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MEDICOETHNOBIOLOGY OF MUSAHAR COMMUNITY IN NAWALPUR DISTRICT, NEPAL

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ABSTRACT

The Musahars are a little-known and backward ethnic group of Nepal and have traditional knowledge of ethnomedicine. They used animals and plants for the treatment of various diseases. This knowledge is vanishing as it is not transferred verbally to the next generation. Hence, this study aimed to document such ethnomedicinal knowledge of the Musahar community by using 60 semi-structured questionnaires. The relative frequency of citation and use value were used to analyze the data. This study recorded 14 species of animals belonging to 12 orders and 14 families for the treatment of 11 different types of ailments. Among them, pigeon was the most commonly used species (UV = 0.27), with 44 used reports by 60 respondents. They treated various ailments, among which respiratory problems were the most commonly treated. Similarly, a total of 54 plant species belonging to 26 orders and 35 families for the treatment of 30 different types of ailments were found. Tulsi was the most common species used (UV = 0.188) with 96 use reports. Plants were commonly used to treat respiratory and integumentary disorders. Ethnomedicinal knowledge was more in the elderly than in the younger generation as they showed an affinity towards modern medicine and modern health services. Hence, this study may help to preserve their traditional ethnomedicinal knowledge before it vanishes.

Key words: Ethnomedicine, medicinal plants, medicinal animals, traditional healers, use value.

INTRODUCTION

Nepal is a multiethnic, multi-lingual, and multi-religious nation with 126 ethnic groups speaking 123 dialects (CBS, 2011). Generally, some ethnic groups such as Tharu, Musahar, Bote, Majhi, Darai, and Kumal are inhabitants of the Terai area. These are wetland-dependent ethnic groups and commonly uptake the natural resources from wetlands for food and traditional medicines (Lamsal et al., 2017). Ethnobiology helps to preserve indigenous knowledge about the uses of natural resources in documented form (Fisher et al., 2017). It is the investigation of culturally based biological and environmental knowledge, cultural perception and cognition of the natural world and associated behavior and practices (Borah & Prasad, 2017). Modern medicines were discovered from the traditional knowledge of ethnomedicine. Ayurveda is also a developed form of ethnomedicine. The ethnic group has traditional knowledge of curing different ailments by using plants and animals.

This knowledge transfers from generation to generation through an orally documented form. So, it is necessary to document it in time. According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicine for their primary health care needs (WHO, 2013).

The Musahars are a little-known and backward group in the Terai of Nepal (CBS, 2011). The Musahars are the one ethnic group in Nepal, with a population of 234,490 (0.88% of the total population) (CBS, 2011). They are marginalized people in Nepal, having their own traditions, culture, language, and treatment system. Most of these people are settled in the Terai and Inner Terai regions, including Morang, Sunsari, Udayapur, Saptari, Siraha, Dhanusa, Rautahat, Mahottari, Bara, Parsa, Nawalparasi, Rupendehi, and Chitwan districts (Koirala, 2004). The name of the Musahar might have come from the occupation of the cast's people, who are still famous for killing mice (*musa*) and eating them (Koirala, 2004). They were dependent on ethnomedicine for health care, but now they are practised in rural areas due to the inclination of people toward modern medical health services. The documents of the ethnic groups were not documented yet.

The Musahars have interesting indigenous knowledge for the treatment of different ailments. However, it is less documented and is still stored in people's memories and activities, so knowledge may be lost after the elderly die. Hence, it is urged to document the indigenous knowledge of the Musahar people, which helps in conserving their ethnobiological knowledge. Hence, this study aimed to explore the different medicinal plants and animals and their uses for the treatment of various diseases used by the Musahar people.

MATERIALS AND METHODS

Study Area

Nawalpur is the newly formed district of Gandaki province in southern Nepal, having an area of 1,043.1 km^2. It lies at 27.8149˚ N latitude and 85.6281˚ E longitude, and its elevation varies from 150 m to 1,937 m. Mt. Devchuli is the highest peak in this district.

The study was focused on locations, i.e., Musaharbasti village of Madhyabindu Municipality, Laughai village of Kawasoti Municipality, and Punarbas village of Devchuli Municipality. The Musahar Basti locations were located near the banks of the Narayani River and the Aarungkhola River. These are located in the buffer zone area of Chitwan National Park. This study area has a tropical type of climate with an average maximum and minimum temperatures 23.03°C and 9.35°C respectively (DHM, 2019). Forests nearer to Musahar settlements consist of various flora and fauna dominated by Sal (*Shorea robusta*), Sisso (*Dalbergia sissoo*), and Khayer (*Acacia catechu*). This area is rich in wildlife such as greater one-horned Rhino, tiger, wild boar, jackal, deer, monkey, snakes, mugger crocodiles, and many birds.

