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Assessment of Traditional Medicinal Plants used to treat human and livestock ailments and their threatening factors in Gulomekeda District, Northern Ethiopia

Authors

Teklay Girmay*, Zeyede Teshome

Department of Biology, Adigrat University, P. O. Box, 50, Adigrat, Ethiopia

Corresponding Author

Teklay GirmayEmail: teklaygirmay@yahoo.com

Abstract

About 80% of the total population of Ethiopia is depending on traditional medicine to treat different types of human illness. More than 90% livestock in Ethiopia rely on traditional medicine. This study was conducted in Gulomekeda district, Eastern Tigray, Northern Ethiopia, to assess the Traditional Medicinal Plants used to treat human and livestock ailments and their threatening factors. Purposive sampling was employed to assess the traditional medicinal plants and local knowledge of the people in the study area. Data was collected by questionnaires and interviews to gather information on plant species used for medicinal plants, part(s) of plants used for medicine, methods of preparations, route of utilizations and source of the plants. A total of 34 medicinal plants, which belong to 27 families were recorded in the study area. The local people use the recorded plants to treat more than 24 different ailments of human and livestock. Leaf was the most frequently used plant part used to treat human disease, followed by root. Oral application was also widely used followed by dermal. Deforestation, drought, erosion, urbanization and overgrazing were found to be major threats to the existence of medicinal plants in the study area. Future policy on documentation of the traditional medicinal plants and research should also focus on proper conservation and development of pharmaceutical drugs from these traditional medicines.

Keywords: Ailments, Gulomekeda, Livestock, Medicinal plants, Threatening factors.

Introduction

Ethiopia is known for its high sources of biodiversity in the world. The country endowed rich flora and fauna, due to its rugged topography and climatic diversity^[1]. For instance, Ethiopian flora is estimated to consist of about 7,000 species. Out of these, it is believed that 10% are endemic to the country and about 14% are used as medicinal plants^[2].

Traditional medicine is a health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses and maintain

well-being. Medicinal plants are useful plants for primary health care and as remedy for diseases and injury for both humans and livestock traditionally^[3].

According^[4] and^[2], about 80% of the total population of Ethiopia is depending on traditional medicine to treat different types of human illness. More than 90% livestock in Ethiopia rely on traditional medicine and over 95% of the traditional medicinal preparations are a plant origin^[5]. Communities of Ethiopia used traditional medicine widely to treat both human and livestock diseases. This is likely due to the availability of these low-cost locally sourced plant-based medicines^[6, 7]. Moreover, due to poor

access to health services, especially in the rural areas, the majority of the Ethiopia people rely mainly on traditional medicine for their primary health care needs^[8]. Ethiopia has a long history of traditional medicine and has developed ways to fight disease. The ways are also as diverse as the different cultures. Healing in Ethiopian traditional medicine is not only concerned with curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental and material wellbeing^[9].

Ethiopian Traditional medicine is commonly used to treat a variety of diseases and it is employing by professional traditional medical practitioners. The traditional medicinal plants are used to treat different human ailments including gastrointestinal disturbances, respiratory disorders, sexually transmitted infections, tuberculosis, impotency, hemorrhoids, rabies, intestinal parasites, skin problems, liver diseases, mental disorders, hypertension, diabetes, gynecological conditions rheumatism, malaria and others^[10, 11]. Not only for human ailments but also used to treat livestock ailments^[7, 12, 6]. Although traditional medicinal plants are very important for treating human and livestock ailments, they are threatening due to anthropogenic and natural threatening factors. These factors are main basis to lose and decreased different medicinal plant species^[13]. These threats are increasing to the level of jeopardizing the traditional medicinal plants of the country due to lack of appropriate conservation and inadequate environmental policies and failure to implement those^[14].

Little effort has been done to assess and document traditional medicinal plants in Tigray region^[15, 16, 13]. However, no ethnobotanical documentation of medicinal plants used to treat human and livestock ailments in Gulomekeda district and its surroundings. Therefore, documentation of medicinal plants and the associated knowledge is important for conserving the plants, ensuring their sustainable use and to preserving the knowledge for the next generation. The present study was aimed to identify traditional medicinal plants

practiced by the local people to treat human and livestock ailments, expose the knowledge of the local people, to document the traditional medicinal plants and their medicinal uses, and to assess threatening factors of the traditional medicinal plants in Gulomekeda district.

