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Research article

Ethnozoological study of the Tamang people in Konjyosom Rural Municipality, Lalitpur, Nepal

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Abstract

Ethnic/indigenous people of Nepal have a long history of using animals as medicine. The current study was conducted to determine the ethnozoological relationship, concerning the use of animals, their body parts, and animal products as traditional medicine by the people of Tamang community living in Konjyosom Rural Municipality in Lalitpur district of Nepal. The study was conducted in Chaughare (Ward Number 1), and the ethnozoological data were collected from local people and key informants through interviews, semi-structured questionnaire surveys, and direct field observation. Results showed that 78% of the respondents out of 100 were familiar with using animals as medicines. These people were reported to use 33 different animals (domestic: 8 species and wild: 25 species) for treating various illnesses and diseases in other ways. Considering the age and gender, female respondents and people of age (50–59 years) mainly used to prefer animal consumption for healing their illnesses and diseases. Furthermore, the oral route of administration (81%) and consumption of flesh via cooking were highly preferred. Their tendency to use animals as medicine was higher, so the risk of threatening a few important faunae may exist in the study area. This study will be baseline information for strategic conservation and management of wildlife in the study area or elsewhere within the country.

Keywords: Body parts; Ethnomedicine; Indigenous knowledge; Medicine; Tamang people

1 | Introduction

Since ancient times, people have been familiar with using animals and plants for food, clothing, medicine, and other purposes (Lev 2003). The World Health Organization estimates that as many as 80% of the people depend primarily on animal and plant-based medications globally (WHO 1993). In Traditional Chinese Medicine, more than 1,500 animal species have been documented to have medicinal use. In traditional medicine, it is estimated that more than 60% of drugs are based on flora and fauna. Different chemical compounds derived from plants and animals are used to improve human health (Souto et al. 2018). Commercially available drugs are based on bioactive compounds taken from natural resources traditionally used by various ethnic cultures around the earth (Cragg and Newman 2013).

Nepal is known for its rich geographic diversity, biomes, ecosystem diversity, and economically significant flora and fauna. Along with the diverse fauna and flora, the country endows an array of ethnic groups rich in tradition, culture, and indigenous system. Notably, 142 castes or ethnicities with 124 languages are spoken as the mother tongue in this Himalayan country (NSO 2022). The different ethnic groups practiced their indigenous and traditional healing systems by utilizing natural resources. Indigenous people are invaluable knowledge banks and pass their treasure verbally from one generation to another (Sharma and Dubey 2013). Rural Nepalese, about 80-90% of the population, rely on traditional medicine for their health care (Bhattarai et al. 2009). Indigenous societies have harnessed valuable knowledge based on their environment, ecology, and culture, which supports the sustainability of their society (Ghimire et al. 2020).

Ethnozoological research has piqued the interest of zoologists and ethnobiologists in Nepal and the Hindu-Kush Himalayas (HKH). Researchers have investigated the ethnozoological significance animals used by various ethnic groups in different landscapes of the country (Lohani 2010; Lohani 2011a; Lohani 2011b; Limbu and Rai 2013; Adhikari et al. 2021). However, as ethnozoological knowledge is commonly lost with the demise of knowledgeable individuals and it is important to systematically document it for preservation for the upcoming generations (Lohani 2012; Vijayakumar et al. 2015; Ghimire et al. 2020). Therefore, many researchers in Nepal have emphasized the need for the scientific study and documentation of this valuable and ever-relevant aspects of ethnozoological information (Lohani 2011 2012; Shrestha and Gurung 2019; Ghimire et al. 2020; Adhikari et al. 2020. As such, the current work explores the interrelationship between animal resources and a small ethnic group of Tamang. The Tamang people constitute one of the main ethnic groups in Nepal, up to 5.81% of the total Nepalese population (NSO 2022). Therefore, the current research aimed to document ethnozoologically important animal faunae utilized by the Tamang ethnic group in Lalitpur, Nepal.

