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# Indigenous Ethnozoological and Ethnoveterinary Medicinal Practices in Leka Dullecha District, Western Ethiopia

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**Abstract:** The use of animals and plants for traditional medicine has emerged since the origin of humankind. Plants and animals are used as a source of food, medicine, clothing and other livelihood services. The study on indigenous ethnozoological and ethnoveterinary medicinal practices in Leka the Dullecha District was designed to investigate animal and plant species used as traditional medicine and the different modes of preparations, applications, storages and human and livestock ailments treated in the area. Data were mainly collected through a questionnaire in the form of an interview with 132 purposively selected respondents and group discussion. A total of 17 medicinal animals and 23 plant species were identified to treat various kinds of human and livestock ailments. The local people used smashing, chopping, powdering, squeezing and anointing as modes of traditional medicinal preparation methods. Traditional medicinal practitioners used plastic bags (27.78%), clay-made pots (25.56%), a sheet of cloths (24.44%), hanging in the home roof (16.67%) and bottles (5.55%) as a storage mechanism for traditional medicine in the study area. The result revealed that the local communities have rich knowledge about ethnozoological and ethnoveterinary traditional medicine, which could serve as baseline information for further ethnopharmacological studies. Documentation of such indigenous traditional medicinal knowledge could also be helpful for the invention of modern drugs. Hence, animal and plant species identified as sources of traditional medicine in the area should be conserved since extractive resource use patterns lead such species to local extinction.

**Key words:** Ethnozoology · Ethnoveterinary · Indigenous knowledge · Traditional healers · Traditional medicine

## INTRODUCTION

Ethnozoology is a science that deals with the various relationships and interactions between human and animal resources. Humans have accumulated knowledge about the significances of animals and plants for humans [1]. Animal derivatives are mostly used to treat various human diseases among many cultures [2]. The practice of treating human disease by the use of therapeutics derived from animals is known as zootherapy. Zootherapy constitutes a significant substitute among many other known therapies practiced worldwide [3]. The World Health Organization (WHO) estimated that as many as 80% of the world's population primarily depends on animals and plant-based medicines. Many human tribes and communities across the globe are utilizing animals as medicines [4]. Zoological medicines have played a significant role in healing different diseases as per the culture of Europeans and Africans, where many animal products are used both as food and medicine [5]. A wide variety of animals and animal products derived from different organs of animals have constituted part of the medicinal substances [6]. Of the 252 essential chemicals that have been used by the WHO, 11.1% come from plants and 8.7% of animals [7]. By-products of wild and domestic animals such as hooves, skins, bones, feathers and tusks form important ingredients in the preparation of curative, protective and preventive medicine [8].

Ethnoveterinary medicine is the science of treating livestock and other domestic animals with traditional medicine [9]. It is a scientific term used for the traditional animal health care that encompasses the knowledge,

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skills, methods, practices and beliefs about animal health care found among different community members. It involves the application of veterinary folk knowledge, theory and practice to treat the ailments of livestock [10]. Ethnoveterinary practices have gained tremendous importance in the last decade due to the discovery of some effective ethnoveterinary products [11]. For the remote local people, traditional veterinary medicines provide cheap therapy and easily accessible compared to the modern drugs [12]. Many farmers use a variety of ethnoveterinary knowledge for the purpose of maintaining the health of their domestic animals and they have utilized it in order to prevent and treat livestock ailments [13]. Many countries have documented ethnoveterinary practices with special emphasis on the use of medicinal plants, whereas the other countries have developed databases for botanical resources that could be used for research and development. Most rural people use herbal medicines for the treatment of domestic animals. Thus, the role of ethnoveterinary medicine in livestock development is beyond dispute, especially in remote rural areas [14-16]. As compared to ethnobotanical research, little attention has been given to zootherapeutic and ethnoveterinary researches. The investigation of zootherapeutic research has been started in the past few decades to aware the variety and importance of non-botanical remedies. In spite of the recent increase in zootherapeutic studies, the subject is still not exhaustively studied. Both ethnozoological and ethnoveterinary traditional medicinal knowledge has been passed orally from generation to generation. This may lead them to extinction or may put them endangered due to the current rapid socioeconomic, environmental and technological changes [17] or due to lack of interest by their descendants to continue in the folkloric claims. The documentation and validation of ethnoveterinary practices arose in the early 1980s. Since then, several studies have been carried out to save ethnoveterinary knowledge from extinction. This is because most traditional knowledge resided with elder community members and disappeared as they died [18]. However, the effort made to document ethnozoological and ethnoveterinary medicines are still insignificant when compared to the undocumented global medicinal animals and plants.

