana* Th. Eje Admek           | Hu       | Powdering the above ground part and given the solution before meal                   | S, P, Dr, Or, F                                  |
| 55  | *Gamphocarpus abyssinicus* Decne. Rebu Hunda| An       | Leaf grounded and paint the patient body                                             | 10 G, Po, Ex, F                                  |
| 56  | *Grewia ferruginea* Hochst ex A. Rich. Dhoqonuu/Lenquata| Hu | Leaf powdered, mixed with fresh butter and painting the eye for three consecutive days | 13 Po, Eye D                                    |
| 57  | *Guizotia scabra* (Vis) Chiov. Adaa/Mech    | Hu       | Leaf powdered, boiled with root powders of *Ajuga intergenterifolia*, *Foeniculum vulgare* and *Withania somnifera*. One cup of the concoction taken orally. | 2 Co, Dr Or, D                                  |
| 58  | *Heteromorpha trifoliata* (Wendel.) Eckl. & Zeyh. Demehee/Yejib merk uze | Hu | Whole plant planted at the back of the house and on front yard by a diviner (Metsehaf Gelach) | S, - , -                                        |
| 59  | *Hygrophila schulli* (Hamilt.) M. R. & S. M. Almeida Q/Mearzi | Bo | Leaf powdered and dispersed on the wound                                              | 3 P, Sp, Ex, D                                  |
| 60  | *Hypericum quartinianum* A. Rich. Muke fonii | Hu | Leaf with roots of *Asparagus* sp. pounded and homogenised in water and given to the patient orally for three consecutive days. Half a glass is the limit for a day | 4 Co, Dr Or, D                                  |
| 61  | *Hypericum revolutum* Vahl Hindhee/Ameja    | An       | Root with leaf of *Inula confertiflora* chewed and spitted on the eye                 | 3 C, S, Ey, F                                   |
| 62  | *Impatiens ethiopica* Grey-Wilson Yehenshohllaa zer | Hu | Root pounded, warmed in a dish on a fire, and creaming palms                          | 2 Pu, Po, Ex, F                                  |
| 63  | *Impatiens rothii* Hook. f. Buri/Gesherit   | Hu       | Root pounded in to pieces and thoroughly warmed on fire and firmly hands them for drying the wound | 2 Pu, Po, Ex, F                                  |
| 64  | *Impatiens tinctoria* A. Rich. Subsp. abyssinica (Hook. f.) Grey-Wilson Ensosilla | Hu | Root pounded, warmed in a dish on a fire, and oiling palms                           | 2 Pu, Po, Ex, F                                  |
| 65  | *Inula confertiflora* A. Rich Mognoree/Weynagelt | An | Root with *Hypericum revolutum* chewed together and spitted on the eye               | 3 C, S, Ey, F                                   |
| 66  | *Jasminum grandiflorum* Qamaxee/Tembelel    | Hu       | Root burned and draw in the smoke                                                   | 3 Bu, In, N, D                                  |
|     | *Jasminum* L.                            | Hu       | Toothache (Yeters himem)                                                            | 3 C, Ho, T, F                                   |

(Continued)
| No. | Common Name                  | Place                  | Disease/Condition | Preparation                                                                 | Mode of Preparation | Author(s) |
|-----|-----------------------------|------------------------|-------------------|-------------------------------------------------------------------------------|----------------------|-----------|
| 67  | Juniperus procera Endlie    | Gaatiraa/Yehabesha Tid| Hu Demon          | Possesesion (Ganen)                                                          | Fr Fruit powder boiled with root of phytolacca dodendraca and fruit powder of Datura stramonium; and wash the patient for three days | 4 Co Dr Or. D |
|     | *Justice* schimperiana      | Dhumuugaa/Sensel       | L Jaundice        | plants milled on palms and the squeezed liquid added to a coffee cup. Drink the liquid every morning for a week. Antidotes recommended is to eat porridge of black leff (Eragostis tef) and drinking local beer (tella) | 4 Pu Dr Or. F |
|     | (Hochst. ex Nees) T. Anders | (Gubet beshita)       | An Sheep diarrhoea| L Leaf grounded and mixed with half cup water. The solution is then drunk | 9 G Dr Or. F |