2 | Materials and methods

2.1 | Study area

Konjyosom Rural Municipality (KRM) is located in the Lalitpur district in central Nepal. It lies between 27°28′36" to 27°33′49" N and 85°15′27" to 85°25′23" E. Its area is 44.18 square kilometers and is situated at the sea level of 1053 meters (m) to 2619 m. Its average temperature is 26.4 °C with a minimum temperature of 2.3 °C. The name "Konjyosom" literally means Lord Buddha in the Tamang language. Out of 9709 total population, most people (75.78%) are Tamang community. The Rural Municipality has applied the approach of 'Go to Konjyosom, consume organic food' and it is being established as an agrotourism hub in Lalitpur (https://www.konjyosommun.gov.np/,

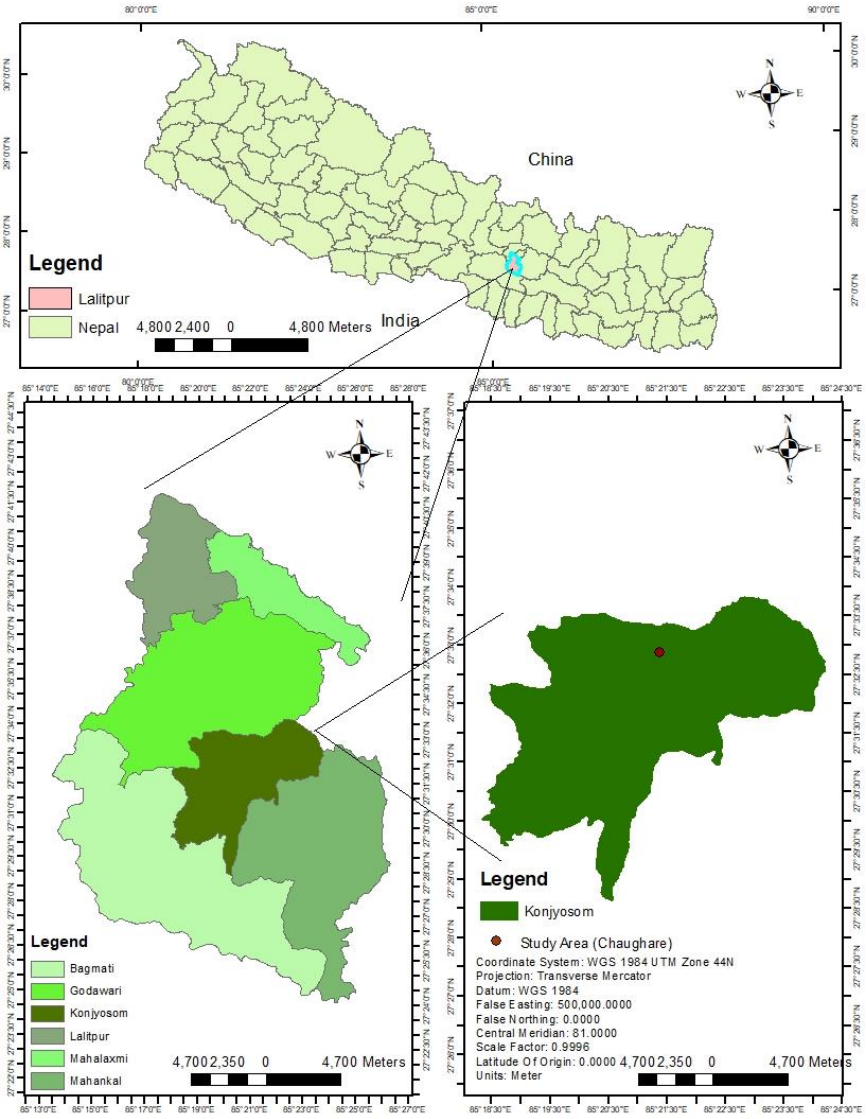

Figure 1. Map of the study area

Table 1. Demographic characters of respondents. SD: Standard Deviation; SE: Standard Error