Materials and Methods

Description of the study area

The study was conducted in four nominated Kebeles of Gulomekeda District of Eastren Tigray Zone, Northern Ethiopia from March to December, 2015, which is found at about 915 km north of Addis-Ababa. It encompasses a total of 84762 populations and 26580 ha land. Of the total population, 88.22% lives in the rural area (BoARD; CSA, 2007). The district receives an average annual rainfall ranging from 400 to 500 mm. Farmlands are characterized by high fragmentation which results in continuing decline of agricultural productivity.

Informants selection

Four Kebeles were selected based on the information obtained by elders and local administrations. The Kebeles were Kisadmateb, Rigbaymedebay, Mereta and Mezabir. These Kebeles are known by different forest coverage. Many closure areas and church forests are found in the Kebeles. Of these four selected Kebeles a total of 60 key informants were purposively selected based on recommendation from elders and local authorities, 36 men and 24 women were selected for the present study. The ages of the key informants were between 22years and 78years. The key informants were selected based on the association of elders, local authorities, traditional healers and local farmers.

Data Collection

We followed^[15] methodologies to collect the ethnobotanical data. Semi-structured interviewees, observation and guided field walks with informants were employed to obtain ethnobotanical data. Interviews were made based on a checklist of questions prepared before hand in English and then translate to the local language

Tigrigna during interview administration for easily understandable to the local people. The prepared questionnaires encompass both open and closed ended questions. The open-ended questions were designed to enable respondents to express their opinion about what they know, what has to be done and soon. During the study, each informant was visited 2 to 3 times to confirm the reliability of the ethnobotanical information. Consequently, the responses of an informant that were not in harmony with each other were rejected since such responses were considered unreliable. Information regarding local names of medicinal plants, methods and conditions of gathering and preparation, part(s) used, diseases treated, dosage used, route of application, adverse effect, uses other than medicinal uses and management methods was recorded at the spot. Observations were made on the morphological features, habitats and threats of each medicinal plant species in the field. Based on the information gained by informants, specimens were collected, numbered, pressed and dried for identification and plates of each traditional medicinal plant were collected. Identification of plants was done in the field and in Adigrat University with the help of experts, by comparison with reliable specimens, illustrations and by using taxonomic keys in the floras of Ethiopia and Eritrea.

Data Analysis

The collected data were analyzed using descriptive statistics. Microsoft Excel and SPSS version 16 software were also used for the analysis.

Results

Plant species practiced as a traditional medicine
Medicinal plants used by the traditional healers from the study area are presented in Table 1 and Table 2. A total of 34 medicinal plants, which belong to 27 families were recorded in Gulomekeda. The local people use the recorded plants to treat more than 24 different ailments of human and livestock. Some families were represented more than one species, like family

Euphorbiaceae (3 species), Solanaceae (3), Polygonaceae (2) and Rhamnaceae (2). Of the total traditional medicinal plants recorded in the specific study area, 76.5% were used to treat human disease, 8.8% to treat livestock disease and 14.7% for treatment of both humans and livestock. The plant parts used to treat human and livestock disease varied from species to species and from disease to disease. Leaves, roots, seeds and stems were among the commonly used plant parts used to treat both human and livestock disease. The result revealed that leaves were the most frequently used plant parts (58.8%) followed by root (17.6%) (Fig.1).

Among the total traditional medicinal plants listed by the local communities in the study area, 61.8% are found in the wild, 17.7% are found in cultivated form and 20.6% are occur in both cultivated and wild state form (Fig. 2).