The significance of animal body parts in the history of pharmacology has been studied since the beginning of the 20$^{th}$ century. However, the use of traditional medicine has a long history in Ethiopia as most of the rural people are familiar with the traditional medicinal practice [19]. Although traditional medicinal knowledge is used much widely to treat livestock and human health in Ethiopia, the ethnozoological and ethnoveterinary traditional knowledge has not yet been well documented. This study was, therefore, designed to document the indigenous ethnozoological and ethnoveterinary traditional medicinal knowledge practiced in the Leka Dullecha district of the east Wollega Administrative Zone. The study focused on the methods of preparation, modes of application and the different parts of animals and plants used in the treatments of human and livestock alignments. This would serve as baseline data for pharmacologists, phytochemists and conservationists for further research and conservation activities of medicinal plants and animals in the area.

## MATERIALS AND METHODS

**Description of the Study Area:** The study was conducted in Leka Dullecha district of the east Wollega Administrative Zone, Oromia Regional State. It is about 358 km West of Addis Ababa and 27 km west of Nekemte town, along Nekemte Jimma road (Figure 1). The capital of Leka Dullecha is called Getema. Leka Dullecha is bordered by Nunu Kumba district in the south, by Guto Gida district in the east, by Buno Bedelle Zone in the west, by Diga district in the north and by the Jima Arjo district in the south. The study area has three agroecological zones. These include the midland, lowland and highland. About 47% of the district falls in the midland, whereas the remaining 44% and 9% are represented by lowland and highland climatic zones, respectively. The study area obtains rainfall from April to November. The annual rainfall of the study area ranges from 1, 000 to 2, 200 mm. The maximum temperature (29°C) was recorded in February and March, whereas the minimum (12°C) was in July and August.

### Methods

**Study Site Selection:** A preliminary study was conducted in August 2018 to select study sites in the district and to test data collection tools. The study was conducted in four Farmer Associations of Leka Dullecha district such as Getema, Gerachew, Bata Yakin and Horda Kewissa. Farmer Associations were purposively selected based on the availability of many traditional healers, the presence of different ethnic groups and the accessibility of the area.

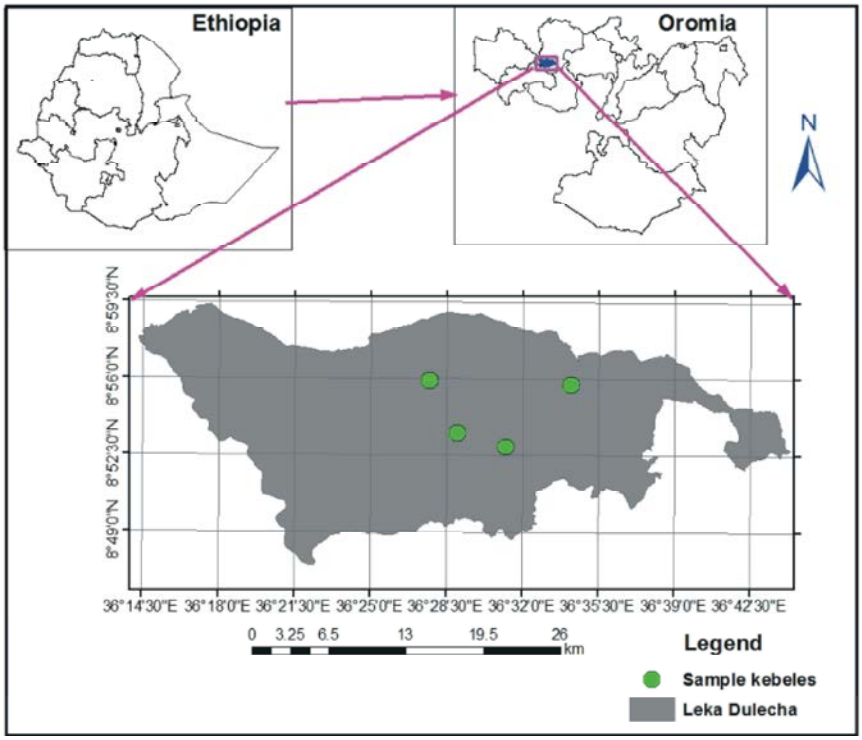


Fig. 1: Map of the study area

**Data Collection:** Ethnozoological and ethnoveterinary data collection were carried out from September 2018 to April 2019 in the selected Farmer Associations. Data were collected through semi-structured questionnaires in the form of an interview with selected residents of the four Farmer Associations. The interview was carried out in *Afaan Oromo*, which is the native language of the local people. The interview was made at the residences of each consent respondent. A total of 132 informants (105, 79.55% males) and (27, 20.45% females) were purposively selected for interviews [20]. These informants were local traditional healers, elders and persons who have long years of experience with traditional medicinal use in the area. Traditional healers and elders were selected purposively based on their experience and local recognition as knowledgeable individuals on zoo-therapeutics and ethno-veterinary medicinal use [21]. However, other consent respondents were selected randomly. The age of all respondents was ≥ 40 years, assuming that they have reach knowledge about the traditional medicinal use. During an interview, information about the local name of zoo-theraptic animals and ethnoveterinary medicinal plants, disease treated, route of administration, ingredients added, parts used and ailments treated were recorded. Ethnoveterinary medicinal plants were collected and identified by an expert in Wollega University's herbarium room. Also, the local name of an animal species was identified using researchers' local knowledge and the scientific names by an appropriate guide and literature.

