Folk Medicinal Use of Some Animals and Their Products in Wolaita, Southern Ethiopia

Abenezer Wendimu
Wolaita Sodo University

Wondimagegnehu Tekalign (wondimagegnehubeyene@gmail.com)
Wolaita Sodo University https://orcid.org/0000-0002-4721-7528

Research

Keywords: Ethnozoology, Folk medicine, Indigenous knowledge, Traditional medicine, Zootherapy

Posted Date: July 24th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-733638/v1

Abstract

Background

Ethiopia is endowed with a diverse set of floral and faunal resources that are useful to human beings in one or another ways. A faunal resource has played a significant role in human life from the earliest days of recorded history for medicinal purposes to treat different ailments and is still common in many parts of the world.

Methods

A field survey was carried out in Diguna Fango district from March 2021 to June 2021 by personal interviews through semi-structured questionnaires and open group discussions.

Results

Altogether 200 (125 male and 75 female) informants provided information regarding the therapeutic uses of different animal parts/products. A total of 39 animal parts/products used for the treatment of 159 different ailments were identified. Mammals occupied the highest use report 26(66.67%), followed by arthropods 5(12.81%) and avian species 4(10.26%). Further, some most popular zootherapeutic animals i.e. *Phacochoerus africanus*, *Hystrix cristata*, *Bos taurus*, *Equus africanus asinus*, *Homo sapiens*, etc. were used to treat more than three different ailments. Anemia, asthma, bone fractures, cold, evil eye, fever, pleurisy, rheumatism, skin disease, and stomach pain were some of the frequently occurring ailments. The most frequently used route was dermal (72%), followed by oral and nasal routes each with 14%. Drinking 32(33%), eating 25(26%), and tying 11(11.30%) were the major modes of application. Fidelity level showed the leg of *Bos taurus* and fur of *Lepus fagani* with the highest (FL = 100%) to treat slipped disc and wound, respectively. The highest value of the RFC index was scored by *Bos taurus* (RFC = 1).

Conclusion

The results show that there's a wealth of ethnozoological knowledge to be documented which could be of use in developing new drugs. Hence, it's hoped that the knowledge contained during the paper is going be useful in future ethnozoological, ethnopharmacological, and conservation-related research of the region.

Background

Ethiopia is endowed with a diverse set of floral and faunal resources that are useful to human beings in one or another ways. Deposits of oil, timber and many different crop plants, and many different species of animals make up rich ecosystems that supporting a wide variety of life forms. Human beings have relied on nature for their basic requirements as the source of medicines, shelters, food, fragrances, clothes, flavors, fertilizers, and means of transportation throughout their lives [1].

Faunal resources have played significant roles in human life from the earliest days of recorded history for medicinal purposes to treat and cure diseases and to improve the health and well-being of humans and livestock. Since prehistoric time's animals, their parts, and products have been used as part of an inventory of medicine in numerous cultures [2].

The world health organization estimates that most of the world's population relies primarily on animal and plant-based medicines [3]. Of the 252 indispensable chemicals that are selected by the WHO, 8.7% are derived from animal resources [4]. In Ethiopia over 320 species of mammals, above 860 species of birds, 200 species of reptiles, 63 species of amphibians, and 145 species of fish diversities were reported [5]. Of these faunal species, some are used in traditional healthcare practices for the treatment of human and livestock ailments.

In north-western Ethiopia, the medicinal uses of 51 animal species were identified to treat around 36 different ailments. Of the animals used therapeutically, 27 species were mammals, 9 were birds, 7 arthropods, 6 reptiles, and 1 species each represented fish

and annelids [6]. In southern Ethiopia, the medical use of 21 animal species was identified to prepare remedies for 46 different ailments. Of the animals used therapeutically, 14 species were mammals, 3 species were reptiles and 4 species were birds [7].

Similar studies from around the world reported animals as medicine in connection with various health conditions by humans and livestock. Traditional healing methods involving many insects and other invertebrate species are reviewed by Meyer-Rochow [8]. In South Africa, animals and plants are commonly used as traditional medicines for both the healing of ailments and for symbolic purposes like improving relationships and attaining luck [9]. In Tangsa and Wancho tribes of north-east India, altogether 55 (both vertebrate and invertebrate species) were identified as therapeutic [10]. A similar study in India, Assama, reported a total of 44 different species used for the treatment of 40 different ailments. In Brazil, it was reported that 283 animal species were used to prepare remedies for the treatment of various ailments [4]. In Bahia state, within the northeast, a part of Brazil, over 180 medicinal animals are recorded in traditional health care practices [11]. In Traditional Chinese Medicine more than 1500 animal species have been recorded to be some medicinal use [12]. Lev and Amar [2] also reported 20 animal species that were sold as traditional drugs in selected markets of Israel.

In the modern era, zootherapy is used as alternative means to many known therapeutic practices in the world. Wild, also as well as livestock and their by-products like hooves, skins, bones, feathers, and tusks, function as important ingredients within the preparation of curative, protective, and preventive medicines [13] [14] [15]. It plays a significant role in healing practices, magic, rituals, and religious societies all over the world [13] [14]. The preparation of remedies for human ailments using therapeutics from animals is known as zootherapy [11].

Currently, more than 80% of the world population uses traditional medicine either on its own or as a complementary medicine [16]. More than 80% of the population in Sub-Saharan Africa relies on traditional medicines and Traditional Health Practitioners (THPs) as the primary source of health care [1] [17]. Like in many other developing countries, in Ethiopia most of the tribal communities are dependent on the local traditional medicinal system for their health care because they are living in very remote areas where hospitals and other modern medicinal facilities are not available. It is estimated that more than 80% of the rural population in Ethiopia depends on traditional medicine [1] [18] [19] [20].

A lot of work has been done on the utilization of plants and their products as traditional and allopathic medicine in the world. Like plants, animal and their products also keep medicinal properties and remain the most available and affordable form of therapy [21]. Most ethnobiological studies conducted in Ethiopia have focused on traditional knowledge of plants [1] [22] [23] [24] [25] [26] [27] [28]. A little work has been done in ethnozoology and particularly no work is documented in Diguna Fango district and there is a definite scarcity of ethnobiological knowledge when it comes to animal products. Therefore, the present study briefly reports an ethnozoological study from Diguna Fango district, Wolaita, Ethiopia.

Methods

Study area

The study was conducted in seven nearby kebeles in the lower Fango cluster of Diguna Fango district (Bilate Charicho; Bilate Eta, Fango Sore, Dimtu, Fango Boloso, Fango Damot, and Fango Ofa) from March 2021 to June 2021. These kebeles were purposively selected supported the supply of the many traditional healers and accessibility. The district is located at 6°57'571"N 38°02'15.7"E. The altitudinal range of study area is between 1395 m.a.s.l. and 2070 m.a.s.l. The area is located approximately 350 km south of the capital of the country Addis Ababa and 93 km from Sodo town, the capital town of the zone in the northeast direction. Diguna Fango is bordered on the southwest by Damot Weyde district, on the west by Damot Gale district, on the north by Hadiya zone, on the northeast by Oromia region, and on the east by Sidama region. The average annual rainfall and temperature of the area are approximately 700 mm and 21 ^{o}C, respectively.

