

Ethno-medicinal uses of vertebrates in Chitwan-Annapurna Landscape, central Nepal

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Keywords: Vertebrates, Ethno-medicine, Multicultural ethnic groups, Biodiversity conservation, Central Himalaya

Posted Date: January 27th, 2020

DOI: <https://doi.org/10.21203/rs.2.21918/v1>

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Version of Record: A version of this preprint was published on October 30th, 2020. See the published version at <https://doi.org/10.1371/journal.pone.0240555>.

Abstract

Background: Traditional knowledge on use of animal products to maintain human health is important since time immemorial. Although a few studies are reported as food and medicinal values of different animals, a comprehensive ethno-medicinal study of vertebrates in Nepal is still lacking. Thus, present study is aimed to document the ethno-medicinal knowledge related to vertebrate fauna among different ethnic communities in Chitwan-Annapurna Landscape, central Nepal.

Methods: Ethno-medicinal information collected by using semi-structured questionnaires, focus group discussion and key informant interview. The data were analyzed by applying Use Value (UV), Informant Consensus Factor (ICF) and Fidelity level (FL).

Results: The study reported a total of 58 species of vertebrates of which 53 were wild and 5 as domestic. They were used to treat 62 different types human ailments. Four vertebrates were also used for veterinary and agriculture. The most commonly used species was *Felis chaus* (UV = 0.25) with 3 use-reports by 10 informants. Cardiovascular and dental problems had the highest ICF value (0.974) with cardiovascular problems having 351 use-reports for 10 animal species and dental problems having 77 use-reports for 3 animal species. The least ICF was found in ophthalmological problems (ICF=0.833, use reports=7 for 2 species).

Conclusions: The vertebrates are widely used by the local people and the traditional healers in Chitwan-Annapurna landscape against various ailments. The users collected the vertebrates mostly from wild. People intentionally or unintentionally kill wild animals that has threatened the availability of different species. Our study revealed in-depth knowledge on use of vertebrates including their status needed for the sustainable ethno-medicinal uses and their future conservation.

Background

Bio-resources (i.e. both flora and fauna) are integral part of the indigenous healing practices used by human beings since prehistoric time [1]. The traditional knowledge on use of bio resources for medicine has significant contribution in maintaining the human health care system even in the present modern societies [2]. In traditional medicine, it is estimated that more than 60% of drugs are based on the extraction flora and fauna [6]. A figure shows the use of more than 1500 animal species in Traditional Chinese Medicine in China [37]. There is also a trade of high number of traditionally used natural products by various ethnic and cultural groups for the treatment of various ailments [3]. To the greater extent, many traditional medicines are traded by many big pharmaceutical companies around the world. World Health Organization (WHO) has selected a total of 252 essential chemicals to prepare drugs, where animals alone contribute 8.7% [6].

A large number of animals are used as medicine under traditional systems such as Ayurveda, Unani, Homeopathy, and Tibetan traditional medicines [4–6]. Many studies have shown use of animals as medicine in Nepal [5, 7–13] including a few studies from Chitwan-Annapurna Landscape, but are mainly related to medicinal plants [14–17] and wild edible plants [18]. Chitwan-Annapurna Landscape lies in between Chitwan National Park in the south and Annapurna Conservation area in the north with high variation in elevation (150 m to 8000 m). This area is mostly inhabited by many types of indigenous and multi-cultural ethnic groups. Therefore, such an area is important for studies related to traditional medicine.

Nepal comprises 125 different multicultural ethnic groups with more than 123 different languages [19]. Thus, Nepal is well-known for rich cultural heritage with diverse ethnic groups [9]. In most ethnic groups, indigenous knowledge on uses of different animals in medicine is generally passed verbally from one generation to the next generation. Such knowledge is commonly lost with the demise of knowledgeable person [2, 11, 20]. It is, thus, important to systematically document such indigenous knowledge so that it can be protected for future generations. This study is aimed to collect and document traditional ethnozoological (vertebrates) knowledge from the Chitwan-Annapurna landscape, central Nepal. Here, we asked following questions: (i) What are different vertebrates that are used in traditional medicines in Chitwan-Annapurna landscape, central Nepal? (ii) What are the modes of preparation and administration of vertebrate based traditional medicine? (iii) What are the major ailments categories treated by different vertebrates and also what are the most important vertebrate species used against different ailments? (iv) What is the conservation status of each vertebrate that is used as traditional medicine? To answer the above-mentioned questions, we collected data in Chitwan-Annapurna landscape, central Nepal.

Materials And Methods

Study area

The study area located in the Chitwan-Annapurna landscape, central Nepal (Fig. 1). The region is connected with the Chitwan National Park in the south and Annapurna Conservation Area in the north. This landscape is rich in globally outstanding biodiversity including three World Wildlife Fund (WWF) Global 200 Eco-regions (Terai–duar Savanna and Grasslands, Himalayan Subtropical Broadleaf Forests, Alpine Shrubs and Meadows), and two Ramsar sites (Beeshazari lake, Chitwan and Lake Clusters of Pokhara valley, Kaski) [21].

The area is prime habitat for many mammal species such as tiger, rhinoceros, common/clouded/snow leopard, sloth/Himalayan black bear, sambar, chital, musk deer, hog deer, goral, etc. This landscape is inhabited by many ethnic, religious and cultural diversities (23 ethnic groups in Chitwan, 26 ethnic groups in Tanahun, 12 ethnic groups in Kaski) [19]. The most dominant ethnic groups in the study area are Tharu, Braman/Chhetri, Tamang, Gurung, Bote in Chitwan; Magar, Gurung, Sanyasi, Tamang, Majhi in Tanahun and Gurung, Magar, Braman/Chhetri and Dalit in Kaski districts.

Data collection

For our data collection, we divided the whole study area into four different study blocks based on topography (Fig. 1):

Block A: Barandabhar Corridor Forest and its adjoining settlement areas in Chitwan district, Bharatpur Metropolitan City (Patihani, Gitanagar, Bhojad, Ramnagar, Kabilas and Chaukidanda), Ratnanagar Municipality (Sauraha, Mohana, Tikauli, Panchakanya), Kalika Municipality (Jutpani and Padampur);

Block B: Community and National forests and its adjoining settlement areas in lower part of Tanahun district, Devghat Rural Municipality (Gaighat, Kaphaldada and Mude), Aanbookhaireni Rural Municipality (Saranghat and Deurali), Bandipur Rural Municipality (Khaharetar, Dharampani and Bandipur villages), Byas Municipality (Keshavtar, Rumsi, Nayagaun);

Block C: Community and National forests and its adjoining settlement areas in upper part of Tanahun district, Rishing Rural Municipality (Manpur, Dhaap, Pipalbot, Chalise gaun), Mygde Rural Municipality (Chhang, Fulbari, Tharpu, Mulabari), Bhimad Municipality (Rishing patan, Bhimad village areas), Suklagandaki Municipality (Firfire, Therpek, Raipur, Taxar);

Block D: Panchase area and lower Annapurna Conservation Area, Pokhara Metropolitan City (Nirmalpokhari, Bharatpokhari, Sidhane, Panchase, Pumdibhumdi), Annapurna Rural Municipality (Bhadaure, Tamagi, Landruk and Ghandruk) from 2017 June to 2018 September.

The ethno-medicinal data on uses of animals (mainly vertebrates) was collected by using Participatory Rural Appraisal (PRA) method [20, 22-24]. In this method we used sets of questions related to use of animals as ethnomedicine and discussed their local status and medicinal properties. For that purpose, we used the photographs of the vertebrates present to that area and discussed in group. The local healers, medicinal practitioners, teachers, social workers were involved in the PRA. We also considered a fair gender composition of the group.

Consent was taken from the respondent prior to formal interview. Semi-structured questionnaires were also used to obtain information from the local people [25, 26]. The respondents were chosen randomly, but were well represented from different ethnicity, geographic locations, age, sex, profession and education levels [27]. Total of 204 people were interviewed during 2017-2019. We used photographs and images of different vertebrates when conducting interviews. The detailed information including local name of the animals, parts used, methods of preparation and mode of administration were recorded. We also documented vernacular names, methods of preparation and the doses of medicine used against different ailments. Latin names and classification of the animals were obtained from standard literature [28-32]. We also recorded conservation status of each animal by using above mentioned literature and IUCN Red data book [60].

Based on the information obtained from informants in the study area, all the reported human related ailments were grouped into 11 categories (Table 1) viz. cardiovascular problem, dental problem, dermatological problem, ear, nose and throat problem,

gastro-intestinal problem, musculoskeletal problem, neurological problem, ophthalmological problem, reproductive problems, respiratory problem and others (fever and headache). In addition to this, we also recorded the veterinary and agriculture uses.

Data Analysis

Informant consensus factor (ICF)

To see if there was agreement in the use of animals in the ailments categories between the animal users in the study area, we used the informant consensus factor (ICF) [33, 34].

The informant consensus factor (ICF) for ailment category c was calculated as

$$ICF_c = (Nur_j - Nt_j) / (Nur_j - 1),$$

where Nur_j is the number of use-reports in each ailment category c and Nt_j is the total number of taxa used in each ailment category c by all informants.

