



## Indigenous knowledge of zootherapeutic use among the people of Hazara division Khyber-Pakhtunkhwa, Pakistan

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The various animals and plant species, their parts, and products are being used in traditional health care and cultural practices but the use of animals, their parts and products have rarely recorded especially in Pakistan. This study investigated and documented animal species used by traditional residents for treatments in the Khyber Pakhtunkhwa Hazara area of Pakistan. A field survey conducted in 2017-2018 in 6 districts of the Hazara region. A total of 63 animal species belonging to 47 families were reported for their ethnozoological importance including Mammals 33%, Birds 25%, Arthropods 17%, Reptiles 8%, Fishes 6%, Mollusks 3%, Annelids 3% Platyhelminthes and Amphibians 2% respectively. Out of 63 animals, 59 have medicinal importance and used to treat different human diseases. The most used animal species to treat various human ailments in Hazara region were includes *Ovisaries* (sheep), *Portunessanguinolentus* crab, *Capra aegagrushircus* (goat), *Columba liviademestica* (pigeon), *Bubalusububalis* (Buffalo) and *Apiscerana* (honey bee) and most used body parts include fats, meat, blood, milk, feces, urine, honey, tusk, feathers and shell. This ethnozoology study can play an important role in the biodiversity and conservation of animal species in the study area, laying the foundation for drug development.

**Keywords:** Ethnozoology, Hazara region, KPK, Pakistan, Zotherapy

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It is recorded from history that there are a variety of connections between people and their surroundings. The interactions of human beings with natural resources, i.e., with plants and animals are the demand of human societies. These associations between human beings and their environment can be understood from the ethnobiological point of view. Ethnobiology is the systematic approach that pinpoints the past and present interrelationships between people and the environment including plants and animals<sup>1</sup>. Ethnozoology can be explained as a major sub-discipline of Ethnobiology which involves links between human cultures and animals and it comprises the names of animal species, their classification, cultural knowledge and their use. These animal resources have major contributions in the life of human beings from many points of view including philosophical, cultural, artistic and religious. The

main reason for taming was to supplement their food with meat, milk and eggs. Initially, animals were domesticated for food only but later it was observed that this domestication of animal species is also useful for some other works like traction of plows and wagons, so it can be considered as a source to increase the productivity of men<sup>2</sup>. The folk medicinal setup forms background for the existence of life is the most valued and complex system. Nature is assuming implausible invocations to human beings as it is a base that fulfils necessities including shelter, food and health facilities according to the needs of human beings. Across the world, the folk medicinal system always has an indispensable part. These folk medicines play an imperative role mostly in rural areas even though the demand for these medicines is in most parts of the world where there are human societies and as this system is beneficial as compared to modern pharmaceuticals, therefore, it shall play an important part in future as well<sup>3</sup>. Faunal resources

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have a crucial role in human life from the earliest times, due to this reason human being are well known about the use of animals to fulfill basic demands of life including food, clothes and health remedies<sup>4</sup>. So, we can say that this use of animals for human welfare can be entitled to ethnozoology. Therefore, ethnozoology can be contemplated as an instinctive connection among native people and animal species<sup>5</sup>. Natural chemical substances remained a part of human life until our forefathers started demolishing these natural constituents to upraise and upgrade their life status and a greater part of these chemicals are from faunal resources. Undeniably, faunal resources are curative weapons that have pivotal roles in health care practices<sup>6</sup>. Thus, the treatment of different human diseases by using faunal resources is termed as zotherapy. It provides a pathway for the development of new pharmaceuticals in a modern medicinal system<sup>7</sup>. Zotherapy has a chief part in the modern medicinal system besides all other known methods of health care. Most of the animal's parts and products like skin, fats, blood, meat, milk, eggs, hooves, feathers, tusks and honey have been used in the formation of medicines used for the treatment of various human diseases. As this indigenous knowledge used for therapeutic remedies is passed orally from one generation to the next generation so there are more chances of dissipation of this knowledge due to rapid environmental, technological and socioeconomic changes<sup>8</sup>. The possible way to solve this matter is that this knowledge should be conserved and documented so that it will be available to future generations. Although a great deal of ethnozoological work has been done in most parts of the world Pakistan is much behind in this regard. In Punjab Pakistan, 108 Mammalian and Bird species have been reported for their cultural and ethnomedicinal uses<sup>5</sup>. No such studies have been reported from this region for the use of animals and their products as folk medicines. Therefore, the present study was planned for documentation of such folk knowledge about the use of animal species to heal different human ailments found among the local communities of the Hazara region.

## Materials and methods

### Study Area

This work was carried out in different parts of the Hazara division 2017 and 2018 to document the knowledge of human welfare found in traditional

therapists and locals. The study area comprises of 6 districts, Abbottabad, Haripur, Mansehra, Battagram, Torgar and Kohistan. The main ethnic groups are Hindko speaking people. There are other communities with different languages including Gojri, Pashtuns and Kohistanis. The people all over the country understand Urdu because it is the National language of Pakistan so interviewed the Urdu language Fig. 1.

### Data collection and analysis

Data collected through field surveys, which mainly include semi-structured interviews to gather information about animals used as drugs. A total of 45 informants were selected to gain knowledge and experience of the animals and their products used in folk therapy. Out of these 38 were male and 7 females. Most informants professional traditional therapists who have a good understanding of animal therapy because they are practicing and treating certain diseases and passing these interviews.