Sampling and data collection

To collect data about the ethnomedicinal use of animals, 35 volunteers have participated in field surveys. They were grouped into five sections (five volunteers in one group). Each group carried out the field survey in the selected kebeles as assigned by the supervisor. The data collectors were taken enough training before starting the field survey. The ethnomedicinal data about the utilization of animals and their products were collected using the participatory rural appraisal (PRA) method, where the informants

also sometimes become investigators themselves, involves an interview, informal meetings, and open group discussions with semi-structured questionnaires [29] [30] [31]. The selection of informants was based on their traditional healing experience, recognition as experts, and knowledge of old aged people concerning the preparation of traditional medicine.

Informants were inquired, about the illnesses cured by animal-based medicines and therefore the manner during which the medicines were prepared and administered. They were also requested thorough information about mode of preparation and blending of animal products used as ingredients and whether or not they use the animal within the healing practice since this type of data indicate how a given medicine is often therapeutically effective in term of the proper ingredients, the right dose and therefore the right length of medication. The local name of animals and detailed ingredients of medicine whether they use only animal parts or mixed with other ingredients like plant material were also noted. The scientific name and species of animals were identified using relevant and standard literature [5] [32] [33].

Group discussion

Brief group discussions were made at each site earlier to the interview on the importance of animals in traditional medicine and related issues with the chosen informants of the study site. During the discussions, an attempt was made to encourage the healers in such a way that their cooperation would be of benefit to the country, and at the same time, informed consent was obtained before data collection.

Semi-structured interviews

A semi-structured checklist and interview questions were prepared beforehand. The interviews have supported the checklist, and a few issues were raised promptly counting on the responses of an informant. The interview was held in Wolaitic, the language of the people by the researchers. The place and time for the discussion were set based on the interest of the informants.

Data analysis

The collected data by semi-structured questionnaire, interview, and group discussion was tabulated and organized. To analyze the collected data Excel for window 2019 was utilized in addition to other appropriate statistical tools such as frequency distribution and percentage. According to the animal parts and products categories in earlier work [6] [34] and with some modification, the medicinal parts and products of animals were categorized based on the usage reports mentioned by the informants within the study area.

Quantitative analysis

Fidelity Level (FL): Fidelity level (FL) demonstrates the percentage of respondents claiming the use of a certain animal species for the same illnesses, was calculated for the most frequently reported ailments as $FL (\%) = Np/N \times 100$

Where: Np is that the number of informants that claim the utilization of animals to treat a specific ailment. N is the number of informants that claim the animal as a medicine to treat any given ailment. The range of fidelity level (FL) is from 1% to 100%. High use-value (close to 100%): the animal species that are widely wont to treat a specific ailment by the local people have higher FL values than people who are less popular [29] [35].

Relative frequency of citation (RFC): Relative frequency of citation (RFC) index shows the local importance of each species. The RFC value was calculated using the formula $RFC = FC/N$; where FC is the number of informants mentioning the use of the species and N is the number of informants participating in the survey [36]. This RFC index varies from 0 to 1. When the RFC index is 0, it means nobody refers to the animal as useful and when the RFC index is 1, it indicates that each one informant in the survey refers to the animal as useful [37].

Results

The present study identified the traditional medicinal knowledge of treating various kinds of ailments using different animals and their parts/products by local inhabitants of different kebeles of Diguna Fango district, Wolaita, Ethiopia. During the field survey, altogether 200 (125 male and 75 female) informants participated in the interview and group discussion. In terms of age range, 94 (47%) informants within the age group 55 and above, followed by 73 informants (36.5%) with 45 to 54 age group and 33 (16.5%)

with 35–44 years age group. Due to lack of awareness, access to modern education, and remoteness of educational institutions, most of the people in the study area were lack formal education. As of the total respondents, 104 respondents were illiterate and the remaining 96 are attended at least primary school either in regular or extension programs.

Totally, 39 animal species used as traditional medicines were identified from Diguna Fango district for the treatment of various human and livestock ailments (Table 1). Among these, mammals constituted the highest use reports 26(66.67%), followed by arthropods 5(12.81%). Furthermore, 4(10.26%) avian species, reptiles 3(7.7%), and fishes 1(2.56%) have been reported to be used in the traditional remedy preparation practices based on animals in the study area (Fig. 1).

Table 1
Medicinal animals, there parts and products for traditional therapeutic purposes by the people inhabiting Diguna Fango, Wolaita, Ethiopia

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
Mammals	Warthog	Gaashuwa (W), Kerkero (A)	*Phacochoerus africanus* (Gmelin, 1788)	Meat	Eating	Bacterial infections, rheumatism
				Spur, Stirrup	Massaging (warm)	Breast pain, swelling
				Teeth	Massaging (warm)	Breast pain
				Soup	Drinking	Bacterial infections, common cold
Mammals	Porcupine	Quxarssaa (W), Jart (A)	*Hystrix cristata* (Linnaeus, 1758)	Meat	Eating	Weight gain, bacterial infections, stomach pain, pleurisy, stunting, rheumatism, swelling
				Bone	Fumigate with smoke	Malaise
				Soup	Drinking	Paralysis, stunting
				Bile	Drinking	Pleurisy
Mammals	Cow	Miizzaa (W), Lam (A)	*Bos Taurus* (Linnaeus, 1758)	Milk (raw)	Drinking	Gastritis, typhoid fever, weight gain, toxin
				Spleen	Eating	Pleurisy, sciatica
				Liver	Eating	Anemia
				Bile	Drinking	Fever (malaria)
				Butter	Eating	Pleurisy, cold, common cold, bone fractures, weight gain
					Topical application	Headache
				Pancreas	Eating (fresh)	Sciatica, cold
				Milk (churned)	Drinking	Energy gain, teeth strength
				Cheese	Eating	Stomach pain
				Fresh butter	Inserting and holding on	Ear pain, teeth pain
				Rumen	Drinking (warm)	Swelling, skin disease
				Digestive juices	Eating with other food	Fever (malaria), throat cancer

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
				Leg, below knee, up to hoof	Inside well covered pot the leg is cooked with spices for 4–6 days and drinking the soup in warm.	Cold, bone fractures, slipped disc
Mammals	Donkey	Hariya (W), Ahiya (A)	*Equus africanus asinus* (Linnaeus, 1758)	Milk (raw)	Drinking	Asthma, pleurisy, pneumonia
				Excrement	Mixing with water and drinking	Cold in chicken
					Smelling	Sinusitis, bronchitis
Mammals	Human	Asaa (W), Sew (A)	*Homo sapiens* (Linnaeus, 1758)	Breast milk	Dropping	Children eye disease
				Urine	Dropping	Wound
				Hair	Fumigation, or, taking hair from the ghul or ghulah and milling, mixing with water then drinking	Evil eye (ghoul)
Mammals	Ethiopian hare	Harbbaynnuwa (W), Tinchel (A)	*Lepus fagani* (Thomas, 1903)	Fur	Topical application	Wound (burnt)
				Meat	Eating	Stunting in children
Mammals	Spotted hyena	Godariya (W), Jib (A)	*Crocuta crocuta* (Erxleben, 1777)	Tongue	Air drying, milling, mixing with water and drinking	Evil eye
				Excrement(dung)	Air drying, milling, mixing with water and taking it orally.	Evil eye, sciatica, improve the quality of milk in livestock, stomach pain
				Sole	Handling	Running problem
				Eye lash	Handling	Over sleeping
				Teeth	Tying around the neck	Lymphadenopathy