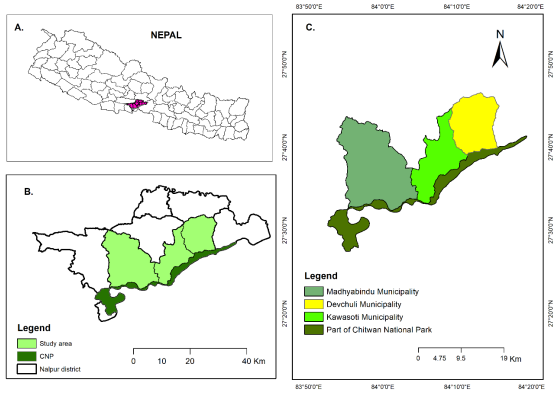

Figure 1. A. Map of Nepal showing Nawalpur east district, B. Nawalpur east district showing study area, C. Intensive study area showing with the part of Chitwan National Park

The total population of Nawalpur is 1082, with an equal ratio of males and females (1:1) (CBS, 2011) (Table 1). The majority of Musahars in this study area are landless and their livelihood is primarily dependent upon natural resources. They collect fish, snails (local name: *ghongi*), and wild vegetables for food (Koirala, 2004). Their traditional professions are fishing and boating.

Table 1. Population of Musahar in Nawalpur district

VDC/ Municipality	Total population	Male	Female
Agryouli	275	132	143
Divyapuri	31	22	9
Kawasoti	72	38	34
Narayani	16	9	7
Naya belhani	100	48	52
Parsauni	42	16	26
Pithauli	87	44	43
Tribeni susta	459	232	227

(Source: CBS, 2011)

METHODS

Data collection

The study was conducted in 2020 from January to March. The information about medicinal plants and animals was recorded and taken photographs of available species.

Open and semi-structured questionnaires were used for the data collection. The households were randomly chosen and oral consent was taken before starting the questionnaires (Adhikari et al., 2020; Alves et al., 2018). The questionnaires were asked in Nepali to the head of the family and the traditional healers who were practising the traditional medicines for the treatment of different ailments. The questionnaire covered information about medicinal plants and animals, their uses, preparing and using the methods of medicinal plants and animals for the treatment of various ailments of local people.

The local healers like Guraus, Dhami, or wizard doctors were selected as key informants for the interview. Questions about traditional healing practices, methods of preparation, used doses, ailments categories, and indigenous knowledge systems were asked, which aided in cross-checking questionnaire responses. This information was very useful for revising the answers and helped to remove the confusion.

Photographs of both known and unknown species of plants and animals available in the study area were taken. The unknown species were recognized by the standard literature review and by experts. The animal and plant species were classified into orders, families, genera, and species. The collected samples were deposited in the Department of Zoology, Birendra Multiple Campus, Bharatpur, Chitwan, Nepal.

Data analysis

The field data were analysed and presented in charts, graphs and tables.

Relative frequency of citation

The relative citation frequency (RCF) was calculated with the help of the formula

$$RCF = \frac{Total\ number\ of\ respondents\ used\ the\ particular\ flora\ or\ fauna}{Total\ number\ of\ respondents} \times 100$$

Use value

The relative importance of animal and plant species used as medicine in the study areas was calculated with the help of the use value for the species:

$$UV_s = \frac{\sum U_S}{N_S}$$

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

RESULTS

The respondents were from the ages of 20 to 79 years, and the females were comparatively higher than the males. More than 80% of the respondents were literate, and the major occupation of Musahar was daily wage workers.

Animals used as ethno-medicine

The study revealed that altogether 14 animal species (11 vertebrates and 3 invertebrates) belonging to 12 orders and 14 families were used for curing 11 different types of diseases/ ailments category (Table 2). Among 14 animal species recorded for medicinal purposes, four were mammals, followed by four Aves, one reptile, two fish, two arthropods, and one mollusca (Figure 2).

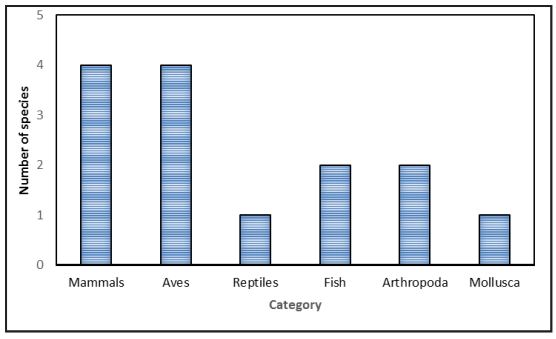

Figure 2. Category of the animals used as traditional medicines by Musahar

The pigeon had the highest relative use frequency (73.3%) for the treatment of common cold and cough, followed by the jackal for asthma and rheumatism (50%), the rhinoceros for asthma (36.7%), and the domestic common fowl for common cold (28.3%) (Table 2). The use value of pigeon was higher (UV = 0.27) with 44 use reports, followed by jackal (UV = 0.18, use reports = 30), rhinos (UV = 0.13, use reports = 22), domestic fowl (UV = 0.10, use reports = 17), little egret (UV = 0.05, use reports = 9) and so on (Table 2).