In each case if an animal was mentioned by an informant as 'used' then we considered it as one 'use-report.' If one informant used an animal to treat more than one ailment in the same category, we considered it as one use-report [61]. Thus, an animal species could be listed in several ailment categories of indigenous uses but in terms of use-reports, each animal species was considered only once per informant in a single ailment category as mentioned by Amiguet et al. [61].

The ICF ranges from 0 to 1, where high values (close to 1) are obtained when only one or a few animal species are reported to be used by a high proportion of informants to treat a particular ailment meaning that there is a narrow well-defined group of animal species used to cure a particular ailment category and/or that information is exchanged between informants. On the other hand, low ICF values (close to zero) indicate that informants disagree over which animal to use due to random choosing or lack of exchange of information about use among informants [62].

Fidelity level (FL)

To determine the most frequently used animal species for treating a particular ailment category by the local people of the study area, we calculated the fidelity level (FL) [63]. For each species s and each ailment category c , we calculated the value FL_{sc} using the following formula:

$$FL_{sc} (\%) = (Np_{sc} / N_s) \times 100,$$

where Np_{sc} is the number of use-reports cited for a given animal species s for a particular ailment category c and N_s is the total number of use-reports cited for any given species s . The animal species with the highest FL_{sc} value is considered the most preferred species for ailment category c .

Use value (UV)

The relative importance of an animal species used as medicine in the study areas was calculated with the help of the use value (UV) for species s [64]:

$$UV_s = \sum U_s / N_s$$

where U_s is the number of use-reports cited by each informant for a given animal species s and N is the total number of informants interviewed for a given animal species s . Use values are high when there are many use-reports for an animal and low when there are few reports related to its use.

To determine correlations between FL value and UV values for each animal species, we used Spearman's correlation coefficient because data were not normally distributed.

Results And Discussion

Demographic details of informants

A total of 204 informants (70 female and 134 male individuals, aged between 18 and 82 years) participated in the study. They belong to different castes (12) and communities (eight of Indo-Aryan or Tibeto-Burman language speaking groups). A large number of respondents were in between 50 to 59 years (n=53). This clearly showed that ethno-medicinal knowledge was higher in aged groups than in young groups. The main reason of little knowledge among young generation might be due to growing number of hospital facilities, migration of people to urban areas and abroad for study and employment, and also the influences of mixed cultures due to cross-cultural communications or settlements in new areas [35, 36].

Mostly the people living in the villages have strong belief on the traditional healing system and traditional medicine. The male and female ratio may indicate the dominancy of the male ethno-medicinal practitioners than female. Such type of trends was also reported in different ethno-medicinal studies [2, 10, 14, 36] (Table 2). About 43% of the respondents were farmers and healers who had broad knowledge of ethno-medicine. There were 38% of the respondents with basic level and 26% of them with secondary level education. Locally popular traditional healers and wizard doctors were involved in the focus group discussion.

Faunal diversity and uses

The present research revealed the use of 58 animal species of 23 orders, 37 families and 53 genera to cure 62 human and 3 veterinary ailments (Table 3). Among the medicinal animals, 53 animal species are collected from the wild and five are domesticated (Table 3). Among the used animals, two animals have poisonous property (Table 3). The use of threatened wild animals was also reported in the treatment of different ailments (Table 3). It shows that many wild animals if used regularly would likely decline leading to possible extinctions.

The order, family, scientific names, English names, Nepali names, IUCN category, use value (UV), parts used, uses are presented in Table 3. Among 58 vertebrates, 24 species (41%) were Mammalia, 16 Aves (28%), 6 Reptilia (1%), 3 Amphibia (0.5%) and 9 Actinopterygii (1.5%) (Fig. 2). Local people and poachers from outside killed animals for their body parts have been causing the greatest threats to wildlife [20, 38]. Similar types of threats were also reported during this study. Mammals considered as the most important vertebrate group that were used very high in traditional medicine. Rural people believed that wildlife mainly mammals are the sources of protein and other essential supplementary foods and medicines [39]. Similar studies showed the uses of vertebrates for more than 232 traditional zoo therapeutic remedies for human and animal health [12], and food and medicinal purposes of humans [10]. The use of a number of animals and the drugs derived from them recorded from the different altitudes of the study area. Practice of using traditional medicine was found higher in the mid hills and mountainous region than Terai region (Chitwan) (Table 1). The local people used cooked meat of Golden jackal for treatment of paralysis and preparation of wine for treatment of rheumatism. Similar type of the practices also reported by Lohani [10] in Tamang community of Sindhupalchowk and Poudel and Singh [40] reported use of meat and fat of Golden jackal for treatment of the rheumatism in Darai community of Chitwan, Nepal. Similarly, Rai and Singh [13] reported such practices in Rai community of Bhojpur. Bones and meat of the animals are full of calcium, protein and phosphorous hence, soup of the bone and meat of animals is given for the person suffering from the muscular spasm, cramp, bone fracture, arthritis and energy (Table 3). A similar type of treatment methods was also recorded in the study of Lohani [10] in Tamang community, Nepal; Vijayakumar et al. [2] in Kerela adjoining areas of Mt. Abu Wildlife sanctuary, India; Nijman and Shepherd [20] in Kyaiktiyo, Myanmar.

Veterinary important traditional medicines and insecticides

Medicinal fauna from four different animal families occurring in four genera and four species have veterinary importance. Generally, animal's parts and products such as urine, droppings, fat and meat are used. They are used internally or externally (Table 3). However, most of the people in the study area have little idea and knowledge about veterinary and agricultural use of vertebrates. Furthermore, this study also indicated that more than 81% of vertebrate species used treating more than one ailment.

Similar studies outside Nepal also reported the wide use of animals in ethno-medicines such as González et al. [41] recorded use of 30 wild vertebrates to treat domestic animals in Spain; Souto et al. [42, 49] reported 11 animals for ethnoveterinary medicine in the semi-arid region of Northeastern Brazil and Gupta et al. [43] reported a total of 11 species of vertebrates for treating various veterinary diseases in India.

Animal parts used

The animal parts used for treating different ailments were of 22 types. Meat was the most preferred parts (n=48), possibly because meat has more protein and medical properties followed by fat (n=11), fecal matter (n=6), gallbladder, horn and antler and blood (each n=5), egg and claws (each n=3), urine, skin, milk, ghee and hair (each n=2), hoofs, feathers, teeth, brain, stomach, shell, quail, bone and legs (n=1) (Fig. 3, 6,7). Similar study of Quave et al. [12] reported whole animal, milk and milk products, meat/animal flesh, fat, honey and eggs, feces, urine, and seminal fluid in different treatment in different ethnic groups of Albania, Italy, Spain and Nepal. In previous studies, it was found that the ethno medicines are prepared from the animal parts and products [2, 4, 11, 13, 46, 48].

Medical preparations and their admission

The medical remedies were based on many kinds of preparations ranging from a preparation made out of a single animal for a single ailment to use of animals in combination (Table 3). There were 12 types of preparations used in the study area. Cooked meat was commonly practiced (31%) followed by boiled and oil (each 12%), paste (11%), soup (10%), raw meat (9%), dry (6%), ash (3%), powder and lotion (each 2%) and fume and wind (each 1%) (Fig. 4). Consumption practices of raw body parts of animals are common for curing diseases in many ethnic groups at global level [2, 23, 35, 40, 44, 45]. However, consumption of raw meat may increase the risks of transmitting different types of parasites and diseases to human [11, 46].

The most common mode of admission of medicine is oral (67%) followed by topical application (30 %) and drop (4%). Topical use is an important way of remedy of musculo-skeletal problems like muscular pain, fractures, rheumatism and arthritis. Such modes of administration were found in studies from Korea [46], in India [2] and also in Nepal [11, 40].

Informant consensus factor, fidelity level and use value

The results of the informant consensus factor (ICF) calculation show that the value in our study ranges from 0.833 to 0.974. Cardiovascular and dental problems have the highest ICF value 0.974, with cardiovascular problems having 351 use-reports for 10 animal species and dental problems having 77 use-reports for 3 animal species. It is followed by musculoskeletal problems (ICF = 0.973; 926 use-reports, 46 species). The least agreement between the informants was observed for animals used to cure ophthalmological uses with ICF value 0.833 with 7 use-reports for 2 animal species (Table 4). Low ICF value might be due to lack of communication for the treatment of such ailments among the people of different cultures, different localities and ethnicities of the study area. Local people believed that there was no any side effects while using these ethnomedicines. Besides, this study helps to generate ethnozoological knowledge among the local people.