Most of the informants were traditional healers by profession and these people have enough knowledge about animal-based remedies because they are practicing these for treatment of certain ailments and through these interviews, we came to know that the people of the region have strong faith on these animal-based drugs and they prefer folk medicines over modern pharmaceuticals. As our interviews were informal so we started with some general questions and their personal information including their names, age, qualifications and experience in this field. Later the information on the medicinal and cultural uses of

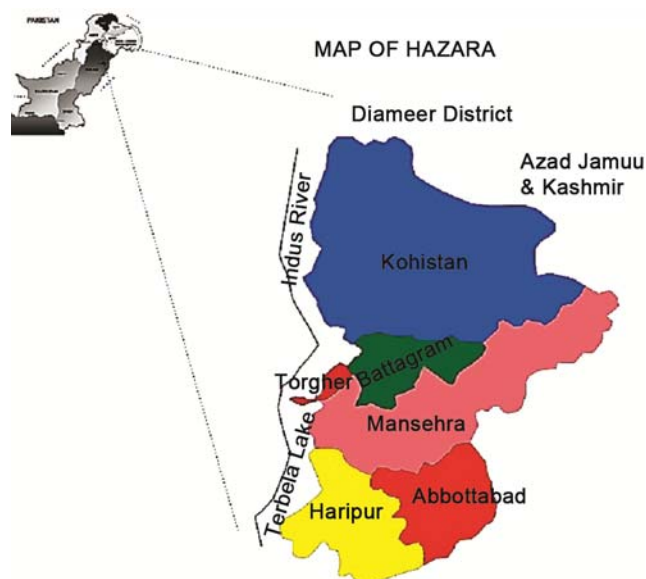


Fig. 1 — Map of Hazara Division

the animals was subsequently obtained, including the local names of the animals, their components or products, and the methods of preparation of the medicaments for use in medicines.

Data were analyzed by use of various indices such as; Use value method (UV), Fidelity level (FL), Relative frequency of mention (RFM), Informant consensus method (FIC) and Frequency of citation (FC).

Fidelity level is the most appropriate method for determining suitable animal species used for the curing human ailments<sup>5</sup>. The formula used to calculate the fidelity level

$$FL (\%) = Np \times 100/N$$

Here Np is the number of informants who claim the use of animal species for the treatment of specific diseases and N is the total number of informants.

Another quantitative method was applied for evaluating the respective consequence of each species based on its corresponding use among informants. The given formula was used for determining the use-value

$$U/N$$

Here,

U is the number of times a species is cited.

N is the total number of informants<sup>6</sup>

The relative frequency of mention (RFM) is contingent on the reported percentage of informants for specific animal species. The relative frequency of mention was determined with the help of the following formula<sup>5</sup>

$$RFM = FM/N (0 \leq RFM \leq 1)$$

Here,

FM is the informant number who provided knowledge about the medicinal use of specific animals and N is the total number of informants.

The frequency of citation is the number of informants who provided data about the use of specific human ailment<sup>6</sup>

The similar features between the information of different informants are checked by informant consensus factor<sup>9</sup> with the help of the following formula.

$$FIC = (Nur - Nt) / (Nur - 1)$$

Here Nur is the number of informants about the use of particular diseases category and Nt is the number

of species used for that particular disease category. FIC value always ranges between 0 and 1.

## Results and discussions

This ethnozoological study in the Hazara region documented about 63 animal species belonging to almost 47 families used to cure 45 diseases of human beings. The zoological names of animal species along with common names, part (s) or product (s) used the disease or ailment for which animal-derived medicines are effective and their fidelity level and use-value are shown in Table 2. Out of these ethnozoological used animals' highest number was that of Mammalia (21 species), followed by Aves (16 species), Arthropoda (11 species), Reptilia (5 species), Pisces (4 species), Mollusca (2 species), Annelida (2 species), Amphibian (1 species) and Platyhelminthes (1 species) shown in Table 1. In similar works, around the world mammals and birds have high uses as traditional medicines. A list of 351 ethnomedicinal benefits of faunal resources has been reported from different research works in India<sup>10</sup>.

This is the first ethnomedicinal report in different regions of the Hazara division. According to the information provided by traditional healers of the region, the people use different animal species to treat various human illnesses. Our results include 63 animals having various medicinal and cultural uses. As mentioned by the informant's milk of a camel (*Camelus dromedaries*) contain several properties including treatment for some diseases like Hepatitis C and jaundiced. This information is not only confined to the healers only but most of the common people of the region also know nutritive and medicinal properties of camel milk. The camel milk is using almost in every house of the region because of its healthful and therapeutic properties and easy availability especially in the summer season the people of warm regions migrate along with their animals to the Hazara region and spent their summer

Table 1 — A number of species in each animal group.

S.NO	Animal Group	Number of species	Percentage (%)
1	Mammalia	21	33.3
2	Aves	16	25.3
3	Arthropoda	11	17.4
4	Reptilia	5	7.9
5	Pisces	4	6.3
6	Mollusca	2	3.1
7	Annelida	2	3.1
8	Platyhelminthes	1	1.5
9	Amphibia	1	1.5