|     |                            |                        | An Blackleg       | L Leaf powder boiled with root powder of Rubia cordifolia and bark powder of Prunus africana and given to the cattle | 8 Co Dr Or. D |
|     |                            |                        | Hu Rabies         | LR Root and leaf boiled together with root of Prunus persica, Nicotiana tabacum and phytolacca dodendraca and drink the solution for at least a week. One tea cup per day is the limit | 6 Co Dr Or. D |
| 69  | Kalanchoe petiota A. Rich   | Bosoqee/Endahula       | L Impotency       | Root and fruit grounded together and drink with the first boiled coffee (ABOL BUNA) | 3 G Or. D |
|     | (Molina) Standl             |                        | An Swelling       | L Leaf warmed up on a fire and paste on the swelling                          | 24 He Pa Ex. F |
| 70  | Lagenaria siceraria (Sch.   | Buqee/Kil              | Hu Impotency      | RF Root and fruit grounded together and drink with the first boiled coffee (ABOL BUNA) | 3 G Dr Or. D |
|     | Bip. ex A. Rich.) Oliv. & Hie |                  | An Swelling       | L Leaf warmed up on a fire and paste on the swelling                          | 24 He Pa Ex. F |
|     |     |                        | An Blackleg       | L Leaf powder boiled with root powder of Rubia cordifolia and bark powder of Prunus africana and given to the cattle | 8 Co Dr Or. D |
|     |     |                        | Hu Rabies         | LR Root and leaf boiled together with root of Prunus persica, Nicotiana tabacum and phytolacca dodendraca and drink the solution for at least a week. One tea cup per day is the limit | 6 Co Dr Or. D |
| 71  | Lantana camara L.           | Yewof kolo             | L Impotency       | Root and fruit grounded together and drink with the first boiled coffee (ABOL BUNA) | 3 G Dr Or. D |
|     |                            |                        | An General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 2 Pu Dr Or. F |
| 72  | Leonotis rainierana Vis.    | Bokkoluu dimma/Ras kimir/| An General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 15 G Dr Or. D |
|     |                            |                        | An Leech          | L Leaves and flowers grounded and the water solution given to the animal to expel out the parasites | 10 Pu Dr Or. F |
|     |                            |                        | Hu General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 10 Pu Dr Or. F |
| 73  | Leucas martinicensis (Jacq. | Bokkoluu adii/Ras kimir/| L Impotency       | RF Root and fruit grounded together and drink with the first boiled coffee (ABOL BUNA) | 3 G Dr Or. D |
|     | R. Br.                      |                        | L Impotency       | RF Root and fruit grounded together and drink with the first boiled coffee (ABOL BUNA) | 3 G Dr Or. D |
|     |                            |                        | An General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 15 G Dr Or. D |
|     |                            |                        | An Chicken diarrhoea| L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 10 Pu Dr Or. F |
|     |                            |                        | An General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 10 Pu Dr Or. F |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
|     |                            |                        | An Chicken diarrhoea| L Leaf ground mixed with INJERA and given to the chicken                         | 3 G Or. D |
| 74  | Maesa lancealata Forssk.    | Abbayii/Kelewa         | L General malaise | L Leaf pounded together with leaf of Ocimum lamiifolium and the squeezed out liquid drink with coffee | 15 G Dr Or. D |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| 75  | Lippia adoensis Hochst. ex  | Kusaayee/Kese          | L General malaise | L Leaf ground mixed with INJERA and given to the chicken                         | 3 G Or. D |
|     | Walp.                       |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| 76  | Malva ventillata L.         | Liitii/Lit             | L General malaise | L Leaf ground mixed with INJERA and given to the chicken                         | 3 G Or. D |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| 77  | Melia azedarach L.          | Melia                  | L General malaise | L Leaf ground mixed with INJERA and given to the chicken                         | 3 G Or. D |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| 78  | Mentha spicata              | Nana                   | L General malaise | L Leaf ground mixed with INJERA and given to the chicken                         | 3 G Or. D |