When selecting the most preferred animal species for each ailment category, we took the highest FL (%) in each category of ailment (Table 5). *Leptoptilos javanicus* and *Duttaphrynus himalayanus* for Cardiovascular ailments, *Bubulcus ibis* for dental problem, *Corvus splendens* *Hemidactylus flaviviridis* and *Varanus bengalensis* for dermatological problem, *Canis lupus familiaris*, *Tyto alba* and *Calotes versicolor* for gastro-intestinal problem, *Lophura leucomelanos* for musculoskeletal problem, *Rattus rattus* *Arborophila torqueola* *Acanthocobitis botia* and *Anabas testudineus* for reproductive problem, *Rhinolopus* sp., *Macaca assamensis*, *Streptopelia orientalis*, *Acridotheres fuscus*, *Schizothorax richardsonii* and *Pethia conchonius* for respiratory problem has the highest FL (100 % each) and *Felis chaus* has the lowest (20 %) for Ophthalmological problem purposes. The 100% animals indicate that healers and local respondents were used that animals for the treatment of same disease. It implied that well-known species were used more than the little-known species to cure the disease or disorders [24, 46, 47]

The most commonly used species was *Felis chaus* (UV = 0.25) with 3 use-reports by 10 informants. It was followed by *Panthera tigris* (UV = 0.23) with 6 use-reports by 57 informants, *Rhinoceros unicornis* (UV= 0.16) with 6 use-reports by 43 informants and *Columba livia* (UV= 0.14) with 3 use-reports by 22 informants (Table 3).

The correlation between the highest fidelity level (%) in ailment categories and animal use value (UV) was not significant (Spearman's correlation test: $r^2 = 0.038$, $p = 0.209$) indicating that the animals systematically used for a specific ailment category are not necessarily those used commonly in the region. Although animals with high FL or UV are the most preferred species in study sites (Table 4 and 5), animals with low FL or UV should not be neglected as failing to mention them to the future generation could increase the risk of gradual disappearance of the knowledge.

Conservation status

Due to lack of modern medical facilities and belief on the traditional healing system, some people of the study area forced to use animals and their body parts for curing various ailments. Besides, superstitions and mythologies were very popular among the ethnic groups that may also play vital roles for using the animals. Therefore, they intentionally or unintentionally kill animals for ethno-medicinal uses which might increase threats to wildlife including many Globally Threatened Species. Out of total (Table 3). Ten animals were Globally Threatened (2 Endangered, 8 Vulnerable), five were Near Threatened, one was Data Deficient and 37 Least Concerned species according to IUCN Red list [60] (Fig. 5). The Government of Nepal implemented National Park and Wildlife Conservation (NPWC) Act 1973 and Forest Act 1993 to protect wildlife and their habitats in Nepal. These laws strictly prohibited the hunting and killing of wildlife. There is no permission of killing the wildlife listed in CITES for food, medicine, and their trade. However, sometimes these laws malfunction due to local religious norms and cultural beliefs enable them to kill those animals. The tribal people have scarce knowledge about the status of wild animals, high superstition and myths associated with traditions that cause harm to wild animals. Hence, these activities of local people may lead the extinction of wildlife. Therefore, to protect the wild animals, the local traditional people should aware about the alternative method of treatment systems such as the use of medicinal plants instead of animal products. Study of Jaroli et al. [48] found that among 24 identified animals used by Garasiya people of adjoining areas of Mount Abu Wildlife Sanctuary, India, 16 animals (including elephant, tiger, sambar, Himalayan black bear) included in IUCN red list. If the people didn't think about the alternative methods of treatment systems, it will bring great problems on wildlife conservation. The global biodiversity crisis, caused mainly by anthropogenic actions, people overexploited the wild animals for ethnomedicine and created obstacles in animal conservation [38]. A similar type of problem was also reported in Brazil [42].

Extinction risk is very high for the vertebrates as compared to invertebrates [50]. Vertebrates are more prone to habitat loss, exploitation, poaching and illegal trade. Besides other studies, ethno-medicinal uses of vertebrates offer the reasons for increasing threats to their conservation. Therefore, this study is mainly devoted to vertebrates and not invertebrates. The ethnic communities and local healers need search for other treatment options such as plants instead of animals. For example, fruits of *Rhus javanica* can use instead of cooked blood of Golden jackal (*Canis aureus*) which was used treating asthma [24, 51]. Seed oil of *Impatiens scabrida* can help to relieve body pain instead of fat of leopard (*Panthera pardus*) [24, 52, 59]. Similarly, powder prepared from the roots of *Heracleum wallichii* used treating stomach problems to substitute meat of Himalayan goral (*Naemorhedus goral*), Indian crested porcupine (*Hystrix indica*) and Liebig's frog (*Nanorana liebigii*) [53, 54]. This study suggests that there is enough space for the researcher to document alternatives of the vertebrates for ethno-medicinal value.

Conclusions

The study is the first effort to document primary data of the ethno-medicinal knowledge about the use of vertebrates by the local people of Chitwan-Annapurna Landscape. Ethno-medicinal knowledge about vertebrates and their body parts and products play the vital role in conservation and consumption of those species. A total of 58 species of vertebrates used for the treatment of 62 human ailments which were grouped into 11 categories. Mammals contributed the highest number among them ($n=24$) in ethno-medicine. This study also indicated that more than 76% of vertebrate species were found to be used for the treatment of more than one ailment. The most commonly used species was *Felis chaus* (UV = 0.25) with 3 use-reports by 10 informants. Cardiovascular and dental problems had the highest ICF value (0.974) with cardiovascular problems having 351 use-reports for 10 animal species and dental problems having 77 use-reports for 3 animal species. The least ICF was found in ophthalmological problems (ICF=0.833, use reports=7 for 2 species). Traditional knowledge was more common among elderly people than young people because of long experiences of utilizing nature while lack of more knowledge among youth. Therefore, our study concluded that there is necessity for documentation of detailed knowledge about the status and specific use-values of

vertebrates as well as the transfer of knowledge from seniors to the youths for sustainable ethno-medicine in living with nature places like Chitwan-Annapurna Landscape, central Nepal. This empirical knowledge described in this study will help for the preparation of conservation planning to control the hunting of threatened wildlife. Furthermore, ethnic people should consider the alternative options such as the use of commonly found medicinal plants and other inorganic salts or compounds for the treatments of ailments. Any future economic gains obtained using indigenous knowledge should be share with local communities to safe guard their intellectual property rights.

Declarations

Acknowledgments

We are grateful to the Department of National Parks and Wildlife Conservation (DNPWC), Nepal, Chitwan National Park and Annapurna Conservation Area, Division Forest Offices of Chitwan, Tanahun and Kaski districts for providing the research permission. Our thanks also go to the field assistances and the respected wizard doctors (Dhami) and traditional healers for transferring hidden knowledge. We are thankful to the local people of the study area who provided the valuable information about the use of vertebrates in ethnomedicine.

Author Contributions

JNA & BPB designed and carried out research. MBR, BPB & JNA performed data analysis. JNA, BPB, MBR & TBT wrote the manuscript.

Funding

The project was supported by the Nepal Academy of Science and Technology, Kathmandu and Institute of Botany, Czech Academy of Sciences, institutional support RVO 67985939.

Availability of data and material

All data collected and analyzed during the study are included in Table and figures of this manuscript.

Ethics approval and consent to participate

Permissions were taken from concerned authorities of the study area such as Department of National Parks and Wildlife Conservation, Division Forest Offices of Chitwan, Tanahun and Kaski districts and local authorities. Prior oral informed consent was obtained from the local people who participated in the interviews and surveys.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1. List of ailments grouped into different categories.

SN	Ailment categories	Biomedical terms	Nepali name
1	Cardiovascular problem	Anaemia	Rakta alpata
		Malaria	Aulo jaro
		Snake bite	Sarpa le tokeko
2	Dental problem	Gum bleeding	Dant bata ragat aune (Harsa rog)
3	Musculoskeletal problem	Rheumatism	Bath rog
		Muscular pain and cramp	Masu tuteko/ Dukheko
		Backbone pain	Dhad dukheko
		Arthritis	Haddi khiyeko
		Strength	Baliyo
		Energy	Sakti
		Protein deficiency	Protein ko kami
4	Reproductive problems	Menstrual problem	Mahinabari ma pida, Kharabi
		Sexual performance	Yaunsakti badaune
		Low sperms	Sukrakit kami hunu
		Infertile	Banjo pan
		Hermaphroditism	Napusakata
		Delivery pain	Prasab pida
		Uterine bleeding	Patheghar bata ragat bagnu
5	Ear, Nose and Troat problem	Ear ache	Kan dukheko
		Speech	Boli ma samashya
		Heart disease	Mutu dukheko
6	Respiratory problem	Asthma	Dam
		Hiccups	Hikka hikka hunu
		Cough	Khoki lageko
		Tuberculosis	Kshyarog
		Pneumonia	Nimoniya
		Cold	Chiso lageko
7	Neurological problem	Anxiety	Chinta rog
		Will power	Ichhasakti
		Mental illness	Manasik rogi
		Epilepsy	Chhare rog
		Neurovascular	Nasa sambandi rog
		Ghost	Bhut lageko
		Tetanus	Danustankar
		Rabies	Rebij
		Paralysis	Pyaralaisis
8	Dermatological problem	Wound	Ghau lageko
		Pimples	Dandiphor
		Burning	Poleko, Dadeko
		Marks of old wounds	Purano ghau ko khat
		Facial spots	Anuhar ma kalo thopla aune
		Skin disease	Chhala ko rog
		Scabies	Luto
		Ring worm	Daad
		Loss of hair	Raun jharne
		Allergy	Chilaune rog
		Measles	Dadura ayeko
		Cracks of soles	Paitala Phutne
		9	Gastro-intestinal problem
Nausea	Wakwaki lagnu		
Ulcer	Andra ma ghau hune		
Endogenous wind	Bayu, Gano gola		
Stomach pain	Pet dukheko		
Gastritis	Amlapitta		
Constipation	Kabjiyat		
Piles	Pile		
Vomiting	Ulti hune		

		Dysentery	Aaun pareko
		Jaundice	Kamalpitta, Pahele rog
10	Ophthalmological problem	Poor vision	Disti alpata
11	Others	Headache	Tauko dukheko
		Fever	Jaro aayeko
12	Veterinary and agriculture use	Insecticides	Kitnasak
		Wounds on cattle	Gai lai ghau bhayema
		Mouth and foot disease	Khoret

Table 2 Demographic profile of the respondents.