Table 2 — Ethnomedicinal uses of animals in the Hazara region, Kp Pakistan

Scientific Name	Common Name	Class	Phylum	Part or product used	Ethnomedicinal uses	Use value	Fidelity level
1 <i>Acridacineria</i>	Grasshopper	Insecta	Euarthropoda	Whole-body	It is used to treat different diseases including asthma, cough and piles.	0.13	13.3
2 <i>Alectorischukar</i>	Chukar Partridge	Aves	Chordata	Flesh or meat	It is used to treat stomach pain and paralysis.	0.44	44.4
3 <i>Anus platyrhynchos</i>	Duck	Aves	Chordata	Meat, eggs, and fats.	It is used for the treatment of asthma, piles, skindiseases and pneumonia.	0.93	93.3
4 <i>Apis cerana</i>	Honey bee	Insecta	Euarthropoda	Honey	Honey is used for the treatment of a variety of diseases including Cough, asthma, infections, allergies, wounds and skin diseases.	1.0	100
5 <i>Balaenopterus musculus</i>	Blue whale	Mammalia	Chordata	Ambergris	This species is used for the treatment of sexual disorders and paralysis.	0.13	13.3
6 <i>Bombyx mori</i>	Silkworm	Insecta	Euarthropoda	Whole-body	It is used for cardiac disorders.	0.15	15.5
7 <i>Bos Taurus</i>	Cow	Mammalia	Chordata	Meat and milk.	Its milk and meat are used for the treatment of women's internal diseases.	0.88	88.8
8 <i>Bubalus bubalis</i>	Buffalo	Mammalia	Chordata	Kidney, pancreases and milk.	Different body parts of this species are used for the treatment of kidney and pancreatic diseases.	1.0	100
9 <i>Camelus dromedaries</i>	Camel	Mammalia	Chordata	Meat, milk, urine and hair.	These species provide relief for different diseases like jaundice, hepatitis C, nervous disorders, wounds and ear pain.	0.93	93.3
10 <i>Canis lupus</i>	Wolf	Mammalia	Chordata	Bone, liver and spleen.	This species is used in the treatment of diseases like stomach pain, liver diseases and male internal diseases.	0.26	26.6
11 <i>Capra aegagrus hircus</i>	Goat	Mammalia	Chordata	Meat, milk and liver.	Goat milk and meat are used for a variety of diseases including Tuberculosis, mouth spitting, stomach pain, headache and night blindness.	1.0	100
12 <i>Capra falconeri</i>	Markhor	Mammalia	Chordata	Meat, fats and stomach.	This species is used for muscle pain and male internal diseases.	0.26	26.6
13 <i>Capra sibirica</i>	Himalayan ibex	Mammalia	Chordata	Meat, intestine, and horns.	This species is used to treat muscle pain, male internal diseases and sterility.	0.4	40
14 <i>Cimex lectularius</i>	Bug	Insecta	Arthropoda	Whole-body	Bugs are used for the value.	0.26	26.6
15 <i>Channamarulius</i>	Saul fish	Fishes	Chordata	Oil	Oil of this fish is useful for joint pain.	0.31	31.3
16 <i>Ciconia nigra</i>	Black stork	Aves	Chordata	Fats	Fats of this bird are used for the treatment of piles.	0.66	66.6
17 <i>Columbia livia domestica</i>	Pigeon	Aves	Chordata	Skin, blood, soup and feces.	It is a very useful bird and used for the treatment of diabetes, paralysis, night blindness, kidney pain, blood pressure and asthma.	1.0	100

*Contd.*

Table 2 — Ethnomedicinal uses of animals in the Hazara region, Kp Pakistan (Contd.)

Scientific Name	Common Name	Class	Phylum	Part or product used	Ethnomedicinal uses	Use value	Fidelity level
18 <i>Couturnixcouturnix</i>	Quail	Aves	Chordata	Eggs and meat.	This is a very beneficial bird and is used in several diseases like paralysis, blood pressure, kidney stones, stomach diseases and cataract.	0.71	71.7
19 <i>Elephasmaximus</i>	Elephant	Mammalia	Chordata	Tusk	Tusk of the elephant in powder form is used to treat infertility in women.	0.53	53.3
20 <i>Equiscasinus</i>	Donkey	Mammalia	Chordata	Milk	Milk of donkey is useful for skin infection, brain weakness and allergies.	0.48	48.8
21 <i>Fasiola hepatica</i>	Liver fluke	Rhabditophora	Platyhelminthes	Whole-body	Liver fluke is used for the treatment of male and female internal diseases.	0.17	17.7
22 <i>Feliscatus</i>	Cat	Mammalia	Chordata	Spleen and meat.	This species is useful for back pain and piles.	0.44	44.4
23 <i>Fenneropenaeusindicus</i>	Lobster prawns	Malacostraca	Arthropoda	Whole-body	Lobster prawns are used for treating nervous disorders.	0.55	55.5
24 <i>Gallus gallus</i>	Hen	Aves	Chordata	Fats, feet, eggs and stomach.	A hen is very beneficial and used in the treatment of different disorders including asthma, paralysis, kidney stones, back pain and paralysis.	1.0	100
25 <i>Hirundorustica</i>	Barn swallow	Aves	Chordata	Blood and meat.	This species is used for the treatment of skin infections, jaundiced, eye burns and kidney stones.	0.62	62.2
26 <i>Hirudomedicinalis</i>	Leeches	Clitellata	Annelida	Fats or oils.	Leeches are used for healing wounds and musculoskeletal pain.	0.4	40
27 <i>Hoplobatrachustigerinus</i>	Frog	Amphibia	Chordata	Oil or fats.	Oils and fats of frogs are useful for male internal diseases.	0.51	51.1
28 <i>Iridomyrmexsp</i>	Ants	Insecta	Arthropoda	Mound	Its mound is used for treating mumps	0.33	33.3
29 <i>Kachugatentori</i>	Turtle	Reptilia	Chordata	Bones and blood.	This species is used for treating asthma and mirge.	0.26	26.6
30 <i>Labeocatla</i>	Catla fish	Fishes	Chordata	Oil and Meat.	This fish is very useful for joint pain.	0.71	71.1
31 <i>Labeorohita</i>	Rohu	Fishes	Chordata	Meat and oil	Meat and oil of this fish are useful for joint pain.	0.84	84.4
32 <i>Lepusnigricolli</i>	Rabbit	Mammalia	Chordata	Meat	The meat of the rabbit is very useful for asthma and bronchial diseases.	0.75	75.5
33 <i>Lumbricusterrestris</i>	Earth worm	Clitellata	Annelida	Whole-body.	Earthworms are used for removing obstructions of the urinary tract.	0.46	46.6
34 <i>Lusciniamegarhynchos</i>	Nightingale	Aves	Chordata	Feces.	Feces of nightingale are useful in removing black spots of skin.	0.55	55.5
35 <i>Macacamulata</i>	Monkey	Mammalia	Chordata	Meat and blood.	It is used to treat Tuberculosis.	0.31	31.1
36 <i>Mactraspp</i>	Bivalves	Bivalvia	Mollusca	Shell	Shells of bivalves are used to treat acne and other skin diseases.	0.42	42.2

Contd.