**Data Analysis:** Data were summarized and analyzed using descriptive statistical methods. Fidelity level (FL) is useful for recognizing the most preferred plants used for curing certain ailments by the respondents. Hence, FL was calculated as the percentage of respondents claiming the use of certain animal species for the same ailments. For frequently reported diseases or ailments, Fidelity level was calculated as FL = Ip/Iu X 100 [22], where Ip is the number of informants who independently indicated the use of a species for treating a particular disease and Iu the total number of informants who reported the species for any given disease. This was used to determine the relative healing potential of the reported medicinal animal or plant species. The Fidelity level varies from 1 to 100% where a high value indicates that that particular species is used by a large number of people, whereas a low-value shows respondents disagreement on the usefulness of a species

in treating ailments. Use value (UV) is an expression of a certain relationship between the consumer and the subject consumed. It is a quantitative method that demonstrates the relative importance of species known locally. UV was calculated for each species by using the formula: UV = SU/n, where, UV is the use-value of the species. U is the number of citations per species and n is the total number of informants [23].

## RESULTS

**Demographic Characteristics:** Among the sampled populations, the sex ratio was predominated by males (68.94%) and the majority was found in the age group of 40-50 (33.33%) and the least was found to be >60 (7.58%). More than half of the respondents (64.39%) were married and the majority of educational status was illiterate (56.82%) and literate (43.18%). The majority of the inhabitants were farmers (79.55%), whereas about 15.15% and 5.30% were government employed and merchants, respectively (Figure 2).

A total of 17 animal species was reported to be used for the treatment of human and livestock ailments in the study area (Table 1). Some of the identified traditional medicinal animals include *Hystrix cristata, Crocuta crocuta, Potamochoerus larvatus, Lepush abessinicus, Panthera pardus* and *Python sebae*. These medicinal animals were used to treat different types of diseases such as swelling, malaria, evil spirit, asthma, wound of fire burn and headache. The meat of bush pig, *P. larvatus,* is used to treat swelling of the abdomen. It had the highest (FL = 92%) followed by meat of *H. cristata* to treat swelling of the abdomen (FL = 89%). The blood of common duiker, *S. grimmia*, reported to be used to treat heart failure (FL = 87.5%), the meat of *P. pardus* treats swelling of the abdomen (FL = 85.9%) and the eyelash of *C. crocuta* is used to treat humans caught by evil eye (FL =83.6%). The most important medicinal species with their high use value were *P. larvatus* (u= 129, uv = 0.98), *S. grimmia* (u = 127, uv = 0.96), *P. pardus* (u = 123, uv = 0.93) and *C. crocuta* (u = 113, uv = 0.86).

A total of 23 plant species was used for treating human and livestock ailments in the study area. Some of the medicinal plants include *Echinops sp, Guzotia scabra, Zingiber officinale, Allivum sativum, Datura stramonium, Rumex nepalensis, Justici schimpriana, Clausena anisata, Stereospermum kunthianum, Brucea antidysentrica, Lepidium sativum, Calpurnia aurea* and *Cucumis ficifolius*. The bulb of *A. sativum* was reported to treat abdominal ache with the highest fidelity level (FL = 86.5%), followed by the root of *Z. officinale* (FL = 82%) and *C. ficifolius* (FL = 78.8%). The leaf of *J. scimperiana* was used to treat rabies (FL = 78%), the leaf of *Echinops spp.* treat dulled and emaciated animals (FL=78.03), the leaf of *C. aurea* used to treat from ectoparasites (FL=72.9%) and the seed of *L. sativum* treat swelling of the abdomen (FL= 67%). The root of *G. scabra* had the lowest fidelity level value (Table 2).

Traditionally, different animal parts are used to treat different ailments in the study area (Figure 3). Some of the animal parts used as medicines are meat 6 (23.08%), blood 4 (15.38%), whole body 3 (11.54%), liver 2 (7.69%), milk 2 (7.69%) and hair 2 (7.69%), civet 1 (3.85%), eyelash 1 (3.85) and bone 1 (3.85%). Among these, meat was the most widely used animal products in traditional medicine in the study area.