	Age groups (Year)						Mean	Median	SD	SE
	20–29	30–39	40–49	50–59	60–69	70–79				
Males (N=44)	7	8	10	9	8	2	7.33	8	2.80	1.15
Females (N=56)	8	11	12	14	10	1	9.33	10.5	4.55	1.86
Mean	7.5	9.5	11	11.5	9	1.5				
Median	7.5	9.5	11	11.5	9	1.5				
SD	0.70	2.12	1.41	3.54	1.41	0.71				
SE	0.5	1.5	1	2.5	1	0.5				

Retrieved March 30, 2024). The Municipality has five wards; however, the current ethnozoological study was mainly conducted in ward number 1, the main village (Chaughare) (Fig. 1). Chaughare (27°34'33" N and 85°21'46" E) is a former part of the Village Development Committee where the majority of people were farmers.

2.2 | Field visits and direct observation

The present study was cross-sectional type. The KRM was visited eight times from 11 May to 29 August 2019 to collect and document information regarding ethnomedicinal uses of animals. Before the study period, the study site (Chaughare) was visited for a pilot survey to collect essential information.

2.3 | Questionnaire survey

First, the permission letter (Permission No. 40/076/77) from Konjyosom Rural Municipality was obtained to carry out studies. A purposive sampling method was used, and 100 local inhabitants (20–79 years) were taken for the ethnozoological study. Individuals who were younger than 20 years were excluded from the study as they used to be unavailable during the study period because they would go for the study. They are believed to have less knowledge on using animals for medicines (Ghimire et al. 2020). Open-ended and semi-structured questionnaires were distributed to the household head. In case the head did not participate in the study, other members were selected for the questionnaire survey. Also, those who could not fill in the information on the questionnaires were interviewed, and each questionnaire was filled out by the researcher himself/herself. Various information regarding medicinal animals and indigenous knowledge systems and techniques was collected through interviews with local healers, knowledgeable elder dwellers, and ordinary people.

2.4 | Data analysis

First, the demographic characteristics were represented by mean, median, standard error, and ranges. Then, the frequency and percentage of the respondents regarding ethnozoological knowledge were calculated. All the generated data were expressed in tables and bar charts in Microsoft Excel 2007. Data were analyzed through chi-square tests unless otherwise stated. Chi-square tests were used to analyze the age-wise and sex-wise significance among various respondents with different response variables. The p values were calculated to evaluate significance among data at a 95% confidence interval (5% significance level).

3 | Results

In the present study, 44 males and 56 females were selected for the investigation of ethnobiological knowledge. Among males, the mean age was 7.33, the median age was 8, the standard deviation (SD) was 2.80, and the standard error (SE) was 1.15. In contrast, the mean age among females was 9.33, the median age was 10.5, the SD was 4.55, and the SE was 1.86. Similarly, age-wise analysis showed that mean±SE was lowest in individuals of 69–79 years age groups whereas it was highest in those of (1.5±0.5 vs 11.5±2.5) (Table 1).

The ethnic people of the Tamang community in Konjyosom Rural Municipality had a tremendous knowledge regarding the use of animals, their body parts, and animal products as traditional medicine as well as food in their traditional ways. In this study, out of 100 respondents, most (78%) were aware of ethnomedicinal practices and had at least one experience of those practices. Similarly, ethnomedicinal practices were adopted mainly by females (55%) than males (45%) without any statistical significance (p=0.1573) (Fig. 2). Regarding age-wise comparison, people with age groups