|     |                            |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| 79  |                           |                        | An Swelling       | L Leaf crushed, warmed on fire and tie on the swelling                         | 2 He Pa Ex. F |
| No. | Plant Name                        | Location/Region | Mode of Preparation and Application                                                                 | Preparer | Type of Preparer |
|-----|----------------------------------|-----------------|--------------------------------------------------------------------------------------------------------|----------|-----------------|
| 80  | Myrica salicifolia A. Rich.      | Kataba/Shinet    | Water solution of the root infusion is given orally                                                   | If       | Dr. Or. D       |
|     | *Myrsine africana* L.            | Qacama/Kechem    | Fruit grounded and concocted with powder fruit of *Hagenia abyssinica*; and the solution drunk        | Co       | Dr. Or. D       |
| 81  | Myrtus communis                  | Adasii/Ades      | Decothing fruit with local beer (TELLA) and drink the solution                                        | De       | Dr. Or. D       |
| 82  | *Hagenia abyssinica*             | An               | Worms in donkey                                                                                        |          |                 |
|     |                                  | An               | Decocting fruit with local beer (TELLA) and drink the solution                                        | De       | Dr. Or. D       |
| 83  | *Hagenia abyssinica*             | Tamboob/Tembaa   | Fruit grounded and boiled with root powder of *Asparagus africanus* and *Cynoglossum geometricum* and take in the solution | Co       | Dr. Or. D       |
| 84  | Ocimum basilicum L.              | Besobilla        | Leaf together with fruit of *capsicum annuum* and root of *Aloe macrocarpa* concocted together and drink the solution | Co       | Dr. Or. F       |
| 85  | Ocimum gratissimum L.            | Q/Michii/Mech medanit | Leaf rubbed between palms & drink the juice                                                       | Pu       | Dr. Or. F       |
| 86  | Ocimum lamifolium                  | Demakessie       | Leaf pounded with leaf of *Lippia adoensis* and *Fuerstia africana*. The squeezed out solution drink with ABOL BUNA (first boiled coffee) and body will be creamed with the remaining leaves | Pu       | Dr. Or. F       |
| 87  | Olea europaea L. subsp. cuspidata (Wall. ex G. Don) Cif. | Ejersa/Weyra    | Latex or oil of any part of the plant is greased on the head for a week                                | Ex       | Po. Ex. F       |
|     |                                  | Dalecho          | Latex from any part of the plant preferably from root mixed with Leaf powder *Ficus Vasta* and pasted on the wound | Ex       | Pa. Ex. F       |
| 88  | Juss.                            |                  | Young growing leaves cut from three different individual plants, chewed them and hold between the aching tooth | C        | Ho. T F         |
| 89  | Osyris quadriflora Decn.         | Waatoq/Qeret     | Latex is mixed with spikes of SINDEDO (*Pinnesetum* sp.) and creaming the affected areas              | Ex       | Po. Ex. F       |
| 90  | Otostegia integrifolia Benth.    | Tungiti/Tungiti  | Smoke the leaf and fumigate the house for a woman who deliver baby                                  | Bu       | Fu. Ex. F       |
|     | Pavetta abyssinica               | Muke-buniti      | Root boiled with leaves of *Bensama abyssinica* and *Rumex abyssinicus* and wash the wound with the solution | Co       | W. Ex. F        |
| 91  | Fresen.                          |                  | Ground the leaf and drunk the solution                                                                | G        | Dr. Or. D       |