Table 2. Ethno-zoological knowledge of Musahar community. Here, V= vertebrates and IV= invertebrates, F= frequency, RF= Relative frequency, UV= Use value

SN	Animal	English name	Vernacular name	Zoological name	Parts used	Method of preparation	Mode of administration	Ailment category	F	RF (%)	UV
1	Rhino	Rhinoceros (V)	Gaida	*Rhinoceros unicornis* Linnaeus, 1758	Urine, Blood	Stream	Inhalation	Asthma	22	36.7	0.13
2	Jackal	Golden Jackal (V)	Shyal	*Canis aureus* Linnaeus, 1758	Whole body	Cooked, wine	Oral	Asthma, Rheumatism	30	50.0	0.18
3	Porcupine	Crested Porcupine (V)	Dhumsi	*Hystrix cristata* Linnaeus, 1758	Meat	Cooked	Oral	Tuberculosis	1	1.7	0.01
4	Mouse	House Mouse (V)	Musa	*Mus musculus* Linnaeus, 1758	Whole body	Cooked	Oral	Gingivitis	8	13.3	0.05
5	Tortorise	Tent Tortoise (V)	Kachhuwa	*Psammobates tentorius* (Bell, 1828)	Gall bladder	Mixed with water	Oral	Delivery fever	1	1.7	0.01

6	Pigeon	Rock dove (V)	Parewa	*Columba livia* Gmelin, 1789	Whole body	Cooked, soup	Oral	Common cold, cough	44	73.3	0.27
7	Heron	Little Egret (V)	Bakulla	*Egretta garzetta* (Linnaeus, 1766)	Meat, Blood	Cooked, Raw	Oral	Gingivitis	9	15.0	0.05
8	Hen	Domesticated fowl (V)	Local kukhura	*Gallus gallus domesticus* (Linnaeus, 1758)	Meat	Cooked	Oral	Common cold	17	28.3	0.10
9	Crow	House Crow (V)	Kaag	*Corvus splendens* Vieillot, 1817	Meat	Cooked	Oral	Conjunctivitis	6	10.0	0.04
10	Mahseer	Tor (V)	Sahar maccha	*Tor putitora* (Hamilton 1822)	Gall bladder	Cooked, mixed with water	Oral	Delivery fever	7	11.7	0.04
11	Eel	Eeel (V)	Bam	*Anguilla bengalensis* (J.E. Gray, 1831)	Whole body	Cooked	Oral	Chest pain	1	1.7	0.01
12	Crab	Crab (IV)	Gangata	*Himalayapotamon atkinsonianum* (Wood-Mason, 1871)	Whole body	Cooked	Oral	Tuberculosis	1	1.7	0.01
13	Prawn	Prawn (IV)	Jhigemachha	*Macrobrachium lamarrei* (H. Milne Edwards, 1837)	Whole body	Cooked	Oral	Eye problem	1	1.7	0.01
14	Slug	Slug (IV)	Ghongi	*Bellamya bengalensis* (Lamarck, 1882)	Muscles	Cooked	Oral	Weakness	16	26.7	0.10

The reported 14 species of animals were used for curing 11 different types of ailments, which were categorised into five different ailment categories: respiratory, ophthalmological, reproductive, dental, and musculoskeletal. Most of the ailments were related to respiratory problems (Table 2). The results showed that 46% of the ailments were related to respiratory problems, 18% were ophthalmological, 9% were reproductive, 9% were dental, and 18% were musculoskeletal (Figure 3).

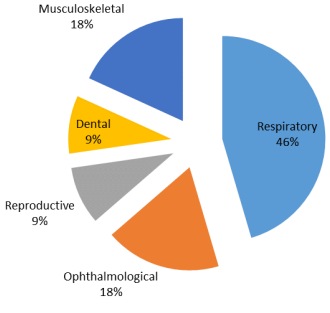

Figure 3. Use of animals and their parts for the treatment of different types of diseases/ ailments

The whole body of animal species, or their organs and products such as blood, gall bladder, muscles, urine, stool, and whole body, were used orally or inhalation as ethnomedicine to treat various ailments (Figure 4). Whole body parts were cited 85 times more frequently than meat (FC = 33), stool and urine (FC = 22), muscles (FC =16), blood (FC =9), and gallbladder (FC =8).