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
Mammals	Sheep	Dorssaa (W), Beg (A)	*Ovis aries* (Linneaus, 1758)	Blood	Drinking	Anemia
				Milk	Drinking	Asthma, cold
				Meat	Eating	Weight gain
Mammals	Goat	Deeshshaa (W), Fiyel (A)	*Capra aegagrus hircus* (Linneaus, 1758)	Milk	Drinking	Fever, tropical diseases, cold, energy gain
				Blood	Drinking	Anemia
				Excrement (urine and feces mixture)	Painting	Mumps
Mammals	Bat	Wurkkaawurkkuwa (W), Yelelit wof (A)	*Cynopterus sphinx* (Vahl, 1797)	Blood, meat	Topical application	Skin disease
Mammals	Dog	Kanaa (W), Wusha (A)	*Canis familaries* (Linneaus, 1758)	Tongue	Eating	Rabies, gastritis
				Urine	Painting	Eye disease (runny eye),ear pain, skin disease, wart
Mammals	Monitor lizard	Wakkallaa (W), Arjano (A)	*Varanus spp.* (Shaw, 1790)	Skin	Tying on hand	Cold, rheumatism
Mammals	Rat	Eceriya (W), Ayt (A)	*Rattus spp.* (Thomas, 1910)	Meat	Eating	Stomach pain
Mammals	Baboon	Geleshshuwa (W), Zinjero (A)	*Papio Anubis* (Lesson, 1827)	Excrement	Mixing with water and drinking	Fever, eye disease, evil eye
				Urine	Drinking	Fever
Mammals	Bushbuck	Gaaraa (W), Yedur fiyel (A)	*Artiodactyla spp.* (Pallas, 1766)	Meat	Eating	Cold
				Horn	Tying	Bone fractures
Mammals	Hippopotamus	Xadiya (W), Gumare (A)	*Hippopotamus amphibius* (Linneaus, 1758)	Meat	Washing with soup	Skin disease
Mammals	Camel	Gaameelaa (W), Gimel (A)	*Camelus dromedaries* (Linneaus, 1758)	Milk	Drinking	Cold

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
Mammals	Serval cat	Bo"uwa (W),Dalganbesa (A)	*Leptailurus serval* (Schreber, 1776)	Excrement (feces)	Mixing with water and drinking	Fever
Mammals	Squirrel	Guppalliya (W), Shekako (A)	*Xerus inauris* (Zimmerman, 1780)	Meat	Eating	Tiredness, heart disease
Mammals	Aardvark	Babbanttaa (W), Awaldgessa (A)	*Orycteropus afer* (Pallas, 1766)	Excrement	Smelling	Evil eye
					Eating	Stomach pain
					Massaging	Skin disease, sore
Mammals	Pig	Gudunttaa (W), Asama (A)	*Sus scrofa* (Linneaus, 1758)	Meat	Eating	Fever
Mammals	Gopher	Occuwaa (W), Filfel (A)	*Thomomys bottae* (Eydoux and Gervais, 1836)	Teeth	Tying	Swelling of glands
Mammals	Cat	Gawaraa (W), Dimet (A)	*Felis domesticus* (Linneaus, 1758)	Teeth	Tying	Swelling of glands
				Fur	Fumigation	Evil sprit
Mammals	Leopard	Zerussa (W), Aboshemane (A)	*Panthera pardus* (Linneaus, 1758)	Skin	Wearing (steam bath)	Joint pain, rheumatism
				Tongue	Tying on hands	Tremor
Mammals	Grey squirrel	Parshsholiya (W),	*Sciurus carolinensis* (Gmelin, 1788)	Meat	Roasting, milling, mixing with water and drinking	Trypanosomiasis, horse disease
Mammals	Common duiker	Genessaa (W), Midakuwa (A)	*Sylvicapra grimmia* (Linneaus, 1758)	Skin	Tying on legs	Walking problem in cattle
Arthropods	Dragonfly	Haatta beexiya (W), Yewuha terb (A)	*Sympetrum flaveolum* (Linneaus, 1758)	Whole body	Tying on neck	Swelling of gland

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
Arthropods	Scorpion	Masimasuwa (W), Gint (A)	*Heterometrus swammerdami* (Simon, 1872)	Whole body	Milling, mixing with water and drinking, applying the powder on the bitten section	Scorpions toxin
Arthropods	Honey bee	Mattaa (W), Nib (A)	*Apis mellifera* (Linneaus, 1758)	Larvae	Eating	Pleurisy, stomach pain
				Honey	Topical application	Skin disease
					Eating in mixture with garlic, ginger and milk	Erectile dysfunction (ED), cold
Arthropods	Tick	Danqquwa (W), Mezhiger (A)	*All tick spp.* (Leach, 1815)	Blood	Painting	Itchy skin disease
Arthropods	Sweat bee	Degerra(W), Tazma (A)	*Halictus scabiosae* (Rossi, 1790)	Wild honey	Nasal intake	Rheumatism
Reptiles	Python	Demiya (W), Zendo (A)	*Python spp.* (Fitzinger, 1826)	Visceral fat	Tying on hand, fumigation	Rheumatism (head), asthma, cold, headache
					Massaging	Skin disease
Reptiles	Snake	Shooshshaa (W), Ebab (A)	*Naja naja* (Linneaus, 1758)	Skin (shed)	Tying on penis	Urinary problems
Reptiles	Chameleon	Shaaqanchchaa (W), Esist (A)	*Chamaeleo chamaeleon* (Linneaus, 1758)	Tongue	Tying	Swelling of gland
Birds	Raven	Qooraasiya (W), Kura (A)	*Corvus corax* (Linneaus, 1758)	Egg	Drinking	HIV, asthma
Birds	Chicken/Hen	Kuttuwa (W), Doro (A)	*Gallus gallus domesticus* (Linneaus, 1758)	Egg	Drinking	Cold, sciatica, pleurisy, gastritis, common cold, fever, abdominal pain
				Spoiled egg	Drinking	Cold in donkeys
				Abdominal fat	Making oil and dropping into ear	Ear pain

Animal group	Common names	Local names	Scientific name	Parts used	Ways of remedy preparation	Aliments treated
				Whole body	Eating	Weight gain, physical injury, cold
				Excrement (guano)	Mixing with water, filtering and drinking	Stomach pain
					Topical application	Skin disease, sore (head)
Birds	Pigeon and Dove	Haraphphiya (W), Rigib (A)	*Columbiformes spp.* (Leach, 1820)	Egg	Drinking	Pleurisy
Birds	Partridge	Kuraachchuwa (W), Jigra (A)	*Alectoris rufa* (Linneaus, 1758)	Egg	Drinking	Cold
Fishs	Fish	Moliya (W), Asa (A)	*Any fish spp.*	Soup	Drinking	Cold
				Meat and oil	Eating and drinking	Bone fractures
				Liver	Eating	Eye disease

The product or part-wise grouping of animals used as traditional medicine demonstrated the use of various parts and products of the animals in the preparation of traditional remedies for different types of ailments in the study area. For instance, visceral organs (bile, fat, tongue, juices, liver, rumen, spleen, and pancreas) and animal products (honey, milk, butter, cheese, and egg) were top-ranked groupings each with 18(20.45%). In addition to these, meat, excreta, and urine of some animals, bone/teeth, external body part (leg, skin, sole, fur, hair, eyelash, horn, spur), the whole body, blood, larvae other products were used for the treatment of a particular type of aliments in the community (Table 2)