Table 1. List of traditional medicinal plants to treat different human diseases

Scientific name	Geez ግእዝ	Family name	Parts used	Methods of preparation	Ingredients added	Route of utilizations	Ailment treated
<i>Acacia etbaica</i> Schweinf.	ሰራው	Fabaceae	Leaf	Crushing	No	Dermal	Wound
<i>Allium sativum</i> L.	ገፅዳ ሸጉርቲ	Alliaceae	Bulb	Grinding	Coffee, tea and butter	Oral	Common cold and malaria
<i>Aloe debrana</i> Christian	ዕረ	Aloeaceae	Root	Taking the root part	No	Tying on damaged body part	Luxation
<i>Artemisia abssinica</i> Sch.Bip. ex A.Rich.	ጨፍ ኣዳም	Rutaceae	Leaf	Cooking	Water & garlic	Nasal	Common cold
<i>Brassica nigra</i> (L.) W.D.J. Koch	ሰናፍጭ	Brassicaceae	Seed	Crushing	Water	Oral	Stomach ache and amoebic dysentery
<i>Carissa spinarum</i> L.	ዓጋም	Apocynaceae	Root	Crushing	Eucalyptus globules Leaf	Fumigation	Febrile illness
<i>Cordia fricana</i> Lam.	ዓውሒ	Boraginaceae	Leaf	Crushing	Coffee	Oral	Febrile illness
<i>Croton macrostachyus</i> Hochst.	ታጎቡክ	Euphorbiaceae	Stem bark	Crushing	Milk	Oral	Heart failure
<i>Cucumis dipsaceus</i> Ehrenb.ex Spach	ሓፍፍሎ	Cucurbitaceae	Leaf	Cooking	Water	Fumigation	Common cold
<i>Cucumis ficifolius</i> A. Rich.	ኣጎል	Cucurbitaceae	Stem	Take the stem part	Garlic, Lemon and Egg	Fumigation	Leg Disease
<i>Datura stramonium</i> L.	መዘርባዕ	Solanaceae	Leaf	Crushing	No	Dermal	Wound
<i>Dodonea angustifolia</i> L.f	ታጎሰት	Sapindaceae	Leaf	Crushing	Water & butter	Dermal	Wart disease
<i>Ekebergia capensis</i> Sparrm.	ጎፅቢ	Meliaceae	Stem	Crushing	No	Nasal	Jew swelling
<i>Euclea racemosa</i> L.	ኩሊዓው	Ebenaceae	Root	Gridding	Honey	Oral	Gastric disease
<i>Eucalyptus globulus</i> Labill.	ገፅዳ ቀላጫጎጦስ	Myrtaceae	Leaf	Cooking	Water	Fumigation	Headache and febrile illness
<i>Euphorbia candelabrum</i> Kotschy	ቆልቆል	Euphorbiaceae	Liquid part	Take the liquid	No	Dermal	Wound
<i>Justicia schimperiana</i> L.	ስምዒዝ	Acanthaceae	Leaf	Cooking	Water and whey	Oral	Ascariasis and stomach disease
<i>Linum ustatissimum</i> L.	ኣጎጣጢዕ	Linaceae	Seed	Crushing	Sugar	Oral	Diarrhea
<i>Olea europaea</i> L.	ኣውሊዕ	Oleaceae	Leaf	Crushing	No	Dermal	Skin infection
<i>Ocimum lamiifolium</i> Hochst. ex Benth.	ደማካሴ	Lamiaceae	Leaf	Crushing	Coffee	Oral	Febrile illness, Headache
<i>Phoenix dactylifera</i> L.	ተምሪ	Arecaceae	Leaf	Crushing	No	Oral	Stomachache
<i>Rehamnus prinoides</i> L. Herit.	ጎሾ	Rhamnaceae	Leaf	Crushing	No	Oral	Tonsillitis
<i>Rumex abyssinicus</i> Jacq.	ጥቆጥቆጥ	Polygonaceae	Root	Crushing	No	Dermal	Leishmaniasis
<i>Rumex nervosus</i> Vahl.	ሓሓት	Polygonaceae	Leaf & stem	Girding	No	Oral	Abdominal pain
<i>Schinus molle</i> L.	ጥቆር በርበረ	Anacardiaceae	Leaf	Crushing	Water	Oral	Stomach ache
<i>Sida schimperiana</i> Hochst. ex A. Rich.	ቸፍርግ	Malvaceae	Leaf	Crushing	No	Oral	Fever, cough
<i>Solanum nigrum</i> L.	ዕጎጉለ	Solanaceae	Apical leaf	Take the leaf	No	Nasal (Smelling via noise)	Bleeding
<i>Tragia cinerea</i> (Pax) and Radcle. Smith.	ኣምዐ	Euphorbiaceae	Root	Grinding	No	Nasal(for bleeding) and fumigation (Febrile illness)	Bleeding and Febrile illness
<i>Vernonia amygdalina</i> Del.	ግራዋ	Asteraceae	Roots/leaves	Crushing	Water	Oral	Malaria
<i>Zingiber officinale</i> Roscoe	ጅንጅብል	Zingiberaceae	Steam	Grinding	Water and salt for tooth	Chewing for tooth & drop for eyes	Infection of tooth and eyes
<i>Ziziphus spinechristi</i> (L.) Desf.	ገባ	Rhamnaceae	Leaf	Crushing	No	Lotion the hair	Dandruff