The local traditional practitioners used different methods for the preparation of traditional medicine. Traditional medicinal preparation varies based on the types of disease treated and the actual site of ailments. The principal methods of plant remedy preparation were smashing 33 (37.08%), followed by chopping 20 (22.47%), powdering 17 (19.01%), squeezing 11 (12.36%), anointing 11 (12.36%) and tying to infected sites 8 (8.99%) (Table 3).

**Peoples' Practice about Traditional Medicinal Animals and Plants:** The majority of people had practiced traditional medicinal use of animals and plants. As reported by traditional medicinal practitioners, 50.25% of traditional medicine was given to adults, 26.44% for sub-adults and 12.32% for children. However, the remaining respondents (11.12%) revealed that they used traditional medicine for different age categories without specifying age for which it was applied (Figure 4).

Traditional medicinal practitioners used different methods to preserve traditional medicine in the study area. Among the different methods used, the use of plastic bags was ranked first 25(27.78%) followed by clay-made pots 23(25.56%), sheet of cloths 22(24.44%), hanging over smoky areas of home roof 15 (16.67%) and bottles 5(5.55%) (Figure 5).

The local people preferred the use of traditional medicines because of various reasons. As reported by the local people, traditional medicine was preferred because of its accessibility 21 (63.64%), low cost 5 (15.15%), acceptability 4 (12.12%) and effectiveness 3 (9.09%) (Figure 6).

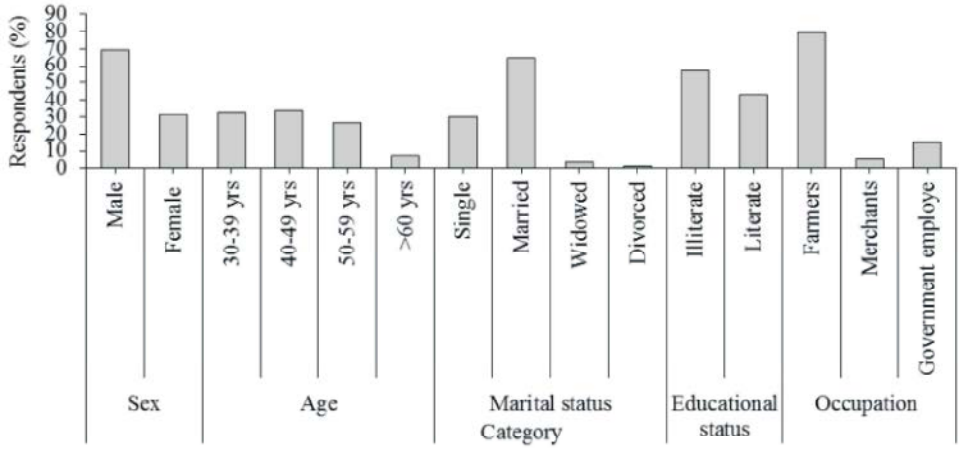


Fig. 2: Demographic characteristics of respondents in the study area

Table 1: Medicinal animals, parts/products used, ailments treated and mode of preparation in the study area

| Scientific name | Parts/ products used | Mode of preparation and application | Ailments treated | Np | N | FL (%) | U | UV |
|---|---|---|---|---|---|---|---|---|
| *Hystrix cristata* | Meat | Fresh meat is cooked and given to children | Swelling of the abdomen | 48 | 54 | 89 | | 0.98 |
| *Procavia capensis* | Meat | Fresh meat is cooked and given to children | Swelling of the abdomen | 21 | 31 | 64.5 | 111 | 0.84 |
| *Capra aegagrus hircus* | Meat and blood | Fresh meat and blood are given for sick person so as to eat and drink | Malaria | 31 | 49 | 63.2 | 89 | 0.67 |
| *Crocuta crocuta* | Eyelash | Fumigating skin of the eyelash when humans caught by evil sprit | Evil eye | 41 | 49 | 83.6 | 113 | 0.86 |
| *Potamochoerus larvatus* | Meat | Cooked fresh meat is consumed by the sick person | Abdominal pain | 48 | 52 | 92 | 132 | 1 |
| *Equus africanus asinus* | Milk | Drinking fresh milk | Asthma | 21 | 30 | 70 | 99 | 0.75 |
| *Lepus abessinicus* | Hair | Hair is placed on wound due to fire burn | Fire burn | 27 | 62 | 43.5 | 93 | 0.70 |
| *Civettictis civetta* | Musky | Sniffing musky through the nose | Headache | 26 | 65 | 40 | | 0.42 |
| *Panthera pardus* | Meat | Consuming cooked fresh meat | Swelling of the abdomen | 49 | 57 | 85.9 | | 0.96 |
| *Python sebae* | Skin | Fumigating dry skin through the nose | Evil sprit | 35 | 49 | 71 | 99 | 0.75 |
| *Gallus domesticus* | Liver | Eating fresh liver | Abdominal pain for human | 28 | 61 | 45 | 77 | 0.58 |
| *Apis mellifera* | Honey | Fresh honey is prepared and let to be drunk | Cough | 18 | 45 | 40 | 55 | 0.42 |
| *Sylvicapra grimmia* | Blood | Fresh blood is mixed with local alcohol and drunken | Heart failure | 42 | 48 | 87.5 | | 0.97 |
| *Tragelaphus scriptus* | Meat | Eating fresh meat | Chest pain | 44 | 62 | 70.9 | 103 | 0.78 |
| *Papio anubis* | Dung | Fumigating dry dung to a broken leg | Broken leg | 42 | 58 | 72.4 | 103 | 0.78 |
| *Chlorocebus aethiops* | Hair | Fumigating hair to a sick cow | Black leg | 38 | 64 | 59.4 | 82 | 0.62 |
| *Gallus sonnerati* | Meat | Eating partially cooked meat | Spine problem | 48 | 54 | 88.8 | 93 | 0.70 |

