Ethnomedicinal Uses and Conservation of Animals among Tharu, Magar and Brahmin Communities of Kapilvastu District, Nepal

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Nepal

A dissertation submitted

in partial fulfillment of the requirements for the award of the degree of Master of Science in Zoology with a special paper on Ecology and Environme

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March 2024

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Declaration

I hereby declare that the work presented in this dissertation "Ethnomedicinal uses and conservation of animals among Tharu, Magar and Brahmin communities of Kapilvastu district, Nepal" has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the authors and institutions.

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Recommendation

This is to recommend that the dissertation entitled "Ethnomedicinal uses and conservation of animals among Tharu, Magar and Brahmin communities of Kapilvastu district, Nepal" has been carried out Nisha Pokharel for the partial fulfillment of Master's Degree of Science in Zoology with special paper Ecology and Environment. This is her original work and has been carried out under my supervision. To the best of my knowledge, this dissertation work has not been submitted for any other degree in any institutions.

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Certificate of acceptance

This dissertation work submitted by Nisha Pokharel entitled "Ethnomedicinal uses and conservation of animals among Tharu, Magar and Brahmin communities of Kapilvastu district, Nepal" has been accepted as a partial fulfilment for the requirements of Master's Degree of Science in Zoology with special paper Ecology and Environment.

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Abstract

This study explores the ethnomedicinal uses and conservation of animals among Tharu, Magar and Brahmin communities of Kapilvastu district, Nepal. Ethnomedicinal knowledge plays a crucial role in indigenous healthcare systems, often utilizing various animal species for medicinal purposes. This research documents varieties of animals utilized in traditional medicinal practices by these communities about how they are prepared, and their parts used by using semi-structured questionnaires through participant observation and interviews by interviewing 300 respondents, 57% female, 43% male, including 100 Tharu, 100 Magar, 100 Brahmin aged between 20 to 85 years. Mammals were used most in all ethnic groups (n=22) followed by aves (n=18), pisces (n=10), insecta (n=4), reptiles (n=2), mollusca (n=2). Arachnid (n=1), crustacean (n=1) and amphibian (n=1) were least used species in ethnomedicine. Among them, it was found that 48 species were wild and 13 were domestic. In Tharu community, maximum number of species were used to cure respiratory diseases 33.56% and musculo-skeletal disease 31.77% and dental was the least treated diseases 0.48% by the ethnomedicinal knowledge. Similarly, in Magar ethnic group, more species were used to cure musculo-skeletal diseases 41.23% and respiratory disease 19.71%. Endocrinology and ENT were the least treated diseases 0.05% and 0.10% respectively. In Brahmin ethnic group, higher species were used to cure respiratory diseases 34.90% and musculo-skeletal diseases 29.93%. However, opthalmological and cardiovascular were least treated disease by use of animals; 1.64% and 0.25% respectively. A generalized linear model (GLM) was employed to examine the association between the medicinal animals reported with the socioeconomic factors: age, education, occupation, and ethnicity. Young people used fewer species than old ones while adults and old adults did not have much significant difference with old as far as species uses were concerned. There were significant associations between agriculture, business, housewives with unemployed ones and they used more species compared to service, labor and student. Although ethnomedicinal animals play a crucial role in Nepal's basic healthcare system, both their availability and usage are decreasing. The findings reveal a significant reliance on animals for therapeutic purposes, with each community exhibiting distinct preferences and practices based on their cultural beliefs.

शोध सार

यस अध्ययनले कपिलवस्तु जिल्लाका थारु, मगर र ब्राह्मण समुदायमा जनावरहरुको प्रयोग र जनावरहरु सम्बन्धित संरक्षण अभ्यासहरु लाइ अन्वेषण गरेको छ । पारम्पारिक ज्ञानले स्वास्थ्य सेवा प्रणालीहरूमा महत्त्वपूर्ण भूमिका खेल्छ, । यस अनुसन्धानले पारम्पारिक औषधिमा प्रयोग हुने जनावरहरुको विविधता, रोगलाई निको पर्ने विधिहरुलाइ ३०० मानिसहरुको सहभागी, अवलोकनहरु र अन्तर्वार्ता मार्फत अर्ध संरचित प्रश्नावली प्रयोग गरी जानकारी टिपोट गर्दछ । सबै जातिहरुमा स्तनधारी प्राणी बढी प्रयोग गरेको पाइयो (नं २२), त्यसै गरी चरा (नं .श. १८) , घर्षने जीवहरु (नं .श.२), माछाहरु (नं .श. १०), किराहरु (नं .श. ४), mollusca (नं .श. २) पारम्पारिक औषधिका लागि प्रयोगमा रहेको थियो । उभयचर (नं .श. १) , arachnid (नं .श. १), crustacean (नं .श. १) हरु पारम्परिक औषधिका लागि कम प्रयोग गरेको पाइयो। यिनीहरु मध्ये ४८ वटा जङ्गली जनावरहरु र १३ वटा घर पालुवा जनावर भएको पाइयो ।। थारु जातीय समुदायमा अधिकतम संख्यामा जनावरहरु स्वासप्रश्वास रोग ३३.५६% र musculo-skeletal रोग ३१.७७% निको पार्न प्रयोग गरेको पाइयो, सबैभन्दा कम संख्यामा दन्त समस्या (०.४८%) निको पार्नका लागि जनावरहरु प्रयोग गरियो ।। मगर समुदायमा musculo-skeletal (४१.२३%) र स्वासप्रस्वास रोग (१९.७१%) निको पार्न अधिकतम जनावरहरु प्रयोग भयो। कम जनावरहरु ग्रन्थि सम्बन्धि रोग (०.०५%) र नाक, कान, घाँटी सम्बन्धि रोग निको पार्न (०.१०%) प्रयोग भएको पाइयो । ब्राह्मण समुदायमा अधिकतम जनावरहरु स्वासप्रस्वास सम्बन्धि रोग निको पार्न (३४.९०%), musculo-skeletal सम्बन्धि रोगहरु निको पार्न (२९.९३%) प्रयोग भएको पाइयो। हृदयसम्बन्धि रोग निको पार्न (०.२५%), आँखा सम्बन्धि रोग निको पार्न (१.६४%) कम जनावरहरु प्रयोग भएको पाइयो । GLM सामाजिक-आर्थिक कारकहरू: उमेर, शिक्षा, पेशा, जातिको साथ रिपोर्ट गरिएको औषधीय जनावरहरू बीचको सम्बन्ध जाँच गर्न प्रयोग गरिएको थियो। निरक्षर, ५० वर्षभन्दा माथिका र वृद्ध र अशिक्षित उत्तरदाताहरू बढी परम्परागत ज्ञान भएका थिए । र त्यहाँ कृषि, व्यापार, गृहिणीहरु ; सेवा, श्रमिक र विद्यार्थीको तुलनामा धेरै प्रजातिहरू प्रयोग गर्थे। यी प्रत्येक समुदायले उनिहरुको सास्कृतिक विश्वासका कारण रोग निको पार्ने फरक परम्परागत ज्ञान र अभ्यासहरु प्रदर्शन गरिएको पाइयो । नेपालको आधारभूत स्वास्थ्य सेवा प्रणालीमा एथनोमेडिकल जनावरहरूले महत्त्वपूर्ण भूमिका खेल्ने भएता पनि तिनीहरूको उपलब्धता र प्रयोग दुवै घट्दै गएको छ । निष्कर्षले चिकित्सीय उद्देश्यका लागि जनावरहरूमा महत्त्वपूर्ण निर्भरता प्रकट गर्दछ, प्रत्येक समुदायले र उनीहरूको सांस्कृतिक विश्वासमा आधारित फरक प्राथमिकता र अभ्यासहरू प्रदर्शन गर्दछ ।

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List of Abbreviations

CBS	Central Bureau of Statistic
CR	Critically Endangered
EN	Endangered
ENT	Eye, Nose and Throat
GLM	Generalized Linear Model
IUCN	International Union for Conservation of Nature
LC	Least Concern
NA	Not Applicable
NT	Near Threatened
UV	Use Value
VU	Vulnerable
WHO	World Health Organization

1. Introduction

1.1 Background

Nepal is a multiethnic, multilingual, and multicultural country (Government of Nepal, 2015) where 142 castes/ethnicities reside (CBS, 2021). The World Health Organization has identified 252 important compounds, of which 11.1% are derived from plants and 8.7% from animals (WHO, 2013). Animals in popular medicine are a widely spread phenomenon from both historical and geographical perspectives, and this use has been studied by researchers in a variety of fields, including ethnography, medicine, pharmacology, and ecology (Ferreira et al., 2009). People from diverse cultures use their traditional medical knowledge to prevent and treat various illnesses by employing medicines derived from plants and animals (Abebe et al., 2022). Indigenous knowledge is the information that is passed down from one generation to the next (Timilsina & Singh, 2015). Indigenous people possess a wealth of information regarding animals and their products in many goods and activities, such as agriculture, cosmetics, pharmaceuticals, and food items and their understanding of ecosystems is particularly important for the preservation and conservation of biological variety (Alves & Rosa, 2005). The practice of using animals for medical purposes is a component of a body of traditional knowledge that is becoming important to conservation biology, public health regulations and sustainable natural resource management. It is crucial to create conservative approaches and regulations to preserve and safeguard the species from extinction in the future (Hazarika & Sharma, 2018). Ethnomedicine relates to medical practices and beliefs that do not directly come from the theories of contemporary medicine but rather are the result of indigenous cultural evolution (Timilsina & Singh, 2015). Ancient connections between humans and fauna can still be seen in a range of cultural interactions with regional wildlife, which are the main key to ethnozoology (Alves & Souto, 2011; Ulicsni et al., 2016; Ishaq & Adil, 2021). Ethnozoology is an area of anthropology that analyzes how human have viewed and utilizes animal resources over time (Borah & Prasad, 2017). Zootherapy is the practice of treating human illnesses with drugs based on substances that are either directly or indirectly produced from animals (Lev, 2003; Alves & Rosa, 2005; Yirga G. et al., 2011). The tribal experience may be useful to today's human being culture in its struggle against disease and ailment (Prakash & Verma, 2021b). Animals have made a substantial global contribution as therapeutic agents in the prevention and

treatment of many human illnesses or disorders (Adhikari et al., 2020). Ethnozoological studies are essential to conservation efforts because they can assist us in creating sustainable management plans (Yenmis et al., 2013).

The use of natural resources is intimately related to human survival. Since ancient times, humans have been using animals for food, clothing, medicine, etc (Arshad et al., 2014; Pradhan, 2016). Animals and their products play a significant role in many conventional therapies (Faiz et al., 2022). Indigenous peoples' traditional medicinal knowledge has been significant in identifying living organisms that are important for treating livestock and human health issues worldwide (Yirga et al., 2011). Traditional medicines, herbal remedies, and modern medicine contain ingredients made from animal species. Investigating how locals interact with natural resources like plants and animals is a multidisciplinary effort. The WHO explains traditional medicine as "the sum of the knowledge, skills, and practices based on the theories, belief, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement of treatment of physical and mental illness" (Prakash & Verma, 2021b). The practice of ethnomedicine started from ancient time and is passed from one generation to the next verbally (Vats & Thomas, 2015). Tharu, Magar, and Brahmin are the major ethnic groups of Nepal. Tharus are an ethnic group with a broad range of cultures and languages in the Terai region (Acharya & Acharya, 1970). People of Kapilvastu speak Nepali, Tharu, and Awadhi languages. More research has been carried out in the field of ethnobotany. Animals were feared, hunted, eaten, and utilized in a variety of ways, including as mythological topics, medicinal remedies, and festive foods (Kebebew et al., 2021).

Therapeutic practice is inadequately recorded leading in the loss and underestimating of its usefulness by the younger generation compared to ethnobotany (Abebe et al., 2022). It is becoming more and more crucial to record ethnopharmacological knowledge before it is lost since many civilizations are losing it quickly (Faiz et al., 2022). A thorough understanding of the wild animals used in complementary medicine is essential to the preservation and proper usage of wildlife. Thus, this study aimed to collect ethnozoological data about the therapeutic animals and items that the Tharu, Magar, and Brahmin community people of Banganga Municipality of Kapilvastu district utilize before it is lost forever.

