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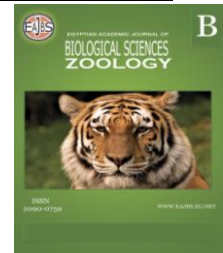


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**Extent and Awareness to Use Animals for Traditional Medicine and Attitudes towards Ethnozoological Knowledge among Communities of Menz Keya Gabriel District, North Ethiopia**

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**ABSTRACT**

Traditional medicinal knowledge has played an important role in identifying living organisms that are endowed with medicinal values for treating human and livestock health problems. This study explores the existing extent and awareness to use animals for traditional medicine and attitudes towards ethnozoological knowledge among communities of Menz Keya Gabriel District, North Ethiopia. The data were collected through questionnaires and interviews from three selected kebeles of the district with 70 respondents. The majority (88.6%) of the local people knew animals that were used as traditional medicine for human and animal disease. Also, local people enforced the use of animals for traditional medicines due to different reasons such as economical reasons (30%), effectiveness (24.3%), sociocultural reason (20%), insufficient or lack of modern medicine (14.3%) and availability and accessibility of medicinal animals around the area (11.4%). Most respondents perceived that traditional medicinal animals are used sometimes (38.6%), while 35.7% and 25.7% use in situational and always manner, respectively. The main threat for medicinal animals in the area arises from habitat loss due to agricultural expansion, firewood and charcoal production. Whereas threats that erode and put the continuity under the question of ethnozoological knowledge emanate from the disinterest of the young generation, and unwillingness, secrecy and oral-based knowledge transfer of healers. Therefore, to avoid erosion of this knowledge and to sustain animals, awareness creation should be given to healers and local people. Further biological researches on medicinal animals should also be conducted.

**INTRODUCTION**

Traditional medicinal knowledge and their practice continue receive high patronage across the globe (Negi *et al.*, 2007; Soewu, 2008), which used in identifying living organisms that are endowed with medicinal values and the treatment of various human and livestock diseases (Mishra *et al.*, 2011; Yirga *et al.*, 2011). Over 70% of many developing nations depend solely on traditional medicines to meet their basic and primary health care need (Elujoba *et al.*, 2005; Salome *et al.*, 2018). Traditional medical practitioners made new findings that have healed major illnesses (Salome *et al.*, 2018)

and they eliminate dangerous diseases like epilepsy, cancer, convulsion, paralysis, snake bites, mental illness (Soewu, 2008), and other hereditary diseases (Salome *et al.*, 2018) among many cultures in the society.

Different animals and their body parts have been played a significant role in the practices of healing medicines of societies all over the world too (Alves *et al.*, 2013; Borah and Prasad, 2017; Salome *et al.*, 2018). As World Health Organization (WHO) estimated, out of the 252 essential chemicals discovered from natural products, about 9% came from animals (Zootherapy) (Dedeke *et al.*, 2006). Zootherapy/animal therapy is a process of healing human ailments by using medicines prepared from different animals or animal derivative products (Salome *et al.*, 2018). It creates a significant auxiliary for other known therapies practiced (Alves and Rosa, 2005). Traditional healing methods are involving hundreds of invertebrate and vertebrate animal species (Lev, 2003; Alves *et al.*, 2007; Meyer-Rochow, 2017).

Since ancient times, these zoological or animal and their products have served as medicinal foods especially in European and African cultures (Lev, 2003; Alves *et al.*, 2013b; Salome *et al.*, 2018). In recent years, the awareness has grown that the unsustainable use of medicinal animals contributes to the risk of extinction of certain species (Alves *et al.*, 2007), yet the links between that body of knowledge and concerns about public health, harvesting impacts, and stakeholders' involvement remain understudied. For example in Ethiopia, 70% of human and 90% of livestock health depend on traditional medicine (Kendie *et al.*, 2018), although the vast knowledge of the traditional uses of animal species of therapeutic value is not well documented in the country (Birhanu, 2013). In Ethiopia, animal species have been used medicinally by indigenous societies for millennia, but little attention has been paid to zootherapeutic and its cultural, medical, economic and ecological significance due to insufficient ethnozoological studies (Kendie *et al.*, 2018). Besides these, the traditional knowledge, as well as the products used by these people, is under threat (Birhanu, 2013; Kendie *et al.*, 2018).

Increased understanding of medical systems in a historical context can potentially bring new insights into the medical significance of fauna in the past, as well as open new therapeutic perspectives in the future and sustained use of naturally occurring compounds (Alves *et al.*, 2013b). This study explored the existing extent and attitude of local people on the medicinal use of animals and ethnozoological knowledge.