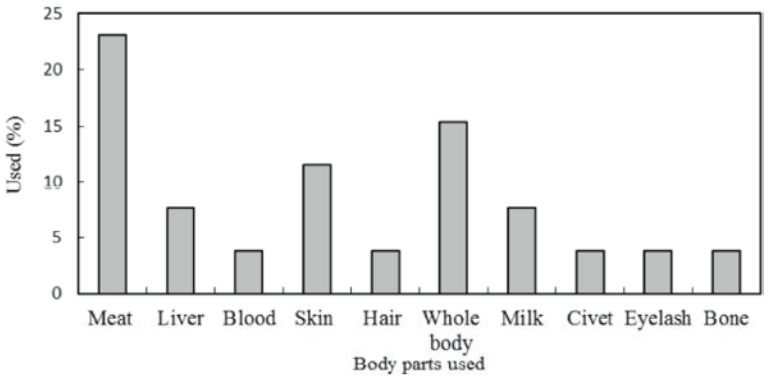


Fig. 3: Body parts of animals used as traditional medicine in the study area

Table 2: Medicinal plants, parts/products used, ailments treated and mode of preparation in the study area

| Scientific name | Parts/ products used | Mode of preparation and application | Ailments treated | Np | N | FL(%) | U | UV |
|---|---|---|---|---|---|---|---|---|
| *Echinops sp* | Leaf | Its leaves are chopped and given to cows with feed | For dulled and emaciate mammals | 52 | 67 | 80 | 103 | 0.78 |
| *Guzotia scabra* | Root | Its roots are inserted into the needle for the suturing of wound part | Suturing of wounded body for all mammals | 24 | 62 | 38.7 | 45 | 0.34 |
| *Cucumis ficifolius* | Root | Smash and mix with water, then let cows to drink | Abdominal ache for cow | 44 | 58 | 75 | 109 | 0.83 |
| *Calpurnia aurea* | Leaf | Squeeze and anoint | Ectoparasites such as lice infestation | 35 | 48 | 72.9 | 93 | 0.78 |
| *Lepidium sativum* | Seed | Powdering and mix with water and then allow mammals to drink | Swelling of the abdomen for cow, dry coughing for all mammals | 48 | 72 | 67 | 89 | 0.67 |
| *Zingiber officinale* | Roots | Bulbs are chopped with salts and given orally for two days | Abdominal ache or cramp | 52 | 63 | 82 | 115 | 0.87 |
| *Justicia scimperiana* | Leaf | Squeezed and given with feed | Rabies | 51 | 65 | 78 | 111 | 0.84 |
| *Allivum sativum* | Bulb | Bulbs are chopped with salts and drenched orally | Abdominal ache or cramp | 45 | 52 | 86.5 | 129 | 98 |
| *Brucea antidysentrica* | Leaf | Drinking water squeezed from the leaf and drops applied on the side of the infected eye | Used for fattening cow, treat blindness or treat eye discharged animals | 21 | 49 | 42.8 | 89 | 0.67 |
| *Clausena anisata* | Leaf | Smash and rub the skin of cow with it | Lice infestation for cow | 36 | 53 | 67.9 | 93 | 0.70 |
| *Dracaena afromontana* | Leaf | Smash and given for cow with feed | Treat illness of cow after delivery | 34 | 47 | 69.3 | 93 | 0.70 |
| *Rumex nepalensis* | Root | Smash and mix with *Zingiber oficinale* and then let cows eat | Abdominal ache or cramp | 58 | 74 | 78.3 | 107 | 0.81 |
| *Stereospermum kunthianum* | Peel | Smash and mix with salts, then let cows drink | Swelling of the abdomen and abdominal ache | 47 | 61 | 77 | 111 | 0.84 |
| *Datura stramonium* | Root | Smash and mix with salt, then given for cow with feed | Abdominal ache | 52 | 73 | 71 | 93 | 0.70 |
| *Nicotiana tobacum* | Leaf | Chopped and given to livestock mammals | Leech | 53 | 71 | 74 | 99 | 0.75 |
| *Solanum gigantum* | Root | Squeeze and let to drink | Rabies | | | | 104 | 0.79 |
| *Citrus limon* | Fruit | Squeeze and mixed with water. Then, let the cow to anoint | Lice infestation | 41 | 56 | 71.9 | 107 | 0.81 |
| *Cucumis ficifolius* | Root | Smash and let to drink | Rabies | 44 | 56 | 78.8 | 95 | 0.72 |
| *Croton macrostachus* | Latex | Smash and let to anoint | Fungal disease | 42 | 75 | 56 | 63 | 0.48 |
| *Clucia lanceolate* | Root | Smash and let cow to drink | Rabies | 33 | 51 | 64 | 87 | 0.66 |
| *Olea europeaea* | Leaf | Chop and sniff to inhale | Rabies and snake bite | 56 | 77 | 72.7 | 93 | 0.70 |
| *Dodonaea angustifolia* | Leaf | Smash and let the cow to anoint | Lice infestation | 36 | 69 | 52.2 | 81 | 0.61 |
| *Phytolaca dodecandra* | Leaf | Drinking squeezed juice of the leaf | Rabies | 31 | 62 | 50 | 75 | 0.57 |