1.2 Statement of the problem

The study of ethnozoology has not garnered as much attention as that of ethnobotany (Lohani, 2010). The documentation of knowledge, analysis and recording about uses of animals is still lacking because of this, it seems essential to document ethnomedicinal knowledge (Poudel & Singh, 2016). Documenting information that helps other communities identify possible sources of money for subsistence is essential to preserving the priceless traditional wisdom (Gautam & Dhakal, 2023). Thus, before the knowledge about the utilization of animals disappears, it is imperative to be documented. There have not been any studies done in the Kapilvastu district about the ethnomedicinal practices among Magar and Brahmin communities. Therefore, this study aims to investigate the traditional healing practices of diseases followed by the Tharu, Magar, and Brahmin communities of Banganga municipality of Kapilvastu district.

1.3 Objectives

1.3.1 General Objectives

The main aim of this study was to analyze the ethnomedicinal uses and conservation of animals among Tharu, Magar and Brahmin communities of Kapilvastu district, Nepal

1.3.2 Specific Objectives

- To document uses of animals and their products as ethnomedicine among Tharu, Magar, and Brahmin communities of Kapilvastu district.
- To evaluate the conservation status of animals used as ethnomedicines.

1.4 Research hypothesis

Research was held by the research scholar with the following presumptions before carrying survey:

- They possess various knowledge about ethnomedicinal uses of animals and is transfer of ethnomedicinal knowledge across various demographic groups.
- The selected ethnic groups have significant dependence on animals to treat different disease rather than modern health facilities.

1.5 Significance of the study

This study is supposed to make good contributions to the existing literature and may help local government to study the lifestyle of these communities. It may help in the new drug discovery processes by publishing this article related to this field. This study will be helpful for the sustainable conservation and management of native species. Information on the local fauna can be useful for academic research and may result in significant financial savings by practicing traditional techniques (Alves & Souto, 2015). Therefore, this study is useful for the traditional healing practices by the Tharu, Magar, and Brahmin communities of Kapilvastu district and also the availability of animals in the study area.

2. Literature review

2.1 Medico-ethnozoology

Ahmad et al. (2023) surveyed in the Cholistan desert of Bahawalpur-Pakistan where 20 animal species in all, nine of which were domestic and 11 of which were wild found as a zootherapy as traditional therapeutic. Out of which mammal were nine, birds were four, reptiles were four and insects were three. Six animals were used to treat certain diseases like asthma, general weakness, five for sexual debility, five for tuberculosis, three for skin problems, three for paralysis, three for arthritis, two for cough, two for leucoderma, one for meningitis, one for impotency, one for piles, one for leprosy, one for diabetes, one for rickets, one for dropsy and one animal is used for the treatment of epilepsy.

Mammals were the primary source of medicinal zootherapeutics for folk veterinary medicines (n=7), reptiles (n=4), birds (n=3), insects (n=1) in Cubati district of Praraiba State, Brazil by Barboza et al. (2007) where the most commonly mentioned resource for its veterinary and therapeutic benefits was animal fat and 62.5, 43.75, 37.5, and 31.25% of the informants, respectively, indicated using sheep (*Ovis aries*), pigs (*Sus scrofa*), cattle (*Bos taurus*), and foxes (*Cerdocyon thous*) in folk veterinary treatment.

Wendimu & Tekalign (2023) reported 39 distinct animal products or parts used to cure more than 50 different human illnesses with N = 26, 66.67% mammals had the highest usage rate, with regard to treating disorders. *Hystrix cristata* demonstrated a high degree of fidelity (FL = 95%), *Bos taurus* had the greatest usage value (maximum of 1.0), human immune deficiency illness, reproductive health, and genito-urinary ailment categories had the highest informant consensus factor (ICF) values (ICF = 1.00), domestic animals (26%) were outnumbered by wild animals (74%), oral administration accounted for 50% of all administration routes, and 58.9% of usage reports were for raw treatments. Mammals were utilized more because of plentiful source of protein and are used more for meat and milk.

Gurung (2021b) carried out study on the animals that were used for Traditional Medicine by the Dhimal Tribe in Damak, Jhapa District, Nepal where 24 species in all were utilized medicinally where more wild animals were used by Dhimal than domesticated ones;

they possessed a native understanding of using traditional medicine to treat a variety of illness.

Adhikari et al. (2020) revealed a total of 58 species of vertebrate animals (53 in the wild and five domestic) which were used for 62 different human disease categories where, four animals were utilized for agricultural purposes and veterinary ailments, With three use-reports from ten informants, *Felis chaus* (UV = 0.25) was the most commonly utilized species, cardiovascular and dental issues had the highest ICF values (0.974), with 351 use-reports for 10 animal species for cardiovascular issues and 77 use-reports for three animal species for dental issues, ophthalmological issues had the lowest ICF (ICF = 0.833, usage reports = 7 for 2 species).

Poudel & Singh (2016) studied on the Darai ethnic group about traditional utilization of plants and animals for medicinal purposes, as well as the indigenous knowledge system that exists in Mangalpur VDC, Chitwan, Nepal and was discovered that the Darai people utilized 76 plant species and 28 animal species in total to treat 22 and 36 various diseases, respectively.

Tamang & Singh (2015) carried out research on the Lapcha of Fikkal VDC in Ilam, Nepal, to document indigenous knowledge system and practice medical ethnobiology where 19 fauna and 61 flora were used to cure different ailments in which the most common illnesses treated were gastrointestinal disorders, skeleto-muscular issues, dermatological infections, and respiratory tract infections.

Lohani (2011) reported 49 distinct animal species, each with unique ethno-zoological significance from Jirels who get food and medication from both domestic and wild animals where the strongest, rarest, fearsome, and largest animals are the ones that provide the most effective zootherapeutic treatments and charms composed of such animals' bone, exoskeleton, or glandular fluids provide Jirels a sense of emotional stability.

Jaroli et al. (2010) carried out an ethnozoological investigation in the vicinity of Mount Abu Wildlife Sanctuary, India in which for 35 various medical conditions, including asthma, weakness, TB, cough, paralysis, and blisters, as well as for other religious reasons, a total of 24 animal species were used; the animals that Garasiya used were made up of mammals (14), birds (five), reptiles (three), arthropod (one), and amphibian (one); the

meat of *Cynopterus sphinx* used to alleviate fever and cough had the greatest FL (96%) but flesh of *Sus scrofa* and tooth of *Elephas maximus* had the lowest FL (12%) where Asthma, cough, and other respiratory conditions were the most commonly reported illnesses.

Lohani (2010) did research in man-animal relationships in Central Nepal where Tamang people valued their understanding of the many applications of 41 genera divided into 28 families. Of all the animals, 14.6% were classified as invertebrates, and the other species were classified as vertebrates in which 58% were classified as food and medicinal, 16% as magico-religious, 18% as omen indicator, and 2% as each of the following categories: trophy, ethnomusical, weather predicting, and taboos.

Ferreira et al. (2009) reported 31 animal species in all, divided into 21 groups, that were known to be utilized medicinally in which the taxa with the highest representation were insects (five species), mammals (seven), fish (five), reptiles (five), and birds (four); Rheumatism, asthma, and inflammations had the highest number of citations among the 24 diseases that the animals sold in marketplaces were used to treat.

Mahawar & Jaroli (2007) studied traditional knowledge of the zootherapeutic Saharia tribe of Rajasthan, about the usage of various animals and items produced from animals as remedies, where 15 animal species in all were utilized for various ethnomedical conditions, such as paralysis, earaches, herpes, cough, asthma, TB, and muscle discomfort and the majority of zootherapeutic knowledge, was focused on domestic animals.

Banerjee et al. (2003) described product of bees, honey has a variety of uses. and has been utilized therapeutically for ages which has excellent antibacterial, anti-inflammatory, and wound-healing qualities.

Ferreira et al. (2009) conducted study on residents of the community Poço Dantas, Crato-CE, Brazil in which 29 species distributed in 17 families were classified as having some sort of medicinal use where the most often represented taxa were mammals (nine), insects (seven), reptiles (seven), birds (four) in which 34 disorders or symptoms were treated with animals and the most common conditions treated with animals were cough, sore throat, and inflammations.

Yuniati et al. (2019) studied on the Potential of Ethnozoology in Traditional Treatment of Bada Ethnic in Lore Lindu Biosphere Reserve in Central Sulawesi were 13 species of animals were used in which mammals comprised higher number were used as traditional medicine which is a part of cultural identity in which animals were utilized in their whole or their parts/products such as meat, liver, bile, fat, and even egg yolks. They were eaten as food, eaten directly/raw, or eaten indirectly/cooked to cure conditions including typhus, asthma, eczema, and itching brought on by colds or allergies. They are also used as massage oil to strengthen muscles.

2.2 Conservation status of medicinal animals

Gurung (2021) did reseach in Dhimal tribe at Jhapa district where it was found that Dhimals were fond of meat so they hunt animals, killing animals where some of them were protected animals like monitor lizards, pangolin, turtle, bat, etc which were killed for ethnomedeicinal practices and habitat destruction also create obstruction in animals number. People kill animals for ethnomedical purposes either intentionally or unintentionally which might increase threats to wild animals (Adhikari et al., 2020). The most prevalent threats encountered by all threatened vertebrate species were logging, agricultural cropping, invasive species, and harvesting (direct human killing) (Ripple et al., 2017). Chakravorty et al. (2011) found that wild animals were used more , including endangered or protective species like hornbill, pangolin, clouded leopard, tiger, bear, and wolf, whose various parts were either used in cultural belief or as food. traditional people rely on ethnomedicine to treat diseases due to magico religious belief because of higher cost of medicines, inadequate hospitals, transportation problem (Ahmad et al., 2023). Wild animals are traded and utilized as traditional remedies, which contributes significantly to the economy however the stability of the natural animal population will be harmed by overuse and commerce (Yuniati et al., 2019). Protected species like hard-shelled turtle, *Cervus unicolor*, *Pavo cristatus* were utilized by the Saharias and conducting more research on traditional cures is essential to validate the presence of any bioactive compounds for sustainable use (Mahawar & Jaroli, 2007).

3. Materials and Methods

3.1 Study area

Study area was Kapilvastu district, lies in Lumbini province of Nepal occupies an area of 1,738km^2. It is bounded by Arghakhanchi District to the north, Dang District to the northwest, Balrampur District, Awadh region, Uttar Pradesh, India, to the west, and Siddharthnagar District, Purvanchal region, Uttar Pradesh, to the south. In terms of geography, the area is separated into the low Chure hills and the Terai lowland plains. Taulihawa is the headquarters of this district. Jagdishpur Reservoir, Ramsar Wetland wetland site is located in this district (Bhandari, 2013) that supports various species of birds and fishes Kapilvastu district has 10 local government among them, six are municipalities and four are rural municipalities. Total population of Banganga municipality is 97114 (MTMP, 2022). The Kapilvastu district has a tropical to subtropical climate, with tropical mixed Hardwood, *Acacia catechu*, *Dalbergia sissoo*, and *Shorea robusta* trees making up the majority of the forest flora (Chaudhary et al., 2016). Thus, the plain area would experience extremely hot summers and mild winters. The highest temperature reaches 41 degrees Celsius and the lowest is 9 degrees Celsius (MTMP, 2022). According to National Population and Housing Census 2021, majority of population in this municipality is Tharu community which comprises (31.4%), Brahmin (26.9%), Magar (11.2%). The main languages of Banganga municipalty are Nepali (59.3%), Tharu (31.1%) and Magar (4.4%). The district's majority of people are employed in agriculture. Most of the municipality's residents made their living from farming natural resources, such as those associated to rivers, such as stones, sands, etc., and forests, such as timbers, ponds, and local markets (Tharu, 2017). One of the district's main crops is paddy rice. For the study, sites were selected based on the settlement of these selected three communities i.e Tharu, Magar and Brahmin. Data were collected from 4 different villages of Banganga municipality of Kapilvastu district namely Gajehada, Bairiya, Gangauliya and Pipara. Both male and female were chosen for the study.