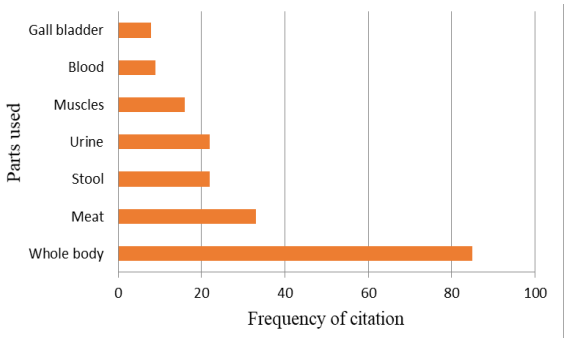

Figure 4. Different body parts of animals used for the preparation of traditional medicine

Medicines were prepared by cooking (70%), direct use (6%), mixing with water (12%),

making wine (6%) and steaming (6%) (Figure 5).

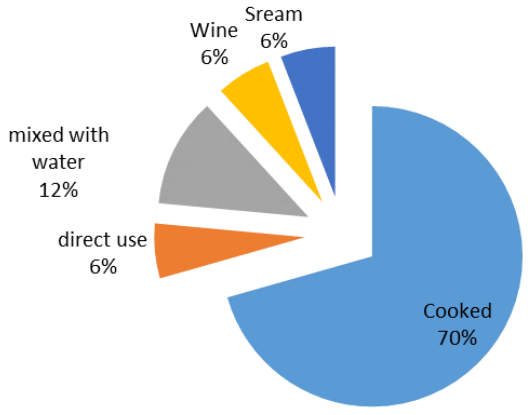

Figure 5. Mode of preparation of animals and their parts as ethnomedicine

Figure 6. Animals used as ethnomedicine by Musahar community A- *Bellamya crassispiralis;* B- *Macrobrachium lamarrei;* C- *Himalayapotamon atkinsonianum;* D- *Anguilla bengalensis;* E- *Tor tor;* F- *Egretta garzetta;* G- *Egretta garzetta;* H- *Canis aureus;* I- *Rhinoceros unicornis*

Plants used as ethnomedicine

A total of 54 plant species belonging to 26 orders and 35 families were used for the treatment of 30 different types of ailments (Table 3). Tulsi had the highest relative use frequency (160%) for common cold and cough treatment, followed by Neem for allergies, abscess, wounds, high B.P., and worms (98.3%), Guava for diarrhea and stomach pain (83.3%), and Turmeric for common cold and cough (36.7%) (Table 3). The use value of Tulsi was higher (UV = 0.188) with 96 use reports, followed by Neem (UV = 0.115, use reports = 59), Gauva (UV = 0.098, use reports = 50), Turmeric (UV = 0.043, use reports = 22), Ginger (UV = 0.041, use reports = 21) and so on (Table 3).

Table 3. Ethnobotanical knowledge of Musahar community. Here, H=Herbs, S=Shrubs, T=Trees, C=Climbers, F=Fungi and RF= Relative frequency, UV=Use Value.

S. N.	Name of Plants	English Name	Vernacular Name (Musahar language)	English Name	Parts Name	Mode of Preparation	Mode of Administration	Ailments category	Frequency	RF(%)	UV
1	Aak	Giant calotrope (S)	Madar	Giant calotrope (S)	Gum	Cuts, squeezed	Tropical	Rheumatism, Crinkle	8	13.3	0.016
2	Aakashe beli	Giant dodder (C)	Aakashe beli	*Cuscuta reflexa* Roxb.	whole body	Juice, Squeezed, Make sleeping mats	Oral, Tropical	Jaundice	10	16.7	0.020
3	Aasuro	Malabar nut (H)	Asuro	*Justicia adhatoda* L.	Leaves	Boiled, Squeezed	Oral	Jaundice, Common cold	2	3.3	0.004
4	Aleo vera	Aleo vera (H)	Gheeukumari	*Aleo vera* (L.) Burm.f.	Leaves	Cuts, squeezed	Tropical	Burns, Pimples	5	8.3	0.010
5	Amala	Indian gooseberry (T)	Amala	*Phyllanthus emblica* L.	Fruits	Powder	Oral, Tropical	Hair fall	9	15.0	0.018
6	Amilo jhar	wood sorrel (H)	Amilo jhar	*Oxalis dilleni* Jacq.	Leaves	Squeezed	Oral	Fever, Headache	6	10.0	0.012
7	Bakaina	Chinaberry (T)	Bakaina	*Melia azedarach* L.	Fruits, Roots	Boiled, Squeezed	Oral	Fever, Diarrhoea	2	3.3	0.004
8	Banana	Banana (H)	Kera	*Musa*	Bark	Squeezed	Tropical	Wound	1	1.7	0.002
9	Barro	Myrobalan (T)	Barro	*Terminalia bellirica* (Gaertn.) Roxb.	Fruits	Direct used, Powder	Oral	Common cold, Cough	16	26.7	0.031
10	Bittergourd	Bittergourd (C)	Karela	*Momordica charantia* L.	Fruits	Cooked	Oral	High B.P.	7	11.7	0.014
11	Bojho	Sweet flag (H)	Bojho	*Acorus calamus* L.	Leaves, roots	Squeezed	Oral	Wound, Cough	5	8.3	0.010
12	Bokejhar	Goat weed (H)	Bokejhar/ Gandhejhar	*Ageratum conyzoides* L.	Leaves	Squeezed	Oral	Cuts	9	15.0	0.018
13	Bottlegourd	Calabash (C)	Lauka	*Lagenaria siceraria* (Molina) Standl.	Fruits	Cooked	Oral	High B.P.	5	8.3	0.010
14	Bryophyllum	Bryophyllum (H)	Ajambari jhar	*Bryophyllum pinnatum (Lam.) Oken*	Leaves	Direct used	Oral	Stone	1	1.7	0.002
15	Cinnamon basil	Cinnamon basil (H)	Daunne phool	*Ocimum basilicum* L.	Leaves	Squeezed	Tropical	Fever	3	5.0	0.006
16	Dumri	Indian Cluster Fig (T)	Dumri	*Ficus racemosa* L.	Bark	Squeezed	Oral	Fever	1	1.7	0.002
17	Ghodtapre	Indian pennywort (H)	Gholtopi	*Centella asictica* (L) Urban	Leaves	Squeezed	Oral	Fever, Headache	18	30.0	0.035
18	Ginger	Ginger (H)	Aaduwa	*Zinger officinale* Roscoe	Rhizome	Boiled	Oral	Common cold, Cough	21	35.0	0.041
19	Guava	Common Guava (T)	Belauti	*Psidium guajava* L.	Leaves	Direct used	Oral	Diarrhea, Stomach aches	50	83.3	0.098
20	Harro	Black Myrobalan (T)	Harra	*Terminalia chebula* Retz.	Fruits	Direct used, Powder	Oral	Common cold, Cough	14	23.3	0.027