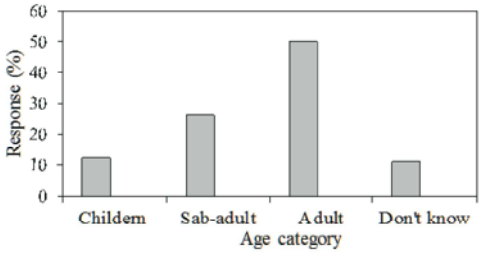


Fig. 4: The utilization of traditional medicine by different age groups in the study area

Table 3: Ranking of indigenous knowledge related to traditional medicine preparation in the Leka Dullecha district (Lh = Local healer)

| Preparation methods | Lh1 | Lh2 | Lh3 | Lh4 | Lh5 | Lh6 | Lh7 | Lh8 | Lh9 | Lh10 | Total | (%) | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Smash | 3 | - | 6 | 3 | 3 | - | 2 | 7 | 1 | 8 | 33 | 37.08 | 1 |
| Chopping | 3 | 1 | - | 3 | 2 | 7 | - | 1 | - | 3 | 20 | 22.47 | 2 |
| Powdering | 5 | 1 | - | - | 1 | - | - | 7 | 3 | - | 17 | 19.01 | 3 |
| Squeeze and anoint | - | - | 5 | - | 1 | - | 3 | - | - | 2 | 11 | 12.36 | 4 |
| Tying | - | 1 | - | - | - | 7 | - | - | - | - | 8 | 8.99 | 5 |

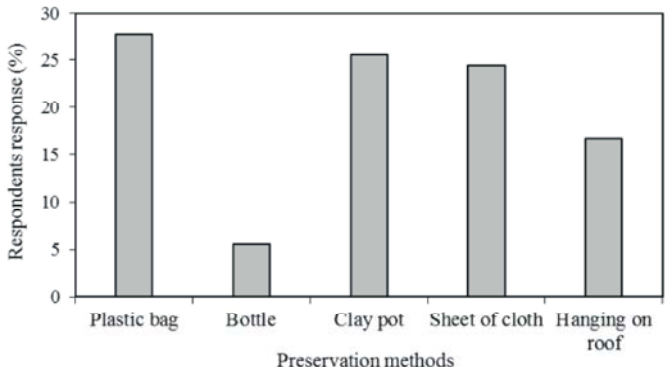


Fig. 5: Different preservation methods of traditional medicine in the study area

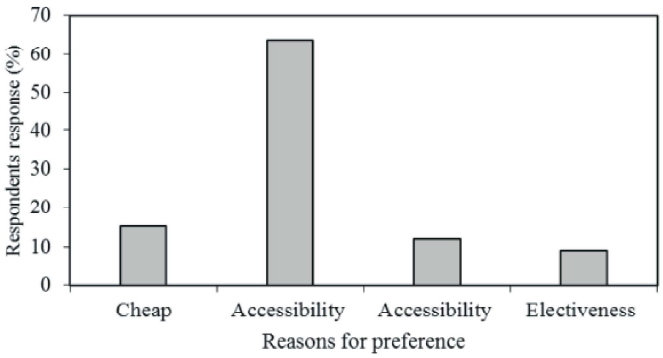


Fig. 6: Reasons for preference of traditional medicine in the study area

Table 4: The side effects and advantages of traditional medicine as reported by the local people in the study area (N = Number of respondents)