| 92  | Pentas schimperiana (A. Rich.) Vatke | Dasie          | Stem is chewed and spitted on the eye                                                                  | C        | S. E F          |
|     | Phytolacca dodecandra            | Handoode/Endod   | Leaf grounded and wash the area with the solution                                                      | G        | W. Ex. D        |
| 93  | L’ Herit                         | Hu               | Leaf together with *Physalis peruviana* dried, grounded and drip a drop or two on the wart              | Co       | dr. Ex. D       |
| 94  | Plantago lanceolata L.           | Qorxobbi/Yehahey Kote/ | Ground the leaf and drunk the solution                                                                | G        | W. Ex. D        |
Table 12 Lists of MPs collected from Ada’a District (Detail descriptions on the mode of preparations and applications) (Continued)

| Plantago major L. | Qorxobbii | Hu | Poisoning | R | Root powder is employed to bandage wounds of any kind | 3 | P | Pa | Ex. | D |
|-------------------|-----------|----|-----------|---|---------------------------------------------------|---|---|---|-----|---|
| 95                | /Yekura wesife/ |    |           |   |                                                   |   |   |   |     |   |
| Premna schimperi Engl. | Urgessa/Chchoho | Hu | Haemorrhoides | L | Leaf grounded and place it on the wound | 3 | G | Pa | Ex. | D |
| 96                |           |    |           |   |                                                   |   |   |   |     |   |
| Protea gagnei J. F. Gmel. | Dasie | Hu | Eye disease | L | Leaf pounded with leaf of Buddleija polystachya, and the juice is dripped on the eye | 4 | Pu | dr. | Ey | F |
| Prunus africana (Hook. f.) Kalms | Hoomii/Tikur Enchet | Hu | Swelling | Ba | Bark dried well, grounded, boiled with water, filtered and drunk | 4 | De | Dr | Or. | D |
| 98                |           |    |           |   |                                                   |   |   |   |     |   |
| Prunus persica (L.) Batsch | Kokii/Kok | Hu | Epistaxis (Neser) | R | Root chewed and band in cloth and place in nose | 2 | C | Is | N | F |
| 99                |           |    |           |   |                                                   |   |   |   |     |   |
| Pterolobium stellatum (Forssk.) Brenan | Harengeemmaa/Kontir | Hu | Rhumantic pain (Kurmat) | R | Root boiled in a cooking dish and fumigating the leg with vapour. | 5 | De | Fu | Ex. | F |
| 100               |           |    |           |   |                                                   |   |   |   |     |   |
| Rhus retinorrhoea | Tilem | An | Anthrax (Aba senga) | Ba | The bark is grounded, boiled with leaf powder of Phytolacca dodecandra in a cup of water. Drink the solution to the animal for a week | 4 | Co | Dr | Or. | F |
| 101               |           |    |           |   |                                                   |   |   |   |     |   |
| Rhus vulgaris Meikle | Dabobecha/Kimmo | An | Diarrhoea | L | The leaf together with the leaf of Premna schimperi and Clerodendrum myricoides is concocted together. The concoction is given to the cattle | 3 | Co | Dr | Or. | F |
| 102               |           |    |           |   |                                                   |   |   |   |     |   |
| Ricinus communis L. | Qoboo/Gulo | Hu | Dandruff (Forofor) | FL | Fruit and leaf pounded together and paint the patient’s head skin | 6 | Pu | Po | Ex. | D |
| 103               |           |    |           |   |                                                   |   |   |   |     |   |
| Rosa abyssinica Lindley | Gora/Kega | An | Invoking spirit (Aganent) | L | Leaf infusion together with leaf powder of Vernonia amygdalina is prepared and small amount of the solution placed through nose and the remaining solution is for painting the body | 7 | If | Po | N | F |
| 104               |           |    |           |   |                                                   |   |   |   |     |   |
| Rosmarinus officinalis L. | Siga metsbesha | Hu | Headache | R | Root powder mixed powder root of Ocimum gratissimum and drunk the solution | 13 | P | Dr | Or. | D |
| 105               |           |    |           |   |                                                   |   |   |   |     |   |