21	Hibiscus	Hibiscus(S)	Ghanti phool	*Hibiscus rosa-sinensis* L.	Leaves	Squeezed	Tropical	Fever, Headache	6	10.0	0.012
23	Jamuna	Java plum (T)	Jamuna	*Syzygium cumini* (L.) Skeels.	Bark	Squeezed	Oral	Diarrhea	13	21.7	0.025
24	Kalo banmara	Crofton weed (H)	Kalo banmara	*Ageratina adenophora* (Spreng.) King & H.Rob.	Leaves	Squeezed	Tropical	Cuts	2	3.3	0.004
25	Kusum	Ceylon Oak (T)	Kusum	*Schleichera oleosa* 9Lour.) Oken	Bark	Boiled	Oral	Sinusitis	2	3.3	0.004
26	Green amaranth	Green amaranth (H)	Lodhe	*Amaranthus viridis* L.	Leaves, roots	Squeezed, cooked	Oral	Headache, Burns during urination	2	3.3	0.004
27	Mango	Mango (T)	Aap	*Mangifera indica* L.	Bark	Boiled, Squeezed	Oral, Tropical	Fever	18	30.0	0.035
28	Methi	Fenugreek (H)	Methi	*Trigonella foenum-graecum* L.	Seeds	Boiled	Oral	Stomach aches	1	1.7	0.002
29	Mulberry	Mulberry (T)	Kimbu	*Morus* L.	Roots	Squeezed	Oral	Worm	2	3.3	0.004
30	Neem	Neem (T)	Neemi	*Azadirachta indica* A.Juss.	Leaves	Squeezed, juice	Oral, Tropical	Allergies, Abscess, Wound, High B.P., Worm	59	98.3	0.115
31	Papaya	Papaya (T)	Mewa	*Carica papaya* L.	Fruits	Juice, cuts	Oral	Jaundice	2	3.3	0.004
32	Pipala	Long pepper (C)	Pipli	*Piper longum* L.	Fruits	Powder	Oral	Common cold, Cough	18	30.0	0.035
33	Pomegranate	Pomegranate (S)	Aanar	*Punica granatum* L.	Fruits cover	Squeezed	Oral	Diarrhea	9	15.0	0.018
34	Rani sinka	Fern (H)	Rani sinka	*Leuritopteris leptolepis* (Fraser-Jenk.) Fraser-Jenk.	Roots	Squeezed, juice	Oral	Jaundice	4	6.7	0.008
34	Rudilo	Bengal pogostemon (S)	Rudilo	*Pogostemon benghalensis*	Leaves	Squeezed	Oral	Cough, Headaches	8	13.3	0.016
35	Sal	Sal (T)	Sal	*Shorea robusta* Roth	Bark, Resin	Squeezed, powder	Oral, Tropical	Dysentery, Diarrhea	10	16.7	0.020
36	Saijan	Drumstick tree (T)	Saijan	*Moringa oleifera* Lam.	Gum	Squeezed	oral	Fever	1	1.7	0.002
37	Seto banmara	Siam weed (H)	Seto banmara	*Chromolaena odorata* (L) R.M.King & H.Rob.	Leaves	Squeezed	Tropical	Cuts	5	8.3	0.010
38	Beans	Hyacinth bean (C)	Simi	*Lablab purpureus* (L.) Sweet	Leaves	Squeezed	Tropical	Fungal infection	8	13.3	0.016
39	Sugarcane	Sugarcane (H)	Ukhu	*Saccharum officinarum* L.	Stem	Squeezed, juice	Oral	Jaundice	6	10.0	0.012
40	Titepati	Mug wort (H)	Titepati	*Artemisia vulgaris* L.	Leaves	Squeezed	Oral	High B.P.	3	5.0	0.006
41	Tomato	Tomato (C)	Gholbheda	*Solanum lycopersicum* L.	Fruits	Direct used	Tropical	Burns	1	1.7	0.002
42	Touch me not plant	Shy plant (H)	Lajawati jhar	*Mimosa pudica* L.	Roots	Squeezed	Oral	Piles	5	0.0	0.010