Table 2
Animal parts or products used to traditional medicine in the study area

Parts/products of animals used as medicine	Citations	Percentage (%)
Meat	13	15.3%
Visceral organs (bile, fat, tongue, juices, liver, rumen, spleen, pancreas)	15	17%
Products (honey, milk, butter, cheese, egg)	18	21.1%
Bone/teeth	5	5.8%
External body part (Leg, skin, sole, fur, hair, eye lash, horn, spur)	12	14%
Excreta (stool and urine)	10	11.7%
Whole body	3	3.5%
Blood	4	4.7%
Larvae	1	1.7%
Biting	1	1.7%
Soup	3	3.5%

The traditional remedies were administrated through different routes viz. oral, dermal and nasal. The most frequently used route was dermal (72%), followed by oral and nasal each with 14% (Fig. 2). The application methods of prepared remedies vary depending on the nature, size, and shape of the animals, part of animals, and products. Drinking 31(33.7%), eating 21(22.8%), and tying 11(11.96%) were the major modes of application (Table 3). In addition to these, dropping, fumigation, handling, holding on, massaging, painting, smelling, topical application, and others were reported modes of application from the study sites. Ready-made solid and liquid preparations were administered orally, whereas fumigation, painting, topical application, and massaging materials were applied to the skin. During fumigation processes, the medicinal fumes were allowed to enter the body via the nose, while some parts of animals like bones, skin, and teeth were believed to serve a healing purpose by tying them on the neck, hand, leg, and/or other parts of the body. Most of the remedies didn't involve the addition of ingredients like sugar, water, butter, honey, teff, and millet flour, salt, spice, milk, egg, and coffee, but there have been cases in which such additives were used in the blend.

Table 3
Mode of application and routes of administration of traditional medicines

Mode of application	Frequency of citations	Percentage (%)
Biting	1	1.1%
Drinking	31	33.7%
Dropping	3	3.26%
Eating	21	22.8%
Fumigation	4	4.35%
Handling	2	2.17%
Holding on	1	1.1%
Massaging	4	4.35%
Painting	3	3.26%
Smelling	2	2.17%
Topical application	6	6.5%
Tying	11	11.96%
Washing	1	1.1%
Wearing	1	1.1%

Animals were used for the treatment of multiple ailments singly or in combination with other animal products and/or parts. In the present study, it was found that animals were used for the treatment of altogether 159 different kinds of ailments including asthma, bacterial infections, cold, evil eye, fever, gastritis, headache, mumps, paralysis, pleurisy, rheumatism, sciatica, sinusitis, skin disease, slipped disc, sore, stomach pain, swelling, rabies and etc. (Table 4)

Table 4
Medicinal animals, their parts/products used, fidelity level and relative frequency of citation

Common names	Parts used	Aliments treated	FL	RFC
Warthog	Meat	Bacterial infections	51	0.34
		Rheumatism	66	
	Spur, Stirrup	Breast pain	47	
		Swelling	55	
	Teeth	Breast pain	43	
	Soup	Bacterial infections	44	
		Common cold	78	
Porcupine	Meat	Weight gain	69	0.79
		Bacterial infections	64	
		Swelling	54	
		Rheumatism	59	
		Stunting	77	
		Stomach pain	68	
		Pleurisy	60	
	Bone	Malaise	57	
	Soup	Paralysis	57	
		Stunting	48	
	Bile	Pleurisy	73	
Cow	Milk (raw)	Gastritis	91	1.00
		Weight gain	76	
		Typhoid fever	66	
		Toxin	90	
	Spleen	Pleurisy	85	
		Sciatica	64	
	Liver	Anemia	78	
	Bile	Fever (malaria)	77	
	Butter	Pleurisy	66	
		Bone fractures	80	
		Common cold	81	
		Weight gain	76	
		Headache	88	
	Pancreas	Sciatica, cold	85	
	Milk (churned)	Energy gain	90	
		Teeth strength	82	

Common names	Parts used	Aliments treated	FL	RFC
	Cheese	Stomach pain	69	
	Fresh butter	Ear pain	57	
		Teeth pain	77	
	Rumen	Swelling	54	
		Skin disease	66	
	Digestive juices	Fever (malaria)	80	
		Throat cancer	65	
	Leg (below knee, up to hoof)	Cold	88	
		Bone fractures	90	
		Slipped disc	100	
Donkey	Milk (raw)	Asthma	67	0.43
		Pleurisy	43	
		Pneumonia	47	
	Excrement	Cold in chicken	33	
		Sinusitis	35	
		Bronchitis	41	
Hen	Egg	Cold	67	0.95
		Fever	50	
		Pleurisy	36	
		Sciatica	45	
		Gastritis	65	
		Common cold	77	
		Abdominal pain	69	
	Spoiled egg	Cold (in donkeys)	22	
	Abdominal fat	Ear pain	39	
	Whole body	Weight gain	89	
		Physical injury	71	
		Cold	43	
	Excrement (guano)	Stomach pain	21	
		Skin disease	32	
		Sore (head)	36	
Human	Breast milk	Children eye disease	30	0.78
	Urine	Wound	52	
	Hair	Evil eye (ghoul)	97	
Ethiopian hare	Fur	Wound (burnt)	100	0.56

Common names	Parts used	Aliments treated	FL	RFC
	Meat	Stunting in children	98	
Python	Visceral fat	Rheumatism (head)	43	0.51
		Cold	44	
		Asthma	37	
		Headache	39	
		Skin disease	22	
Spotted hyena	Tongue	Evil eye	78	0.65
	Dung	Evil eye	53	
		Sciatica	56	
		Improve the quality of milk in livestock	39	
		Stomach pain	22	
	Sole	Running problem	12	
	Eyelash	Oversleeping	19	
	Teeth	Lymphadenopathy	33	
Fish	Soup	Cold	90	0.79
	Meat	Bone fractures	78	
	Oil	Bone fractures	77	
	Liver	Eye disease	43	
Bee	Larvae	Pleurisy	89	0.86
		Stomach pain	87	
	Honey	Skin disease	77	
		Erectile dysfunction (ED)	75	
		Cold	66	
	Biting	Fever	58	
Sheep	Blood	Anemia	55	0.79
	Milk	Asthma	34	
		Cold	67	
	Meat	Weight gain	92	
Goat	Milk	Fever	69	0.65
		Energy gain	88	
		Cold	79	
		Tropical diseases	76	
	Blood	Anemia	87	
	Excreta	Mumps	60	
Bat	Blood	Skin disease	88	0.43

Common names	Parts used	Aliments treated	FL	RFC
	Meat	Skin disease	75	
Dog	Tongue	Rabies	32	0.32
		Gastritis	10	
	Urine	Eye disease (runny eye)	15	
		Skin disease	9	
		Ear pain	13	
		Wart	31	
Monitor lizard	Skin	Cold	41	0.38
		Rheumatism	43	
Sweat bee	Wild honey	Rheumatism	75	0.65
Rat	Meat	Stomach pain	77	0.21
Dove	Egg	Pleurisy	64	0.62
Baboon	Excrement	Fever	44	0.12
		Eye disease	43	
		Evil eye	52	
	Urine	Fever	13	
Bushbuck	Meat	Cold	33	0.23
		Weight gain	87	
	Horn	Bone fractures	67	
Tick	Blood	Itchy skin disease	54	0.14
Hippopotamus	Meat	Skin disease	25	0.37
Snake	Skin (shed)	Urinary problems	9	0.32
Camel	Milk	Cold	73	0.79
Partridge	Egg	Cold	69	0.66
Dragonfly	Whole body	Swelling of gland	45	0.55
Scorpion	Whole body	Scorpions toxin	44	0.31
Serval cat	Excrement (feces)	Fever	36	0.55
Squirrel	Meat	Tiredness	66	0.78
		Heart disease	43	
Aardvark	Excrement	Evil eye	37	0.82
		Stomach pain	17	
		Skin disease	42	
		Sore	36	
Chameleon	Tongue	Swelling of gland	54	0.32
Raven	Egg	HIV	25	0.24