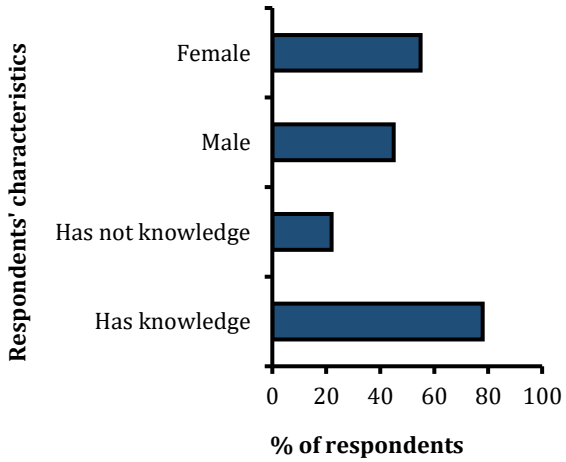

Figure 2. Percentage of respondents with respect to their characteristic features

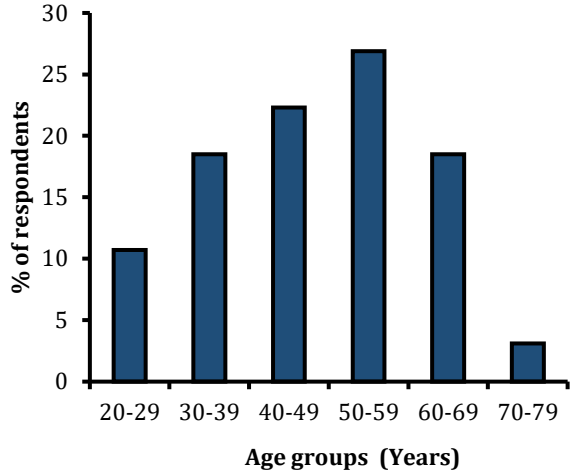

Figure 3. Age-group-wise percentage of people using animals as medicine

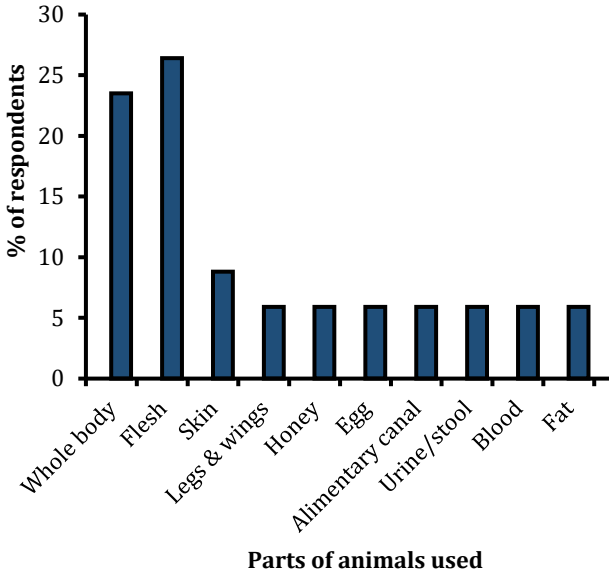

Figure 4. Percentage of respondents using animal or its part/s for medicine

50-59 years used to apply ethnomedicinal practices predominantly (26.29%) compared to other age groups with a statistical significance (p=0.0001, Fisher's exact test) (Fig. 3).

They were reported to use both domestic and wild animals, including the aquatic species, as a part of their traditional healing process. The ethnic people used a total of 33 animals to treat 65 different disease conditions. The significant diseases were asthma, cancer, fever, piles, gastric, diabetes, cold, cough, and others (Annex 1). Among 33 different animals, the Tamang people used 11 species under Mammalia, nine species under aves, two under reptilia, one under amphibia, one under Pisces classes, and nine under invertebrate groups. Similarly, 75.8 % of the species were wild, and 24.2% were domestic animals (Table 2).

Tamang community people in the study area used various animal parts and products for medicinal purposes. The use of flesh (29.48%) was recorded to be the highest, followed by the use of whole body (24.35%), and the use of the animal products, such as skin (10.26%), and leg and wings, honey, egg, alimentary canal, urine and stool, blood, and fat (each 5.13%) with a statistical significance (p<0.0001) (Fig. 4).