Questionnaires (n=204)	Block A	Block B	Block C	Block D	Total	Percentage
No of household interviewed	52	45	58	49	204	100
Occupation wise						
Farmer	19	21	28	19	87	43
Students	4	6	4	3	17	8
Teacher	8	4	8	5	25	12
Social workers	5	5	7	5	22	11
Government employer	7	5	3	1	16	8
Hotel owner	2	0	0	6	8	4
Business	7	4	8	10	29	14
Gender						
Female	15	12	27	16	70	34
Male	37	33	31	33	134	66
Academic status						
Illiterate	4	5	6	9	24	12
Literate	14	18	28	17	77	38
Secondary	16	11	13	14	54	26
Intermediate	9	6	7	4	26	13
University	9	5	4	5	23	11
Caste system						
Dalit	1	6	2	6	15	7
Gurung	8	4	10	34	56	27
Magar	2	16	28	0	46	23
Newar	0	3	7	0	10	5
Tamang	3	5	0	4	12	6
Darai	4	2	0	0	6	3
Sanyasi	0	2	7	0	9	4
Braman/Chhetri	5	5	4	3	17	8
Gharti	0	0	0	2	2	1
Tharu	18	0	0	0	18	9
Mushahar	6	0	0	0	6	3
Bote	5	2	0	0	7	3
Age group (year)						
15-19	3	3	2	1	9	4
20-29	3	3	4	4	14	7
30-39	8	6	4	7	25	12
40-49	12	10	11	8	41	20
50-59	12	14	18	9	53	26
60-69	10	6	14	11	41	20
70-79	2	3	5	7	17	8
Above 80	2	0	0	2	4	2

Table 3 Medicinal uses of vertebrates and their body parts in traditional medicine by the people inhabiting in Midhill Nepal.

(Where, W= Wild, D= Domestic, EN= Endangered, V= Venerable, NT= Near threatened, DD= Data deficient, LC= Least concerned, UV= Use value).

SN	Family	Scientific Name	English names	Nepali names	IUCN category	UV	Parts used	Uses	Similar use references
Class: Mammalia									
Order: Carnivora									
1	Canidae	<i>Canis aureus</i> Linnaeus, 1758	Golden jackal (W)	Shyal	LC	0.03	Meat, blood, fat	Cooked meat with oat and pea is believed to use the people suffering from paralysis; wine prepared from the meat is considered as good for people suffering from rheumatism; fresh or cooked blood is believed to good for asthma; massage from the fat or oil will be relief from muscular pain and cramp.	[4]
2	Canidae	<i>Canis lupus familiaris</i> Linnaeus, 1758	Black dog (D)	Kalo Kukur		-	Scat	The paste of the old dry scat of the black dog is considered as the good for poisoning.	
3	Felidae	<i>Panthera pardus</i> (Linnaeus, 1758)	Leopard (W)	Chituwa	VU	0.04	Meat, Skin, Fat, bone, hair	Cooked meat is used to retain the sexual performance; ghost will not enter into the home, if they have a piece of leopard skin; massage from the fat of leopard, provide relief from back bone pain and arthritis; the ash of the hair is mixed with mustard oil and used in old wounds, help for curing; the soup of the bone is considered as aphrodisiac in nature. Veterinary and agriculture use- the dry skin is rubbed and the paste is used in the cattle suffering from mouth and foot disease.	[12]

4	Felidae	<i>Felis chaus</i> Schreber, 1777	Jungle cat (W)	Ban Biralo	LC	0.25	Meat	The whole body is unskinned and boiled to make soup and given to the patients of arthritis and poor vision.	
5	Felidae	<i>Panthera tigris</i> (Linnaeus, 1758)	Tiger (W)	Baag	EN	0.23	Teeth, brain, blood, skin, meat, faecal matter	The paste of the teeth of tiger is considered as good for rabies, asthma; lotion of the brain is suggested to use in face for pimples and raw brain is also prescribed to eat to remove laziness; blood of tiger is used for strength and develop willpower; paste of dry skin and hair is prescribed in mental illness; cooked meat of tiger is good for nausea and malaria suffering person; dry ash of scat is mixed with black powder, black salt and honey and prescribed to eat for the treatment of burning, piles, epilepsy, ulcer and malaria.	[12, 40]
6	Ursidae	<i>Ursus thibetanus</i> G. [Baron] Cuvier, 1823	Asiatic black bear (W)	Kalo bhalu	VU	0.04	Gall bladder, claws	The gallbladder of the bear is cooked with rice or wheat and made dry. Such dry grains is supplied to the patients of malaria and Jaundice for a week; the claw is rubbed and made a fine paste and used in skin to remove the marks of old wounds.	[12]
7	Ursidae	<i>Melursus ursinus</i> (Shaw, 1791)	Sloth bear (W)	Rukh bhalu	VU	0.10	Gall bladder, meat, claws	Dry gall bladder is prescribed to remedy from cold, improve eye sights, and control fever; soup of meat of	[12]

bear help to stop endogenous wind to arrest convulsion; bear meat is valued as sexual-performance and health booster; the claw is rubbed and made a fine paste and used in skin to remove the marks of old wounds.

Order: Cetartiodactyla

8	Bovidae	<i>Naemorhedus goral</i> (Hardwicke, 1825)	Himalayan goral (W)	Ghoral	NT	0.04	Horn, hoops, meat	The horn of the goral is rubbed and made a fine paste and used in the navel region for curing the stomach pain; the hoops are rubbed and the paste is used to remove the black spots from the face, the cooked meat is used to promote strength and virility.	
9	Bovidae	<i>Ovis aries</i> Linnaeus, 1758	Sheep (D)	Bhendo		0.02	Ghee, milk	The massage from the ghee of sheep during muscular cramp is considered as good for victim; the milk of the sheep is mixed with long pepper (<i>Piper longum</i> L.) and given to the person suffering from stomach pain.	[11-13]
10	Bovidae	<i>Bos taurus</i> Linnaeus, 1758	Cattle (D)	Gai		0.02	Urine, milk, ghee,	Urine of cow help to control the skin disease while applying on the skin twice a day for a week; urine also help to relief from gastritis while drinking half tea glass of grass early in the morning before meal; Milk of cow helps to promote strength and virility; massage by ghee of cow gets relief from muscular and	[11, 12]

							<p>joints pain. Veterinary and agriculture use- urine of cattle is used in the crops for killing the harmful insects likewise, droppings of cow helps to reduce the insects in the crops.</p>		
11	Bovidae	<i>Bubalus bubalis</i> <i>bubalis</i> (Linnaeus, 1758)	Buffalo (D)	Bhaisi		0.03	Meat, faecal matter	Meat is used to promote strength and virility; Dry dung is burnt and mixed with mustard oil and applied to cure measles and scabies.	[11, 55, 56]
12	Cervidae	<i>Rusa unicolor</i> (Kerr, 1792)	Samber (W)	Jarayo/mriga	VU	0.05	Horn, Meat	The antler is rubbed and make a fine paste and used on the face is help to make the fair face, The past of the antler is used to cure old ring worm; the paste is also used around the large wound is help to reduce the rash of wound; cooked meat is used to promote strength and virility.	[13]
13	Cervidae	<i>Muntiacus vaginalis</i> (Boddaert, 1785)	Northern red muntjac (W)	Rate, Rato mirga	LC	0.05	Meat, horn	Cooked meat helps to relief the person suffering from heart disease; the antler is rubbed with water and used as ear drops during earache.	[11, 55, 56]
14	Cervidae	<i>Axis axis</i> (Erxleben, 1777)	Chital (W)	Chital	LC	0.06	Antler, Meat	The antler is rubbed and make a fine paste and used on the face is help to make the clear face; the paste is also used around the large wound to reduce the rash; the cooked meat is used to promote strength and virility.	[11, 55, 56]
15	Suidae	<i>Sus scrofa</i> Linnaeus, 1758	Wild boar (W)	Bandel	LC	0.04	Meat	The cooked meat is used to promote strength	[11, 12]

and virility; the soup of dry meat (leg) is provided to relief the patient suffering from epilepsy.