Common names	Parts used	Aliments treated	FL	RFC
		Asthma	36	
Pig	Meat	Fever	44	0.43
Gopher	Teeth	Swelling of glands	36	0.28
Cat	Teeth	Swelling of glands	28	0.67
	Fur	Evil sprit	33	
Leopard	Skin	Joint pain	55	0.44
		Rheumatism	43	
	Tongue	Tremor (hand)	55	
Grey squirrel	Meat	Trypanosomiasis	80	0.39
		Non specified horse disease	36	
Duiker	Skin	Walking problem in cattle	24	0.88

The highest number of parts/products used was reported from cows 11(33.3%) to treat 21(37.5%) different ailments. The second rank was occupied by spotted hyena 5(15%) used to treat 7(12.5%) different ailments (Table 4).

Fidelity level calculated to identify the most frequently and preferably used species in the treatment of certain diseases showed the leg of the cow (*Bos taurus*) and fur of Ethiopian hare (*Lepus fagani*) with the highest (FL = 100%) to treat slipped disc and wound, respectively. On the other hand, the meat of Ethiopian hare (*Lepus fagani*) to treat stunting in children, the hair from human (*Homo sapiens*) to relive evil eye (ghoul), the milk from a cow (*Bos taurus*) to treat gastritis, remove toxin and energy gain, the meat from sheep (*Ovis aries*) to weight gain, the leg of the cow (*Bos taurus*) to treat bone fractures and the soup from fish to treat cold each with the highest FL above 90% (Table 4).

The relative frequency of citation (RFC) index was calculated to determine the local importance of each species. The most cited animal species were: *Bos taurus* (RFC = 1), *Gallus gallus domesticus* (RFC = 0.95), *Sylvicapra grimmia* (RFC = 0.88) and *Apis mellifera* (RFC = 0.86). The highest value of the RFC index was scored by *Bos taurus* which demonstrates the importance of this animal species in the study area as it was mentioned by a higher number of informants. However, animal species with low RFC values for instance *All tick spp.* (RFC = 0.14) and *Papio anubis* and (RFC = 0.12) do not mean that they are not important locally but it may be that most of the people are not aware of their therapeutic properties.

Discussion

Throughout the history of mankind, there have been dependence and co-dependence between humans and animals. The use of animal parts or products as food, medicine, clothing, etc. is noticeable mutually by a broad geographical distribution and profound historical origins. Research suggests that humans evolved from a vegetarian lifestyle to one including meat in their diets around 2.5 million years ago (at the dawn of the genus Homo) [38] [39]. Up until around 12,000 years ago, humans derived food and raw materials from wild animals and plants [40]. Other evidence of ancient human-animal relationships is often seen in rock paintings that depict wild animals like bison, horses, and deer with human figures hunting them. This sort of evidence corroborates the observation of Marques [41], that human-animal interactions have constituted basic connections altogether societies throughout history.

The variety of interactions (both past and present) that human cultures maintain with animals is that the fabric of Ethnozoology, a science that has its roots as deep within the past because of the first relationships between humans and other animals. According to Sax [39], human attitudes towards animals probably evolved long before the first attempts to portray them artistically or examine them scientifically. In this sense, it's been speculated that the origin of ethnozoology coincides with the looks of humans as a species or, perhaps more correctly, with the primary contact between our species and other animals [43]. This view of ethnozoology assumes that these interactions are an integral a part of human culture and society.

Africa is best known for the enormous diversity and richness of its faunal resources. It has nearly 2,000 key biodiversity areas and supports the world's most diverse and abundant large ungulates, or hoofed mammals populations [44] [45] and freshwater fishes than any other continent. These animals are distributed within the two regions of the zoographic area referred to as the Paleotropical realm: the Afrotropical region, which comprises the continent south of the Sahara and the southwestern part of Arabia, and therefore the Madagascan region.

According to Bekele and Yalden [5], Ethiopia supports over 320 species of mammals, above 860 species of birds, 200 species of reptiles, 63 species of amphibians, and 145 species of fish diversities. All species of animals, ranging from insect larvae through rodents, antelopes, and monkeys are exploited for food, cloth, and traditional healthcare practices for the treatment of different human and livestock ailments. About 80% of the human population still depends on traditional medicine [1] [18] [19] [17] [20].

In the present study, 39 animals and their parts or/and products that were believed to be medicine for over 159 kinds of ailments were identified from Diguna Fango district, Wolaita, Ethiopia. Other similar studies reported altogether 23 animals and/or their parts to be used in traditional medicines in Degu tribes in the Northern Tigray region of Ethiopia [34]. A total of 21 animal species were used to prepare remedies for 46 ailments were reported in southern Ethiopia [7]. Sixteen species of medicinal animals were collected and identified for treating 18 different human ailments within the Kafta-Humera District, Northern Ethiopia [46]. A complete of 51 animal species were identified to treat around 36 different ailments from Metema Woreda, North-Western Ethiopia [6].

Away from Ethiopia, 147 medicinal vertebrate species representing 60 mammal species, 33 reptile species, 53 bird species, and 1 amphibian species were reported in South Africa [9]. Oliveira et al. [47] also described 23 animal species that are being used as traditional medicines in Brazil. Of a total of 36 vertebrate species used in the treatment of ailments and disease in India, mammals comprised 50%; they were birds, fishes, reptiles, and amphibians [48]. One hundred and eight species of animals, which include: 83% birds and 17% mammals were documented in South Asia, Pakistan [49]. The study conducted by Borah and Prasad in India recorded a total of 44 different species of animals that are used for the treatments of 40 different ailments [50]. Other findings in different parts of the world have identified different vertebrate species used for traditional medicine [51] [52].

In the study area, of the animals used therapeutically, 26(66.67%) species were mammals, 5(12.81%) were arthropods, 4(10.26%) birds, 3(7.7%) reptiles, and 1(2.56%) fishes. In a similar study from Ethiopia, of 51 animals used therapeutically, 27(52.9%) species were mammals, 9(17.6%) were birds, 7(13.7%) arthropods, 6(11.76%) reptiles, and 1(1.96%) species each represented fish and annelids [6]. A total of 21 animal species were used to prepare remedies for 46 ailments; 14 (66.64%) were mammals, 3(14.28%) were reptiles and 4(19.04%) were birds from southern Ethiopia [7]. The highest proportion of mammalian species in zootherapeutic activity was also observed by Felipe et al. [54] in Brazil. However, insects occupied the very best uses (30.9%), followed by mammals (23.8%), fishes (16.7%), reptiles (11.9%), amphibians (7.1%), annelids (4.8%), and gastropods (4.8%) during a similar study from India [50].