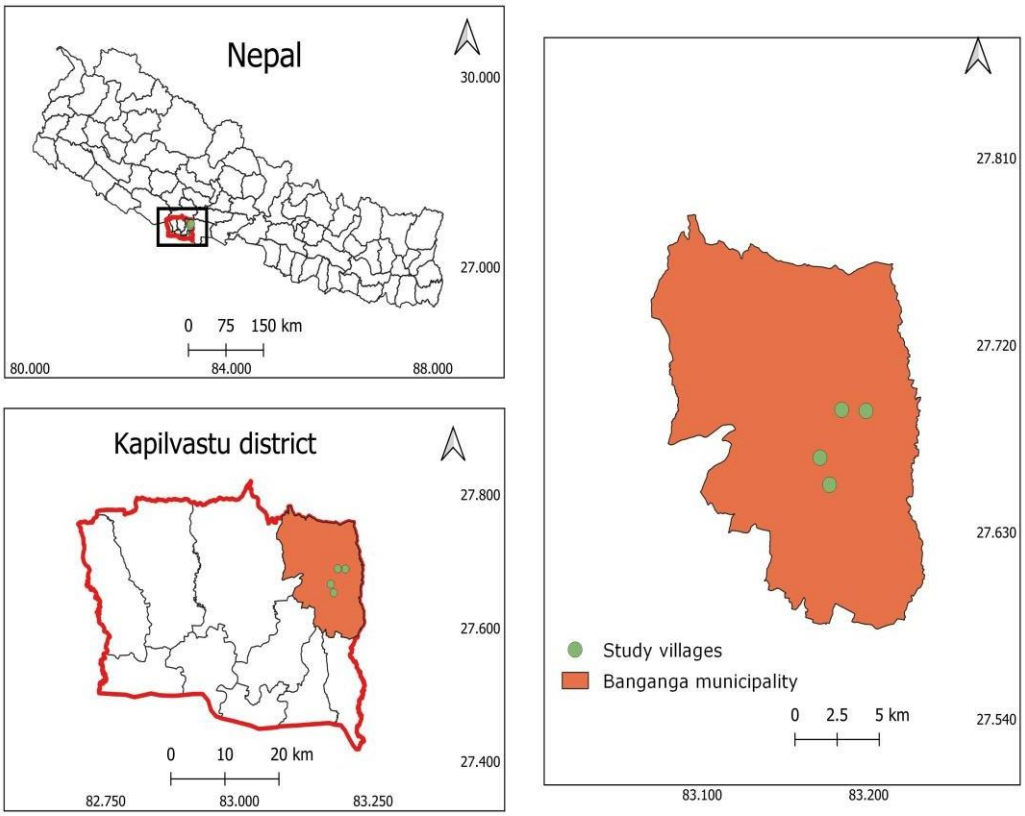

Figure 1. Map showing study sites of Banganga Municipality of Kapilvastu district, Nepal

3.2 Methods

Prior field visit was done to know the settlement type of ethnic groups living there on Februaruy 2023. Data was collected from June to October of 2023. A total of 300 respondents were interviewed where each ethnic groups have equal number of individuals interviewed. The respondents were selected randomly from selected ethnic groups where knowledgeable elder people, school teacher, youth, students, etc were interviewed for this study. Interviews with respondents using semi-structured open-ended questionnaires were used to record information about the usage of animals and the parts and products that were used from them. The International Society of Ethnobiology's ethical criteria was applied for this study where, each respondent's personal oral consent was obtained prior to interviews (ISE, 1893). People over 20 years of age who resided in the research region and were reachable during the data collection period. All of the respondents were asked only once to minimize repetition of information. They were asked about any medications using animals and their parts for treatment of several ailments. The study is qualitative in nature.

3.2.1 Nature and source of data

Primary data were used to meet the goals of this study. The data were gathered using a variety of techniques, which are detailed below: All the data collected from primary sources through direct interviews from selected communities of the Kapilvastu district.

3.2.1.1 Interviews

Interviews with a selected respondents which include elders, community leaders, school teachers, labourers, students. Discussions were held regarding their caste, language, education, occupation, family members and indigenous knowledge.

3.2.1.2 Species identification

All the local name of animals were documented from the field. After that, animal species were taxonomically categorized into class, order, family, genus and species.

3.3 Tools and Data Analysis

R program (4.3.3 version) and Microsoft Excel 2019 were used for the data analysis. Data were entered into excel spreadsheet, analyzed and presented in tables and bar graphs. Tables were made for identification, classification, parts or products used, medicinal uses

of fauna for the detail study while bar graph was prepared for categorizing animal according to IUCN Red List.

Data was further analyzed using formulas:

a. Use Value (UV)

The UV gives the mean (average) number of usage reports for each species and informant (Leonti, 2022).

It is calculated as $UV_s = \Sigma(U_s/N_s)$

Where, N_s is the total number of informants for a particular animal species that were questioned. U_s is equal to the total number of reports of uses for a certain animal species that each informant said (Ferreira et al., 2009). According to Ferreira et al., (2009), UV is independent of the researcher's perspective.

b. Informant Consensus Factor (ICF)

ICF was computed to ascertain data and determine the general agreement over which species are effective for specific ailments by the ratio of number of use reports (N_{ur}) in each category minus 1 and the number of use reports in each category minus the number of taxa used (N_t) i.e ICF = $(N_{ur} - N_t)/(N_{ur} - 1)$(Ferreira et al., 2012). ICF value lies between 0 to 1 (Singh et al., 2018).

c. Fidelity level (FL)

When analyzing the data, FL was computed to discover which animal species are most frequently used by informants to treat a certain ailment category. FL identifies the respondent's top choice used to treat the specific ailment category.

It is calculated as: FL (%) = N_p x 100 /N

where N is the overall number of informants who use animals as medicine to treat any given sickness, and N_p is the number of informants who claim to use a species to treat a specific disease or illness (Loko et al., 2019).

The fidelity level (FL) has a range of 1% to 100%, and a high use rating (100%) indicates that many individuals used this specific animal species for treating specific diseases,

whereas a low value indicates that respondents used this animals in different ailments categories (Jaroli et al., 2010).

d. Generalized Linear Model (GLM)

GLM analysis was employed to investigate the relationship between ethnomedicinal uses and conservation of animals and several predictor variables. These predictors include demographic factors (such as age, ethnicity, and gender), socio-cultural variables (such as education and occupation level). The response variable was constructed to represent the frequency of ethnomedicinal practices and animal conservation efforts within each community.

e. Relative Importance (RI)

RI is a broad indicator of the diversity of uses which is based on the adaptability of use-categories as well as more specialized applications (Leonti, 2022).

The relative importance of species is calculated by dividing its number of use categories by the number of the most versatile species, as well as by dividing its number of pharmacological properties (uses) by the number of pharmacological properties (uses) of the most versatile species and is based on the adaptability of use-categories as well as more specialized uses (Leonti, 2022).

Table 1. List of diseases grouped into different illness categories (Adhikari et al., 2020)

S.N.	Illness category	Diseases	Nepali name
1	Respiratory problem	tuberculosis, cold, cough, asthma, pneumonia	kshyarog, chiso, khoki, dam, pneumonia
2	Dental problem	toothache, cavity, gum bleeding	daat dukheko, daat kira ley khako, data ma harshaa laako
3	Musculoskeletal problem	muscular pain, joint pain, rheumatism, joint swelling, bone fracture, arthritis, weakness, hernia, protein deficiency	maasu dukheko, jorni dukheko, baath rog, haddi bhachiyeko, haddi khiyeko, kamjori, hernia, protein ko kami
4	Reproductive problem	menstrual problems, infertility, low sperm, lactation, virility	mahinabari kharabi, bajhopan, sukrakit ko kami, stanpan, birata
5	Ear, Nose and Throat problem	ear infection, speech, eye problems, nose bleeding	kaan ma samasya, boli ma samasya, dristi ma samasya, naak bata ragat bagnu
6	Nervous system problem	headache, anxiety, insomnia, ghost, tetanus, paralysis, epilepsy	tauko dukhnu, chinta, nid nalagnu, bhut lageko, danustankar, chhare rog
7	Gastro intestinal problem	gastritis, diarrhea, jaundice	amalpitta, pakhala, pahele rog
8	Dermatological problem	wounds, pimples, burns, blisters, dry skin, hair fall, scar, measles	ghau, bibira, poleko, foka, sukkah chhala, kapal jharnu, daag, dadura
9	Opthalmological problem	eye weakness	kamjor aakha
10	Cardiovascular problem	anemia, blood pressure	rakta alpada
11	Endocrinal problem	diabetes	madhumeha
12	Others	cancer, fever, typhoid	cancer, joro, myadhe joro

4. Results

Demographic details of informants

A total of 300 respondents; 100 respondents from each ethnic groups (170 females and 130 males; aged between 20 to 85) interviewed in the survey. They belong to Tharu, Magar and Brahmin ethnic groups. A slightly more than half of the respondents were engaged in agriculture. Around two-fifth of people possessed basic level education. Most of the respondents were between 30-49 age group (n=148).

4.1 Faunal diversity and uses

A total of 22 mammals, 17 birds, 2 reptiles, 1 amphibian, 10 pisces, 2 mollusca, 2 insecta, 1 arachnid and 1 crustacean were used as an ethnomedicine in Tharu communities. Similarly 15 mammals, 12 birds, 2 reptiles, 1 amphibian, 3 pisces, 2 mollusca, 2 insecta, 1 arachnid and 1 crustacean were used as an ethnomedicine by Magar. Likewise, 20 mammals, 13 birds, 2 reptiles, 1 amphibian, 4 pisces, 2 mollusca, 4 insecta, 1 arachnid and 1 crustacean were used as an ethnomedicine by Brahmin. Mammals were mostly used animals for ethnomedicinal practices followed by aves, pisces, insecta in all three communities. Comparatively, amphibian, arachnida and crusatacea were used less (Figure 2). The study revealed a rich diversity of ethnomedicinal knowledge among the Tharu, Magar, and Brahmin communities in the Kapilvastu district. Each community exhibited unique practices and preferences regarding the use of animals for therapeutic purposes.

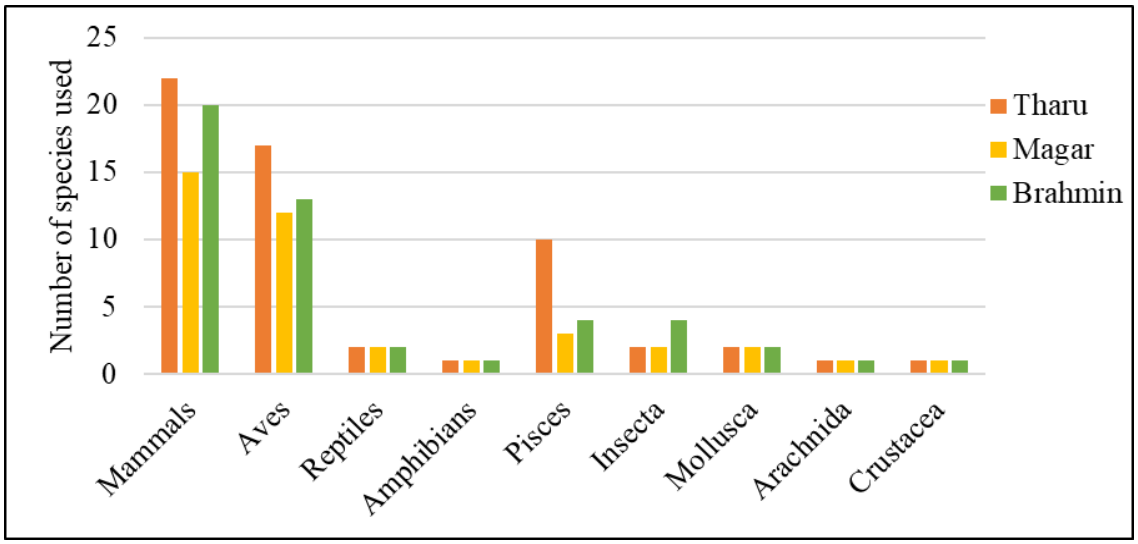

Figure 2. Taxonomic groups of animals used in ethno-medicinal practices among different ethnic communities of Kapilvastu district

4.2 Conservation Status

From data collection, according to the International Union for Conservation of Nature (IUCN) Red List; it has been determined that the majority of the species utilized in Tharu are of Least Concern = 29, Vulnearable = 4, Near Threatened = 5, Endangered = 4 and Critically Endangered = 1. In Magar, more species used are of Least Concern = 20, Vulnearable = 2, Endangered = 3 and Near Threatened = 3. In Brahmin communities, number of species used are of Least Concern = 24, Vulnearable = 3, Endangered = 4 and Near Threatened = 2.