## MATERIALS AND METHODS

### Study Area:

The study was conducted in Menz Keya Gebriel District, North Shewa Zone, Amhara, Ethiopia. It is located between latitudes of 10°01'0" and 11°11'0"N and Longitudes of 36° 41'30" and 37°50' 0"E. The District is located 312 km from 2960 meters above sea level (masl). The area receives a mean annual rainfall of 1000 mm with mean minimum and maximum annual temperature of 10 and 25°C, respectively. The agroecology of the area is 20% low land, 42% midland and 38% highland (Molla *et al.*, 2015). Menz Keya district has 66,581 total populations residing in 12 rural kebeles and one urban kebele (Zemero town).

### Sampling and Data Collection Method:

The data collection was conducted from January to May, 2021 in three purposively selected kebeles. From these three Kebeles, 70 respondents were selected for the questionnaire survey randomly to see the general knowledge of medicinal animals and traditional medicine. The informants were traditional healers, farming experts, and spiritual intellectuals. Based on their recognition as experts and knowledgeable members

concerning folk medicine (Haileselasie, 2012), 4 key informants for interview also were selected purposively from each Kebele. The data were collected using a questionnaire, and interview to obtain indigenous knowledge of healers, use and conservation of the medicinal animals.

#### Data Analysis:

A descriptive statistical method such as percentage and frequency will be employed to analyze and summarize the data.

## RESULTS

### Demographic Features of Respondents:

A total of 70 informants were interviewed, out of which 16 were traditional healers and the rest were inhabitants of the research area. The majority of informants consisted of male 38 (54.3%) whereas females were 32 (45.7%). Most (31.4 %) of the respondents were aged between 41-50 years. Respondents explained that the people in this range of age were more experienced and have wider knowledge in animal healing practice. While the respondent between 51-60 years old were only 18.6%. Most (31(44.3%)) of the respondents were farmers. And also 44 (62.9%) of respondents were literate (formally educated), while 26 (37.1%) were illiterate. Additional socio-demographic characteristics of the respondents such as sex and marital status are presented in Table 1.

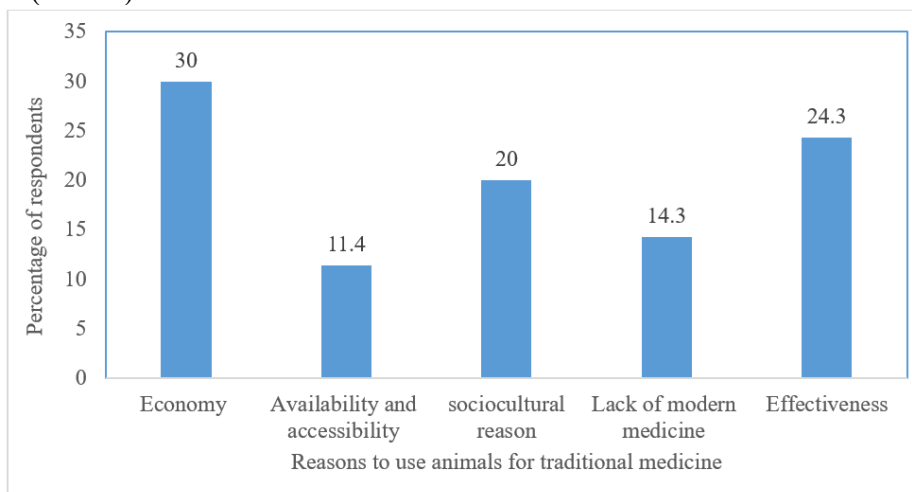
**Table 1.** Socio-demographic characteristics of the informants in the study area

Basic information	Characteristics	Number of respondents	Percentage (%)
Sex	Female	32	45.7
	Male	38	54.3
Age	20-30	11	15.7
	31-40	17	24.3
	41-50	22	31.4
	51-60	7	10
	>60	13	18.6
Education	Literate	44	62.9
	Illiterate	26	37.1
Marital status	Married	39	55.7
	Single	19	27.1
	Divorced	12	17.2
Livelihood	Farmer	31	44.3
	Government Worker	17	24.3
	Merchant	10	14.3
	Religious Worker	8	11.4
	Unemployed	4	5.7

### Respondent's Attitude Towards Traditional Medicinal Animals and Ethnozoological Knowledge:

The majority of the respondents (88.6%) were new animals that were used as traditional medicine for human and animal disease, while only 11.4% of respondents did not know animals are using for traditional medicine. Of the total respondents, most 43 (61.4%) were stated that medicinal animals found in gorge/kola area followed by Dega (20%) region, but the remaining 18.6% of respondents were agreed medicinal animals are found in Weyna Dega agro-ecology. Local people enforced the use of animals for traditional medicines to treating human and livestock disease due to different reasons (Fig. 1) such as economical reason (30%), effectiveness

(24.3%), sociocultural reason (20%), insufficient or lack of modern medicine availability around the area (14.3%) and availability and accessibility of medicinal animals around the area (11.4%).