The inhabitants of the study area were found to use different parts/products of animals in the preparation of traditional remedies for the treatment of various illnesses. The parts/products of animals were grouped under meat/fat, external organs, blood, visceral organs, whole body, excreta, bone/teeth, and product categories and these categories were similar to ones reported by Haileselasie [34] and Kendie et al. [6]. Other findings also stated that wild and domestic animals and their by-products such as hooves, skins, bones, feathers, and tusks are important ingredients in the preparation of curative, protective, and preventive medicine [15] [55] [56] [57]. Meyer-Rochow [8] also reported different organs of invertebrate animals used as traditional medicines. Among the different animal body parts used for remedial preparation in the present study, visceral organs (bile, fat, tongue, juices, liver, rumen, spleen, pancreas) and animal products (honey, milk, butter, cheese, egg) have the highest proportion each with 18 (20.45%), followed by meat 13(14.7%). However, other similar findings reported flesh with the highest proportion (33.8%), followed by fat (11.5%), bone (8.6%), and blood (8.6%) [6] [7].

This study showed that traditional medicines were administrated by drinking 31(33.7%) followed by eating 21(22.8%), tying 11(11.96%), topical application 6(6.5%), fumigation and massaging each 4(4.35%), painting and dropping each 3(3.26%), smelling and handling each with 2(2.17%), holding on, washing, wearing and biting each 1(1.1%). Other studies reported similar findings from North-Western Ethiopia [6]. During the fumigation process, the medicinal fumes were allowed to enter the body via nasal openings to treat different ailments. Some parts of animals like bones, skin, and teeth were believed to be medicine by tying on the neck or other parts of the body [58].

The dermal (72%), nasal (14%), and oral routes (14%) were the foremost commonly used routes of administration within the study area. In line with this study, Kindie et al. (2018) reported oral, nasal, and dermal routes because the most ordinarily known administration routes of traditional remedies in their study area. Other similar findings reiterated oral (69.8%), dermal (21.6%), (7.2%) nasal, and (1.4%) auditory meatus routes because of the most ordinarily practiced routes of administration [7].

From this study, it had been observed that 2 animal species with an FL 100% (Table 4) like cattle which is employed for the treatment of herniated disc (FL = 100%), and *Lepus fagani* used for the treatment of wound (FL = 100%). Other animal species with an FL above 90% were 5 in numbers like *Lepus fagani* used for the treatment of stunting in children (FL = 98%), *Homo sapiens* used for the treatment of evil eye (ghoul) (FL = 97%), domestic sheep used for the treatment of weight gain (FL = 97%) and *Bos taurus* are used for the treatment of cold, bone fractures, energy gain, toxin, gastritis each with (FL = 90%). However, *Canis familaries* and *Naja naja* have the lowest fidelity level (FL = 9%). The animal species that are widely wont to treat a specific ailment by the local people have higher FL values than people who are less popular [29] [35]. From this study, the results indicate that one animal can treat a variety of human ailments, and one ailment is often treated by many animal species. As an example, cold may be a major disease and may be treated by quite 15 animal species. The animals; *Phacochoerus africanus*, *Hystrix cristata*, *Bos taurus*, *Equus africanus asinus*, *Homo sapiens*, etc. were wont to treat quite three human ailments (Table 4). Other similar findings in Ethiopia reported equivalent trends [5] [7] [34] [46]. Far away from Ethiopia, this fad has also been described in many studies on traditional medicinal remedies in several parts of the planet [9] [47 [49] [50] [51] [52] [53].

The relative frequency of citation (RFC) index was calculated to work out the local importance of every species. The foremost cited animal species were: *Bos taurus* (RFC = 1.00), *Gallus gallus domesticus* (RFC = 0.95), *Sylvicapra grimmia* (RFC = 0.88), *Apis mellifera* (RFC = 0.86) and *Orycteropus afer* (RFC = 0.82). The highest value of the RFC index was scored by *Bos taurus* (RFC = 1.00) which shows the importance of this animal species within the study area because it was mentioned by a better number of informants [37]. However, animal species with low RFC values for instance *All tick spp.* (RFC = 0.14) and *Papio anubis* (RFC = 0.12) don't mean that they're not important locally but it's going to be that the majority of the people aren't conscious of their therapeutic properties (Table 4).

Comparison with previous studies

Some of the animal species getting used in ethnic communities of this study area have also been reported to be used for similar purposes elsewhere. The study also showed better therapeutic and remedial purposes with the animal parts and byproducts to treat different ailments (Table 1). For instance, porcupine meat is employed for the treatment of bacterial infections, weight gain, swelling, rheumatism, stunting, stomach pain, pleurisy, bone fracture, and malaise. The soup and bile from an equivalent animal are used for the treatment of paralysis, stunting, and pleurisy, respectively. Tan et al. [59] and Gomez [60] reported similar findings from Indonesia and Malaysia, respectively.

Drinking the milk of cows is employed for the treatment of gastritis, weight gain, and typhoid. Other similar findings reported an equivalent thing from their study areas (Altaf et al., 2017) [6]. Most of the time, the inhabitants within the study area prescribe milk to drink if someone took in toxic chemicals in an accident. They believe that the toxic chemicals will prolong the body as if the patient drinks the milk. This finding is reported for the primary time as completely unique within the present study. Eating raw spleen is employed for the treatment of pleurisy and sciatica. At an equivalent time eating liver fresh has a good health-promoting effect especially in anemic-related conditions which are in line with the finding of Kendie et al. [6]. Drinking bile or eating during a mixture of already prepared foods is common practice to alleviate a fever associated with malaria. In line with this study, the therapeutic uses of animal biles in traditional Chinese medicine are reviewed by Wang and Carey [61].

Butter is eaten directly or during a mixture with other foods for the treatment of pleurisy, bone fractures, common cold, and weight gain. Other similar findings reiterated the medicinal use of butter in line with this study [6]. The appliance of butter on the top of the head is employed to alleviate a severe headache within the present study is supported by Gemechu and Tola [62]. Holding the fresh butter inside the auditory meatus is common practice alleged to assist the natural clearing of earwax from an individual's ear and to alleviate otalgia (earache). Placing onto the teeth may help to alleviate teeth ache. Consistent with Dentrix [63], butter is really an actual effective food for dental health in line with this study.

Drinking churned milk is used to gain energy and plays a great role in strengthening the teeth especially in children in the present study is supported by the work of Thorning et al. [64] and Malmir et al. [65]. Drinking rumen is used for the treatment of swelling and

skin disease. Drinking digestive juice plays a significant role in the treatment of fever related to malaria and throat cancer. The part of the leg (below knee, up to hoof) is finely cooked in a large pot for three up to four consecutive days with spices. Then, drinking the soup directly helps to relieve cold and popular treatment for bone fractures and slipped discs in humans. This finding is novel and has not been reported elsewhere despite their golden therapeutic importance.

Drinking the excrement of donkeys is used for the treatment of cold in chicken, sinusitis, and bronchitis in humans. Drinking raw milk is also used for the treatment of asthma, pleurisy, and pneumonia in the present study is supported by Schwarcz [66] and Prasad [67]. Breast milk of humans is used for the treatment of eye disease especially for a child by dropping onto the eye is in line with the findings of Diego et al. [68]. Urinating to the wound allows the wound to become covered by scab during the healing process and speed the recovery. Ramesh et al. [69] also reported the wound healing activity of human urine.