Furthermore, respondents were also reported to consume ethnomedicinally important animals in four different ways. Cooked meat was commonly practiced (51.30%), followed by raw meat (30.7%) and liquor and paste (each 9%), with a statistical significance (p<0.0001) (Fig. 5). Similarly, we reported two primary routes of administration of these ethnomedicines. They were oral routes (81%) and topical uses (19%), particularly on the skin. The preference of two routes by different people was a statistically significant difference (p<0.0001, Fisher's exact tests).

4 | Discussion

The current study recorded that 78% of the Tamang people were aware of the uses of animals or their parts or tissues for treating and preventing diseases. Previous ethnobiological studies in Nepal were conducted on the Tamang, Tharu, Raji, Lapcha, Tangbetons, Rai, Limbu, Magar, Balami, and Jirel by different authors (Ghimire et al. 2020). The females had more knowledge of ethnic medicines than males, which might be because of their usual home-centered activities as males are usually out for employment and daily wages. In this situation, females have to care for their children and themselves to treat and prevent diseases. A similar result was also documented in some previous studies with traditional medical practitioners in India (Prabhu et al. 2014). Furthermore, females are explained to occupy a significant part of consumers, while males occupy a major portion of

Table 2. Diversity of animal species

Animal types (Groups)			Total no. of species	Percentage (%)
Wild animals	Vertebrates	Mammals	8	75.8%
		Aves	5	
		Reptiles	2	
		Amphibians	1	
		Fishes	1	
	Invertebrates		8	
Domestic animals	Vertebrates	Mammals	3	24.2%
		Aves	4	
	Invertebrates		1	
	Total		33	

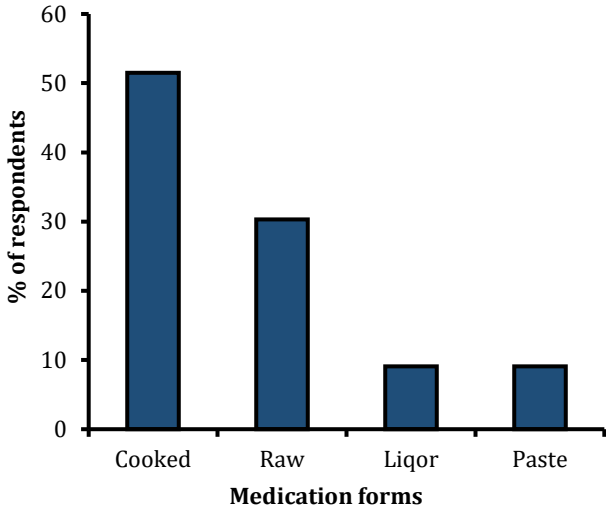

Figure 5. Percentage of respondents using animal or its part/s via different medication forms

sellers of traditional medicine in Kurdish markets (Mati and De Boer 2011).

Even though it is difficult to discuss the underlying causes of ethnic knowledge in the highest percentage of people of age groups 50-60 years compared to others, different sampling numbers might have generated biased data. However, older people who are more than 60 years old could have forgotten to respond well due to their aging behaviors. This shows that the aged people were more skilled in the zoo therapeutic practices passed to them by their seniors. The reason for less traditional medicinal knowledge to the younger generation would be due to urbanization and assimilation of allopathic medicine, which is easily accessible, more reliable, and relief faster after treatment than homeopathy and ethnic medicine. The current trend was more or less similar to the observation in Assam (Verma et al. 2014).