**Fig. 1.** Reasons that enforced people to use animals for traditional medicines

Most (38.6%) of respondents perceived that local people are using traditional medicinal animals (TMAs) sometimes, while 35.7% and 25.7% of respondents reported we use animals for traditional medicine in situational and always manner, respectively (Table 2). Respondents were stated that TMAs use more advantages than modern medicine because of easily availability (31.4%) and effectiveness (28.6%) of TMAs to cure the disease. While 14 (%) respondent stated traditional medicine are cheapest than modern medicine as an advantage. Also, most 34 (48.6%) of respondents revealed that using TMAs has a disadvantage because of unknown doses. However, 17 (24.3%) respondents perceived that medicinal animals are not supported by modern medicine.

**Table 2.** Frequent utilization, and advantage and disadvantage of traditional medicinal animals

	Alternatives	No. of Respondents	Percentage
The frequency of people uses TMAs	Sometimes	27	38.6
	Always	18	25.7
	Situational	25	35.7
Advantage of using TMAs	Effectiveness	20	28.6
	Easily available	22	31.4
	Cheap	14	20
	No use	14	20
Disadvantage of using TMAs	Unknown dose	34	48.6
	Not support by modern medicine	17	24.3
	No disadvantage	19	27.1

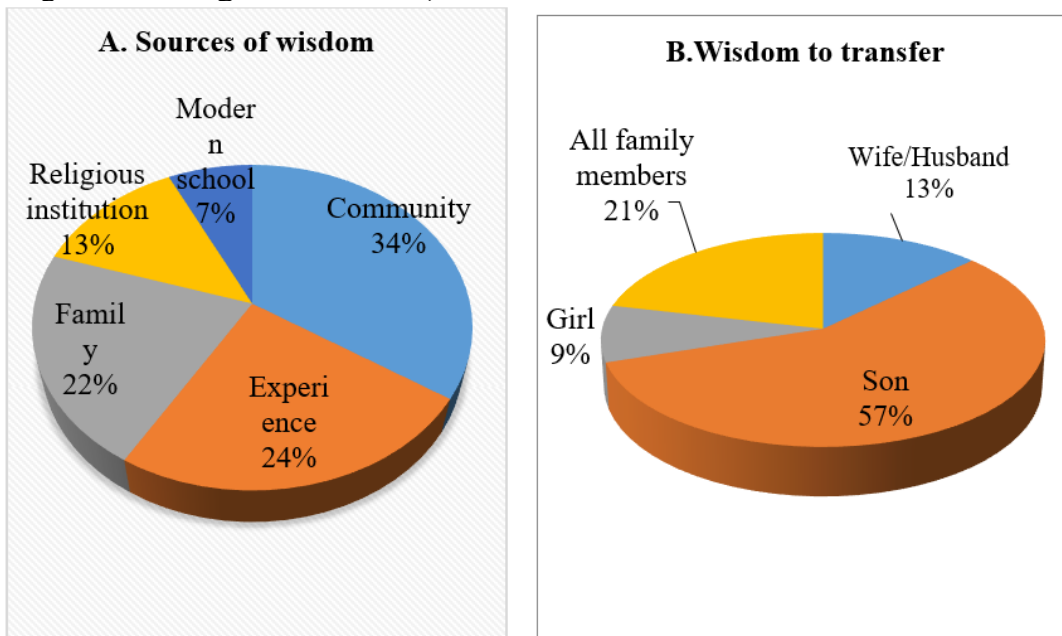
Based on the questionnaires survey, not all local people were used animals for traditional medicine equally in the study area. Therefore, most of the time ethnic groups or farmers (61.4%) were using traditional medicines from animals followed by religious persons or patriarchs (14.3%). However, very few (5.7%)

modern educated people were using animals for traditional medicine. The remaining 18.6% of respondents were answered all categories of local people are using animals for medicine in the study area (Table 3).

**Table 3.** Categories of people who are using traditional medicines more

	Category	No. of respondents	Percentage
Which categories of people use traditional medicines more?	Farmers	43	61.4
	Employee	4	5.7
	Religious persons or patriarchs	10	14.3
	All People	13	18.6

The respondent said that Ethnozoological knowledge learnt mostly from the local community (34.3%) followed by experience (24.3%) and family (21.4%). Also, 12.9% and 7.1% of respondents reported that sources of knowledge of traditional medicine are the religious institution and modern school respectively (Fig. 2A). According to respondent’s information, healers transfer their Ethnozoological knowledge mostly to their sons (57.1%) followed by all family members (21.4%). But, only 8.6% of respondents said healers want to transfer their knowledge to their daughter (Fig. 2B). It is not easy to get traditional medicinal information in Ethiopia as healers considered their indigenous knowledge a professional secret, only to be passed orally to their older son, at their oldest age (Yirga, 2010; Yirga *et al.*, 2011; Zerabruk and Yirga, 2011; Yirga *et al.*, 2018).