43	Tulsi	Holy Basil (H)	Tulsi	*Ocimum tenuiflorum*	Leaves	Boiled, Juice	Oral	Common cold, Cough	96	160.0	0.188
44	Turmeric	Turmeric (H)	Beshar	*Curcuma longa* L.	Rhizome	Boiled	Oral	Common cold, Cough	22	36.7	0.043
45	Fire Flame Bush	Fire Flame Bush (S)	Dhyaro Phool	*Woodfordia fruticosa* (L.) Kurz	Flowers	Squeezed	Oral	Cough	1	1.7	0.002
46	Alainchi	Black cardamom (H)	Alainchi	*Amomum subulatum* Roxb.	Fruits	Juice	Oral	Gastritis	1	1.7	0.002
47	Lamb's quarter	Lamb's quarter (H)	Bethe	*Chenopodium album* L.	Leaves, seeds	Fried	Oral	Back pain	3	5.0	0.002
48	Dill	Dill (H)	Soop	*Anethum graveolens* L.	Leaves	Cooked	Oral	Back pain	3	5.0	0.006
49		Red mushroom (F)	Rato chyau	*Ganoderma Lucisum L.*	whole body	Powder	Tropical	Ear infection	2	3.3	0.004
50	Sarpa gandha	Serpentine(S)	Dharmaruwa	*Rauvolfia serpentina* (L.) Benth.	Roots	Squeezed	Oral	Fever	1	3.3	0.002
51	Glori plant	Glori plant(S)	Bhanti	*Clerodendrum viscosum* Vent., nom. superfl.	Leaves	Squeezed	Oral, Tropical	Fever	1	1.7	0.002
52	Wallich milk parsley	Wallich milk parsley (H)	Chini jhar	Selinum tenuifolium L.	whole body	Juice	Oral	Menstruation Problem	1	1.7	0.002
53	Blueberry myrtle	Blueberry Myrtle (S)	Kali dath	*Myrsine semiserrata* Wall.	Leaves	Boiled	Oral	Common cold	1	1.7	0.002
54	Sweat Basil	Sweat Basil (H)	Babari	*Ocimum basilicum L.*	Leaves	Direct used	Oral	Vomiting	1	1.7	0.002

The reported plants were categorised into different groups, such as trees, shrubs, herbs, climbers, and fungi. This study recorded 26% of trees, 15% of shrubs, 46% of herbs, 11% of climbers, and 2% of fungi used as medicine (Figure 7, Figure 8).

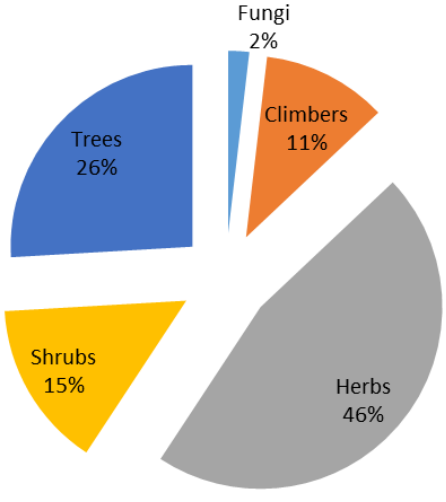

Figure 7. Category of Plants used as traditional medicine by Musahar community

This study found that 54 species of plants were used for treating 30 types of ailments by the Musahar community (Table 3). The result showed that 31 % of the ailments were gastrointestinal, 31% were integumentary, 11% were musculoskeletal, 15% were respiratory, 4% were reproductive, 4% were cardiovascular, and 4% were genitourinary (Figure 9). Headache, fever, winter fever, and stones could not have been classified in medical terms.