Taking hair (mow) from the ghul or ghulah (a person with the spirit of the evil eye) and milling, mixing with water then drinking or direct fumigation in fire and smelling the smoke is used for the treatment of the evil eye (ghoul). This finding is novel and has not been reported elsewhere, however, it is a commonly practiced means of evil eye treatment in the study area. The fur of the Ethiopian hare is applied to the wound (dressed) so that scab is formed immediately. No matter how this medication is popular and practiced in the whole community since time immemorial, no reports were identified to support the present work. This makes the present finding a novel.

The visceral fat of python is used for the treatment of rheumatism particularly in the head region, cold, asthma, headache, and skin disease either tying on hand or fumigation. Another similar finding has reported the use of fat in the treatment of skin disease and rheumatism [70].

The ingestion of the tongue and excrement of the spotted hyena is used for the treatment of evil eye, sciatica, and stomach pain and also helps to improve the quality of milk in livestock. The sole, eyelash, and teeth play a significant role in the treatment of running problems, oversleeping, and lymphadenopathy by handing while walking feels sleeping, and tying around the neck, respectively. In line with the present study, magicality of the hyena in folklore studies dates back to the times of the ancient Greeks and Romans, who believed that different parts of the hyena's body were effective means to various aliments were reviewed by Frembgen [71].

Drinking fish soup is used for the treatment of cold; the meat and oil are for the treatment of bone fractures, and liver for treatment of eye disease. In line with the present study, other similar studies found that foods rich in omega-3s and calcium, like fish oil has bone-boosting benefits. Omega-3 fatty acids can contribute to visual development and therefore the health of the retina within the back of the attention. It was also reported that fishes are a great source of vitamin D, perfect for curing sniffles during cold and flu season [72] [73] [74].

Eating the larvae of the honey bees is used for the treatment of pleurisy and stomach pain. Painting honey on the skin is used for the treatment of skin disease and eating in a mixture with garlic, ginger and milk may help to relieve erectile dysfunction (ED) and cold. The direct biting of bees may help to relieve fever. In line with the present study, other findings reported similar things in their review [75] [76].

Drinking the blood of sheep is used for the treatment of anemia. The milk is for asthma and cold. The meat is for weight gain in the present study is in line with the findings of Mohapatra et al. [77]. Drinking blood and raw milk of goats is used for the treatment of anemia, fever, energy gain, cold, and any tropical diseases. In line with the present study, the nutritional and medicinal value of goat milk is reviewed by Singh [78].

Eating the tongue of a dog is used for the treatment of rabies and gastritis. Painting or dropping urine systematically onto the eye or eating in tiny amounts is used for the treatment of ear or eye disease (runny eye), wart, and skin disease is reported for the first time from the study area as a novel traditional therapy. Tying the skin of the monitor lizard on hand is used for the treatment of cold and rheumatism as reported from the Aho tribe of Nagaland [79]. Eating the meat of rats was used to relieve stomach pain similar to the fining reported from northern Ethiopia [6].

Dosages of remedies

Generally, the dosage of remedies in the study area was not standardized; the amount depends on the practitioner who prepares the parts or products of animals for therapeutic purposes. In different doses for the treatment of similar conditions, the same animal

species with a particular part are prescribed. Informants still lack consensus on the doses of certain prescriptions and insufficient dosing accuracy, these may be the major drawbacks of traditional medicines. It is commonly known that some traditional healers do give different dosages and frequency of application depending on age, sex, and other condition or vary the medicine itself on such differences.

Medicinal animals and their parts and/or products commercialization

In rural areas of Ethiopia traditional medication is the cheapest and sometimes the only form of healthcare available. Friends, relatives, and neighbors provide traditional treatment free of charge or paid in a more flexible arrangement such as payment in cash or kind and on a credit basis. This is specifically prevalent in rural communities. There is no organized commercialization of medicinal animals, except for the few cases where some foods with medicinal value are sold in small markets and roadsides.

Conclusion

Ethiopia is believed to be rich in biodiversity and home to different ethnic groups, many of which have adopted their own techniques to protect their health by using traditional medicine derived from plants and animals. Animal-derived medicines are an alternative to treat various ailments in both rural and urban areas. Thus, the results of this study described the 39 animals parts and/or products used as a traditional zootherapeutic remedial measure followed by the native people of Wolaita to treat more than 150 different ailments in the study area. Anemia, asthma, bone fractures, cold, evil eye, fever, pleurisy, rheumatism, skin disease, and stomach pain were some of the frequently occurring ailments. Moreover, this study recorded the most popular animal-derived medicine to cure various ailments. *Phacochoerus africanus*, *Hystrix cristata*, *Bos taurus*, *Equus africanus asinus*, *Homo sapiens*, etc. were used to treat more than three human ailments. However, efforts to document, conserve, and manage the indigenous knowledge and skill were scarce and in the preliminary stage, and important indigenous knowledge is getting lost together with the elders and experts. Hence, it is important to document, conserve, and manages the indigenous knowledge, and further research should be done to test the products scientifically for product development and formulations of strategies for sustainable management and conservation of bio-resource also as providing potential for novel drug discoveries.

Recommendations

Large proportions of both urban and rural inhabitants in the study area use traditional medicine. This indicates that traditional medicine plays a significant role in filling the gap in modern health services and help to replace expensive treatment and drugs not available for users nearby. However, some of the practitioners do not have knowledge about the zoonotic disease and do not use any protective mechanisms during remedy preparation. Thus, supported this subsequent recommendations are forwarded:

- Before using any animals for therapeutic purposes it is good to test the health condition of that particular species.
- Practitioners should be organized in association and should be trained by concerned bodies to upgrade their skills.
- By using this baseline data for future reference other interested scholars needed to undergo further and detailed study on the analysis of active ingredients and other pharmacological and ethnozoological aspects of animals in Wolaita.
- Comparative study on ethnomedicinal animal population abundance should be conducted at different geographic areas to see the local effect of the traditional medicinal practices.

Declarations

Ethics approval and consent to participate

The ethics approval is not applicable. The methods of obtaining ethnobiological data followed guidelines set by the International Society of Ethnobiology Code of Ethics for this research. Oral consent was obtained before the interviews. The objective of the research was explained to all respondents in brief.

Consent for publication

This manuscript doesn’t contain any person’s data, and further consent for publication isn’t required.

Availability of data and materials

The data generated and analyzed during the current study are included in the body of this paper.

Competing interests

The authors declare that they have no conflict of interest.

Funding

This research didn't receive any specific grant from funding agencies within the public, commercial, or not-for-profit sectors.

Authors' contributions

Both of the authors proposed the research conception and design, and Abenezer Wondimu collected data from the respondents along with volunteers, organized the data on the computer, did the analysis, interpretation, and identification, and wrote the manuscript. Wondimagegnehu Tekalign read commented on and approved the final manuscript.

Acknowledgments

We are very much grateful to all volunteers involved in data collection and all the respondents who shared their traditional zootherapeutic knowledge; without their contribution, this study would have been impossible. Finally, we would like to extend our gratitude to Wolaita Sodo University for their permission to do this research work.