Table 2 — Ethnomedicinal uses of animals in the Hazara region, Kp Pakistan (Contd.)

Scientific Name	Common Name	Class	Phylum	Part or product used	Ethnomedicinal uses	Use value	Fidelity level
37 <i>Melanoperdixniger</i>	Black partridge	Aves	Chordata	Soup and meat.	Its meat is very beneficial for bronchitis.	0.53	53.3
38 <i>Mosculuspreus</i>	Musk deer	Mammalia	Chordata	Meat	The meat of deer is used for the treatment of asthma.	0.86	86.6
39 <i>Naemorhedus goral</i>	Deer	Mammalia	Chordata	Meat	This species is useful for asthma.	0.88	88.8
40 <i>Oenenthesfusca</i>	Brown rock chat	Aves	Chordata	Feces.	This species is useful for the treatment of diseases like constipation and gastric issues in infants.	0.44	44.4
41 <i>Ovisaries</i>	Sheep	Mammalia	Chordata	Fats, milk, and meat.	Sheep is useful for the treatment of heart pain and scorpion bites.	1.0	100
42 <i>Oxus cobra</i>	Snake	Reptilia	Chordata	Fats or oil.	Fats and oils are useful for several disorders like eye burns, arthritis, sexual weakness and muscular pain.	0.77	77.7
43 <i>Oyster spp</i>	Oysters	Bivalvia	Mollusca	Shell.	A shell of oyster species is used to treat leucorrhoea.	0.31	31.3
44 <i>Pantheraleo</i>	Lion	Mammalia	Chordata	Oil or fats	Oils and fats of the lion are useful for the treatment of paralysis.	0.37	37.7
45 <i>Pantherapardus</i>	Common leopard	Mammalia	Chordata	Blood and fats.	This species is useful for paralysis and eye burns.	0.42	42.4
46 <i>Parasteatodatepidarorium</i>	Spider	Aricnida	Arthropoda	Whole-body.	Spider is used in the treatment of cancer.	0.24	24.4
47 <i>Passer domesticus</i>	House sparrow	Aves	Chordata	Soup and meat.	House sparrow is used for the treatment of paralysis, gas troubles and constipation.	0.86	86.6
48 <i>Pavocristatus</i>	Peacock	Aves	Chordata	Feathers.	Feathers of the peacock are used to heal wounds and burns.	0.22	22.2
49 <i>Photinuscarolinus</i>	Firefly	Insecta	Arthropoda	Whole-body.	It is used to treat kidney stones.	0.17	17.7
50 <i>Portunessanguinolentus</i>	Crab	Crustacea	Euarthropoda	Whole-body	Crab is used for a variety of diseases like cough, kidney stones, asthma and female menstrual issues.	0.95	95.5
51 <i>Rhinoceros unicornis</i>	Rhinoceros	Mammalia	Chordata	Oil or fats.	Oils and fats of this species are used to treat paralysis.	0.62	62.2
52 <i>Salmotrutta</i>	Trout	Fishes	Chordata	Meat and fats.	This species is used for joint and body pain.	0.91	91.1
53 <i>Scincussincus</i>	Sand fish	Reptilia	Chordata	Whole-body.	This species is used to treat nervous disorders.	0.64	64.4
54 <i>Scorpion spp</i>	Scorpio	Chelicerata	Arthropoda	Fats or oil.	This species is used for the treatment of paralysis and kidney stones.	0.55	55.5
55 <i>Streptopeliadeceocta</i>	Dove	Aves	Chordata	Meat and soup.	Its meat is beneficial for cough and early onset of puberty.	0.86	86.6
56 <i>Strutiocamelus</i>	Ostrich	Aves	Chordata	Meat and fats.	This species is used for Scorpio bites, skin infections and puberty issues.	0.53	53.3

*Contd.*

Table 2 — Ethnomedicinal uses of animals in the Hazara region, Kp Pakistan (Contd.)

Scientific Name	Common Name	Class	Phylum	Part or product used	Ethnomedicinal uses	Use value	Fidelity level
57 <i>Uromastyxhardwiicki</i>	Spiny-tailed lizard.	Reptilia	Chordata	Fats or oil.	Fats and oils are used for the treatment of paralysis and sexual weakness in males.	0.35	35.5
58 <i>Ursusthibetanus</i>	Bear	Mammalia	Chordata	Fats or oil.	Fats are used for paralysis	0.48	48.8
59 <i>Zootoca vivipara</i>	Common Lizard	Reptilia	Chordata	Ash	It is used for menstrual issues.	0.2	20

season because the weather here is perfect for their animals. Not only the milk of camel (*Camelus dromedaries*) but other parts of its body like its hairs, meat and urine are also used for the treatment of certain diseases like for ear pain camel's urine is put into the ear which heals pain and for wounds, its hairs are lapped on infection site which provides a remedy to that infection. If we look at some of the previous works regarding use of animals in the treatment of human diseases there are several examples for this, as we have talked about the urine of camel used in our area in the similar way the urine of sheep (*Ovisaries*), ass (*Equasasinus*), goat (*Capra aegagrushircus*) and rhinoceros (*Rhinoceros unicornus*) are being used in different parts of the world for diseases including fever, asthma, acne, anemia, syphilis, ear and eye infections, mouth infections, rashes, and memory loss. The camel urine (*Camelus dromedaries*) is also helpful to control cell proliferation and apoptosis<sup>11</sup> and its manifest opposition towards the infections caused by fungi and heat<sup>12</sup>. Just like the milk of camel, there are a lot of other animals whose milk is used in the study region for a variety of diseases. These animals include goat (*Capra aegagrushircus*), sheep (*Ovisaries*), buffalo (*Bubalusbubalis*) and cow (*Bostaurus*). Similarly, the ethnozoological analysis of Assam India resulted in about 44 animal species including 25 vertebrates and 19 invertebrates used for the treatment of 40 different human ailments<sup>13</sup>.