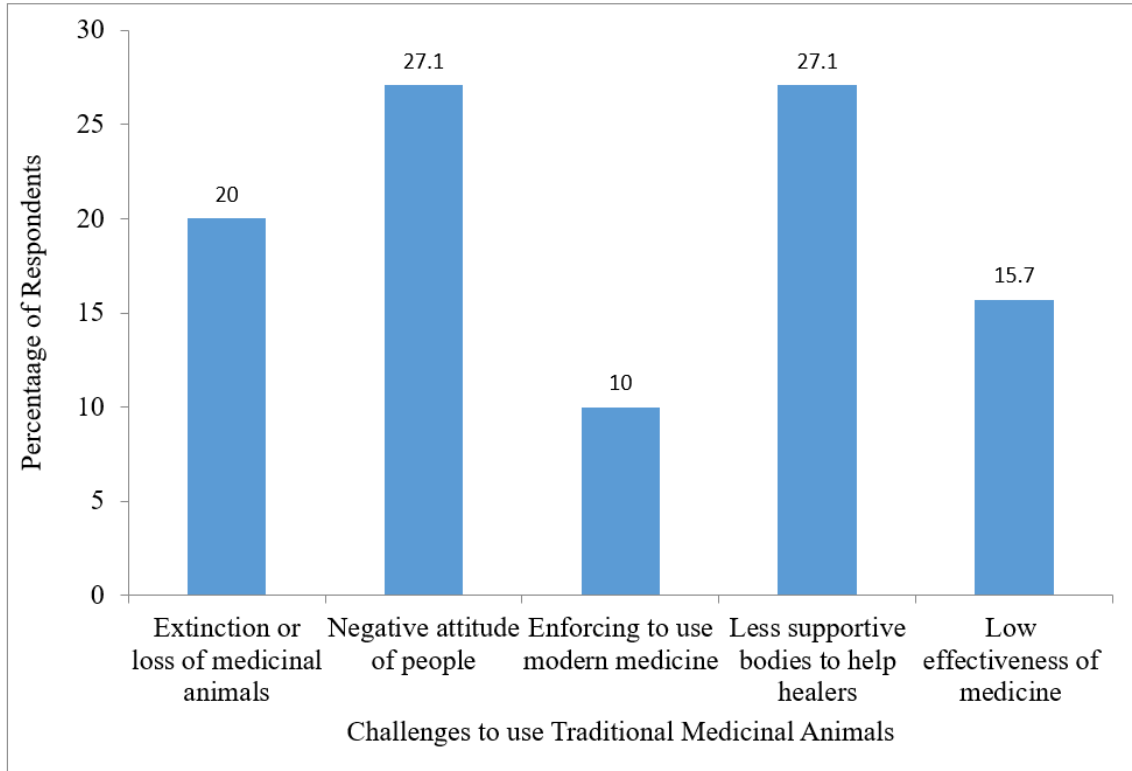
**Fig. 2.** Inheritance of healing wisdom (A. Sources of Ethno-zoology Knowledge, and B. Healers willingness to transfer their healing wisdom)

**Challenges to use Animals for traditional medicine and development of Ethnozoological knowledge**

According to respondent’s survey, the negative attitude of the local people and lack or absence of supportive bodies to motivate traditional



healers and (27.1% each), extinction or loss of medicinal animals in the area (20%) were the most challenge that hinders to use animals for traditional medicine in the study area (Fig. 3). On the other hand, 51.4% of respondents also were reported even family members of traditional healers agreed traditional medicinal animals are not better than modern medicine as a challenge.