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Figures

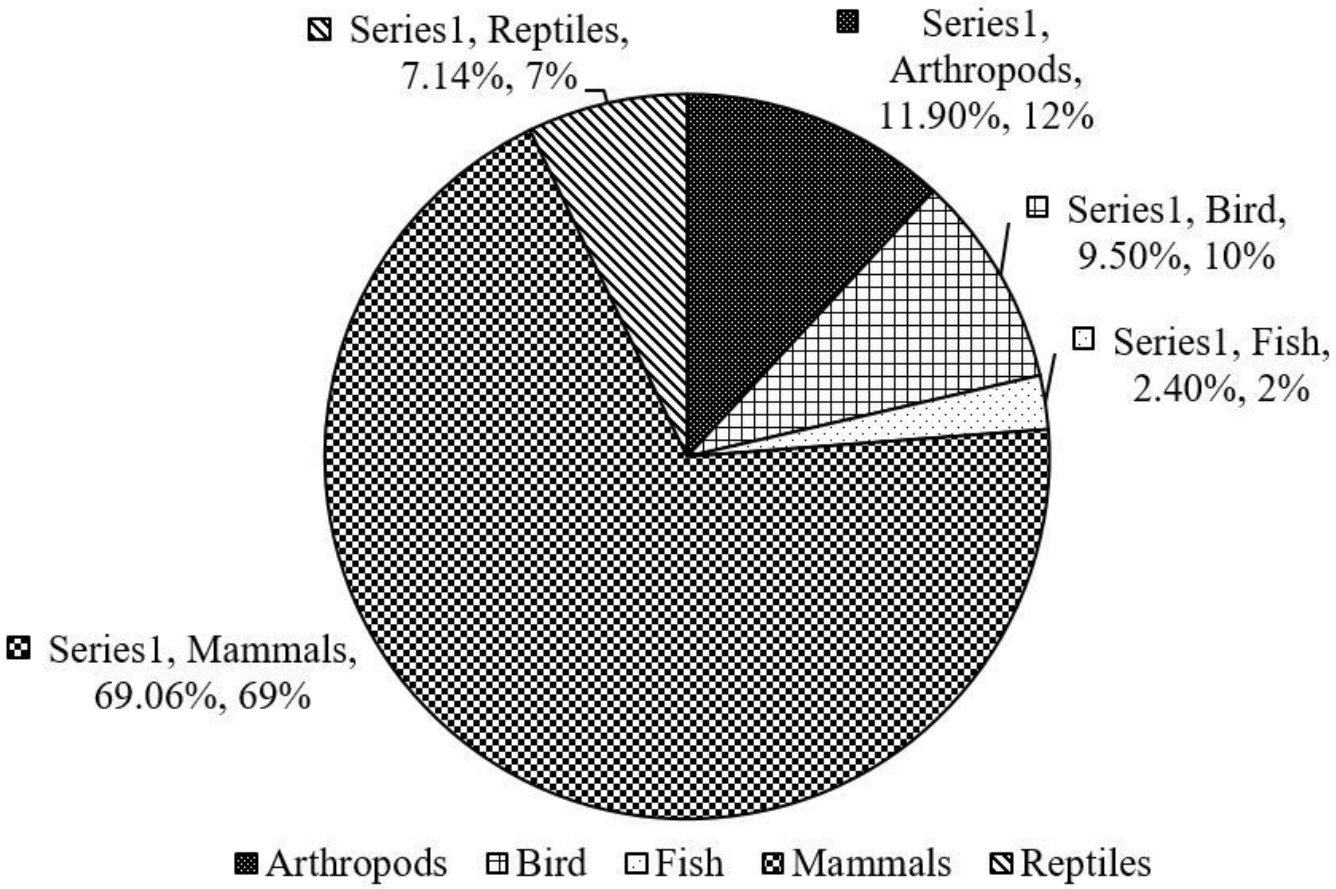

Figure 1

Classification of animals and number of species used for zootherapy in the study site

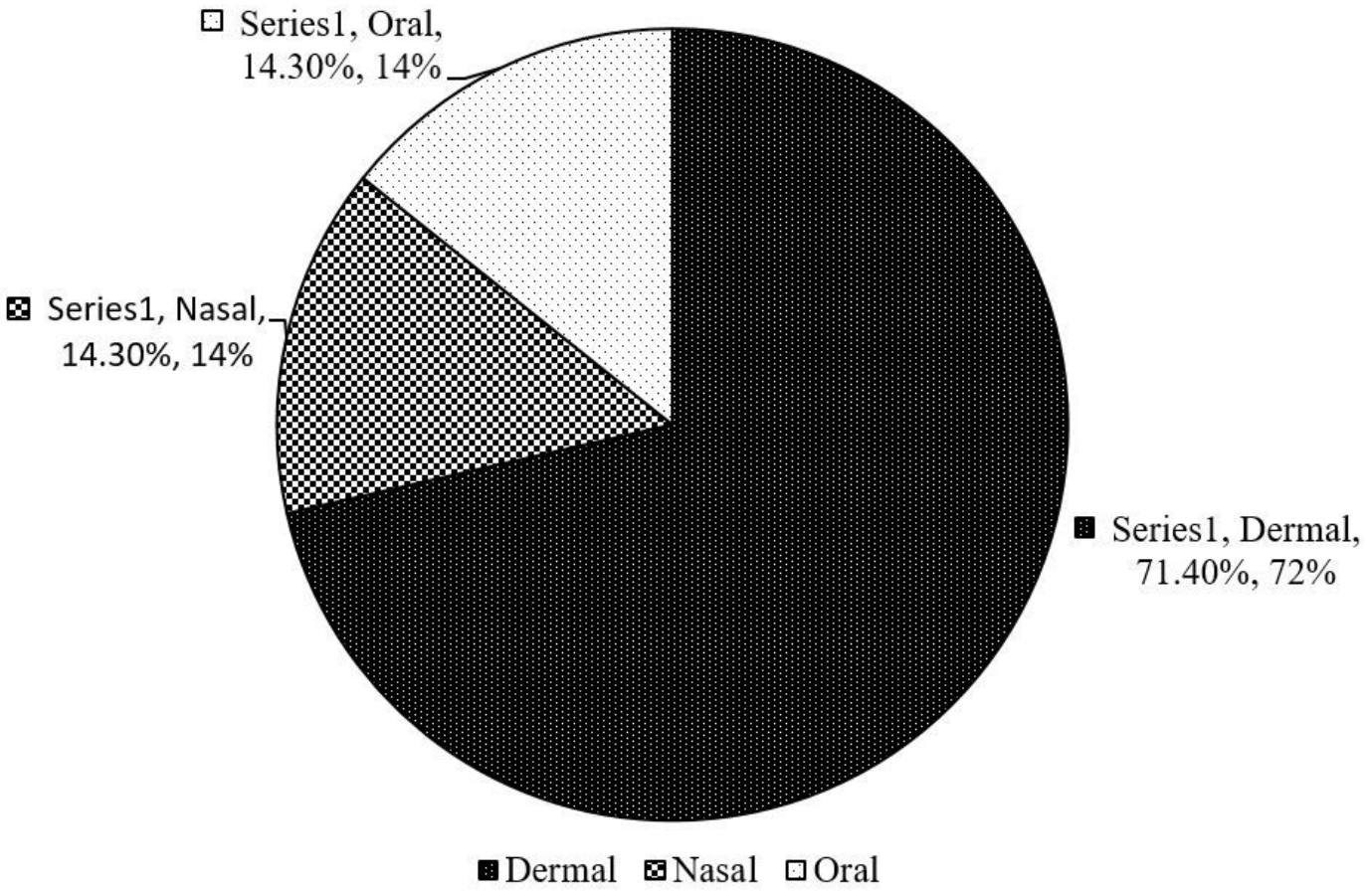

Figure 2

Route of administration of the remedies