The reported species mostly comprises of 50 species of least concern, 4 endangered, 4 vulnerable, 3 near threatened, 1 data deficient and 1 unprotected species. Although most of the species used in medicines in the study area are the least concern there are some endangered and near-threatened species so due to their consistent use in medicines these species could become extinct so steps should be taken for conservation of fauna in and this type of neglected knowledge should be included into strategies of management and biodiversity conservation.

Table 3 — Conservation status of animal species used ethnozoological in the Hazara region.

Conservation status	Animal species number	Percentage (%)
Least Concern	50	79.3
Endangered	4	6.3
Vulnerable	4	6.3
Near threatened	3	4.7
Unprotected	1	1.58
Data deficient	1	1.58

For the treatment of different human diseases, body parts and products of different animal species have been utilized including milk, meat, eggs, shell, tusk, feathers, fats, oils, feces, antlers, urine, stomach, bones as shown in Table 3. The people of the given region use different animals' milk to treat different diseases like cow (*B. taurus*), goat (*C. a. hircus*), sheep (*O. aries*), Buffalo (*B. bubalis*), camel (*C. dromedaries*) and donkey (*E. asinus*) milk for fever, stomach pain, allergies, skin infections, body weakness, Mouth spitting, muscular pain, male and female internal diseases and hepatitis C. The existence of essential nutrients including proteins, vitamins, and minerals in the milk provide comforts to different body pains and enhance sexual powers<sup>14,15</sup>. Similarly, fats and meat have been used for the treatment of jaundice, paralysis, asthma, kidney pain, stomach pains, wounds, kidney stones and piles. Fats having omega-3 fatty acids may be useful for the treatment of different human diseases. A study reported that people of Panjab, Pakistan use the oils and fats of different animal species to treat different body pains including back and joint pain, headache, fever, skin infections and sex potent. Some old research works also reported that oils and fats of animal species are used to treat the thrombotic and aging effects, atherosclerosis, and neurological disorders. Similarly, the blood of different animal species is also used for the treatment of diseases like Paralysis, T.B, skin, and eye diseases<sup>5</sup>. An ethnozoological work in Ethiopia revealed that different body parts of the cow (*Bostaurus*),

porcupine (*Hystrix spp*), common warthog (*Phacochoerus africanus*), elephant (*Elephas maximus*) and spotted hyena (*Crocuta crocuta*) were being used for the treatment of different diseases<sup>8</sup>. Another such work from India documented that the fats of *Buceros bicornis*, fat and flesh of *Hystrix sp* and the tusk of *Elephas maximus* were used for the treatment of arthritis, body ache, rheumatic pain, pimples and conjunctivitis<sup>10</sup>.

Animals frequently used for healing of various ailments reported by most of the informants have a high frequency of citation. In present study Honeybee (*A. cerana*), Buffalo (*B. bubalis*), Pigeon (*C. l. domestica*) and sheep (*O. aries*) have a maximum frequency of citation because a maximum number of people provided ethnomedicinal information about these species whereas Grasshopper (*A. cineria*) and Blue Whale (*B. musculus*) have the lowest frequency of citation because only six people reported these two species. Another work in Punjab documented red turtle dove (*Streptopelia tranquebarica*) and Indian ring dove (*Streptopelia decaocta*) was having a high frequency of citation i.e., 32 and earthworm (*Lumbricus terrestris*) was having low frequency of citation i.e., 1 in district Lahore whereas common quail (*Coturnix coturnix*) was having a high frequency of citation i.e., 22 and Humans (*Homo sapiens*) was having low frequency of citation i.e., 1 in district Jhelum<sup>6</sup>.

In current study sheep (*Ovis aries*), Buffalo (*Bubalus bubalis*), pigeon (*Columbia lividomestica*) and Honeybee (*Apis cerana*) have a maximum relative frequency of mention whereas Grasshopper (*Acrida cineria*) and Blue whale (*Balaenoptera musculus*) have a minimum frequency of mention. The lowest (RFM) value does not show that these species are unimportant but it shows that the maximum number of people do not know the use of these species. If we look at a previous work in Punjab among mammalian species desert hare (*Lepus nigricollis dayanus*) had the maximum relative frequency of mention whereas Mediterranean pygmy shrew (*Suncus eustrucsus*) and house shrew (*Suncus murinus*) had the minimum relative frequency of mention and if we look at bird species House sparrow (*Passer domesticus*) had highest relative frequency of mention i.e., 0.58<sup>5</sup>. Research work about the use of animal species for the treatment of human diseases in India reported about 44 animal species. Out of them, an animal with the highest relative frequency of mention was *Metaphirehouletti* i.e., 0.68, followed by *Pteropus giganteus* with 0.66 and the animals having the lowest relative frequency of mention were *Pherosshussp* and *Hemidactylus flaviviridis* i.e., 0.02<sup>13</sup> Fig. 2.