Table 2. List of traditional medicinal plants to treat different livestock diseases

Scientific name	Geez ግላዝ	Family name	Parts used	Methods of preparation	Ingredients added	Route of utilizations	Diseases treated
<i>Aloe debrana</i> Christian	ዕረ	Aloaceae	Taking the liquid	Bleeding the stem part	No	Dermal	Tick
<i>Datura stramonium</i> L.	መዘርባዕ	Solanaceae	Leaf	Crushing	Water	Dermal	Louse
<i>Dovyalis abyssinica</i> (A. Rich.) Warb.	ሰረሮ	Flacoutiaceae	Leaf	Crushing	No	Nasal	Worms in head
<i>Euclea racemose</i> L.	ኩሊዓው	Ebenaceae	Leaf	Crushing	No	Oral	Abdominal crump
<i>Euphorbia candelabrum</i> Kotschy	ቆልቆል	Euphorbiaceae	Taking the liquid	Bleeding the stem part	No	Dermal	For swelling part of body
<i>Justicia schimperiana</i> L.	ስምዒዛ	Acanthaceae	Leaf	Crushing	No	Oral	Coughing
<i>Nicotina tabacum</i> L.	ትንባኮ	Solanaceae	Leaf	Crushing	No	Nasal	Leech infestation
<i>Opuntia ficus-indica</i> (L.) Miller.	በለስ	Cactaceae	Stem	Crushing	No	Oral	Snake bite

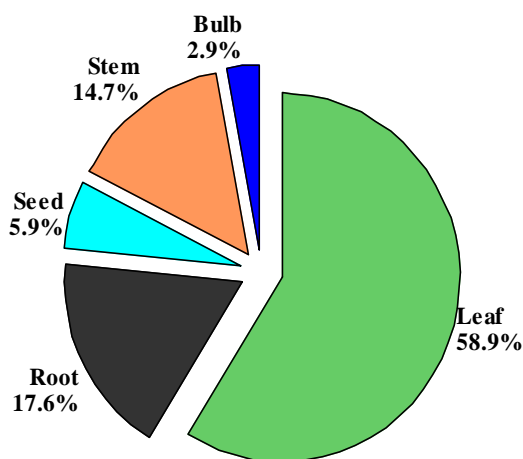


Fig.1. Plant parts of medicinal plants preparation for Human livestock ailment treatment

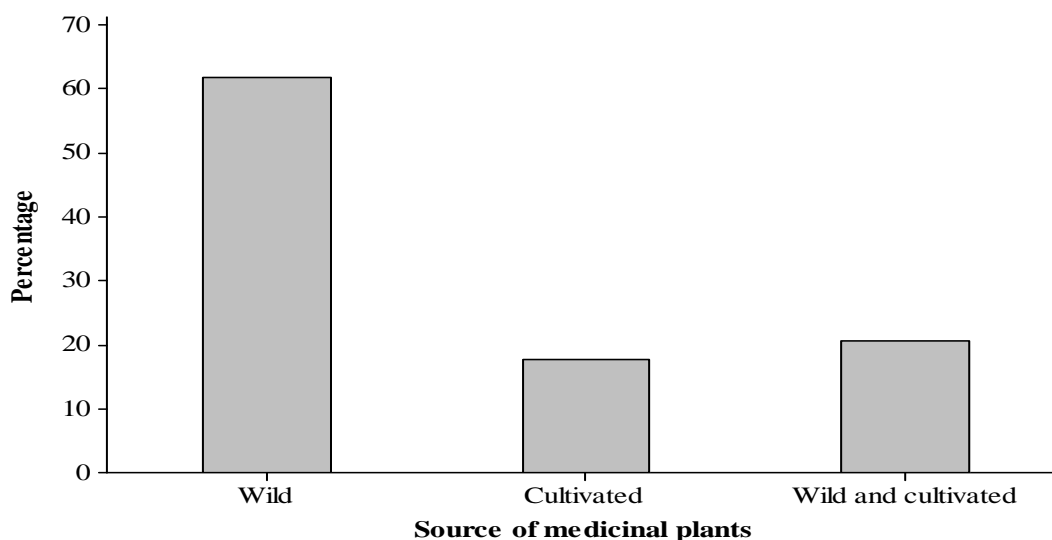


Fig.2. Sources of medicinal plants

Methods of preparation and mode of administration

The respondents were used different methods of preparation for different plants and different diseases. In the current result various preparation methods of traditional medicine were used by the interviewees who include traditional healers,