Despite the abundance and presence of varieties of insects, mammalian groups of animals were mainly used or consumed for their ethnomedical values. In some reports, mammals and reptiles are the main animals used in medicine (Alves et al. 2008, 2016; Fernandes et al. 2013). Aves were also used as traditional medicine is similar to the results in the Southern region of the United States, Israel, and India (Kakati and Doulo 2002; Solavan et al. 2004; Nolan et al. 2006, Mishra et al. 2011; Lev 2013). Previous studies in different landscapes of Nepal reported the use of other genera and species of animals to treat and prevent various ailments by different ethnic/indigenous communities; for example, 41 genera by Tamang (Lohani 2010), 39 species by Magar (Lohani 2011a), 65 species by Balami (Timilsina and Singh 2014), 49 species by Jirel (Lohani 2011b), 36 species by Raji (Poudel and Singh 2016), 19 species by Lapcha (Tamang and Singh 2014), 27 species by Rai (Rai and Singh 2015), 17 species by Tangbetons (Paudyal and Singh 2014), and 58 species by multiple ethnic communities (Adhikari et al. 2020).

Notably, the use of zoo medicine is widespread via oral routes in the population currently being studied. Our finding agrees with the results of a few other studies, where the oral route of administration of ethnomedicine is a common phenomenon (Jaroli et al. 2010; Benitez 2011; Verma et al. 2014). Worldwide raw consumption of animals or animal parts for different therapeutic purposes is a standard method among ethnic communities (Benitez 2011; Kim and Song 2013; Vijay Kumar 2015). For example, consuming the whole animal body (frugivorous bats), even without removing its viscera, has been a common practice among indigenous Chepang in central Nepal (Ghimire et al. 2020; Adhikari et al. 2021). However, the topical route of administration is also highly effective. It is still a popular way to treat diseases like pain, bone fractures, wounds, and piles, including skeleton-muscular system disorders like paralysis, swellings, tetanus, and arthritis (Jaroli et al. 2010; Chellappandian et al. 2014; Kim and Song 2013; Verma et al. 2014). This clearly shows that the currently studied Tamang population was rich in their knowledge of using medicinal values of animals or their parts/organs/tissues. However, the overuse of such animals for medicines may lead to endangerment and extinction if further awareness programs are not conducted. However, the sustainable exploitation of such animals become highly demanding in local places where ethnic/indigenous people solely believe in the ethnozoological values of animals rather than the modern tools and technology of medicines.

5 | Conclusions

The present study indicates that the Tamang people in Konjyosom Rural Municipality know extensively about using animals, their body parts, and animal products for medical purposes. The elderly members of the community and some experts such as Dhami/Baidhya have significant experience in treating various diseases. This study solely provides the base for further scientific study on the therapeutic value of various traditional uses of zoo therapeutics by the people. It helps to find novel biological compounds for the discovery of new drugs. It emphasized the need for evidence-based study on ethnomedicine in the future, particularly studying the effects of consuming or applying these animals or their parts on human physiology and immunology. The current study not only enhances our understanding of traditional animal-based medicine but also addresses the socio-economic significance of ethnic communities, biodiversity conservation, and sustainable animal resource management.

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Authors' contributions

All authors except RP and TRG contributed equally. RP tabulated and analyzed data. TRG conceptualized the study and supervised the work. All authors reviewed and edited the manuscript.

Ethical statement

This is our original work and has not been previously published or submitted for publication elsewhere. Permission for field survey was provided by the Konjyosom Rural Municipality, Lalitpur, Nepal (Permission No. 40/076/77). During the interview, written consent was obtained from each household head for collecting data.

Conflicts of interest

The authors declare no conflict of interest.

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Annex 1. Animal parts that are used for different purpose and their descriptions.