Figure 8. Plants used by the Musahar as medicine A- *Chenopodium album;* B- *Acorus calamus;* C- *Justicia adhatodav;* D- *Centella asictica;* E- *Anethum graveolens* F- *Calotropis gigantean;* G- *Aleo vera;* H- *Ageratum conyzoides;* I- *Ageratina adenophora;* J- *Clerodendrum viscosum;* K- *Ocimum tenuiflorum;* L- *Pogostemon benghalensis.* M- *Hibiscus rosa-sinensis;* N- *Mimosa pudica;* O-*Chromolaena odorata;* P- *Artemisia vulgaris;* Q- *Carica papaya;* R- *Cuscuta reflexa;* S- *Lablab purpureus;* T- *Morus spp.;* U- *Psidium guajava;* V- *Woodfordia fruticose;* W- *Saccharum officinarum;* X- *Bryophyllum spp.*

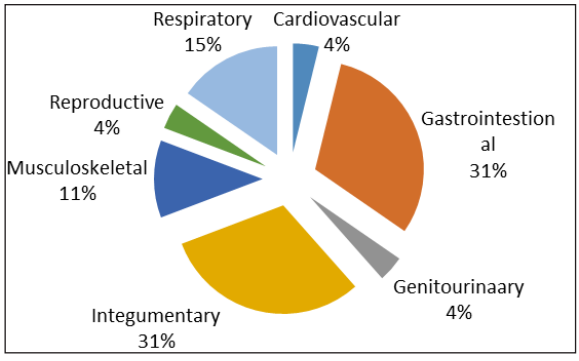

Figure 9. Different types of diseases/ailments

The parts of plants used either orally or topically for medicinal purposes were bark, flowers, fruits, fruit cover, leaves, roots, seeds, stems, etc. In some cases, gum, resin, and the whole body were also used for treatment (Figure 10). Leaves were mostly used (Frequency of citation = 295) rather than fruits (FC = 75), bark (FC = 45), rhizome (FC = 43) and so on.

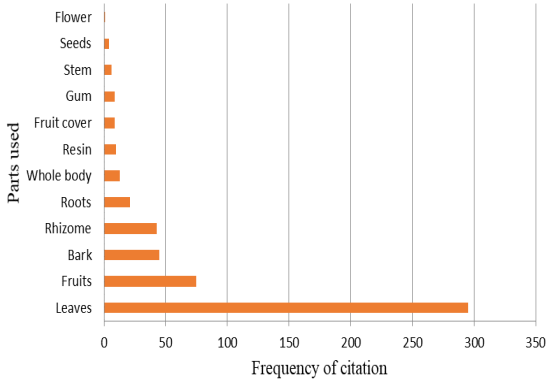

Figure 10. Different body parts of plants used for the preparation of ethnomedicines

Some plants were used directly without preparation. Most of the plants and their parts were prepared as medicines by using various methods such as boiling, chewing, cooking, cuts, direct use, frying, juice, powder, squeezing, etc. Most ethnomedicine was prepared by squeezing, which is 46%, boiled 13%, juice 11%, powder 9%, cooked 7%, direct used 9%, fried 1%, cuts 4%, and fried 1% (Figure 11).

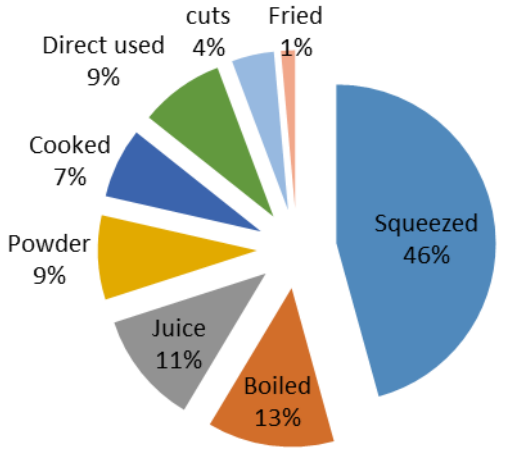

Figure 11. Mode of preparation of plants and their parts as ethnomedicine

DISCUSSION

Animals used in ethnomedicines

The Musahar people used many animal and plant species by using their traditional knowledge for the treatment of various ailments. An ethnobiological study conducted in Nawalpur district showed that plant species were mostly used in comparison to animal species for curing various ailments. The result of the present study documented 14 animal species used by the Musahar for medicinal purposes. A similar study by Koirala (2004) reported 20 species of animals used as medicine in the Musahar community of Chitwan. But our study was focused on the small and scattered communities that are directly affected by modern medicine. Many researchers worked in the field of ethnobiology and recorded zoological knowledge and ethnomedicinal knowledge from the different communities in Nepal, such as the Raute community and reported 48 animals used, but among them, only five were used as medicine (Singh, 1995); the Jirel community and reported 49 species of animals used for different ethnozoological uses (Lohani, 2011), Limbu community and reported 15 species of animals used for treating different ailments (Tamang & Singh, 2014); the Darai of Chitwan and recorded 26 species of animals for ethnozoological uses including medicine (Poudel & Singh, 2016), Munda ethnic group in Jhapa and reported 25 animal species for ethnozoological uses (Ghimire, 2016).