village herbalists and religious peoples. Among the preparation methods, crushing, grinding and cooking were the most common. Out of methods of remedy preparations, crushing was the dominant (58.8%) followed by grinding (14.7%). The remaining methods of preparation and their percentage are indicated in Fig. 3.

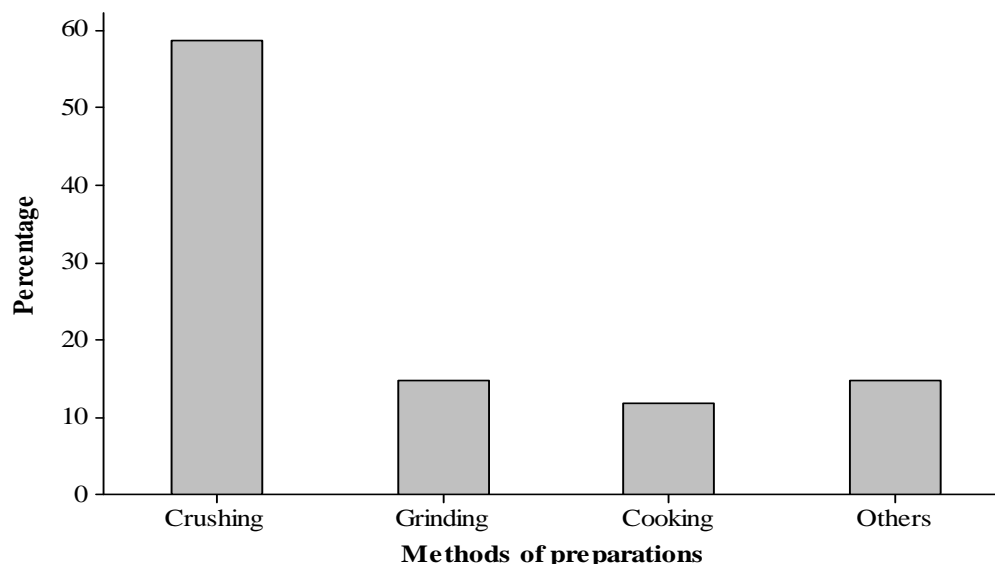


Fig.3. Methods of preparation of medicinal plants

According to the interviewees, different ingredients are added to the traditional medicinal plants. The ingredients may vary depending on the type of plants and diseases. Additives which added to the medicinal plants were honey, milk, sugar, butter, salt, garlic, coffee, tea, Lemon,

garlic, and water. The traditional medicinal plants had different route of utilizations. This may vary according to the nature of the disease. Majority (41.2%) of the traditional medicines were taken orally, followed by dermal (20.6%) and nasal (17.6%) (Fig. 4).