Order	Family	English name	Local name	Scientific name	Used parts	Disease name / other values	Methods of preparation/ consumption
Accipitriformes	Accipitridae	Black eagle	Kakakul	*Ictinaetus malaiensis*	Whole body	To cure diarrhea & vomiting	Making soup
Anseriformes	Anatidae	Local duck	Pani Haas	*Anas platyrhynchos domesticus*	Meat and Eggs	It is used to treat iron deficiency anemia (especially during pregnancy); it increases RBCs and is even effective in treating piles.	Meat is taken by cooking; egg is taken by boiling or raw.
Anura	Dicroglossidae	Frog	Paha	*Hoplobatrachus tigerinus*	Flesh and Skin	To cure diarrhea, dysentery, measles, and arthritis; to remove scratches, and treat cuts, and burns. Fever, typhoid, and weakness	By making a soup; a paste of fat can be prepared and covered on the burn-burned part; the dried skin of Paha is soaked in fresh water for the whole night, and then it is applied over the cut parts and then covered tightly with a bandage from outside. Can eat it raw, or you can make it dry then grind, and drink it with water too.
Artiodacryla	Bovidae	Buffalo	Bhaisi	*Bubalus bubalus*	Milk and meat	It enhances immunity, muscular growth, and strong bones.	Meat by cooking; milk is either drunk after boiling, but the preparation of khuwa is highly preferred over cow milk.
Artiodactyla	Cervidae	Chital	Mriga	*Axis axis*	Flesh	To treat body pain, arthritis, and heart disease.	The meat is cooked and usually, soup is preferred.
Artiodactyla	Bovidae	Goat	Khasi	*Capra hircus*	Whole body and, milk	It is used to treat body weakness, fever, and headache; it boosts immune power.	Soup made from their legs to enhance calcium; taken by boiling
Artiodactyla	Bovidae	Cow	Gai	*Bos indicus*	Urine and milk	Gastric & urinary retention; enhances immunity and muscular growth	Milk is either drunk after boiling, but Khoya (Khuwa in Nepali) is prepared by evaporating milk to a solid consistency by thickening it in a large iron utensil (Kadai).
Atriodactyla	Moschidae	Musk deer	Kasturi mriga	*Moschous chrysogaster*	Flesh, musk pod, and skin	Used to make medicine for different diseases	The whole body is useful to prepare different types of medicine; musk pods are very expensive.
Carnivora	Canidae	Golden jackal	Syaal	*Canis aureus*	Flesh and alcohol	It is consumed to treat body pain, heart disease, and, sinusitis; alcohol is used to treat Rheumatoid arthritis bath (Uric acid)	It is consumed by cooking; alcohol is either drunk (half-glass morning/evening or used in infected areas or joints and is highly preferred.
Carnivora	Canidae	Fox	Fyauro	*Vulpes ferrilata*	Liver and flesh	It is used for bloating and abdominal distention.	It is kept dry in the sun stored for further use and then cooked before intake.
Carnivora	Felidae	Tiger	Bagh	*Panthera tigris*	Flesh, skin, and teeth	Diarrhea; when the baby cries and doesn't want to have mother's milk. It is believed that if you have meat, you will not suffer from paranormal things; skin for clothes and bags; teeth are used to cut in poisonous parts.	Give the baby dry tiger meat (one piece is enough). Others could have it either raw or making soup.
Carnivora	Ursidae	Himalayan black bear	Bhalu	*Ursus arctos*	Fat and, Bile/Gallbladder	It is used for relieving backbone pain and joint aches; heart disease, high fever, and cough.	Topical use in the skin is highly preferred; it is consumed by cooking.
Carnivora	Felidae	Black cat	Dhade biralo	*Felis* spp.	Flesh, lungs, and liver	When people have problems in the lungs and liver	Remove its skin, cook it well, and have it as a soup
Coleoptera	Scarabaeidae	White grub	Khumre kira	*Phyllophaga* spp.	Whole body	BP, Fever, bone, and weakness	Keep it on glass and have it with water.
Columbiformes	Columbidae	Oriental turtle dove	Dhukur	*Streptopelia orientalis*	Flesh	Nutritive value	The flesh is cooked and eaten.
Columbiformes	Columbidae	Rock dove	Parewa	*Columba livia*	Whole body	Arthritis (uric acid)	By cooking.
Decapoda	Cancridae	Crab	Gangata	*Cancer* spp.	Whole body	It is used to treat bed wetting; It sharpens memory and, cures gastric disorders.	Consumed by cooking, or roasting only after removing the external hardened skin
Galliformes	Phasianidae	Local chicken	Kukhura	*Gallus gallus domesticus*	Egg, blood, and whole body	Body pain, headache, allergy, weakness, uric acid, cough, dysentery, piles, and fire burn; it is used to gain the strength of women bearing a child.	Mixed raw egg with uncooked milk + half a spoonful of honey/ sugar; while cooking as far as possible, don't remove the nail and dry it (under a light fire) for 2 days, mix it with chaypi,