The homogeneity level found among data provided by different informants was found out by the Informant consensus factor method. The people of the Hazara

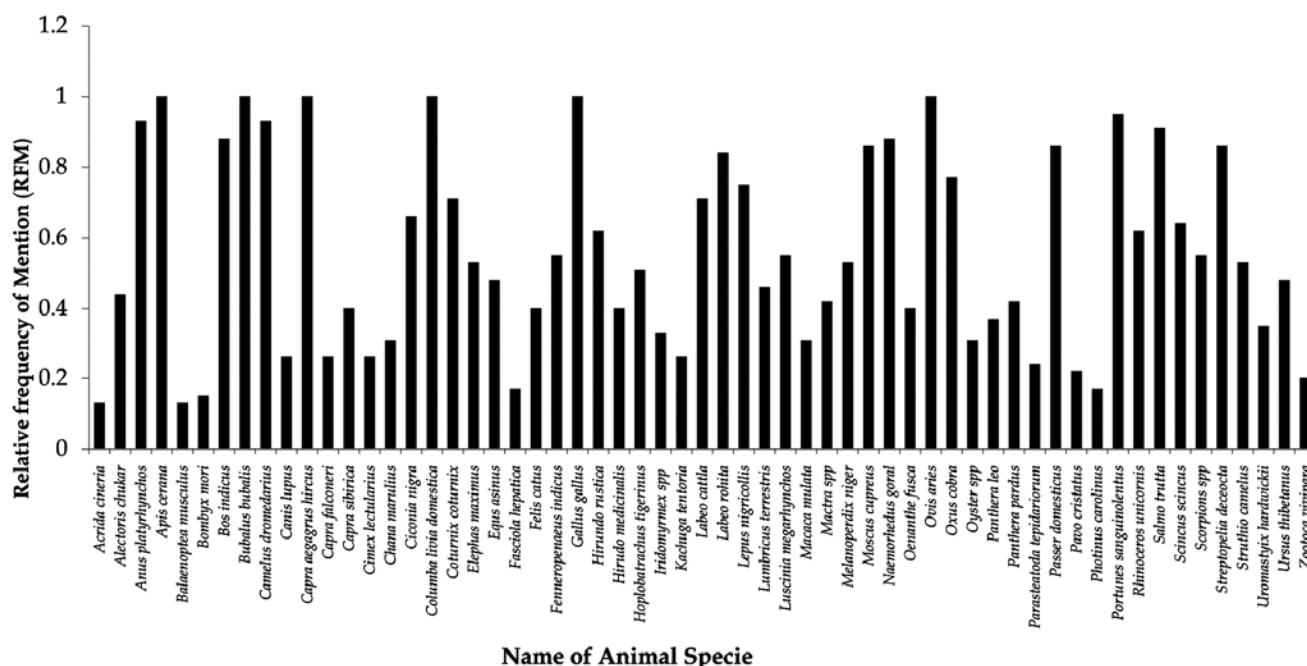


Fig. 2 — Relative Frequency of mention (RFM)



region have faith in the use of animals for medicinal purposes and they use animal species for treating different diseases. FIC values show Cancer, Mumps, Cataract, Mouth spitting, Leucorrhea, Ear pain, Pancreatic diseases, Liver diseases, Ulcer, Hepatitis C, Acne, Valer, Diabetes, Black spots of skin, Obstructions in the urinary tract and Arthritis 1.0, Constipation, Gas trouble, Burns, Body pains, Scorpio bites, Menstrual issues, Nervous disorders, T.B, Bronchitis, Eye burns, Back pain, Blood pressure, Sterility, Muscle pain, Night blindness, Sexual weakness, Female internal diseases, Hasba, Allergy, Skin diseases, Kidney pain and Cough 0.9, Kidney stones, Joint pain, cardiovascular diseases, Wounds, stomach pain, Piles, Paralysis and Asthma 0.8 Fig. 3.

Fidelity level determined the most appropriate species use to treat different human diseases. Animal

species with most uses have high fidelity level. Among the reported species Sheep (*Ovisaries*), Hen (*Gallus gallusdomesticus*), Goat (*Capra aegrushircus*), Pigeon (*Columbia liviademestica*), Honey bee (*Apiscerana*) and Buffalo (*Bubalusububalis*) depicted the highest fidelity level i.e., 100% because these species have a lot of uses whereas Grasshopper (*Acridacineria*) and Blue whale (*Balaenopteramusculus*) depicted the lowest fidelity level. After all, these two species just have few uses. The fidelity level determines the medicinal importance of animals and lay paths for drug discovery. The animal species with maximum use reports have a high fidelity level whereas the animal species with a minimum number of uses have the lowest fidelity level<sup>10</sup>. Some previous research work in Punjab Pakistan documented few animal species