**Fig. 3.** Challenges to use Traditional Medicinal Animals to heal human and livestock diseases

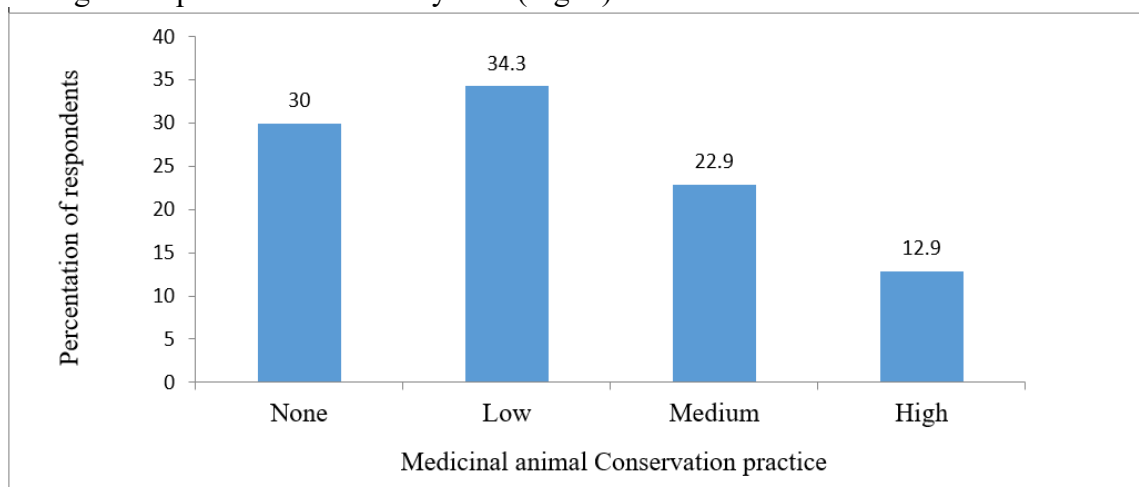
Respondents also mentioned major factors that hind the development of knowledge of ethnozoology i.e. lack of information about animals used for traditional medicine (32.9%), negative attitude of people to healers or their knowledge (30.0%) and the unwillingness of healers to transfer their knowledge to the next generation (Table. 4). Traditional knowledge is eroding very rapidly, which calls for urgent action to document all related data before the traditional knowledge is lost forever. The knowledge with the traditional healing practices using animals is now fast disappearing due to modernization (Jain *et al.*, 2007; Yirga *et al.*, 2011; Yirga *et al.*, 2018). Loss of traditional knowledge has much impact on the development of modern medicine (Yirga *et al.*, 2018).

**Table 4.** Major factors for the development of ethnozoological knowledge

Factors ethnozoological knowledge	No. f respondents	Percentage
Negative attitude of people for healer	21	30.0
Lack of information on uses of animals for medicinal value	23	32.9
The unwillingness of healers to transfer their knowledge to the next generation	15	21.4
All	11	15.7

### Conservation practices for Traditional medicinal animals and Ethnozoological knowledge:

There is a massive loss of wildlife in Ethiopia and also across the globe which has been causing severe constraints on the availability and accessibility of plant and animal species used for medicinal purposes (Anyinam, 1995; Yirga *et al.*, 2011; Yirga *et al.*, 2018). Indigenous people have been collecting medicines from local plants and animals without threatening the population dynamics of the species because of the low level of harvesting (Jain *et al.*, 2007). However, based on focus group discussion and interview data, the main threat for medicinal animals in the area arises from habitat loss due to agricultural expansion, firewood and charcoal production. Of 70 respondents, 21 (30.0%) and 24 (34.3%) respondents were revealed that there are no and low conservation activities in the study area to manage animals for traditional medicine and Ethnozoological knowledge, respectively. However, the remaining 22.9% and 12.9% of respondents were stated that there are medium and high conservation and management practices in the study area (Fig. 4).



**Fig. 4.** Conservation and protection status of traditional medicinal animals

Although the conservation practice of traditional medicinal animals were less and low by concerned bodies or local people in the study area as mentioned above, however, 44.3%, 12.9% and 11.4% of respondents stated community, agriculture and rural development office and culture and tourism office where the three responsible bodies to protect and conserve medicinal animals and ethnozoological knowledge in the study area (Table 5).

**Table 5.** Responsible body to protect and conserve medicinal animals

No.	Responsible body	No. of respondents	Percentage
1.	Community	31	44.3
2.	Agriculture and rural development office	9	12.9
3.	Health center	2	2.9
4.	Culture and tourism office	8	11.4
5.	NGO's	3	4.3
6.	All	17	24.3

Based on the interview of informant's information, various factors were recorded as the main threats for the traditional medicinal animal/knowledge. There are extinction and migration of animals as a result of agricultural encroachment, firewood



and charcoal collection. According to the traditional healers, nowadays searching of medicinal animal require a long time and moving long-distance even going to neighboring Districts to collect. The death of elder people and assimilation by alien culture was the major threat for the loss of Indigenous knowledge. In general, the knowledge on traditional medicine becomes lesser and lesser due to its secrecy, the unwillingness of the young generation to gain the knowledge, oral-based transfer, unavailability of the species, influence of modern medicine and miss awareness. As a result, the community suffered important erosion of ethnomedicinal knowledge. On the other hand, the younger generation could be attributed to the low interest to inherit and use ethnomedicinal knowledge.