16	Suidae	<i>Sus domesticus</i> Erxleben, 1777	Pig (D)	Sungur		0.08	Gall bladder, Fat	Gall bladder is boiled and mixed with honey and black salt and given the person suffering from asthma for a month; the melted fat of pig is used in the face as lotion to cure pimples.	[11, 12]
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Order: Chiroptera

17	Rhinolophidae	<i>Rhinolopus</i> sp.	Bat (W)	Chamero		-	Meat	The cooked meat of bat is good for asthma; the meat soup is given to the patients twice in a day for one months to cure from tuberculosis.	
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Order: Lagomorpha

18	Leporidae	<i>Lepus nigricollis</i> F. Cuvier, 1823	Indian hare (W)	Kharayo	LC	0.04	Blood, Meat, Hair	Fresh blood of rabbit is given to the patients for drinking for the treatment of asthma; cooked meat of rabbit is given at least 3 days for the treatment of menstrual problems; the ash of the hair is mixed with mustard oil and used in wounds.	[12, 40]
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Order: Perissodactyla

19	Rhinocerotidae	<i>Rhinoceros unicornis</i> Linnaeus, 1758	Indian Rhinocers (W)	Gaida	VU	0.16	Horn, Meat, Urine	The powder of horn of rhino is advised to use the person suffering from fever, arthritis, anxiety and food poisoning, cooked meat or soup is suggested to eat for the treatment of paralysis and tuberculosis; urine is used as ear drops to cure ear ache.	[11]
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Order: Primates

20	Cercopithecidae	<i>Semnopithecus</i>	Tarai gray	Kalo Bandar	NT	0.09	Meat	cooked meat is	[11, 12]
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hector (Pocock, 1928) langur (W)

believed to use for the relief of rheumatism, asthma, anemia.

21	Cercopithecidae	<i>Macaca assamensis</i> M'Clelland, 1840	Assame macaque (W)	Pahare Bandar	NT	-	Meat	The meat of the monkey is cooked with small pea and given to patients suffering from Tuberculosis for a month.
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Order: Rodentia

22	Hystricidae	<i>Hystrix indica</i> Kerr, 1792	Indian crested porcupine (W)	Dumsi	LC	0.04	Stomach, Meat, Quails, Fecal matter	Stomach and intestine parts are dried (along with oat) and given to people suffering from the asthma; cooked meat is given to the children suffering from cold and stomach pain; wizard doctors use the quails to protect the sick people from ghost; dry fecal matter is grinded well and make a fine paste with honey and given to patients suffering from abdomen pain. [4]
23	Muridae	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat (W)	Muso	LC	-	Meat	The cooked meat is considered as good for increasing sperms of male.

24	Sciuridae	<i>Petauista</i> sp.	Flying squirrel (W)	Rukh Lokharke	LC	0.09	Meat, Fat	The un-skinned body of flying squirrel is kept into the mustard oil and used for massage; the hair on the head will reappear when the oil of the squirrel is used on the head for a month.
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Class: Aves

Order: Ciconiiformes

25	Ciconiidae	<i>Leptoptilos javanicus</i> (Horsfield, 1821)	Lesser adjutant (W)	Garud	VU	-	Claws, Meat	The paste of claws of stork is applied on the place of snake bite and considered as extraction of poisons from bite; hot soup of meat
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is prescribed to eat for the patient of malaria for a month.

Order: Charadriiformes									
26	Charadriidae	<i>Vanellus indicus</i> (Boddaert, 1783)	Red-wattled lapwing (W)	Hutitaun	LC	0.04	Egg	Egg is given to the person suffering from gum bleeding and piles.	[5, 11]
Order: Columbiformes									
27	Columbidae	<i>Treron sphenurus</i> (Vigors, 1832)	Wedge-tailed green-pigeon (W)	Haleso	LC	0.02	Meat	The soup of meat is given the paralysis suffering person for a month; cooked meat is considered as good for cold suffering person.	[11]
28	Columbidae	<i>Columba livia</i> Gmelin, 1789	Rock dove (W)	Parewa	LC	0.14	Meat, Fecal matter	Cooked meat is given to the patients of paralysis; dry fecal matter is applied as a paste with mustard oil to treat boils and blisters.	[4, 5, 56]
29	Columbidae	<i>Streptopelia orientalis</i> (Latham, 1790)	Oriental turtle-dove (W)	Dhukur	LC	-	Meat	Soup of the meat is prescribed protection from cold.	[4, 13]
Order: Galliformes									
30	Phasianidae	<i>Arborophila torqueola</i> (Valenciennes, 1826)	Hill partridge (W)	Pyura	LC	-	Meat	The soup of meat is considered as good for sexual performance and infertile male and female.	
31	Phasianidae	<i>Lophura leucomelanos</i> (Latham, 1790)	Kaliz pheasant (W)	Kaliz	LC	-	Meat	Cooked meat is used to promote strength and virility for child and child bearing mothers.	[11, 13]
32	Phasianidae	<i>Francolinus francolinus</i> (Linnaeus, 1766)	Black francolin (W)	Titra	LC	0.02	Egg, Meat	Boiled egg is given to the anemia suffering women; cooked meat is used to promote strength and virility.	[13]
33	Phasianidae	<i>Gallus gallus</i> (Linnaeus, 1758)	Red jungle fowl (W)	Ban Kukhura	LC	0.09	Fat, meat	It will get relief when the fat/oil of the Red jungle fowl is used in burning wounds; cooked meat and soup is used to promote strength and virility.	[11, 13]
34	Phasianidae	<i>Pavo cristatus</i> Linnaeus, 1758	Common pea fowl	Mayur	LC	0.08	Feather, Meat,	Ash of feather is mixed with	[5, 11, 12]

(W)

Egg

coconut oil and prescribed to use for the patients suffering from headache, hiccups and vomiting; cooked meat is prescribed to use for energy, and protect from cold; boiled egg is suggested to use for gum bleeding.

Order: Passeriformes

35	Passeridae	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow (W)	Bhagera	LC	0.10	Meat	The paste of the meat is used on the anus of the baby to control constipation; fume is applied on the whole body for controlling allergy; the head of the sparrow is used for increasing sexual performance.	[4, 5]
36	Sturnidae	<i>Acridotheres fuscus</i> (Wagler, 1827)	Jungle myna	Sarau	LC	-	Meat	The soup prepared from the meat of common myna with black powder, black salt is considered as good for coughing and pneumonia.	[4, 5]
37	Corvidae	<i>Corvus splendens</i> Vieillot, 1817	House crow (W)	Kag	LC	-	Blood	The raw blood is applied to treat wounds of the skin and crakes of the sole of feet.	

Order: Pelecaniformes

38	Ardeidae	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle egret (W)	Bakulla	LC	-	Meat	Cooked meat of heron is prescribed during gum bleeding and protection from hot.	
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Order: Psittaciformes

39	Psittacidae	<i>Psittacula krameri</i> (Scopoli, 1769)	Rose-ringed parakeet (W)	Suga	LC	0.04	Meat	Meat of parrot is considered as good for the production of speech in child and it also helps for sexual performance to adults.	[40]
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Order: Strigiformes

40	Tytonidae	<i>Tyto alba</i> (Scopoli,	Common	Huichil	LC	-	Meat	Meat is boiled	
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1769)

barn-owl
(W)and eaten with
black salt for
treatment of
dysentery.**Class: Reptilia****Order: Chelonia**

41	Chelonidae	<i>Nilssonia hurum</i> (Gray, 1830)	Indian peacock softshell turtle (W)	Kachhuwa	VU	0.04	Meat, Shell	Raw meat is used to cure from piles; the shell is rubbed and the paste is given In uterine bleeding cases.
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Order: Squamata

42	Agamidae	<i>Calotes versicolor</i> (Daudin, 1802)	Common garden lizard (W)	Chheparo	LC	-	Meat	Meat cooked and eat for the treatment of Jaundice. Veterinary and agriculture use-the whole body is boiled in mustard oil and then used to heal wounds on cattle's body. [4, 57]
43	Colubridae	<i>Ptyas mucosa</i> (Linnaeus, 1758)	Rattle snake (W)	Dhaman	LC	0.07	Fat	Fat is melted and applied on affected part of burning; melted fat is applied for massage in backbone pain.
44	Gekkonidae	<i>Hemidactylus flaviviridis</i> Rüppell, 1835	Northern house gecko (W)	Mausuli	LC	-	Fat	The whole body is boiled with Mustard oil and the oil is used to heal eczema.
45	Varanidae	<i>Varanus bengalensis</i> (Daudin, 1802)	Bengal monitor lizard (W)	Gohoro	LC	-	Meat	The boil meat is suggested to eat for the treatment of ringworm. [5]
46	Varanidae	<i>Varanus flavescens</i> (Gray, 1827)	Golden monitor lizard (W)	Sun Gohoro	LC	0.07	Meat, fat, skin	Boiled meat is suggested to eat for arthritis; cooked meat is suggested to use for rheumatism; fat is melted and applied in burning place and scabies, belt made by dry skin is used during backbone pain. [12]