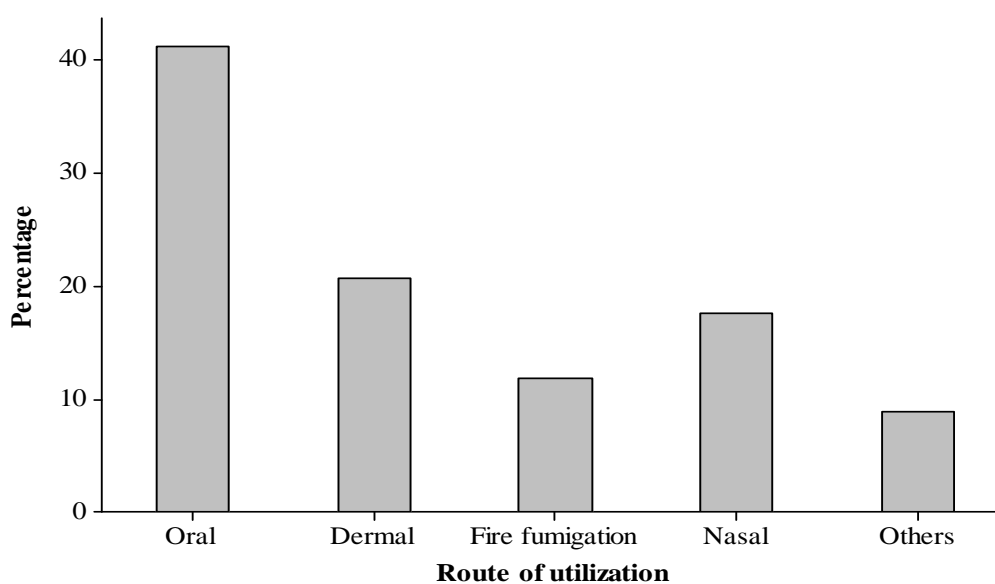


Fig.4. Route of administration of traditional medicines

Threats of medicinal plants in the study area

The same to other living organisms, traditional medicinal plants are also affected by several factors. Factors which affect abundance of traditional medicinal plants may human, natural or both. Threats may diminish the abundance of traditional medicinal plants in the study area and the country level. Not only decrease their abundance, traditional medicinal plants may also be extinct due to the threats.

In the present study, respondents confirmed that deforestation, drought, erosion, urbanization and overgrazing are the major threats for the reduction of traditional medicinal plants in the district. The result of the present study revealed that deforestation for agriculture, construction and fuel wood was ranked first followed by drought as the major threats to the medicinal plants.

Discussion

In the current assessment, a total of 34 wild medicinal plants were recorded for treating both human and livestock diseases. Majority of the medicinal plants (76.5%) were reported for using in the treatment of human diseases while 8.8% were used to treat livestock diseases. In general, in different parts of Ethiopia and in Tigray region in particular, various medicinal plants were reported which were used to treat different types of human and livestock diseases^[17, 13, 16, 18, 15, 19, 7, 6].

The study revealed that, Euphorbiaceae and Solanaceae families were represented with high species which were consisted three species each. In other study which is conducted in South Omo, Southern Ethiopia, Lamiaceae family was covered the major plant family^[7]. Fabaceae was the largest number of medicinal plants in south-central Zimbabwe^[20]. On the other hand, Solanaceae was represented by largest species in Kilte awlalo district^[16].

The present result showed that leaves were the most frequently used plant parts followed by root. Similar finding were also reported by different researchers.^[19] was reported leaves were as the most commonly used plant parts for herbal

preparations in and Around Alamata, Southern Tigray, Northern Ethiopia. Study conducted in Kilte Awulaelo District, Tigray Region, Northern Ethiopia showed that leaves were widely used plant parts for a range of preparations than the other parts^[16]. Ethnobotanical Study conducted in Gemad District, Northern Ethiopia also revealed that leaves were the most dominant plant part^[13]. Similar results were reported by^[15] and^[21] from Endrta District, South-eastern Tigray, Northern Ethiopia and from Kafficho people, southwestern Ethiopia respectively.

On the other hand,^[6] and^[18] were reported that root was the most frequently used plant part used to treat human disease followed by leaf. Study conducted in Gindeberet district, Western Ethiopia revealed that leaves and roots were the most commonly used plant parts for herbal preparations with same proportion^[11].

Among the total traditional medicinal plants recorded in the study area, most of them (61.8%) were wild. This result is in agreement with studies else-where in Ethiopia. Similar result was reported from Minjar-Shenkora District, North Shewa Zone of Amhara Region, Ethiopia^[17]. They have collected 76.27% species of the medicinal plants from the wild of the total collected medicinal plants.^[21] also reported a significant proportion of medicinal plants (74.19%) were collected from the wild in their study. Study conducted by^[15] in Endrta District, South-eastern Tigray showed that most (62.96%) of the traditional medicinal plants were wild. An ethno-veterinary botanical survey of medicinal plants in Kochore district of Gedeo Zone, Southern Nations Nationalities and Peoples Regional State of Ethiopia confirmed that most of the traditional medicinal plant species were collected from wild habitats^[22]. Most of traditional medicinal plants are collected mainly from forest and pasture ranges^[23].