This study was also gathered recommendations from the healers and local people on what endorse to do forward to sustained medicinal animals and ethnozoological knowledge for the future. Besides this, most (40.0%) of respondents were recommended that both awareness creation and integration of traditional medicine with modern medicine should be done to transfer ethnozoological knowledge to the next generation. While other 35.7% and 24.3% of respondents were respectively forwarded awareness creation and integration of traditional medicine with modern medicine. Key informants also were stated that for better transfer of the indigenous knowledge to the younger generation government and non-governmental organizations must pay due attention. This requires identifying the causes and trying to solve them in collaboration with the extension and research system.

#### **Conclusion and Recommendations:**

The findings suggest that the traditional animal-derived medicines are an alternative to treat various common ailments in Menzkeya Gabriel District. The result revealed that many old generation people were found to lack formal education, but they have acquaintance about use of local faunal resources for traditional medicinal. It is suggested that the government should integrate this health care system into the existing one to ensure proper development and harnessing ethnomedicine in Ethiopia as well as in the study area.

The main threat for medicinal animals in the area arises from habitat loss due to agricultural expansion, firewood and charcoal production. Whereas threats that erode and put the continuity under the question of ethnozoological knowledge emanate from the disinterest of the young generation in traditional medicine, and unwillingness, secrecy and oral-based knowledge transfer of healers. The local community's knowledge in the use of animal resources is very important for conservation efforts directed at protecting the animals. Folk medicine practitioners tend to have extensive knowledge of the ecology and use of the local fauna. However, as many local cultures are increasingly threatened, the need to document their knowledge of animals for medicinal and other uses becomes more urgent. Therefore, to avoid erosion of the indigenous knowledge and to ensure sustainable use of animals continual awareness creation should be given to healers with training and club formation. Moreover, awareness rising should be made to young generations and communities in the study area in order to avoid egocentric and abusive behavior and to enhance the participatory role regard to issues of traditional medicinal knowledge, resource use, value, management and conservation of medicinal animals. Further projects concerning the conservation and management of medicinal animals are needed. Further biological researches on medicinal animals should also be conducted and documented well and create a project by the ministry of health to utilize them in drug development.

#### **Acknowledgment**

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support. They are also grateful to the local administrators and people who helped them during the investigation period.

### Ethical Approval

All applicable international, national, and institutional guidelines for the care and use of animals were followed. We respected the welfare of animals and excluded situations when animals were in pain.

## REFERENCES

- Alves R.R.N., Le o-Neto N.A., Brooks S.E., and Albuquerque U.P., (2009). Commercialization of animal-derived remedies as complementary medicine in the semi-arid region of northeastern Brazil, *Journal of Ethnopharmacology*, 124: 600–608 <http://dx.doi.org/10.1016/j.jep.2009.04.049>
- Alves RRN, Alves HN. (2011). The faunal drugstore: animal-based remedies used in traditional medicines in Latin America. *Journal of Ethnobiol Ethnomed*; 7:1–43.
- Alves RRN, Oliveira TPR, Rosa IL. (2013). Wild animals used as food medicine in Brazil. *Evidence-Based Complementary and Alternative Medicine*, 2013:1–12; doi:10.1155/2013/670352
- Alves RRN, Rosa IL, Santana GG. (2007). The role of animal-derived remedies as complementary medicine in Brazil. *BioScience*, 57(11):949–55.
- Alves RRN, Rosa IL. (2005). Why study the use of animal products in traditional medicine? *Journal of Ethnobiol Ethnomed*; 1:1–5.
- Alves RRN, Vieira WLDS, Santana GG. (2008). Reptiles used in traditional folk medicine: conservation implications. *Biodiversity Conservation*; 17:2037–49.
- Alves, N., Neta, S., Trovão, M., Barbosa, L., Barros, T. and Dias, P. (2012). Traditional uses of medicinal animals in the semi-arid region of northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine*, 8:41.
- Alves, R.R.N. and Rosa, I.L. (2007). Zootherapeutic practices among fishing communities in North and Northeast Brazil: a comparison. *Journal of Ethnopharmacol.*; 111:82–103.
- Alves, R.R.N., Oliveira, T.P.R. and Medeiros, F.M.T. (2017). Trends in Medicinal Uses of Edible Wild Vertebrates in Brazil. *Evidence-Based Complementary and Alternative Medicine*, Vol. 2017, 22 pp. <https://doi.org/10.1155/2017/4901329>
- Amjad, M.S., Qaeem, M.F., Ahmad, I., Khan, S.U., Chaudhari, S.K., Malik, N.Z., Shaheen, H., Khan, A.M. (2017). Descriptive study of plant resources in the context of the ethnomedicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan. *PLoS ONE*, 12 (2017), Article e0171896, 10.1371/journal.pone.0171896
- Anyinam C (1995). Ecology and ethnomedicine: exploring links between current environmental crisis and indigenous medical practices, *Social Science and Medicine*, 40: 321–329.
- Bezerra, D.M.M., de Araujo, H.F.B. Alves, A.G.C. and Alves, R.R.N. (2013). Birds and people in semiarid northeastern Brazil: symbolic and medicinal relationships. *Journal of Ethnobiology and Ethnomedicine*, 9 (3), 1–11.
- Birhanu Z. (2013). Traditional use of medicinal plants by the ethnic groups of Gondar Zuria District, North-Western Ethiopia. *Journal of Natural Remedies*, 13(1):2320–3358.
- Borah and Prasad (2017). Ethnozoological study of animals based medicine used by traditional healers and indigenous inhabitants in the adjoining areas of Gibbon Wildlife Sanctuary, Assam, India. *Journal of Ethnobiology and Ethnomedicine*,