Class: Amphibia**Order: Anura**

47	Bufoidea	<i>Duttaphrynus himalayanus</i> (Günther, 1864)	Common toad (W)	Khasre Bhyaguto	LC	-	Meat	Meat is boiled and given to the patients of heart disease mixing with honey. [4, 5]
48	Dicroglossidae	<i>Hoplobatrachus tigerinus</i> (Daudin, 1802)	Tiger frog (W)	Pahelo Pawa	LC	0.06	Fat, Meat	Oil of tiger frog is used in old wound, cooked

								meat is given to the pregnant women and other anemic persons for energy.	
49	Dicroglossidae	<i>Hoplobatrachus rugulosus</i> (Wiegmann, 1834)	Black frog (W)	Kalo Pawa	LC	0.09	Legs, Meat	Dry legs of black frog are hanged on the neck small kids, so that they can suck easily. It is regarded as the legs provides the more energy than breast feeding to child; cooked meat of frog is given to people suffering from stomach pain and suffering from cold.	[4, 5]
Class: Actinopterygii									
Order: Anguilliformes									
50	Anguillidae	<i>Anguilla bengalensis</i> (Gray, 1831)	Indian mottled eel (W)	Raj bam	NT	0.05	Meat	Cooked meat is prescribed to eat for controlling anemia and neurovascular disorders; fish soup is prescribed to eat for controlling asthma; fish oil and soup of meat is advised to use for the treatment of muscular pain and cramp.	[4, 5]
Order: Cypriniformes									
51	Balitoridae	<i>Acanthocobitis botia</i> (Hamilton, 1822)	Striped loach (W)	Garela Fish	LC	-	Meat	Cooked meat is used to promote strength and virility, sexual performance and control hermaphroditism.	
52	Cyprinidae	<i>Tor putitora</i> (Hamilton, 1822)	Mahasheer (W)	Sahar	EN	0.04	Gall bladder, Blood, Fat	Gall bladder of fish is dried with oats, wheat etc. and given to the patients suffering from fever; blood is used in the sore wounds in the foot; fish oil has more protein and supply to children for growth and mental development. Veterinary and agriculture use-	[4, 5]

								fresh blood of the Tor is used to the animals suffering from mouth and foot disease.	
53	Cyprinidae	<i>Schizothorax richardsonii</i> (Gray, 1832)	Asla (W)	Asala	VU	-	Meat	Use to promote strength for pregnant women.	[12]
54	Cyprinidae	<i>Pethia conchonius</i> (Hamilton, 1822)	Rosy barb (W)	Sidhre	LC	-	Meat	Fish is cooked with black piper and holy basil (<i>Ocimum tenuiflorum</i>) and the paste is used for the treatment of pneumonia.	[5, 40]
Order: Osteoglossiformes									
55	Notopteridae	<i>Notopterus notopterus</i> (Pallas, 1769)	Grey feather back (W)	Patala machha	LC	0.10	Meat	The fish is burned and cooked with mustard oil, black salt, black piper and prescribed to eat for the relief during delivery pain; fish is boiled with black piper, black salt and holy basil (<i>Ocimum tenuiflorum</i>) and given to eat during stomach pain	
Order: Perciformes									
56	Anabantidae	<i>Anabas testudineus</i> (Bloch, 1792)	Climbing perch (W)	Kabai	DD	-	Meat	Head portion of the fish, long pepper (<i>Piper longum</i>) and chilly are boiled together and prescribed to eat during menstrual problems.	[5, 40]
Order: Synbranchiformes									
57	Synbranchidae	<i>Monopterusuchia</i> (Hamilton, 1822)	Gangetic mudeel (W)	Chuche Bam	LC	0.01	Meat, blood	Boiled meat is prescribed to eat to get relief from muscular pain; raw blood is consumed for the treatment of anemia.	[5, 40]
Order: Siluriformes									
58	Siluridae	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Cat fish (W)	Buhari	NT	0.05714	Gall bladder, Meat	Boiled bile is prescribed to eat for the treatment of tetanus, cooked meat is prescribed to promote strength and virility.	[5, 40]

Table 4 Categories of ailments and informant consensus factor (ICF) for these categories.

Ailment categories	Number of use-reports (Nur)	Number of taxa (Nt)	Informant consensus factor (ICF)
Cardiovascular problem	351	10	0.974
Dental problem	77	3	0.974
Musculoskeletal problem	926	26	0.973
Reproductive problems	355	12	0.969
Ear, Nose and Throat problem	63	3	0.968
Respiratory problem	452	16	0.967
Neurological problem	262	12	0.958
Others	47	3	0.957
Dermatological problem	369	22	0.943
Gastro-intestinal problem	263	17	0.939
Ophthalmological problem	7	2	0.833
Total	3172	126*	

*A taxon may be reported in more than one ailment category

Table 5 Most frequently used animal for different ailment categories based on highest FL (%) in each ailment category.

Ailments	Animal	FL(%)
Cardiovascular problem	<i>Leptoptilos javanicus</i> (Horsfield, 1821)	100
	<i>Bufo bufo</i> (Linnaeus, 1758)	100
Dental problem	<i>Bubulcus ibis</i> (Linnaeus, 1758)	100
Dermatological problem	<i>Corvus splendens</i> Vieillot, 1817	100
	<i>Hemidactylus flaviviridis</i> Rüppell, 1835	100
	<i>Varanus bengalensis</i> (Daudin, 1802)	100
Gastro-intestinal problem	<i>Canis lupus familiaris</i> Linnaeus, 1758	100
	<i>Tyto alba</i> (Scopoli, 1769)	100
	<i>Calotes versicolor</i> (Daudin, 1802)	100
Musculoskeletal problem	<i>Lophura leucomelanos</i> (Latham, 1790)	100
Reproductive problem	<i>Rattus rattus</i> (Linnaeus, 1758)	100
	<i>Arborophila torqueola</i> (Valenciennes, 1826)	100
	<i>Acanthocobitis botia</i> (Hamilton, 1822)	100
	<i>Anabas testudineus</i> (Bloch, 1792)	100
Respiratory problem	<i>Rhinolopus</i> sp.	100
	<i>Macaca assamensis</i> M'Clelland, 1840	100
	<i>Streptopelia orientalis</i> (Latham, 1790)	100
	<i>Acridotheres fuscus</i> (Wagler, 1827)	100
	<i>Schizothorax richardsonii</i> (Gray, 1832)	100
	<i>Pethia conchonius</i> (Hamilton, 1822)	100
Ear, Nose and Throat problem	<i>Psittacula krameri</i> (Scopoli, 1769)	75.6
Neurological problem	<i>Wallago attu</i> (Bloch & Schneider, 1801)	60
Others	<i>Tor putitora</i> (Hamilton, 1822)	56.9
Ophthalmological problem	<i>Felis chaus</i> Schreber, 1777	20