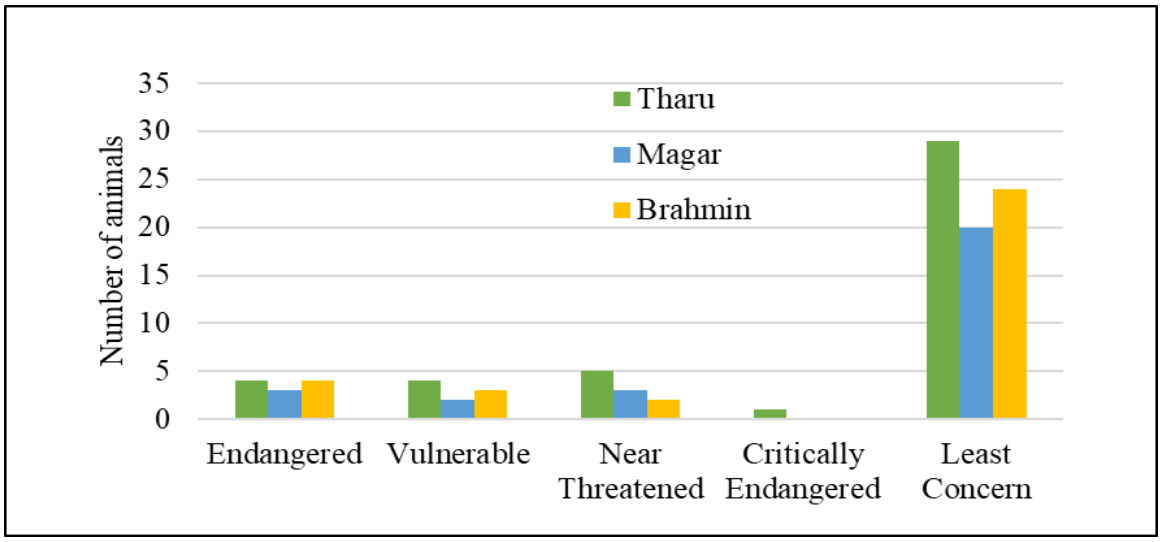

Figure 3. Conservation status of animal species used in ethnomedicine from Kapilvastu district

4.3 Mode of preparation

In all ethnic groups, for the preparation of medicines, cooking is the highest followed by raw, boiled and melted. Soup and wine are the least used method to cure ailments (Figure 4).

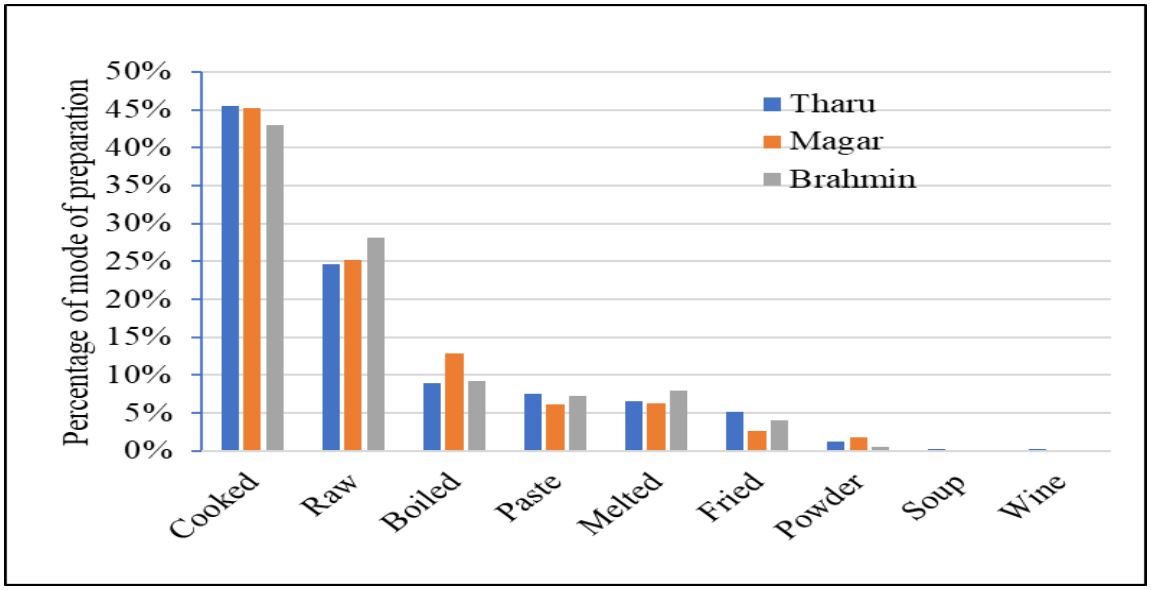

Figure 4. Mode of preparation of medicine from body parts of animals

The part or product of animal used most to cure different ailments were meat followed by milk, whole body. Meat is the most used part for curing disease and most of animals used to cure musculo-skeletal disease, respiratory diseases and gastrointestinal disease but brain is the least used body part n=2 for Tharu, and completely 0 to other two ethnic groups (Figure 5). Mostly, oral method is used to cure different ailment.

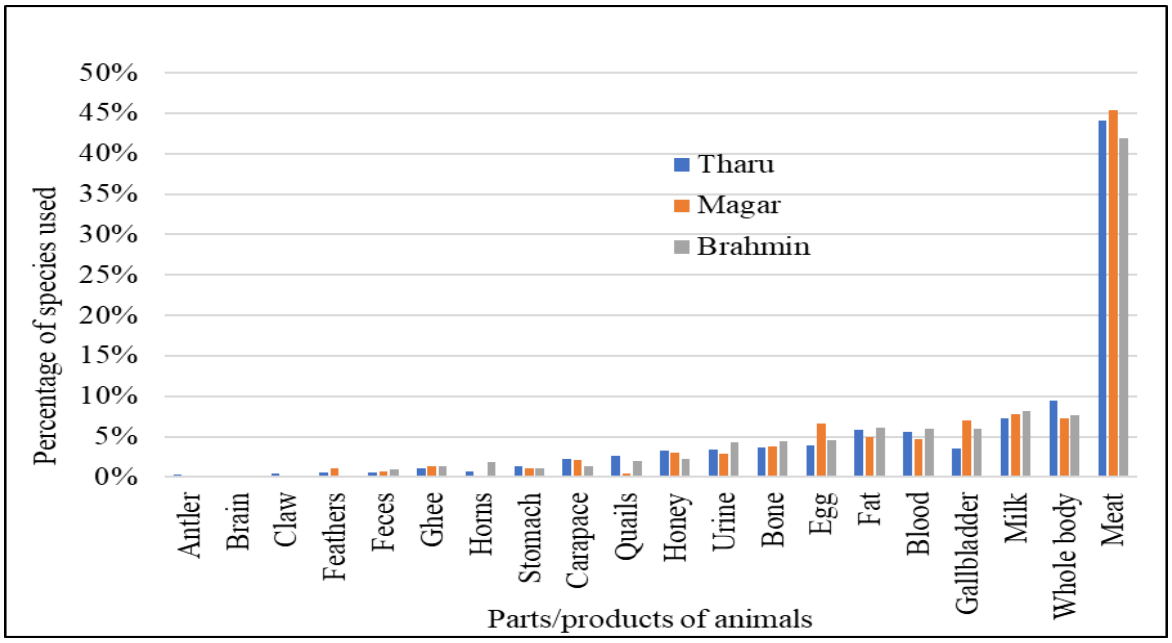

Figure 5. Parts/products of animal used most in ethnomedicinal practices

Use Value (UV)

In Tharu ethnic groupp, the mostly widely used medicinal animal were *Lepus nigricollis*, *Manis sp.* and *Holobatrachus tigerinus* with each of 1 Use Value . In Magar ethnic group, *Rhinolophus affinis* = 0.136 possesed higer Use Value (UV) followed by *Vespa crabro* - 0.125 and *Scorpions* = 0.142. In Brahmin ethnic group, highly used medicinal animal were Duck (*Anas sp.*) = 0.882 followed by *Acridotheres tristis* = 0.333.

Table 2. Different uses of animals and their body parts in ethnomedicine

(✓ represent one pharmacological use, ✓✓ represent two pharmacological uses, ✓✓✓ represent three pharmacological uses)

S. N	Scientific name	Local name	Order/Family	IUCN category	UV	Parts used	Ethnic group			References
Class: Mammalia							**Tharu**	**Magar**	**Brahmin**	
1	Golden Jackal (W) *(Canis aureus) (Linnaeus, 1758)*	Shyal	Carnivora Canidae	LC	T-0.022 M-0.015 B-0.027	meat, fat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Flesh is combined with grains and fermented with a yeast knownas 'Shyal ko raksi' used in body massage and taken orally to cure rheumatism, arthritis, TB	✓ **Medicinal value**: Blood is consumed to cure rheumatism	✓✓	(Lohani, 2011a), (Lohani, 2011b), (Betlu, 2013), (Timilsina & Singh, 2015) (Vijayakumar et al., 2015), (Poudel & Singh, 2016), (Adhikari et al., 2020), (Gurung, 2021a) (Gautam & Dhakal, 2023)

2	Indian crested Porcupine (W) *(Hystrix indica) (Kerr, 1792)*	Dumsi	Rodentia Hystricidae	LC	T-0.041 M-0.055	stomach, meat, quails, feces	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Meat along with stomach is cooked and consumed to cure asthma, pneumonia, dried feces cure cough **Magico-religious value**: It is believed that keeping quails protect from ghost	✓✓✓ **Magico-religious value:** wearing quails cure measles, chickenpox	✓✓✓	(Lohani, 2011a), (Lohani, 2011b), (Rai & Singh, 2015), (Kushwah et al., 2017), (Kendie et al., 2018), (Abebe et al., 2022), (Gautam & Dhakal, 2023)
3	Wild boar (W) *(Sus scrofa) (Linnaeus, 1758)*	Bandel	Cetartiodactyla Suidae	LC	M-0.090	fat, meat	**Food value**: Meat is cooked and consumed as food. **Medicinal value**: Cooked meat cure weakness and fat is melted and applied on affected parts to cure measles.	**Food value:** ✓ cooked meat cure epilepsy	✓✓	(Gurung, 2021b)
4	Tiger (W) *(Panthera tigris) (Linnaeus, 1758)*	Baagh	Carnivora Felidae	EN	T-0.083 M-0.075	meat, fat	**Medicinal value**: Fat is melted and applied on affected parts to cure arthritis	**Medicinal value**: Cooked meat cure gastritis fat is applied on affected part to	✓ **Medicinal value**: Bile is consumed to cure pneumonia	

								cure paralysis		
5	Sambar Deer (W) *(Rusa unicolor) (Kerr, 1792)*	Jarayo	Cetartiodactyla Cervidae	VU	T-0.15 B-0.062	meat, horns	**Medicinal value**: Cooked meat cure weakness, paste of horns is applied on rashes	-	✓ **Medicinal value**: Cooked meat promote virility, paste of horns cure sprain	(Adhikari et al., 2020)
6	Greater One-horned Rhino (W) *(Rhinoceros unicornis) (Linnaeus, 1758)*	Gaida	Perissodactyla Rhinocerotidae	VU	T-0.111 M-0.125 B-0.05	urine	**Medicinal value**: Urine is consumed to cure asthma	**Medicinal value**: urine is applied to cure burn	**Medicinal value:** Urine is consumed to cure gastritis, asthma, tuberculosi	(Lohani, 2011a)

									s	
7	Goat (D) *(Capra hircus)*	Bakhra/ Boka	Artiodactyla Bovidae	-	T-0.073 M-0.065 B-0.065	milk, leg, brain	**Food value**: Meat is cooked and consumed as food. **Medicinal value**: Milk is taken orally to cure measles and protein deficiency, cooked leg meat strengthen bone	✓✓	✓✓ **Medicinal value**: Eating brain help in development of brain	(Mahawar & Jaroli, 2007), (Lohani, 2011a), (Kendie et al., 2018), (Kebebew et al., 2021), (Ahmad et al., 2023)
8	Cow (D) *(Bos taurus) (Linnaeus, 1758)*	Gai	Artiodactyla Bovidae	NA	T-0.044 M-0.056	milk, urine, ghee, curd	**Food value**: Boiled milk is consumed which is highly proteinous diet. **Medicinal value**: Urine cure gastritis, ghee is melted and apply on body to cure muscular pain, curd improve digestion. **Symbolic value**: Urine is sprayed in house to disinfect and sanctify.	✓✓✓	✓✓✓	(Poudel & Singh, 2016), (Bullitta et al., 2018), (Adhikari et al., 2020), (Chhetri et al., 2020)