- 13:39. DOI 10.1186/s13002-017-0167-6
- Chakravorty J, Meyer-Rochow VB, Ghosh S. (2011). Vertebrates used for medicinal purpose by members of Nyishi and Galo tribes in Arunachal Pradesh (North-East India). *Journal of Ethnobiol Ethnomed* 7:13.
- Costa-Neto E.M., (1999). Traditional use and sale of animals as medicines in Feira de Santana City, Bahia, Brazil, *Indigenous Knowledge and Developmental Monitor*, 7: 6–9
- Dedeke GA, Soewu DA, Lawal OA, Ola M. (2006). Pilot survey of ethnozoological utilization of vertebrates in southwestern Nigeria. *Indilinga: African Journal of Indigenous Knowledge Systems*. Vol. 5 (1), 87-96
- Dereje and Chane, (2014). Ethnozoological Study of Traditional Medicinal Animals Used by the Kore People in Amaro Woreda, Southern Ethiopia, *International Journal of Molecular Evolution and Biodiversity*, Vol.4, No.2, 1-9 (doi: 10.5376/ijmeb.2014.04.0002).
- Friedman, J., Yaniv, Z., Dafni, A., and Palevitch, D. (1986). A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among bedouins in the Negev desert, Israel. *Journal of Ethnopharmacol.* 16, 275–287.
- Gazzaneo LRS, de Farias Paiva Lucena R, Albuquerque UP. (2005). Knowledge and use of medicinal plants by local specialists in an region of Atlantic Forest in the state of Pernambuco (Northeastern Brazil). *Journal of Ethnobiol Ethnomed.*; 1:9
- Haileselasie, T.H. (2012). Traditional Zootherapeutic Studies in Degu'a Tembien, Northern Ethiopia. *Current Research Journal of Biological Sciences* 4(5): 563-569; ISSN: 2041-0778
- Heinrich, M., Ankli, A., Frei, B., Weimann, C., and Sticher, O. (1998). Medicinal plants in Mexico: healers' consensus and cultural importance. *Social Science AND Medicine* 47(11):1859-71.
- Herbert D.G., Hamer, M.L., Mander, M., Mkhize, N., Prins, F. (2003). Invertebrate animals as a component of the traditional medicine trade in KwaZulu-Natal, South Africa. *African Invertebrates*; 44 (2) : 00–00
- Husain, F. and Farhatul, B.W. (2018). Identification of Medicinal Animals in Traditional Medicine in Rural Central Java. (A Preliminary Result of Ethno-Zootherapeutical Study). *Advances in Social Science, Education and Humanities Research (ASSEHR)*, vol. 313(1), 1-4
- Jain, A., Katewa, SS., Galav, PK., Nag, A. (2007). Unrecorded Ethnomedicinal Uses of Biodiversity from Tadgarh-Raoli Wildlife Sanctuary, Rajasthan, India. *Acta Botanica Yunnanica*, 29: 337-344.
- Jaroli D.P., Mahawar M.M., and Vyas N., (2010). An ethnozoological study in the adjoining areas of Mount Abu wildlife sanctuary, India, *Journal of Ethnobiology and Ethnomedicine*, 10(6): 1186-1746.
- Kendie, F.A., Andualem, S.M. and Andargie, M.D. (2018). Ethnozoological study of traditional medicinal appreciation of animals and their products among the indigenous people of Metema Woreda, North-Western Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 14:37, 2-12. <https://doi.org/10.1186/s13002-018-0234-7>
- Leonti, M. (2011). The future is written: impact of scripts on the cognition, selection, knowledge and transmission of medicinal plant use and its implications for ethnobotany and ethnopharmacology. *Journal of Ethnopharmacol.*, 134 (2011), pp. 542-555
- Logan, M. H. (1986). "Informant consensus: a new approach for identifying potentially