| Variable | N (%) |
|---|---|
| Side effects of using traditional medicine from both animals and plants | |
| Negative effects | |
| • Vomiting | 7(31.82) |
| • Diarrhea | 5(22.73) |
| • Abdominal pain | 2(9.09) |
| • Transmission of zoonotic diseases | 8(36.36) |
| Positive aspects | |
| • Equally available for all individuals | 18 (81.82) |
| • Easily available | 4 (18.18) |
| Advantage of traditional healers' existence? | |
| • Acts as baseline further study | 18 (81.82) |
| • Traditional knowledge easily handed down for generations | 4 (18.18) |

As reported by the locals, the use of both animal and plant traditional medicines have many side effects which include diarrhea (22.73%), vomiting (31.82%), abdominal pain (9.09%) and transmission of zoonotic disease (36.36%). About 81.82% of health workers believed that both traditional medicinal animals and plants were equally

available, whereas about 18.18% believed that traditional medicinal animals and plants were easily available. All 100% health workers believed that the organization of traditional medicinal practitioners at district level had an advantage because it is a baseline for scientific investigation (Table 4).

## DISCUSSION

Study on ethnozoological and ethnoveterinary traditional medicinal practices in the Leka Dullecha district was mainly considered older people as they have rich knowledge compared to youngsters. Traditional medicinal knowledge was rarely shared for youngsters because they are not committed to keep the knowledge of traditional medicine as secret. Older people accumulated traditional medicinal knowledge over long years of experience and exposure to different human and animal ailments. Most of the time, knowledge of traditional medicine was transferred orally to elder within the family and then to others when they get matured. Recently, modern generations are less likely depended over traditional medicines. This could lead to the decline of indigenous traditional medicine knowledge in the modern generation than in uneducated older people. Educated individuals rely more on modern medicine than uneducated individuals. Similarly, ul Hassan *et al*. [24] reported that young generation had little knowledge about the traditional medicines while the older people know much more about the traditional knowledge to treat human and livestock ailments.

Livestock and their products are playing a significant role in the economy of Ethiopia because it is used as food sources and industrial raw materials. Also, livestock is the most known asset and sources of income in the rural people of Ethiopia. In addition, livestock plays a significant role in traditional agriculture in rural communities. As a result, they use diverse traditional medicine to have healthier livestock. The local people are using traditional medicine to treat their livestock, mainly due to lack of access and high price of modern medicines. Besides, the local people depend on traditional medicines due to the lack of modern education which made them to give less attention to the modern medicine. The local people in the Leka Dullecha district used various animal and plant species to treat various human and livestock diseases. As stated by Oyda [25], farmers in developing nations use medicinal plants for treating livestock diseases due to lack of access to modern veterinarians' medicines. Moreover, they have no trust on the modern medicine, but on traditional medicine. Also, ethnoveterinary medicines are easily prepared with very little or no cost to farmers. Sometimes, farmers use traditional medicines as an emergency treatment for livestock until they obtain modern medicines.

About 80% of people living in developing countries use traditional medicine for treatment of different types of illness and disease [26]. In Ethiopia, 70% of human and 90% of livestock population depend on traditional medicine [27]. In the present study area, 23 plants and 17 animal species were identified for the treatment of different livestock and human ailments. Similarly, Haileselasie [21] have documented 23 traditional medicinal animals or their products in Degu tribes in the Tigray region.

Different plants and animals were identified and documented as the sources of traditional medicine for animal and human health care practices [28]. The local people found to use different parts/products of animals and plants for the treatment of different kinds of human and livestock ailments. Animals and the products derived from their body organs constitute part of the inventory of medicinal substances [3]. Similarly, meat, liver, shell, blood, milk, skin and the whole-body parts of animals were used to treat different diseases in the present study area. Several studies also reported that wild and domestic animals and their products such as hoof, skin, bone, feather and tusk were used in the preparation of curative, protective and preventive medicine [28, 29, 30]. In the present study area, leaf and root were the most common parts of plants used for the preparation of traditional medicine. This is in agreement with the findings of Tabuti *et al.* [31] and Hunde *et al.* 32], where root and leaf are the most widely used plant part in ethnoveterinary medicine practices. The utilization of leaves for ethnoveterinary medicine does not have an impact on medicinal plants as the harvest system is sustainable. To the contrary, the practice of using root as traditional medicine has serious impact as the total removal or gradual removal of roots threaten the future survival of medicinal plant species. For the plant species whose roots are used for traditional medicine, special conservation activities should be done to sustain the species.