9	Indian hare (D) *(Lepus nigricollis)*	Kharayo	Lagomorpha Leporidae	LC	T-1 M-0.052 **B-0.3**	meat, blood, skin	**Food value**: Meat is cooked and consumed as food. **Medicinal value**: Blood and meat is cooked and taken to cure menstrual problem.	**Food value**: ✓ **Medicinal value**: Fresh blood is consumed to cure asthma	✓✓ **Medicinal value**: Skin is heated and apply on aching joints	(Adhikari et al., 2020)
10	Ox (D) *(Bos spp.) (Linnaeus, 1758)*	Goru	Cetartiodactyla Bovidae	-	T-0.083 M-0.125 B-0.058	gallbladder	**Medicinal value**: Raw bile is taken to cure tuberculosis	✓	✓ **Medicinal value**: It is taken to cure tuberculosis, sinusitis, toothache	
11	Bat (W) *(Rhinolophus affinis) (Horsefield, 1823)*	Chamero	Chiroptera Rhinolophidae	LC	T-0.153 M-0.136 B-0.052	meat, bone	**Medicinal value**: Cooked meat and bone is consumed by asthma patients, cure night blindness and tuberculosis	**Medicinal value**: Cooked meat is consumed to cure	✓	(Borah & Prasad, 2017), (Adhikari et al., 2020), (Gurung, 2021a)

								tuberculosis.		
12	Black dog (D) *(Canis lupus familiaris) (Linnaeus, 1758)*	Kalo kukur	Carnivora Canidae	-	T-0.25 B-0.142	feces	**Medicinal value**: Powder of feces is consumed to cure typhoid	-	✓	
13	Hanuman Langur (W) *(Semnopithecus entellus) (Dufresne, 1797)*	Badar	Primates Cercopithecidae	NT	T-0.036 M-0.04 B-0.051	meat, feces	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure rheumatism, TB, joint pain	✓✓	✓ **Medicinal value**: Cooked meat maintain blood pressure level, powder offeces remove alcohol addiction	(Lohani, 2010)

14	Pig (D) *(Sus domesticus) (Erxleben, 1777)*	Sungur	Artiodactyla Suidae	-	T-0.1666 M-0.096 B-0.181	nose, meat, fat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Nose part of pig is cooked and consumed to stop nose bleeding, cooked meat consumed to relief from weakness, fat is melted and apply on pimple	✓✓	✓✓	(Poudel & Singh, 2016), (Adhikari et al., 2020), (Chhetri et al., 2020)
15	Chital (W) *(Axis axis) (Erxleben, 1777)*	Harin	Cetartiodactyla Cervidae	LC	T-0.214 B-0.1	meat, claw	**Medicinal value**: Cooked meat improve strength, virility and paste of claws remove marks of old wounds	-	✓	(Adhikari et al., 2020)
16	Buffalo (D) *(Bubalus bubalis) (Linnaeus, 1758)*	Bhaisi	Cetartiodactyla Bovidae	-	T-0.073 M-0.024 B-0.071	milk, meat	**Food value**: Boiled milk is consumed as food **Medicinal value**: Milk is boiled and taken to cure protein deficiency and meat is cooked and consumed to gain strength	✓✓	✓✓ Medicinal value: Powder of dried earwax cure typhoid	(Adhikari et al., 2020)
17	Sheep (D) *(Ovis aries) (Linnaeus, 1758)*	Bheda	Cetartiodactyla Bovidae	NA	T-0.2 M-0.02 B-0.05	meat, fat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure cold and also cure rheumatism, fat is melted and cures scars	✓✓	✓✓	(Lohani, 2011a)

18	Human (D) *(Homo sapiens)*	Manchhe	Primates Hominidae	-	T-0.2	milk	**Medicinal value**: 1-2 drops of milk help to clear eyes	-	✓	(Haileselasie, 2012), (Poudel & Singh, 2016), (Chhetri et al., 2020), (Gautam & Dhakal, 2023), (Wendimu & Tekalign, 2023)
19	Donkey (D) *(Equus asinus)*	Gadha	Perissodactyla Equidae	-	T-0.333	milk	**Medicinal value**: Milk is consumed to cure measles	-	-	(Abebe et al., 2022)
20	Horse (D) *(Equus spp)*	Ghoda	Perissodactyla Equidae	-	T-0.2	urine, brain	**Medicinal value**: Consuming urine remove alcohol addiction and brain is taken which cure typhoid, pneumonia	-	✓	(Poudel & Singh, 2016), (Gautam & Dhakal, 2023)
21	Rat (W) *(Rattus rattus) (Linnaeus, 1758)*	Musa	Rodentia Muridae	LC	T-0.102 M-0.045 B-0.12	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: It is believed that consuming cooked meat of rat cure piles, asthma, toothache, tuberculosis	✓✓	✓✓	
22	Pangolin (W) *(Manis sp.)*	Salak	Pholidota Manidae	CR	T-1	shell	**Magico-religious value**: It is believed that wearing shell of pangolin provides energy to children	-	-	(Gurung, 2021a)
	Class: Aves									

23	Pigeon (W) *(Columba livia) (Gmelin, 1789)*	Parewa	Columbiformes Columbidae	LC	T-0.028 M-0.035 B-0.012	meat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: cooked meat cure cold, cough, fever and blood is applied on burn surface	✓✓	✓✓	(Lohani, 2012), (Poudel & Singh, 2016), (Gurung, 2021a), (Gautam & Dhakal, 2023)
24	Red Junglefowl (W) *(Gallus gallus)*	Ban kukhura	Galliformes Phasianidae	LC	T-0.2 M-0.062	fat, meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Fat is melted and applied in burn, cooked meat provides strength and virility	✓✓	-	(Lohani, 2011a), (Souto et al., 2012), (Adhikari et al., 2020)
25	*Hen/ Rooster (D) (Gallus domesticus)*	Local kukhura	Galliformes Phasianidae	-	T-0.086 M-0.033 B-0.092	meat, fat	**Food value**: Meat is cooked and consumed as food. **Medicinal value**: Fat is melted and applied in burn, cooked meat provide strength	✓✓	✓✓	(Ferreira et al., 2012), (Souto et al., 2012), (Martínez, 2013), (Tamang & Singh, 2015), (Altaf et al., 2017), (Kendie et al., 2018), (Chhetri et al., 2020), (Jugli et al., 2020)

26	Kaliz pheasant (W) *(Lophura leucomelanos)*	Kaliz	Galliformes Phasianidae	LC	T-0.153 M-0.035 B-0.130	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat is consumed to cure piles, weakness, rheumatism	✓✓	✓✓	(Rai & Singh, 2015), (Adhikari et al., 2020)
27	Common Mynah (W) *(Acridotheres tristis)*	Dangrey rupi	Passeriformes Sturnidae	LC	T-0.25 M-0.037 B-0.333	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat is taken orally to cure jaundice, piles	✓✓	✓✓	(Gurung, 2021a)
28	Red wattled Lapwing (W) *(Vanellus indicus)*	Hutitau chara	Charadriiformes Charadriidae	LC	T-0.230 M-0.024 B-0.076	egg, meat	**Food value:** Boiled egg and cooked meat are consumed as food **Medicinal value**: Boiled egg is consumed which cure asthma, typhoid, pneumonia, TB	✓✓	**Food value:** ✓ **Medicinal value**: Boiled egg and cooked meat cure tetanus	(Lohani, 2011a), (Poudel & Singh, 2016), (Gautam & Dhakal, 2023)
29	Common Quail (W) *(Coturnix coturnix)*	Battai chara	Galliformes Phasianidae	LC	T-0.096 M-0.042 B-0.046	meat, egg	**Food value**: Meat and boiled egg are consumed as food **Medicinal value**: Cooked meat and boiled egg cure asthma	**Food value**: ✓ **Medicinal value**: Boiled egg and cooked meat cure cold	✓✓	(Lohani, 2011a)

								and fractured bone		
30	Duck (D) *(Anas sp.)*	Haas	Anseriformes Anatidae	-	T-0.097 M-0.057 B-0.882	egg, meat	**Food value**: Cooked meat and boiled egg are consumed as food **Medicinal value:** Cooked meat and boiled egg is consumed to cure low blood pressure, improve eyesight and cure weakness	**Food value**: ✓ **Medicinal value**: Cooked meat cure piles	**Food value**: ✓ **Medicinal value**: Cooked meat cure piles	(Altaf et al., 2018), (Shoukat et al., 2020)
31	House sparrow (W) *(Passer domesticus) (Linnaeus, 1758)*	Bhagera	Passeriformes Passeridae	LC	T-0.153 M-0.045 B-0.061	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure cold	**Food value**: ✓ **Medicinal value**: Cooked meat promote strength and virility	**Food value**: ✓ **Medicinal value**: 1-2 drops of blood is used to cure ear infection	(Lohani, 2011a), (Lohani, 2011b), (Poudel & Singh, 2016), (Altaf et al., 2018), (Chhetri et al., 2020)

32	Common Peafowl (W) *(Pavo cristatus) (Linnaeus, 1758)*	Mayur	Galliformes Phasianidae	LC	T-0.230 M-0.052	feathers	**Medicinal value**: Powder of feathers is consumed to cure cough, typhoid	✓	-	(Lohani, 2011a)
33	Oriental Turtle-dove (W) *(Streptopelia orientalis) (latham, 1790)*	Dhukur	Columbiformes Columbidae	LC	T-0.222	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat is taken orally to cure cold	-	-	
34	House Crow (W) *(Corvus splendens) (Vieillot, 1817)*	Kaag	Passeriformes Corvidae	LC	T-0.064 M-0.052	meat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure eye infection and blood is applied on crack skin	✓	✓✓ **Medicinal value**: Paste of bone is applied on affected part to cure fractured bone	(Adhikari et al., 2020), (Gurung, 2021a)
35	Cattle Egret (W) *(Bubulcus ibis) (Linnaeus, 1758)*	Bakulla	Pelecaniformes Ardeidae	LC	T-0.166 B-0.076	meat, bone	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat and bone is consumed to cure paralysis	-	✓✓	

36	Rose- ringed parakeet (W) *(Psittacula krameria) (Scopoli, 1769)*	Suga	Psittaciformes Pasittacidae	LC	T-0.125	meat	**Magico-religious value**: It is believed that consuming cooked meat improve speech in children	-	-	(Adhikari et al., 2020)
37	Jungle Mynah (W) *(Acridotheres fuscus) (Wagler, 1827)*	Sarau	Passeriformes Sturnidae	LC	T-0.16 B-0.103	meat	**Food value**: Cooked meat is consumed as food **Medicinal value**: Cooked meat cure cough, pneumonia	-	**Food value**: ✓ **Medicinal value**: Cooked meat cure piles	(Adhikari et al., 2020)
38	Lesser Adjutant (W) *(Leptoptilos javanicus) (Horsfield, 1821)*	Garud	Ciconiiformes Ciconidae	NT	T-0.222	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Coked meat cure malaria	-	-	
39	White rumped Vulture (W) *(Gyps bengalensis)*	Gidda	Accipitriformes Accipitridae	CR	T-0.033 M-0.028 B-0.042	bone	**Medicinal value**: Paste of bone cure fractured bone and is both applied and taken orally	✓✓	✓✓	(Gautam & Dhakal, 2023), (Manqele et al., 2023)