Figures

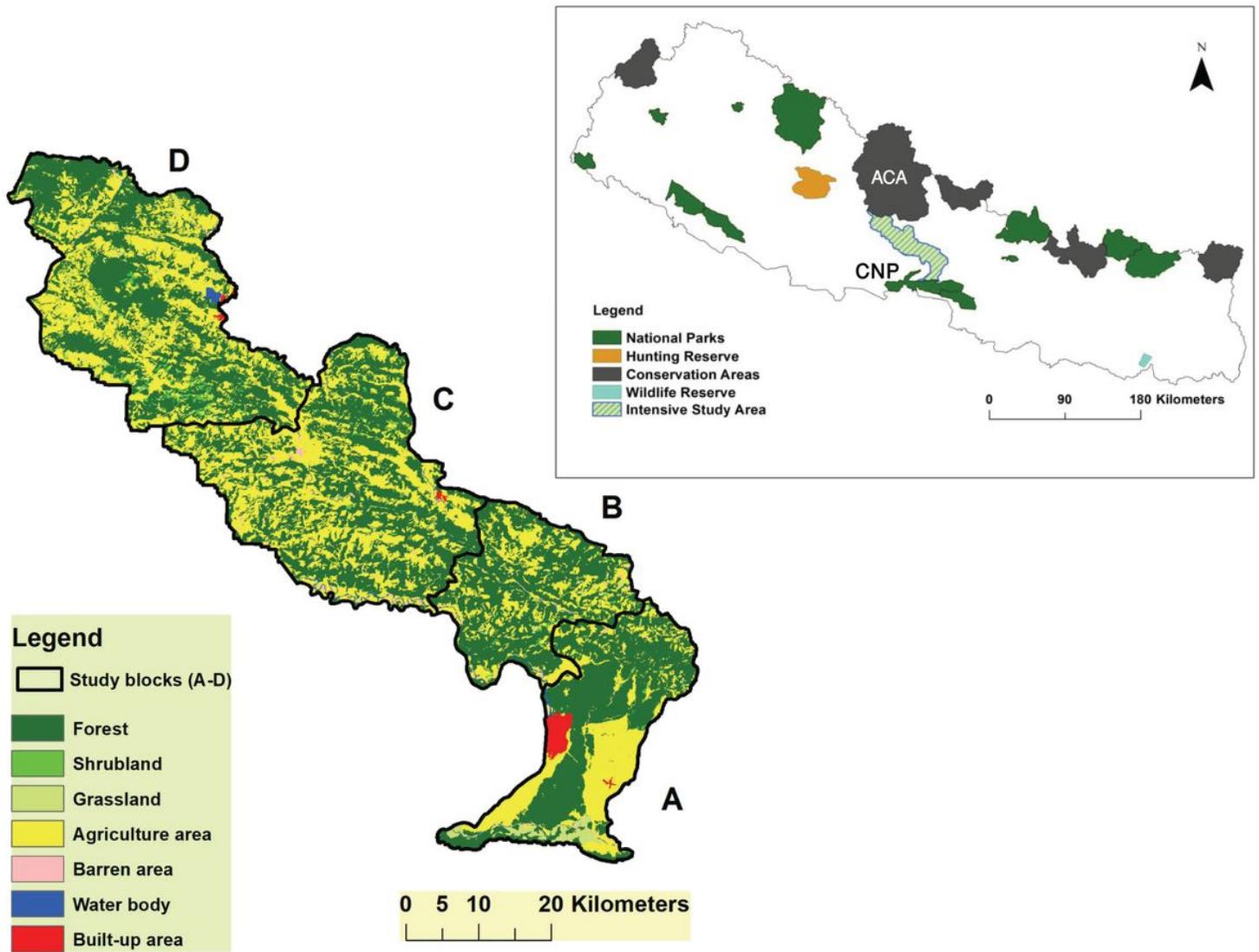


Figure 1

Map showing the intensive study areas which links two biodiversity significant areas: Chitwan National Park (CNP) and Annapurna Conservation Area (ACA).

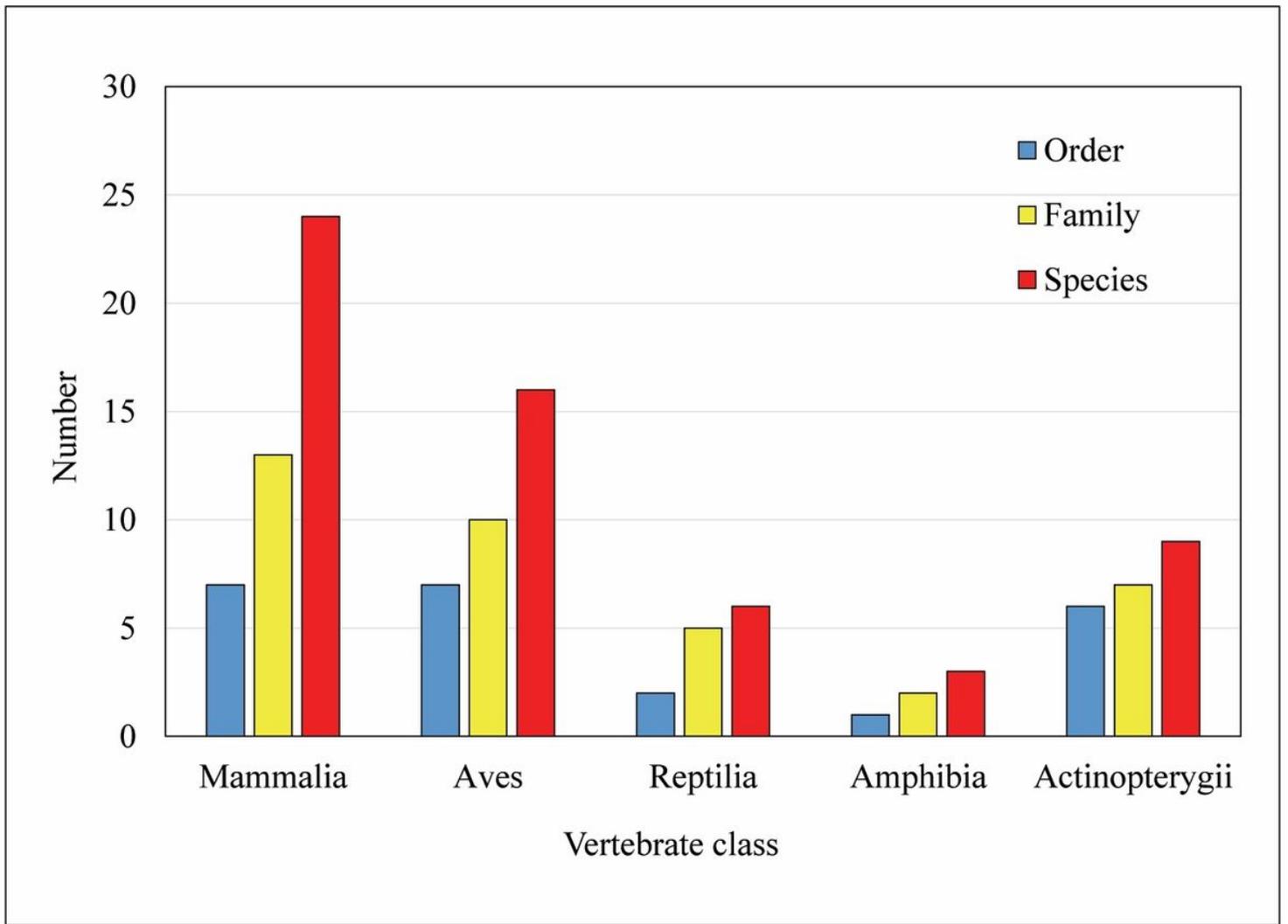


Figure 2

Taxonomic groups of vertebrates used in ethno-medicinal practices among different ethnic communities of Chitwan-Annapurna Landscape.

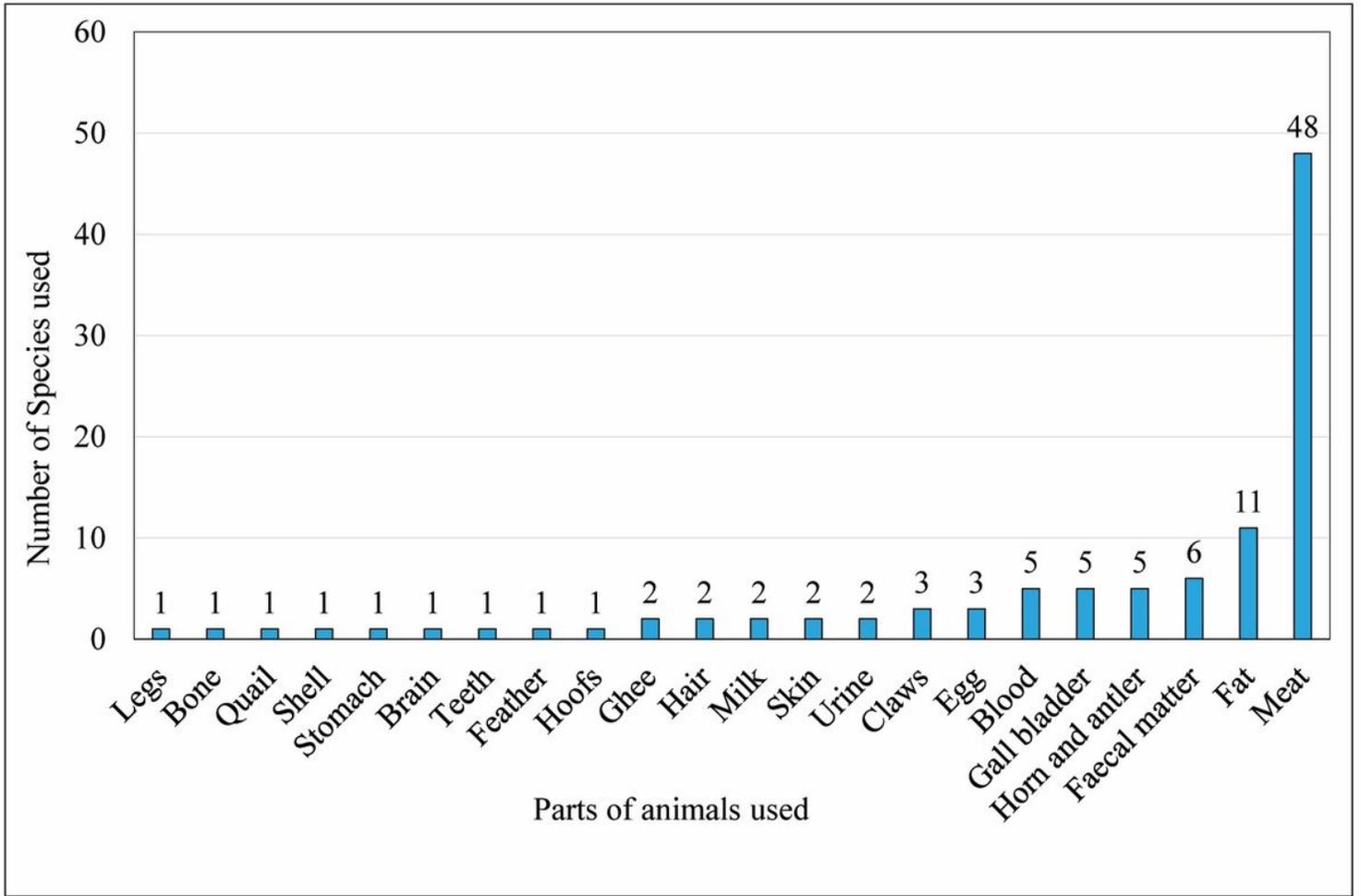


Figure 3

Percentage contribution of body parts of vertebrates used in ethno-medicine.