For medicinal purposes, different parts or organs of animals were used, such as gall bladders, blood, muscles, urine, stool, meat, etc. In some cases, the whole body may also be used. A total of two species of animals were used for curing asthma, common cold, delivery fever, gingivitis, and tuberculosis, and one species of animal was used for curing chest pain, conjunctivitis, cough, eye problems, rheumatism, and weakness. Similar types of body parts of animals also used for the preparation of medicines for treating different ailments were also reported in previous studies (Alves et al., 2017; Borah & Prasad, 2017; Ferreira et al., 2009; Jaroli et al., 2010; Kim & Song, 2013; Lohani, 2011, 2012; Rai & Singh, 2015; Vijayakumar et al., 2015).

The most common modes of administration of medicine are oral and tropical. Topical use is an important way of remedying Musculo-skeletal problems like muscular pain, fractures, rheumatism, and arthritis. Such modes of administration were found in studies from Korea (Kim & Song, 2013), in India (Vijayakumar et al., 2015), in Brazil (Alves, 2009; Alves et al., 2017; Barboza et al., 2007) and also in Nepal (Lohani, 2012; Poudel & Singh, 2016).

The wild animals were declining gradually and it was difficult to collect them. The government of Nepal banned killing wild animals and using their body parts. Clinical medicine was easy to access and more effective than traditional medicine, hence the new generation used modern medicine rather than traditional. The process of making medicine out of animal parts was a really tough one (Alves et al., 2013; Henderson

& Harrington, 1914). Therefore Musahar used the small number of animals that are easily available in their community for medicinal purposes. The younger generation is unknown about ethnomedicine as they have no interest in it. Therefore, after the death of the senior people, ethnic knowledge will disappear. (Borah & Prasad, 2017). Due to the dense population and different types of modern equipment and the overlapping of different castes, these people are avoiding their own culture and indigenous knowledge. They are imitating the new trends, culture, etc. Therefore, I found different results than those of previous researchers due to the majority of people who migrated from the hills and local people Tharus and Musahars have forgotten their own culture, norms, and ritual values and are learning the culture of other ethnic groups. The new generation moves from one place to another for work and they copy the culture of the other there by.

Plants used in ethnomedicines

This study tried to find out whether Musahar of Nawalpur knew about the ethnomedicinal importance of plant species commonly present in-home garden and around the study area. In terms of plant diversity, plant parts used, and life forms, the results of our study resembled other studies on ethnobotany and ethnomedicine conducted in various regions of Nepal (Bhattarai et al., 2011; Dangol & Gurung, 1991; Ghimire, 2016; Malla et al., 2014). This study also showed that 54 plant species belonging to 26 orders and 35 families were used for the treatment of 30 different types of ailments. Among them, herbs were highly abundant (n = 25), followed by trees (n = 11), shrubs (n = 8), climbers (n = 6) and fungi (n = 2). A similar pattern was reported in other parts of Nepal (Bhattarai & Khadka, 2016; Malla et al., 2014; Pandey et al., 2020; Panthi & Singh, 2013; Rokaya et al., 2010).

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For medicinal purposes, different parts of plants, such as fruit, fruit covers, gum, resin, leaves, flowers, barks, stems, roots, etc. are used. In some cases, the plant's entire body is used. Eight plant species were used to treat cough and common cold, seven for fever and diarrhoea, five for headaches and jaundice, four for high blood pressure and wounds, and three for cutting wounds. Similarly, two species were used for treating fever in winter, stomach pain, burns, back pain, and worms. Similarly, one species was used to treat allergies, abscesses, urination burns, pimples, crinkles, dysentery, ear infections, fungal infections, gastritis, hair loss, menstruation problems, piles, rheumatism, sinusitis, stone, and vomiting. Previous studies also showed that the plants and their parts were used to make different traditional medicines for treating different ailments (Kunwar, 2018; Kunwar et al., 2010; Uprety et al., 2012).

CONCLUSION

The present study showed that the Musahar community of the study area had traditional knowledge on the uses of 14 animals (11 vertebrates and 3 invertebrates) and 54 plants for treating 11 and 30 categories of ailments, respectively. The elderly had comparatively more traditional knowledge than the young. Villagers still depend on traditional medicine for their primary health care and for the treatment of normal ailments such as common cold, cough, headache, diarrhoea, burns, cut wounds, wounds, fungal infections etc. This study recommends documenting such traditional knowledge from the other ethnic groups before it vanishes.

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