40	Common Hoopoe (W) *(Upupa epops)*	Bhadrai chara	Bucerotifor mes Upupidae	LC	B-0.076	meat	-	-	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat improve speech in children and promote intelligence	
	Class: Reptilia									
41	Golden Monitor lizard (W) *(Varanus flavescens) (Gray, 1827)*	Sun Gohoro	Sqamata Varanidae	EN	T-0.096 M-0.090 B-0.105	meat, fat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure arthritis, rheumatism, physical weakness, fever and fat is melted and applied to cure rheumatism	**Food value**: ✓ **Medicinal value**: Cooked meat cure jaundice and	✓✓	(Adhikari et al., 2020)

								rheumatism		
42	Turtle (W) *(Nilssonia hurum)* *(Gray, 1830)*	Kachhuwa	Chelonia Chelonidae	EN	T-0.024 M-0.063	meat, carapace, bile	**Food value**: Cooked meat is consumed as food **Medicinal value**: Cooked meat cure asthma, pneumonia, powder of carapace cure pneumonia and bile is consumed to cure TB	✓✓ **Medicinal value**: Bile is consumed to improve digestion	✓✓	(Gupta et al., 2003), (Rai & Singh, 2015)
	Class: Amphibian									
43	Indian Bullfrog (W) *(Hoplobatrachus tigerinus)*	Paha	Anura Dicroglossidae	LC	T-1 M-0.105 B-0.166	meat	**Medicinal value**: It is believed that consuming cooked meat of it cure malnutrition	✓	✓	
	Class: Pisces									
44	Gangetic mudeel (W) *(Monopterus cuchia)* *(Hamilton, 1822)*	Chuche Bam	Synbranchiformes Synbranchidae	LC	T-0.045	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure muscular pain	-		(Adhikari et al., 2020)

45	Cat fish (W) *Wallago attu (Block and Schneider, 1801)*	Buhari	Siluriformes Siluridae	NT	T-0.086	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat promote strength and virility	-		(Adhikari et al., 2020)
46	Mahasheer (W) *(Tor putitora) (Hamilton, 1822)*	Sahar	Cypriniformes Cyprinidae	EN	T-0.153 B-0.125	meat, fat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat and blood promote strength and mental development, blood is applied on wound	-	✓✓	(Adhikari et al., 2020)
47	Asla (W) *(Schizothorax richardsonii) (Gray, 1832)*	Asala	Cypriniformes Cyprinidae	VU	T- 0.071	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat provide strength	-	-	(Adhikari et al., 2020)
48	Rosy barb (W) *(Pethia conchonius) (Hamilton, 1822)*	Sidhre	Cypriniformes Cyprinidae	LC	T-0.066 B-0.043	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure pneumonia	-	✓✓	
49	Common eel (W) *(Amphipnous cuchia)*	Andha baam	Synbranchiformes Synbranchidae	LC	T-0.034 M-0.050 B-0.047	meat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure muscular pain, piles, raw blood cure cancer	✓✓	✓✓	(Gurung, 2021a)

50	Indian motted eel (W) *(Anguilla bengalensis) (Gray, 1831)*	Raj baam	Anguilliformes Anguillidae	NT	T-0.166 M-0.076	meat, oil	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat and oil cure anemia, muscular pain and piles	✓✓	-	(Adhikari et al., 2020)
51	Striped loach (W) *(Acanthocobitis botia) (Hamilton, 1822)*	Garela machha	Cypriniformes Balitoridae	LC	T- 0.2	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat promote strength	-	-	(Adhikari et al., 2020)
52	Grey feather back (W) *(Notopterus notopterus) (Pallas, 1769)*	Patala machha	Osteoglossiformes Notopteridae	LC	0.15	meat	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Consuming cooked meat help to recover after delivery quickly	-	-	(Adhikari et al., 2020)
53	Magur (W) *(Clarias batrachus)*	Magur	Siluriformes Clariidae	LC	T-0.15 M-0.085 B-0.043	meat, blood	**Food value**: Meat is cooked and consumed as food **Medicinal value**: Cooked meat cure physical weakness	✓✓	✓✓ **Medicinal value**: Raw blood cure piles	(Shams, 2018), (Gurung, 2021a)
	Class: Insecta									

54	Honeybee (W) *(Apis cerena)*	Mauri	Hymenoptera Apidae	-	T-0.017 M-0.021 B-0.023	honey	**Food value**: Honey is consumed as food **Medicinal value**: Consuming honey in lukewarm water cure cold, cough	✓✓	✓✓	(Tamang & Singh, 2015), (Poudel & Singh, 2016), (Jugli et al., 2020), (Gautam & Dhakal, 2023)
55	Hornet (W) *(Vespa crabro) (Linnaeus, 1758)*	Aringal	Hymenoptera Vespidae	-	T-0.125 M-0.125 B-0.031	whole body	**Medicinal value**: It is fried and taken orally to cure cough	✓	✓	
56	Potter wasp (W) *(Eumeninae)*	Kumalkoti	Hymenoptera Vespidae	-	B-0.076	mud	-	-	**Medicinal value**: Mud is applied to cure muscular pain	
57	Locust (W) *(Schistocerca gregaria)*	Salahakira (W)	Orthoptera Acrididae	NA	B-0.083	whole body	-	-	**Medicinal value**: It is fried and consumed to improve eye sight	

	Class: Arachnid									
58	Scorpio (W) *(Scorpions)*	Bichhi	Scorpions Arachnids	-	T-0.125 M-0.142 B-0	whole body	**Medicinal valu**e: It is fried and taken orally to cure TB	**Medicinal value**: It is preserved in oil and that oil help to take out throns from the body	✓	
	Class: Crustacean									
59	Crab (W) *(Himalayapotamon atkinsonianum)*	Gangato	Decapoda Potamidae	LC	T-0.081 M-0.067 B-0.090	whole body	**Food value**: It is fried and consumed as food **Medicinal value**: It is fried and taken to cure jaundice and also increase memory power	**Food value**: ✓ **Medicinal value**: It is taken to increase lactation, stop bedwetting, cure cold, weakness, cure fractured	✓✓	(Lohani, 2011a), (Bobo et al., 2015), (Meyer-Rochow, 2017), (Prakash & Verma, 2021a)

								bone		
	Class: Mollusca									
60	Slug (W) *(Anadenus sp.)*	Chiplekira	Pulmonata Helicidae	-	T-0.028 M-0.035 B-0.015	whole body	**Medicinal value**: It is mixed in milk and taken to cure fractured bone, cancer	✓	✓	
61	Apple snail (W) *(Pila globosa) (Lamarck, 1822)*	Ghogi	Architaenioglossa Viviparidae	LC	T-0.077 M-0.052 B-0.1	meat	**Food value**: It is cooked and consumed as food **Medicinal value**: Soup and cooked meat cure TB, anemia, improve eye sight	✓✓	✓✓	

Informant Consensus Factor (ICF)

For Tharu community,

The highest number of use reports is observed in the respiratory category, totaling 618, followed by musculoskeletal ailments with 585 reports. These categories possessed Informant Consensus Factors (ICF) of 0.9497 and 0.9417, respectively, indicating strong agreement among community members regarding the effectiveness of remedies. ENT and dental ailments, while relatively less reported with 11 and 9 respectively, exhibit ICF values of 0.80 and 0.75, indicating some variability in traditional remedies within these categories (Table 3).

Table 3. Categories of ailments and informant consensus factor (ICF) for these categories for Tharu

Ailments categories	Number of use reports	Number of taxa (Nt)	Informant Consensus Factor (ICF)
Gastro-intestinal	184	13	0.9344
Respiratory	618	32	0.9497
Dermatological	127	17	0.8730
ENT	11	3	0.8000
Cardiovascular	46	4	0.9330
Reproductive	54	11	0.8823
Neurological	69	9	0.8824
Dental	9	3	0.7500
Musculoskeletal	585	35	0.9417
Opthalmological	60	7	0.8983
Others	78	14	0.8312

For Magar community,

Musculoskeletal ailments possess remarkably high Informant Consensus Factor (ICF) of 0.963 followed by neurological ailments with ICF values of 0.962 reflecting strong agreement among community members regarding effective remedies. Conversely, the ENT and endocrinology categories present limited use reports, with only 2 and 1 and consequently, ICF values of 0 (Table 4).

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

Ailments categories	Number of use report	Number of taxa (Nt)	Informant consensus factor (ICF)
Gastro-intestinal	327	14	0.960
Respiratory	381	19	0.952
Dermatological	124	10	0.927
ENT	2	2	0.000
Cardiovascular	14	2	0.923
Reproductory	82	7	0.926
Neurological	27	2	0.962
Musculoskeletal	805	31	0.963
Endocrinology	1	1	0.000
Opthalmological	33	4	0.906
Others	49	8	0.854

For Brahmin community

The ophthalmological category stands out with an exceptionally high ICF of 0.968, supported by 32 reports, indicating strong agreement among informants regarding effective remedies for eye-related issues. Cardiovascular and other categories have ICF values ranging from 0.750 to 0.815 respectively (Table 5).

Table 5. Categories of ailments and informant consensus factor (ICF) for these categories for Brahmin

Ailments categories	Number of use reports	Number of taxa (Nt)	Informant Consensus Factor (ICF)
Gastro-intestinal	192	13	0.937
Respiratory	681	31	0.956
Dermatological	129	11	0.922
ENT	33	3	0.938
Cardiovascular	5	2	0.750
Reproductive	115	13	0.895
Neurological	96	8	0.926
Dental	18	2	0.941
Musculo-skeletal	584	30	0.950
Opthalmological	32	2	0.968
Others	66	13	0.815

Fidelity Level (FL)

Higher Fidelity level denotes the most frequently used species (Table 6), it is important to remember that animals with low FL or UV should also be included because excluding them might raise the chance that the knowledge will gradually disappear.

Table 6. Most frequently used animal(s) for different ailment categories based on the highest FL (%) in each ailment category of Tharu, Magar and Brahmin respectively

i.

Ailments	**Animal**	**FL% of Tharu**
Musculo-skeletal	*Sus scrofa*	98.86%
Respiratory	*Nilssonia burun*	98.76%
Gastro intestinal	*Bos taurus*	73.21%
Dermatology	*Axis Axis*	64.28%
ENT	*Sus domesticus*	55.55%
Neurology	*Wallago attu*	52.17%
Reproductive	*Rattus rattus*	51.28%

ii.

Ailments	**Animal**	**FL% of Magar**
Respiratory	*Coturnix coturnix*	97.87%
Musculo-skeletal	*Pila globosa*	97.36%
Gastro intestinal	*Bos taurus*	92.30%
Cardio vascular	*Anguilla bengalensis*	50%
Reproductive	*Acridotheres tristis*	39.62%
Dermatology	*Sus domesticus*	35.48%
ENT	*Sus domesticus*	3.23%
Neurology	*Hystrix indica*	0.24%

iii.

Ailments	Animal	FL% of Brahmin
Neurology	*Bubulcus ibis*	100%
Musculo-skeletal	*Canis aureus*	97.26%
Dermatology	*Sus domesticus*	90.90%
Gastro intestinal	*Bubalus bubalis*	80.95%
Reproductive	*Anas spp.*	76.47%
Respiratory	*Clarius batrachus*	60.00%
ENT	*Passer domesticus*	29.24%
Cardio vascular	*Semnopithecus entellus*	3.84%

Using R studio, In Tharu community, there is significant differences in age to total ailment category known ($p < 0.005$), however there is no any differences in gender, education and occupation to total ailments category known. It implies that age is a factor that determine knowledge about the ailments treated by use of animals but there is no association with gender, educational qualification and occupation to the knowledge of ailments treated using animals.