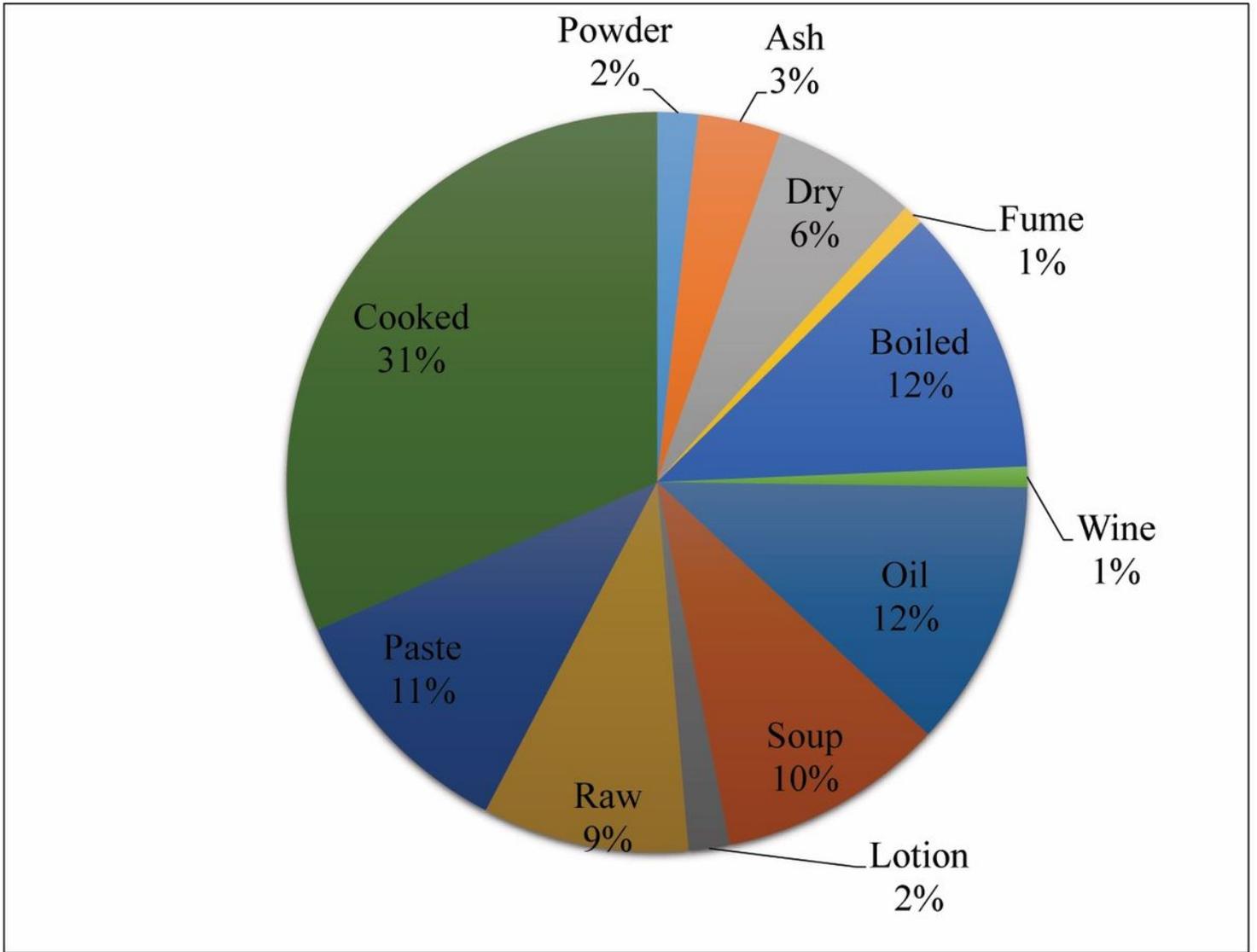


Figure 4

Mode of preparation of medicine from body parts of vertebrates.

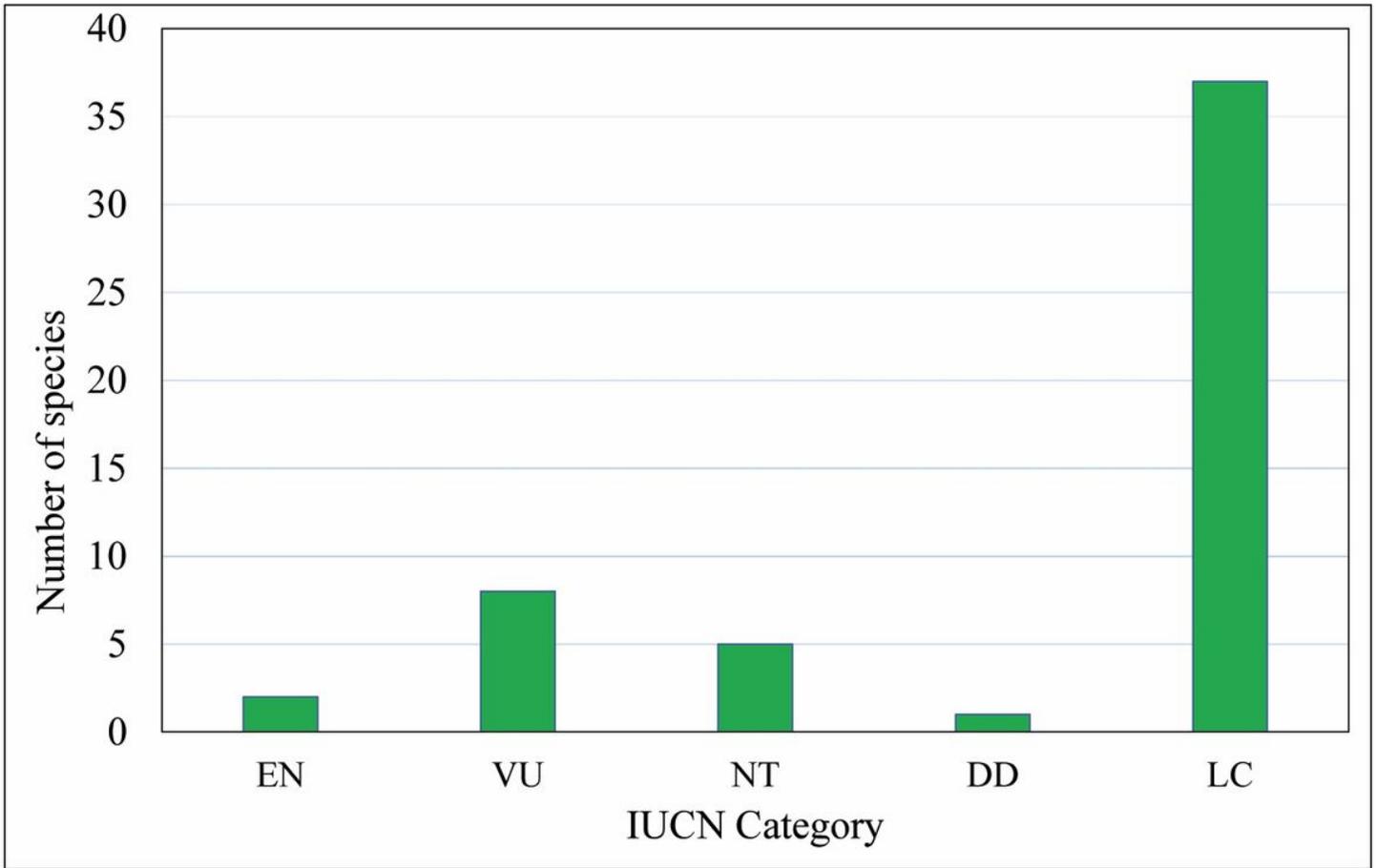


Figure 5

Conservation status of wild vertebrate species used for ethnomedicine in Chitwan-Annapurna Landscape, Nepal (according to IUCN Red List, 2019).



Figure 6

Parts of animals used by local ethnic group for the treatment of different diseases: A- Skin of Tiger (paste of dry skin and hair is prescribed in mental illness) B- Dry meat (leg) of Wild boar (the soup of dry meat (leg) is provided to relief the patient suffering from epilepsy) C- Bone of Leopard (the soup of the bone or paste is considered as aphrodisiac in nature). D- Leg of Lesser adjutant (The paste of claws of stork is applied on the place of snake bite).



Figure 7

Parts of animals used by local ethnic group for the treatment of different diseases: A- Belt made by the skin of Monitor lizard (belt made by dry skin is used during backbone pain) B- Horn of Himalayan goral (The horn of the goral is rubbed and made a fine paste and used in the navel region for curing the stomach pain) C-Treatment by local healer using traditional medicines D- Bat (The cooked meat of bat is good for asthma, tuberculosis).