							gahad, mungko dal, and chilly (chilly + some other spices, and jira) then make soup; put fat on the burned part. Cut cock and get its fresh blood in a glass and mix it with mustard oil and then let her drink (this will save her life from death).
Galliformes	Phasianidae	Quail battai	Battai	*Coturnix coturnix*	Meat & Eggs	It is used to treat asthma; it boosts the immune system	It is consumed by cooking; it is taken by boiling but better results are obtained if eaten raw eggs.
Galliformes	Phasianidae	Pheasant	Kalij	*Lophura leucomelanos*	Meat	It is used to treat anemia, enhances muscle build-up, and is highly effective for weight loss	Consumed by cooking
Haplotaxidae	Lumbricidae	Earthworm	Gadeula	*Eisenia fetida*	Whole body	Measles and chickenpox	Dry and make soup or take it with milk.
Hymenoptera	Apidae	Honeybee	Mouri	*Apis cerena*	Honey	It treats coughs, colds, cuts, and burns. Bee stings are believed to reduce heart disease. Honey boosts physical and mental stamina; to prepare alcohol which cures gastritis and upper respiratory tract infection	Have it with hot water (1 spoon honey + 1 glass alcohol). The alcoholic fermentation of diluted honey is made with yeast.
Hymenoptera	Vaspidae	Wasp and hornet	Barulo and Aringal	*Vespa* spp.	Honey	For food taste	Fried and raw
Hymenoptera	Formicidae	Ant	Kamila	*Iridomyrmex* spp.	Egg	Infertility	Boil its egg with salt/ sugar and have it.
Legomorpha	Leporidae	Rabbit	Kharayo	*Oryctolagus cuniculus*	Fresh blood and meat	High BP Uric acid (reduce)	Fresh blood from rabbits will reduce high BP; meat is consumed after cooking.
Masogastropod	Ampullariidae	freshwater snail	Ghongi	*Pila globosa*	Soft body	Body weakness; to heal cracked/fractured bones.	Cooking
Ophiocephaliformes	Channidae	Fish	Hile machha	*Channa gachua*	Pancreas, and whole body	To kill worms and asthma	Separate the pancreas from its body then dry, make powder, and have it with water; consumed whole fish by making soup.
Orthoptera	Acrididae	Grasshopper	Fatengra	*Acridomorpha* spp.	Stool	To clot blood	Apply on the cut wound
Pelecaniformes	Ardeidae	Cattle egret	Sarou/ bakulla	*Bubulcus ibis*	Whole body	Piles, common cold, cough, and fever	Make soup and have it.
Rodentia	Hystricidae	Porcupine	Dumsi	*Hystris drachyora*	Intestine, stomach, gallbladder, blood and spine	Asthma; blood Cancer; treating wounds, like Pilonidal sinus or any other cyst or abscess and blisters.	Either make a soup or make it dry and have it with water Fresh blood is drunk directly; its spine is used for piercing the wound and letting the fluid or pus flow off.
Squamata	-	Snake	Sarpa	-	Flesh and fat	To cure eye slightness; snake fat is believed to cure cancer.	By cooking; by applying it on the cancerous parts
Squamata	Gekkonidae	Lizard	Mausuli	*Hemidactylus*	Bone	The bones of lizards are used to keep away from evil spirits.	Collect dead lizards and get their bones
Stylommatophora	Helicidae	Slug	Chiplekira (smaller)	*Anadenus* spp.	Whole body	It is used to treat fractured bones; Cure chronic TB	Either the live animal is swallowed or lassi is prepared, mixing it with milk and banana.