| Rubia cordifolia L. | Enchiberi/Enchibir | Hu | Wound | R | Root grounded and sprinkle the powder on the wound | 13 | P | Sp | Ex. | D |
| 106               |           |    |           |   |                                                   |   |   |   |     |   |
Table 12 Lists of MPs collected from Ada’a District (Detail descriptions on the mode of preparations and applications) (Continued)

| Code | Species/Description | Disease/Condition | Preparation | Mode of Preparation | Tested Dose | Mode | Tested | Source |
|------|---------------------|-------------------|-------------|---------------------|-------------|------|--------|--------|
| Hu Cough | Root grounded, homogenised and drunk with butter stayed for 7 years. One glass is the limit for adult and a cup is for children | 7 | G | Dr | Or | D |
| An Cataract (Bemora yete-shefene ayen) | Root chewed with root of Fuertia africana and spitted on the cattle’s eye | 5 | C | S | E | F |
| Rubus steudneri | Leaf powdered, mixed with EMAMESA QEBE (butter from a cow with same colour calf), and cream it on the area butter from a cow with same colour calf), and cream it on the area | 2 | P | Po | Ex | D |
| Agogota Stabbing pain (Wugat) | Leaf with root of Rubia cordifolia and Leaf of Thymus schimperi boil together with butter and drink | 2 | Co | Dr | Or | F |
| Rumex abyssinicus Jacq. Meqmeqo | Root washed, crushed and boiled with butter. One glass of the solution drunk per day | 5 | Co | Dr | Or | F |
| Rumex nepalensis Shuultii/Tulet | Root powdered and given to the cattle with ATELLA (By product of TELLA) | 2 | P | Dr | Or | D |
| An Scabies (Ekek) WP | Whole plant pounded, mixed with water and wash the animal with it | 2 | Pu | W | Ex | F |
| Rumex nervosus Vahl Dhangaggoo/Embuacho/ | Root powdered and paste on the penis forehead | 5 | Pu | Pa | Ex | F |
| Ruta chalepensis L. Xeenaadama/Tsenadam/ | Root chewed and ingest the juice | 29 | C | Sw | Or | F |
| Salix mucronata Alaletu/Ahaya MIKEGNA-SHEREGNA | Chewing the leaf and sipping it in | 6 | C | Sw | Or | F |
| Salvia nilotica Jacq Hulegebe | Root powder mixed with resin of Euclea racemosa Subsp. schimperi and applied on the wound once a day | 3 | P | Pa | Ex | F |
| Schinus molle L. Kundoberbere zaf | Root powder mixed with flour of Tikur and given to eat against rabies before an animal bitten by a mud dog | 2 | Ba | E | Or | D |
| Sida schimperiana Chefreg | Root dried, powdered, and baked with flour of Tikur (Eragostis tef) and given to eat against rabies before an animal bitten by a mud dog | 2 | Ba | E | Or | D |
| Hochst. ex A. Rich. Preventing bitch birth | Leaves infusion mixed with fruit of Solanum incanum is prepared and drunk | 2 | If | Dr | Or | D |
| Snowdenia polystachya (Fresen.) Muja Muja Scabies (Ekek) | Root boiled with root of Carissa spinarium and wash the animal with the concoction | 2 | Co | W | Ex | D |
| Solanecio gigas (Vatke.) Gommana osolee | Grounding the leaf and drinking the solution. In any | 7 | G | Dr | Or | D |

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| Table 12 Lists of MPs collected from Ada’a District (Detail descriptions on the mode of preparations and applications) (Continued) |
|---|
| C. Jeffrey /Yeshikoko gomen/ | case the dose shall not exceed a cup |
| Solanum anguivi Lam. /Zerch Enbuay/ | Hiddi Worabessa Hu Intelligence Se Seed grounded, boiled with leaf of Datura stramonium and small amount given to a child to be a fast learner |
| 118 | 2 P Po Ex. D |
| | Hu Danruff Fr Fruit together with leaf of Acacia albida and Ruta chalepensis powdered, mixed with Vaseline and paint the head |
| | 2 Ba E Or. D |
| | An Rabies Fr Fruit powder baked with brown teff (*Eragostis tef*) and given to dog against rabies. This is given to healthier dog not to be infected with rabies |
| Solanum incanum L. /Yehabesha Embuay/ | Hiddii An Tick bite Fr Infusion of fresh fruit mixed with kerosene gas and spray on the skin of the animal |
| 119 | 2 If Sr Ex. F |
| | An Horse Scabies R Pounding the root with carbon (carbon rod of dry cell) and spraying the water solution on the infected part. |
| | 2 Pu Sr Ex. F |
| | Hu Wounds L/Fr Pounding the fresh leaf and fruit and drip a drop of the extract on the wound |
| | 2 Pu Dr. Ex. F |