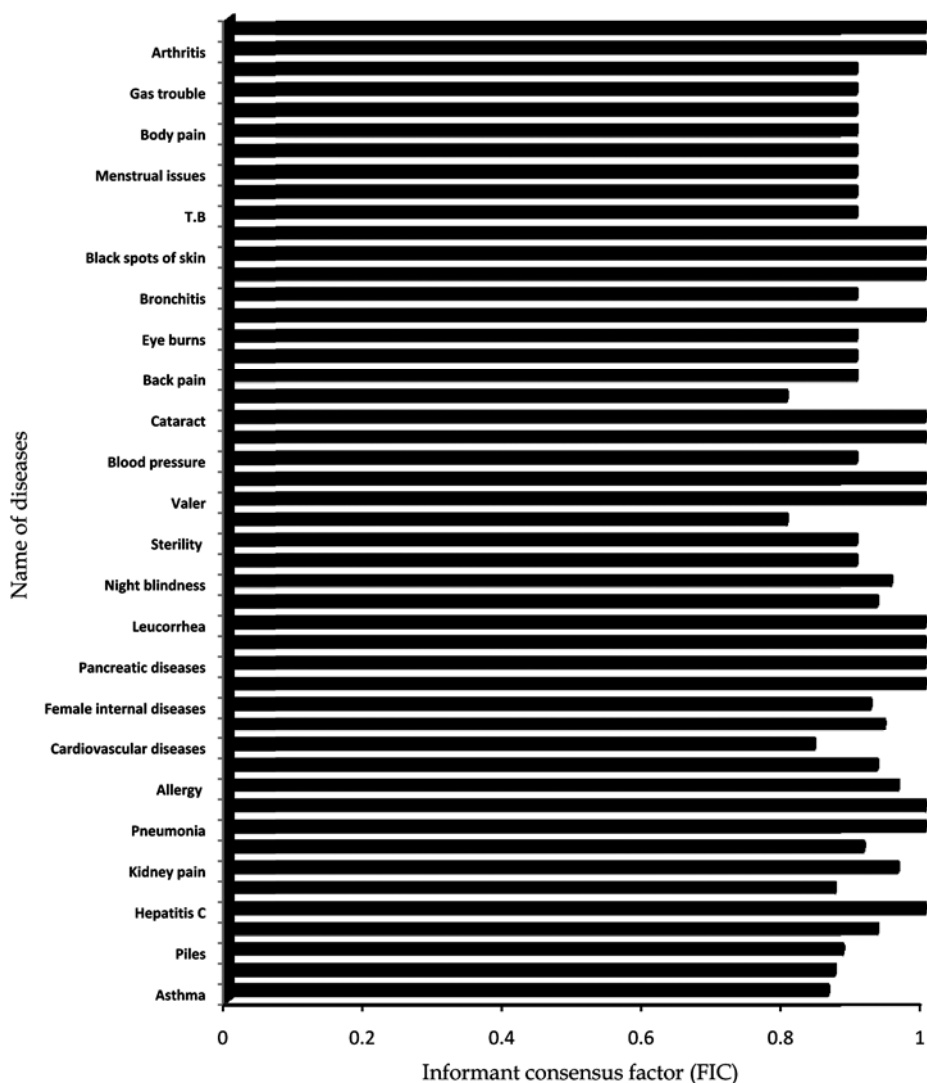


Fig. 3 — Informant Consensus factor (FIC)

having fidelity level 100% including *Bostaurus*, *Gallus gallus*, *Ovisaries*, *Passer domesticus*, *Anus platyrhynchos*<sup>5</sup>. Another ethnozoological study in India documented 23 animal species used to treat 45 different human

diseases having the meat of cow used to treat cough and fever with highest fidelity level of 96% and house fly with lowest fidelity level of 20%<sup>16</sup>. In similar studies in Assam Northeastern India, 34 animal species were reported having medicinal importance. Out of them, the animals with the highest fidelity level were *Hoolockhoolock* with FL=97%, *Paratelphusasp* with FL=96%, *Melursusursinus* with FL=93% and animals with lowest fidelity level were *Periplanetaamericana* and *Lutrogaleperspicillata* with FL=2%<sup>10</sup>. In an ethnozoological study in the adjoining areas of Mount Abu wildlife sanctuary, India animals such as *Cynopterussphinx* has the highest fidelity level i.e., 96% used for the treatment of a cough and fever whereas tusk of *Elephasmaximus* has lowest fidelity level i.e., 12% used for the treatment of pimples<sup>17</sup>. In other ethnozoological studies in India, the species with maximum fidelity level was *Periplanetaamericana* i.e., 92.3% and the species with minimum fidelity level was *Pherosophussp* i.e., 6.9%<sup>13</sup> Fig. 4.

The comparative importance of animal species among the people is identified by the use-value

method. This is a quantitative method and used to identify associations between species and its use among people. The use-value of animal species used in the study area is shown in Table 2. Among the reported species Sheep (*Ovisaries*), pigeon (*Columba liviadomestica*) and Honeybee (*Apis cerana*) depicted the highest use value of 1.00 whereas Grasshopper (*Acridacineria*) and Blue whale (*Balaenopteramusculus*) has lowest use value of 0.13. The ten animals having maximum use value in the study region has been shown in Fig. 5. In a previous report from two cities of Punjab highest use value of 0.89 for Pigeon (*Columba livia*) and 0.88 for Hen (*Gallus gallus*) was calculated and the lowest use-value of i.6 and o.i2 was obtained<sup>6</sup>. Besides the medicinal importance of species, these animals also have other uses like some animal species were used for hunting and entertainment and some were used for ornamental purposes because they are stuffed and their feathers are used in making toys. These include Chukar partridge (*Alectorischukar*), Black stork (*Ciconianigra*), Musk deer (*Moscuscupreus*), deer (*Naemorhedus goral*) and Collared dove (*Streptopeliadeceocta*). *Equuscaballus* (Horses) with decorated craft (Baggi) are used in the wedding ceremony. *Bubalusbubalis* (Buffalo), *Bostaurus* (cow), *Capra aegagrushircus* (Goat), *Camelus dromedaries* (Camel) and *Ovisaries* (Sheep) are