In Magar community, there is significant differences between age, sex, occupation to total ailments category known ($p < 0.005$) and no significant difference between education to total ailment category. It indicates that age, occupations and gender are the factors that determine the knowledge of ailments treated whereas education plays no role in it.

In Brahmin community, comparison of total ailment category to gender and education, there is no any significant differences and there is significant differences between age and occupation to ailment category known ($p<0.005$). It shows that occupation and age are the factors that determine knowledge of diseases treated using animals.

S.N.	Variable	χ^2	df	p
1	Age/ Total ailments category	T-38.622	T-18	**T-0.0032**
		M-38.833	M-18	**M-0.0030**
		B-42.814	B-15	**B-0.0001**
2	Sex/ Total ailments category	T-5.8711	T-12	T-0.9224
		M-12.689	M-6	**M-0.0482**
		B-10.877	B-5	B-0.0538
3	Education/ Total ailments category	T-20.573	T-18	T-0.3015
		M-55.174	M-54	M-0.43
		B-13.275	B-20	B-0.8653
4	Occupation/ Total ailments category	T-30.822	T-24	T-0.159
		M-143.9	M-108	**M-0.0119**
		B-38.43	B-25	**B-0.0419**

Table 7. Relationship between different variables

Generalized Linear Model (GLM)

Using GLM, it was found that young people (under 30 years) had little knowledge about ethnomedicine. Although most of the respondents were between 30 to 50 age group, it was found that old adult people (50 to 70 years) possessed more ethnomedicinal knowledge. There were significant associations between agriculture, business, housewife with unemployed ones and they used more species compared to service, labor and student (Table 8). There is significant differences between illiterate with respondents who had bachelor degree and above; possessed little knowledge compared to illiterate. There is significant association of unemployed with agriculture, business and housewife and they possessed more ethnomedicinal knowledge compares to labor, service and students.

Table 8. Model-average parameter estimates and their Lower Confidence Interval (LCI) and Upper Confidence Interval (UCI) 95% confidence limit (CL), describing factors affecting the ethnomedicinal knowledge.

Parameters	Estimate					
	S	**SE**	**LCI**	**UCI**	**z**	**p**
(Intercept)	2.78764	0.10241	2.586421	2.988854	27.153	**< 2e-16**
Adult	-0.10683	0.07463	-0.25364	0.039974	1.426	0.1538
Oldadult	-0.0148	0.07261	-0.15769	0.128082	0.203	0.8391
Young	-0.51937	0.08769	-0.69187	-0.34688	5.901	**< 0.001**
Ethnicity Magar	-0.18829	0.0444	-0.27562	-0.10096	4.226	**<0.001**
Ethnicity Tharu	-0.11343	0.04619	-0.20427	-0.0226	2.448	**0.0144**
Above Bachelor	-0.1603	0.08074	-0.31918	-0.00142	1.977	**0.048**
Basic	-0.04508	0.0512	-0.14584	0.055669	0.877	0.3805
Secondary	-0.10113	0.05671	-0.21272	0.010458	1.776	0.0757
SexM	0.03127	0.03768	-0.04285	0.10538	0.827	0.4083
Agriculture	0.26947	0.12665	0.020203	0.518739	2.119	**0.0341**
Business	0.29619	0.13816	0.024248	0.568129	2.135	**0.0328**
Housewife	0.65648	0.26841	0.128187	1.184774	2.436	**0.0149**
Labor	0.24157	0.13909	-0.0322	0.515334	1.729	0.0837
Service	0.21073	0.132	-0.04909	0.470539	1.59	0.1119
Student	0.16222	0.1639	-0.16038	0.484825	0.986	0.3243

Relative Importance of Species (RI)

The highest RI value was observed in *Bos taurus* among Tharu (RI = 1.714) and Magar (RI = 2.00), whereas for Brahmin; the highest RI value was jn *Capra hircus* (RI = 1.667 which implies that they are most versatile species compared to other species and also they have more significances or effectiveness in traditional healing practices (Appendix 3).

5. Discussion

All groups were aware of the zootherapeutic potential of some domestic and wild animals in treating illnesses that are diagnosed locally. The largest reported usage of entire animals for therapeutic purposes was found, followed by the use of various animal parts and byproducts (Prakash & Verma, 2021b). Certain zootherapeutic treatments are exclusive to a single group, while others have equal popularity across all groups. Global interest in alternative healing approaches is amazingly increasing (Farooq et al., 2019). Despite the fact that modern medicine has replaced animal medicine, reports of its use remain till today. The practice of using animals for medical purposes is a component of traditional knowledge that is becoming more and more important to conversations about conservation biology, public health regulations, sustainable natural resource management, etc (Hazarika & Sharma, 2018).

Mammls were used most in all ethnic groups as they are larger in size and easily seen compared to other class of animals. Most of the animals used were wild which indicates that people rely more on wild animal. Meat is the most used part in ethnomedicine and cooking is the most preferred way of preparing medicine for curing diseases. Comprehensive surveys conducted among the Tharu, Magar, and Brahmin communities have revealed that a significant proportion of the animal species featured in their traditional medicinal practices are not currently facing current threats to their survival. Despite the prevalence of "Least Concern" species, it is essential to recognize the importance of continued monitoring and conservation efforts to ensure the long-term sustainability of both the animal populations and the associated traditional knowledge systems within these communities. The GLM analysis revealed significant associations between predictor variables and ethnomedicinal practices among the Tharu, Magar, and Brahmin communities of Kapilvastu district. Notably, variables such as age category, ethnicity, and education level emerged as significant predictors, while gender and other socio-cultural factors showed varying degrees of influence. Age is a major factor that determine knowledge to cure diseases. People who were engaged in agriculture, business and housewife possessed more ethnomedicinal knowledge compared to labor, service and student. Gautam & Dhakal (2023) also supported the similar findings. People who were engaged in agriculture possessed more ethnomedicinal knowledge. Barboza et al. (2007) also supported similar finding. Comapred to other ethnic groups, Brahmin have better

educational qualifications. Moreover, Brahmin showed a particular reverence for sacred animals in accordance with Hindu religious beliefs, while the Magar incorporated domesticated animals and livestock into their healing traditions. The Brahmin community might have a longer history of engagement with ethnomedicinal practices, allowing for the refinement and expansion of knowledge over time. Tharu ethnicity also showed a significant association. Tharu demonstrated understanding of medicinal fauna found in forest environments. 'People of old adult and old category showed significant associations with ethnomedicine usage. Similar finding was found by Wendimu & Tekalign (2023) whesre old aged people possessed more traditional knowledge. Young people had little knowledge compared to elder ones. This is a result of the widespread ownership of traditional knowledge by parents on the use of animals as medicine. Educated young people nowadays are already aware of health issues and seek out medical facilities like hospitals and health centers (Yuniati et al., 2019).

Participants categorized as illiterate had a significantly higher likelihood of using ethnomedicine. Illiterate individuals rely more on traditional healing practices because of prioritizing more ethnomedicinal knowledge than using modern health care facilities to cure different ailments. Illiterate communities may hold a strong sense of cultural pride and autonomy in following their traditional healing knowledge. The socioeconomic position of the respondents, which includes access to national highways and medical facilities, as well as awareness and ease of access, may be a factor in the differences in how different species are used (Karki et al., 2023).

On the other side, people are depleting animals illegally in the name of traditional medicine. It is possible to prevent the exploitation of wild animals and still provide these communities with culturally appropriate healthcare by educating them about the effectiveness of medicinal plants and other non-animal-based medicine. Both traditional and modern medicine should be integrated for the implementation of effective policy regarding conservation of animals (Lohani, 2010). More researches should be done to identify the animals and their produts to confirm their bio active compounds scientifically (Ahmad et al., 2023). In order to preserve ethnozoological history, it would be strongly recommended to have workshops or meetings with older people from rural areas, as the usage, customs, and rituals that have been documented only remain in the memories of the elderly (González et al., 2016).

6. Conclusions and recommendations

6.1 Conclusions

Education and awareness programs can inform community members about alternative treatment options, such as the use of medicinal plants or locally more available species , inspite of using endangered species. Collaboration between traditional and western medicine systems can also provide holistic healthcare solutions that respect both cultural beliefs and conservation objectives. Community-based conservation initiatives, supported by strong policy enforcement and research efforts documenting ethnomedicinal knowledge, can further strengthen conservation efforts and promote sustainable livelihoods that are compatible with wildlife conservation objectives. However, these interventions must be implemented with cultural sensitivity, involving local communities in decision-making.

6.2 Recommendations

1. Community Education and Awareness Programs:

Implement education and awareness initiatives aimed at local traditional communities to inform them about the importance of wildlife conservation and the implications of using animal products for medicinal purposes highlighting alternative treatment options.

2. Discouraging illegal hunting

Random killing should be strictly prohibited. Those animals which are old, disabled should be selected for killing if necessary instead of females and younger ones.

3. Research and Monitoring

Conduct research to assess the impact of traditional medicine practices on wildlife populations. Monitor changes in the prevalence of wildlife exploitation for medicinal purposes and evaluate the effectiveness of conservation interventions over time.

7. References

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Appendices

Appendix 1. Demographic character of respondents

Table 1. Total number of households interviewed where there are different age groups, occupations, gender of various ethnic groups from Banganga municipality

	Questionnaire (300)	**Gajehada**			**Bairiya**			**Pipara**			**Gangauliya**			**Total**	**Percentage**
Parameter	No of household interviewed	75			75			75			75			300	
	Occupation	M	T	B	M	T	B	M	T	B	M	T	B		
Occupation	Labor	0	8	0	3	2	0	2	10	0	4	7	0	36	12
	Farmer	8	29	7	17	6	14	6	11	17	27	6	6	154	51.33
	Business	0	4	2	2	0	0	2	3	3	6	1	0	23	7.66
	Service	2	8	4	2	2	16	4	1	12	5	1	4	61	20.33
	Student	0	1	0	0	0	4	1	0	3	3	0	0	12	4
	Housewife	0	0	2	1	0	6	0	0	0	5	0	0	14	4.66
Gender	Male	7	31	8	14	8	23	12	13	14	30	9	1	170	56.66

	Female	3	19	7	11	2	17	3	12	21	20	6	9	130	43.33
Education	Illiterate	0	13	2	2	3	0	1	5	0	7	4	3	40	13.33
	Basic	4	20	5	12	2	6	8	16	8	24	9	5	119	39.66
	Secondary	6	14	6	11	5	21	6	4	17	18	2	0	110	36.66
	Bachelor and above	0	3	2	0	0	13	0	0	10	1	0	2	31	10.33
Age group	20-29 (young)	0	8	0	4	0	15	4	4	8	10	1	0	54	18
	30-49 (adult)	8	21	4	17	0	20	7	17	18	22	8	6	148	49.33
	50-69 (old adult)	2	16	9	3	6	5	3	3	9	15	6	4	81	27
	70 and above (old)	0	5	2	1	4	0	1	1	0	3	0	0	17	5.66

Appendix 2. Checklist of total families of medicinal animals

Table 2. Classification of animals into different families of three different ethnic groups

S.N.	Family	Number of medicinal animal species		
Mammals		**Tharu**	**Magar**	**Brahmin**
1	Bovidae	5	5	5
2	Canidae	2	1	2
3	Cercopithecidae	1	1	1
4	Cervidae	2	0	2
5	Equidae	2	0	1
6	Felidae	1	1	1
7	Homonidae	1	0	1
8	Hystricidae	1	1	1
9	Leporidae	1	1	1
10	Manidae	1	0	0
11	Muridae	1	1	1
12	Rhinocerotidae	1	1	1
13	Rhinolophidae	1	1	1
14	Suidae	2	2	2
Aves				
1	Phasianidae	5	5	3
2	Columbidae	2	1	1
3	Sturnidae	2	1	2
4	Charadriidae	1	1	1
5	Anatidae	1	1	1
6	Passeridae	1	1	1
7	Corvidae	1	1	1
8	Ardeidae	1	0	1
9	Pasittacidae	1	0	0
10	Ciconidae	1	0	0
11	Accipitridae	1	1	1
12	Upupidae	0	0	1