| 120 Solanum marginatum Linn. f. Hiddii/Tileku Enbuay Hu Long stay menstruation R Root powdered with roots powder of Achyranthes aspera, Solanum incanum, Jasminum grandiflorum, wrapped together, woven three times over head and between legs and tied around the waist |
| | 5 P Tw Ex. D |
| | Stephania abyssinica Kalaala/Engochit An Rabies R Root powder baked with flour of brown teff (*Eragostis tef*) and small amount given once. |
| 121 (Dillon ex A. Rich.) Walp. | 6 Ba E Or D |
| | An Blackleg R Root powders of the plant and Rumex abyssinicus, Cyphostemma adenocaule, Eucalyptus globules, Allium sativum, and Solanum incanum mixed together in a litter of water and drink once |
| | 5 Co Dr Or. D |
| | Hu Unwanted pregancy R 15-20 cm fresh root whose upper part chewed inserted to the womb for aborting unwanted pregnancy |
| | 3 C Is V F |
| | Hu Wound R Either powdered or fresh root boiled with leaf of *smilax aspera* and wash the wound |
| | 3 Co Pa Ex. D/F |
| | Hu Swelling R Root grounded and dissolved in a cup of water and drink. The recommended antidotes is to drink ABOL BUNA with no sugar |
| | 5 P Dr Or. P |
| | Hu Sudden illness R Little sized root chewed and only small amount of the extract swallowed |
| | 4 C Sw Or. F |
| 122 Tagetes minuta L. Tiro An KINKIN | Ag Above ground part collected from field and sleep chickens on it |
| 123 Thunbergia alata Sims. Hareg Hu Cough H | Powder of root taken once mixed with honey |
| 124 Thymus schimperi Ronniger Xoosanyii/Tosigne Hu Hypertension H | Root dried, powdered, and drink with tea |
| 125 Urtica simensis Steudel Dobii/Sama Hu Gonorrhoeae (Chebit) R Infusion of Root is prepared and the genital organ washes with it once daily. |
| 125 | 2 If W Ex. F |
### Table 12: Lists of MPs collected from Ada’a District (Detail descriptions on the mode of preparations and applications) (Continued)

| MP Code | Species Name | Part Used | Ailments Treated | Form of Preparation | Route of Application | Total Informants | Key |
|---------|--------------|-----------|------------------|---------------------|---------------------|------------------|-----|
| 126     | Verbascum sinaticum | R | Root crashed, placed in a fire and fumigating the smoke | 4 | Bu Fu Ex. D |
| 127     | Verbena officinalis Lq | R | Root with Phytoleca dodecandra leaf boiled and the solution drunk | 4 | Co E Or. D |
| 129     | Withania somnifera (L.) Dunal. | L | Leaf is grounded and the solution taken orally | 5 | G Dr Or. D |
| 130     | Xanthium strumarium L. | L | Leaf juice of Xanthium. strumnium, Clematis simensis, Calpurnia aurea applied through nose and ear of the animal to expel the parasite | 5 | If Sr D |
| 131     | Zehneria scabra L. | L | Root powdered and drink the water solution | 6 | P Dr Or. D |

**Key:**
- **UT**-used to treat (An=domestic animal, Hu=Human, Bo=both), **AT**-Ailments treated, **PU**-Part used (Ag=above ground part, Ba=bark, Br=branch, Fl=flowers or inflorescence, Fr=fruit, L=leaf, L/fr=leaf and fruit, La=latex or resin, Lf=leaf and inflorescence, R=root, RB=root and bark, RF=root and fruit, RL=root and leaf, RS=root and stem, S=stem, Se=Seed, WP=whole plant), **IC**-total number of informants who cited the MPs for treating the major ailments, **FP**-forms of preparation (Ba=baking, Bu=burning, C=chewing, Co=concoction, De=decoction, G=grinding, Ex=Exudate collection H=heating or warming, If=infusion, P=powdering, Pu=pounding, Wp=without processing), **MT**-means of treatment (Bu=smoking, Dr=drinking, Dr.=dripping, E=eating, Fu=fumigating, H=holding between aching tooth, I=inhaling, Is=inserting, Pa=pasting, Po=polishing or creaming, S=spitting on eye, Sm=smelling, Sp=spinkling, Sr=spraying, Sw=swallowing chewed juice, Tw=tie around waist, W=washing), **RA**-routs of application (Ea=ear or auricular, Ex=external or dermal, Ey=Eye or ocular, N=nasal=NE=nasal and through ear, Or=oral, T=on tooth, V=vaginal **CP**-condition of preparation (D=dry, F=fresh, DF=dim or fresh). ****- Local name not known.
Appendix

Details on the mode of preparations and applications of remedies are given in the appendix (Table 12).

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

Authors’ contributions
All authors have equal contribution; and all authors have read and approved the final manuscript.

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