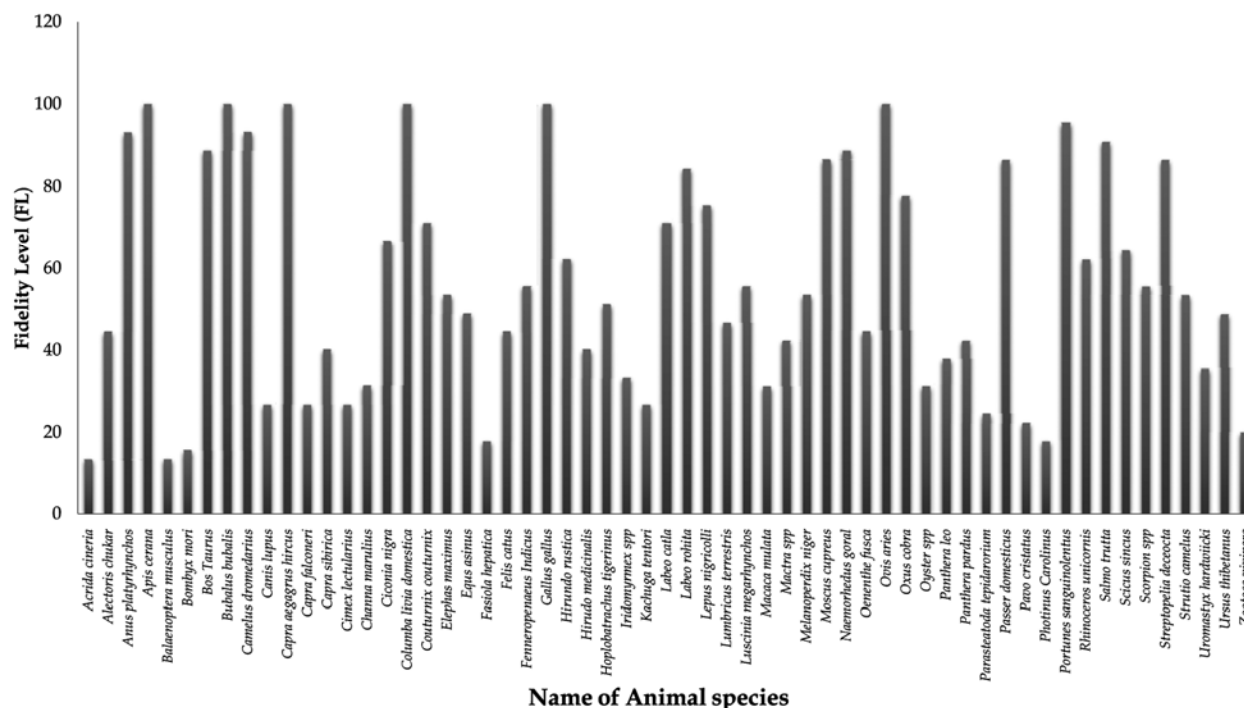


Fig. 4 — Fidelity level of ethnomedicinally used animal species of the Hazara region

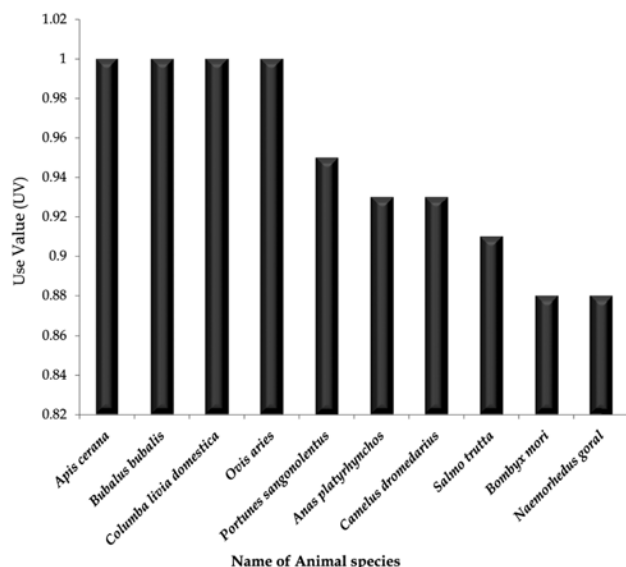


Fig. 5 — The use value of the animal species



Fig. 6 — Some important animal species used ethnozoologically in Study area

reared for milk and milk products (curd, butter, ghee), meat, leather and wool. The skin of some mammal species was used to make leather products. Similarly, according to some previous report's spines of some animal species like Indian crested porcupine (*Hystrixindica*) and (*Hystixcollaris*) were used as

magic rituals and as needles while bones of some animal species like a bear (*Ursusthibetanus*) were used in defensive mechanism<sup>5</sup>.

Our study and some other works revealed that animal species are not only used for medicinal purposes but they also have other uses as well so it is utmost to clear the fact that the use of animals for medicinal purpose is not the single threat to the wild population but there are certainly other reasons which must be considered along with medicinal uses like hunting for food and recreation and loss of habitat etc. Therefore, the multiple uses of animals and their effect on animal population must be considered seriously and recovery steps should be taken for their proper management and conservation especially those species which are highly exploited<sup>10</sup>.

It was observed that people nowadays prefer the traditional methods of health care over modern pharmaceuticals because of the effectiveness and easy availability of traditional medicines. Therefore, zotherapy can be considered an important part of the traditional health care system, however, overexploitation and lack of monitoring should be considered seriously for the conservation and management of faunal resources Fig. 6.

### Conclusions

The ethnozoological knowledge of the locals of the study area indicates that they're significantly associated with their environment and animals. Through the investigation of the study area, 63 animals with ethnozoological importance were identified, which mainly included mammals, birds and arthropods. 59 of them have medicinal treatment for 45 human diseases. So, there is an utmost demand to properly record the important medicinal animals and their parts and products. Further research works are essential for scientific approval to make sure the medicinal importance of animal species and their products. The old traditional methods are implemented by most of the societies throughout the world but this knowledge is confined only to the specific areas or to a certain group of people, therefore, its documentation is very necessary for future use. This ethnozoological information will be helpful in upcoming research works in the science of ethnozoology and it is also important in the conservation of biodiversity and community development

### Competing interest

The author(s) declare that they have no competing interests.

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