Pisces				
1	Synbranchidae	2	1	1
2	Siluridae	1	0	0
3	Cyprinidae	3	0	2
4	Anguillidae	1	1	0
5	Balitoridae	1	0	0
6	Notopteridae	1	0	0
7	Claridae	1	1	1
Reptiles				
1	Vranidae	1	1	1
2	Chelonidae	1	1	1
Amphibians				
1	Dicroglossidae	1	1	1
Insects				
1	Apidae	1	1	1
2	Vespidae	1	1	3
Arachnids				
1	Arachnidae	1	1	1
Crusataceans				
1	Potamidae	1	1	1
Mollusca				
1	Helicidae	1	1	1
2	Viviparidae	1	1	1

Appendix 3. RI of animal of three ethnic groups

Table 3. Analysis of Relative Importance of Species of different animals of Tharu, Magar and Brahmin ethnic groups

S.N.	Animal	RI_Tharu	RI_Magar	RI_Brahmin
	Class: Mammals			
1	*Canis aureus*	0.952	0.810	0.917
2	*Hystrix indica*	1.238	1.381	1.375
3	*Sus scrofa*	1.095	0.952	1.042
4	*Panthera tigris*	0.476	1.095	1.042
5	*Rusa unicolor*	0.762	0.810	0.708
6	*Rhinoceros unicornis*	0.619	0.619	0.583
7	*Capra hircus*	1.524	1.381	1.667
8	*Bos taurus*	1.714	2.00	1.625
9	*Lepus nigricollis*	0.619	0.476	1.042
10	*Bos spp.*	0.476	0.476	0.458
11	*Rhinolophus affinis*	0.619	0.762	0.458
12	*Canis lupus familiaris*	0.476	0.619	0.458
13	*Semnopithecus entellus*	0.619	0.952	1.167
14	*Sus domesticus*	1.095	1.095	0.917
15	*Axis axis*	0.762	-	0.458
16	*Bubalus bubalis*	1.095	0.952	1.042
17	*Ovis aries*	1.095	0.810	1.042
18	*Homo sapiens*	0.476	-	0.583
19	*Equus asinus*	0.476	-	-
20	*Equus spp*	0.762	0.476	0.458
21	*Rattus rattus*	1.238	0.810	1.042
22	*Manis sp.*	0.476	-	-
	Class: Birds			
23	*Columba livia*	0.952	0.952	0.792
24	*Gallus gallus*	0.810	0.810	-

25	*Gallus domesticus*	1.381	1.095	1.292
26	*Lophura leucomelanos*	0.952	0.952	1.042
27	*Acridotheres tristis*	0.810	0.952	0.792
28	*Vanellus indicus*	1.095	0.952	1.042
29	*Coturnix coturnix*	1.095	0.952	1.042
30	*Anas sp.*	1.238	1.095	1.042
31	*Passer domesticus*	1.238	1.095	1.167
32	*Pavo cristatus*	0.762	0.476	0.458
33	*Streptopelia orientalis*	0.952	0.667	-
34	*Corvus splendens*	0.619	0.476	0.708
35	*Bubulcus ibis*	0.810	0.667	0.792
36	*Psittacula krameri*	0.476	0.333	0.333
37	*Acridotheres fuscus*	1.238	0.667	1.042
38	*Leptoptilos javanicus*	0.952	0.667	0.667
39	*Gyps bengalensis*	0.619	0.952	1.042
40	*Upupa epops*	-	-	0.458
	Class: Reptiles			
41	*Varnaus flavescens*	1.095	0.952	0.917
42	*Nilssonia hurum*	0.952	1.095	1.167
	Class: Amphibian			
43	*Holobatrachus tigerinus*	0.476	0.619	0.792
	Class: Pisces			
44	*Monopterus cuchia*	0.810	0.667	-
45	*Wallago attu*	0.952	0.667	1.042
46	*Tor putitora*	1.238	0.667	-
47	*Schizothoraz richardsonii*	0.810	0.667	-
48	*Pethia conchonius*	0.810	0.667	0.792
49	*Amphipnous cuchia*	1.095	1.095	1.042
50	*Anguilla bengalensis*	0.952	0.952	-
51	*Acanthocobitis botia*	0.810	0.667	-
52	*Notopterus notopterus*	0.810	0.667	-
53	*Clarias batrachus*	1.095	1.238	0.792

	Class: Insects			
54	*Apis cerena*	0.952	0.952	0.917
55	*Vespa crabro*	0.476	0.476	0.458
56	*Schistocerca gregaria*	-	-	0.125
57	*Eumeninae*	-	0.29	0.125
	Class: Arachnid			
58	*Scorpions*	0.476	-	-
	Class: Crustacean			
59	*Himalayapotamon atkinsonianum*	1.667	1.238	1.417
	Class: Mollusca			
60	*Anadenus sp.*	0.619	0.619	0.458
61	*Pila globosa*	0.667	0.952	1.292

Appendix 4. **Questionnaires for Ethnomedicine**

Are you willing to give answers to the respective questions? Yes/No, If Yes proceed to Q.N 1-18

1. Name of the respondent: _____
2. Age: _____
3. Sex: 1. Male 2. Female
4. Educational qualifications _____
5. Caste: _____
6. Family members: _____
7. Source of income: _____
8. Address: _____
9. Land: _____
10. Ward No: _____
11. Village/ Tole: _____
12. Access to health center: Bus ( ), walk ( )
13. Treatment system: a. Use of ethnomedicine
    b. Go to the wizard doctor (Dhami)
    c. Go to a Health center or hospital
    d. Use of homeopathy

14. Use of animals and animal parts for medicine

Name of animals	Local name	Parts use	Treatment	Side effects	Preparations and administration methods	Effectiveness	Available source

15. If any animals used in any special ritual activities? List them:

Name of animal	Local name	Name of ritual activities	Animal used for	Mythological belief

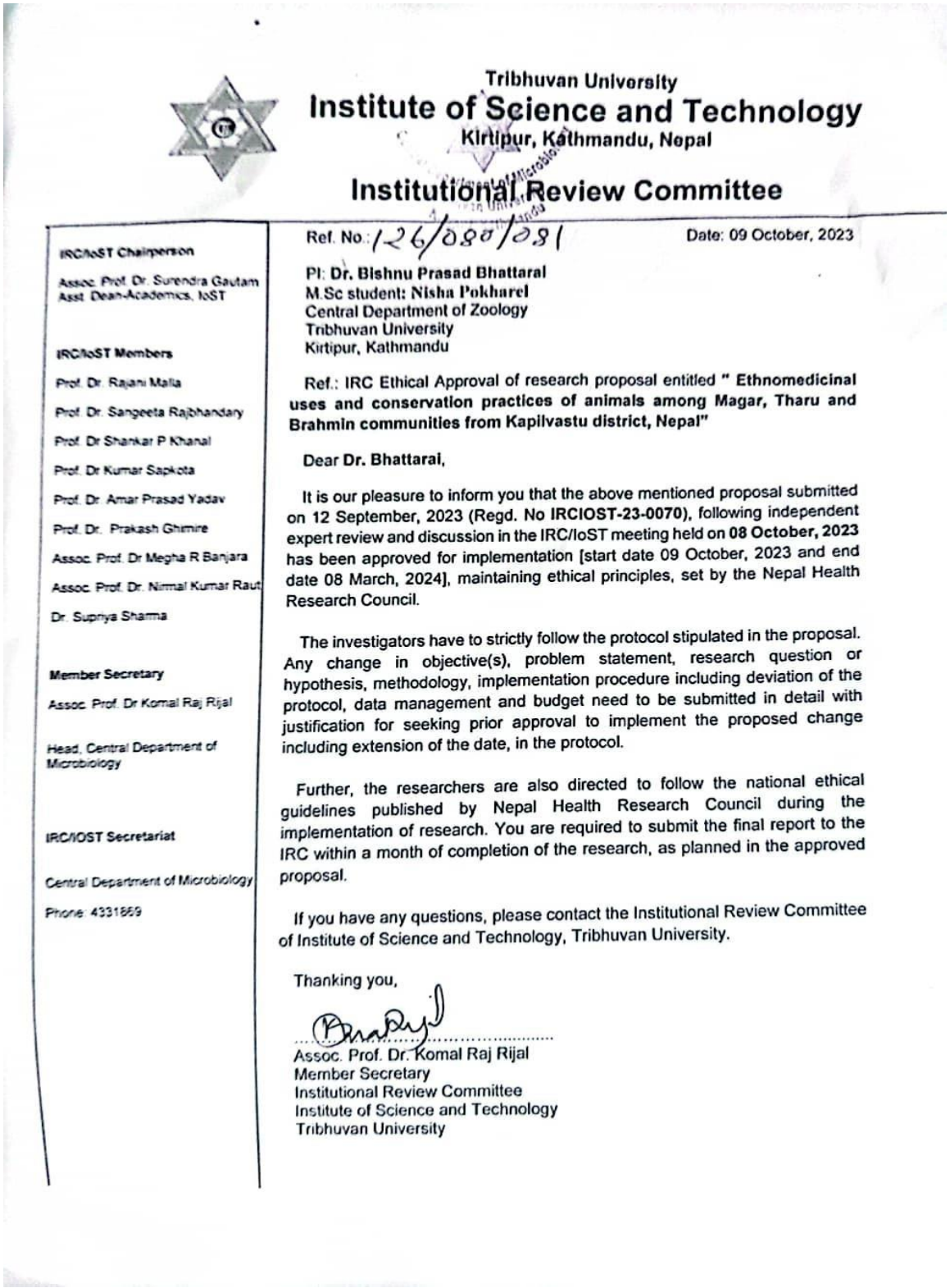
16. Distance to nearest forest_____

17. If ethnomedicine does not work what did you do?

_____

Appendix 5. IRC Ethical approval

Photograph 1. Ethical approval letter of Institutional Review Committee for field work



Tribhuvan University
Institute of Science and Technology
Kirtipur, Kathmandu, Nepal

Institutional Review Committee

IRC/IoST Chairperson
Assoc. Prof. Dr. Surendra Gautam
Asst. Dean-Academics, IoST

IRC/IoST Members
Prof. Dr. Rajani Malla
Prof. Dr. Sangeeta Rajbhandary
Prof. Dr Shankar P Khanal
Prof. Dr Kumar Sapkota
Prof. Dr. Amar Prasad Yadav
Prof. Dr. Prakash Ghimire
Assoc. Prof. Dr Megha R Banjara
Assoc. Prof. Dr. Nirmal Kumar Raut
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Assoc. Prof. Dr Komal Raj Rijal
Head, Central Department of Microbiology

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Central Department of Microbiology
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Ref. No: 126/080/081 Date: 09 October, 2023

PI: **Dr. Bishnu Prasad Bhattarai**
M.Sc student: **Nisha Pokharel**
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu

Ref.: IRC Ethical Approval of research proposal entitled **" Ethnomedicinal uses and conservation practices of animals among Magar, Tharu and Brahmin communities from Kapilvastu district, Nepal"**

Dear **Dr. Bhattarai,**

It is our pleasure to inform you that the above mentioned proposal submitted on 12 September, 2023 (Regd. No **IRCIOST-23-0070**), following independent expert review and discussion in the IRC/IoST meeting held on **08 October, 2023** has been approved for implementation [start date 09 October, 2023 and end date 08 March, 2024], maintaining ethical principles, set by the Nepal Health Research Council.

The investigators have to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure including deviation of the protocol, data management and budget need to be submitted in detail with justification for seeking prior approval to implement the proposed change including extension of the date, in the protocol.

Further, the researchers are also directed to follow the national ethical guidelines published by Nepal Health Research Council during the implementation of research. You are required to submit the final report to the IRC within a month of completion of the research, as planned in the approved proposal.

If you have any questions, please contact the Institutional Review Committee of Institute of Science and Technology, Tribhuvan University.

Thanking you,

.....
Assoc. Prof. Dr. Komal Raj Rijal
Member Secretary
Institutional Review Committee
Institute of Science and Technology
Tribhuvan University