There are different ways of preparing traditional ethnozoology and ethnoveterinary medicines to treat human and livestock diseases. In the present study, smashing, followed by chopping, powdering, squeezing,

anointing and tying to infected sites were identified as the most common preparation methods of ethnozoological and ethnoveterinary medicines. The preparation methods of traditional medicine varied based on ailments treated, ingredients required for extraction and routes of application. However, the preparation of traditional medicine does not require additive substances such as sugar, butter, salt and spice as reported by Kendie *et al.* [33]. Ethnozoological and ethnoveterinary traditional medicines were mainly administered by drinking, eating, anointing, tying, branding, fumigation and massaging [31, 34]. Likewise, people in the Leka Dulecha district administered traditional medicine as food, sneezing, anointing, fumigation and tying on a particular body parts need to be treated. The use of traditional medicine varied among different age categories in the study area. Traditional medicine has been mostly administrated for adult, sub-adults and children. This could be associated with the fear of the lack of dosage for administration of traditional medicine for children than sub-adults and adults. Similar problem on the lack of knowledge of dosage administration in traditional medicine was reported by Birhanu and Dereje [35]. Hence, the use of traditional medicinal remedies for the children might have a serious side effects on their health as they have less resistance compared to sub-adults and adults. However, traditional healers reported that they prescribed different doses of remedies for different age groups in the study area. According to Tadese *et al.* [36] more amounts of remedies were given for adults than children to treat the same disease. Most of the time, traditional medicinal practitioners administer by reducing the amount by 25% or less for the children. Though the amount of the traditional medicine dosage administered was not known, the amount administrated for all age categories by no means match with the standard of modern medicine prescribed in literature.

Ethnoveterinary medicine is frequently used for the treating of livestock diseases by many different ethnic groups in Ethiopia. It plays an important role in animal production and livelihood development of the local people and the country. It provides valuable alternatives to and complements western veterinary medicine [37]. Ethnoveterinary medicine is accessible, easy to prepare and administer at little or no cost to the farmer [38]. Similarly, people in the present study area preferred ethnoveterinary and ethnozoological traditional medicine because of its accessibility, low cost, acceptability and effectiveness of treatments. Traditional medicines were harvested or used for human and livestock remedies from the wild because of easy access and harvest and with no or low cost. Especially, farmers who have low income for their livelihood activities directly depend on ethno-veterinary and ethno-zoological traditional medicine to treat human and livestock ailments. As remarked by Taylor *et al.* [40]. The use of local, more easily accessible resources is possibly related to historic aspects and to financial constraints that limit access to such resources.

Traditional medicinal practitioners use different methods to store traditional medicine in the study area. Among these, the use of plastic bags was ranked first, followed by pot made of clay, cloth, hanging over smoky areas of home roof and bottles. Traditional medicines which are not easily available were harvested and preserved every time they encountered in the area. However, traditional medicines which are used as fresh were not harvested and stored, but their locations were marked for future use. The local people mentioned that vomiting, diarrhea, abdominal pain and transmission of zoonotic diseases are the common side effects of traditional ethnozoological and ethnoveterinary medicines. This could be ascribed to the lack of dosage, modes of reparation and consumption of raw meat. As reported by Taylor *et al*. [40] more than 800 human pathogens come from animals. Hence, more than 75% of emerging human infectious diseases are caused by Zoonoses [40, 41].

## CONCLUSION AND RECOMMENDATIONS

Indigenous ethnozoological and ethnoveterinary traditional knowledge are very important for developing new drugs. The conservation of faunas and floras used for traditional ethnozoological and ethnoveterinary medicines has paramount significance for the sustainable use of these species. Hence, indigenous ethnozoological and ethnoveterinary medicinal studies addressed in this study will be worthwhile for future ethnopharmacological studies and conservation of the species. The result of this study showed that animals and their products and plants have vital roles in the treatment of different human and animal ailments. The local people have rich indigenous knowledge about the preparation, administration and traditional remedies of ethnozoological and ethnoveterinary medicines. However, less effort has been

made to document and conserve indigenous traditional medicines of the area in particular and in Ethiopia in general, though the country is known for its diverse fauna, flora and associated traditional medicines. Traditional medicinal knowledge is limited to elders and used by marginalized communities in remote areas. Since traditional medicine is less likely used by the modern generation, animals and plants used for the purpose are highly vulnerable to extinction because of unsustainable exploitation. We suggest that further indigenous traditional health remedy knowledge should be studied and documented since it is an important therapeutic option for remote and poor rural communities. Furthermore, the government and other stakeholders should regulate the utilizations of traditional ethnozoological and ethnoveterinary medicines and find a way of integrating indigenous knowledge with the modern medicine. It is, therefore, imperative to alert the local community on the significance of biodiversity conservation in general and the sustainable use of species identified as sources of ethnozoological and ethnoveterinary traditional medicine in the study area.

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