In the present study, the respondents notified as a numerous techniques of preparation are employed before administering the remedies. Out of methods of remedy preparations, crushing was the dominant (58.8%) followed by grinding (14.7%).

This finding is analogous with the previous studies conducted in different parts of Ethiopia. Traditional healers in and around Fiche district, central Ethiopia, crushing was the dominant type of remedy preparation ^[12]. Ethnobotanical Study of Medicinal Plants Used to Treat Human Ailments by Guji Oromo Tribes in Abaya District and Borana, Oromia, in Ethiopia identified that crushing and pounding, chewing, concoction and decoction were among the different mode of remedy preparations. Of these modes of preparation, crushing and pounding were the dominant one ^[24]. The present result is in agreement with the findings of ^[6]. In their result crushing was the most common mode of preparation followed by chewing.

The traditional medicinal plants had different route of utilizations. This may vary depending on the type of plants and type of diseases. In the present investigation, majority (41.2%) of the traditional medicines were taken orally, followed by dermal with accounting (20.6%). These results were similar to the findings of previous investigators ^[6,11,15,25,7,13,17]. They reported that oral administration was found to be the dominant route of remedy administration. In contrast, Ethnobotanical Study of Medicinal Plants in and Around Alamata, Southern Tigray, Northern Ethiopia revealed that dermal was the most common followed by oral among the different routes application ^[19]. The present result was also disagrees compared to the finding of ^[16]. He had investigated that the greater proportions of medicinal plants were applied externally than internally (oral, local, nasal and oracular) applications among the various routes of administration of traditional medicinal plants in the study area,

The present investigation confirmed that deforestation, drought, erosion, urbanization and overgrazing were found to be the key factors for threatening traditional medicinal plants of the area. A significant number of respondents agreed that uncontrolled fire for agricultural expansion is the major human induced factor contributing for

plant disappearance from their natural habitat. This finding is comparable with several research reports ^[17, 13, 16]. A research conducted in Samre district, south-eastern Tigray, northern Ethiopia showed that both anthropogenic and natural factors were the main threatening factors that lead to the lose and decreasing of different medicinal plant species. Over harvesting for fire wood, construction, agriculture, for fence, and lack of awareness, urbanization and over-grazing were some of the anthropogenic threatening factors identified in the study area. Moreover, pressure like recurrent drought, land fragmentation, erosion and deforestation were some of the natural threatening factors that aggravated the threats to the medicinal plant species ^[13]. According to ^[17], agricultural expansion, firewood, charcoal production, urbanization and construction were the main threat for medicinal plants in their study area. ^[16] also identified that deforestation, overgrazing and recurrent drought were resulted in the reduction in number and diversity of trees and shrubs used for medication.

Conclusion and Recommendations

In conclusion, the current study confirmed that traditional medicine, mainly involving the use of medicinal plants, is playing a significant role in fulfilling the primary healthcare to the majority of the communities. The local communities who live in and around Gulomekeda district, Tigray Region have a good knowledge about the plants, their distribution, uses and parts of the plants used. The study area is rich in medicinal plants diversity. A total of 34 species of medicinal plants were recorded. Among the total traditional medicinal plants majority were used to treat human disease and few were used to treat livestock disease. About 61.8% of the traditional medicinal plants were found in the wild, 17.7% of them are found in cultivated form and 20.6% are occur in both cultivated and wild state form. The current finding revealed that leaves were the most frequently used plant parts followed by root. Crushing was the dominant (58.8%) followed by grinding (14.7%)

out of remedy preparation techniques. Majorities (34%) of the traditional medicines were taken orally, followed by dermal (20.6%) and nasal (17.6 %). Drought, overgrazing and deforestations were the major threats for the loss of valuable traditional medicinal plants in the study area which calls for proper conservation of the plants and for appropriate policy enforcement and implementation of regulatory measures. Awareness creation among the communities is important to preserve the indigenous medicinal plant species. As this study conducted in few Kebeles, a comprehensive research on ethnobotany socio-cultural aspects in order to explore additional medicinal plants of the district is required. In general, proper documentation and preservation of traditional medicinal plants and associated indigenous knowledge is important all over the country and in Tigray Region in particular. Future policy and research should also focus on proper conservation and development of pharmaceutical drugs from these traditional medicines.

Conflict of interests

The authors did not declare any conflict of interest.

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