- effective medicinal plants,” in *Plants in Indigenous Medicine and Diet: Biobehavioral Approaches*, ed N. L. Etkin (Bedford Hills, NY: Redgrave publishers), 91–112.
- Mahawar, M.M. and Jaroli, D.P. (2006). Animals and their products utilized as medicines by the inhabitants surrounding the Ranthambhore National Park, India. *Journal of Ethnobiology and Ethnomedicine*, 2:46 doi: 10.1186/1746-4269-2-46
- Mezgebu, B. (2015). Medicinal Use of Fauna in the Indigenous Medicine System of Gendewuha and Kumeraaf tit Kebeles of Metema Woreda, North West Ethiopia; *International Journal of Innovative Research and Development* (2015) vol 4 (8) :459-464.
- Misganaw, M., Seboka, N., Mulatu, A, and Ayenew, A. (2021). Documentation of Traditional Knowledge Associated with Medicinal Animals in West Gojjam Zone of Amhara Region, Ethiopia. *Research Square* <https://doi.org/10.21203/rs.3.rs-31098/v1>
- Mishra N, Rout SD, Panda T. (2011). Ethno-zoological studies and medicinal values of Similipal Biosphere Reserve, Orissa, India. *African Journal of Pharmacy and Pharmacology*, 5(1):6–11. 10.5897/AJPP09.241
- Molla, B., Worku, Y., Shewaye, A. and Mamo, A. (2015). Prevalence of strongyle infection and associated risk factors in equine in Menz Keya Gerbil District, North-Eastern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 7(4), 117-121. DOI: 10.5897/JVMAH2014.0354
- Mukherjee, P.K., Nema, N.K., Venkatesh, P., Debnath, P.K. (2012). Changing scenario for promotion and development of Ayurveda forward. *Journal of Ethnopharmacol.*, 143 (2012), pp. 424-434
- Musa, M.S.; Abdelrasool, F.E.; Elsheikh, E.A.; Ahmed, L.A.M.N.; Mahmoud, A.L.E.; Yagi, S.M. (2011). Ethnobotanical Study of Medicinal Plants in the Blue Nile State, South-Eastern Sudan. *Journal of Medicinal Plants Research*, 5, 4287–4297.
- Phillips, O., Gentry, A. H., Reynel, C., Wilkin, P., and Galvez-Durand, B., C. (1994). Quantitative ethnobotany and amazonian conservation etnobotánica cuantitativa y la conservación de la amazonia. *Conservation Biology*, 8, 225–248.
- Rahman, I.U.; Ijaz, F.; Iqbal, Z.; Afzal, A.; Ali, N.; Afzal, M.; Khan, M.A.; Muhammad, S.; Qadir, G.; Asif, M. (2016). A Novel Survey of the Ethno Medicinal Knowledge of Dental Problems in Manoor Valley (Northern Himalaya), Pakistan. *Journal of Ethnopharmacol*, 194, 877–894. [CrossRef] [PubMed]
- Rehman, M.N. Ahmad, M., Sultana, S., Zafar, M., Edward, S. (2017). Relative popularity level of medicinal plants in Talagang, Punjab Province, Pakistan. *Revista Brasileira de Farmacognosia*, 27 (2017), pp. 751-775
- Riccucci M. (2012). Bats as materia medica: an ethnomedical review and implications for conservation. *Vespertilio*, 16: 249–270
- Salome K. Timothy, Danmalam U. Habib, Ayeni E. Ayodeji (2018). Survey of zoological materials used in traditional medicine in Sabon Gari and Zaria Local Government Areas, Kaduna State, Nigeria. *Journal of Complementary Medicine Research*, 8 (1): 32–39 10.5455/jcmr.20180329091359
- Shaheen, H., Qaseem, M.F., Amjad, M.S., Bruschi, P. (2017). Exploration of ethno-medicinal knowledge among rural communities of Pearl Valley; Rawalakot, District Poonch Azad Jammu and Kashmir. *Plos One*, 10.1371/journal.pone.0183956
- Shil, S., Choudhury, M.D., Das, S. (2014). Indigenous knowledge of medicinal plants used by the Reang tribe of Tripura state of India. *J.Ethnopharmacol*, 152 (2014),

pp. 135-141.

- Simelane T.S., and Kerley G.I.H., (1998). Conservation implications of the use of vertebrates by Xhosa traditional healers in South Africa, *South Africa Journal of Wildlife Resources*, 28: 121–126
- Soewu D. A., (2008). Wild animals in ethnozoological practices among the Yorubas of southwestern Nigeria and the implications for biodiversity conservation. *African Journal of Agricultural Research*, 3: 421–427
- Tabuti, J.R.S., Lye, K.A., Dhillion, S.S., (2003). Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. *Journal of Ethnopharmacology*, 88, 19–44.
- Tardío, J., and Pardo-De-Santayana, M. (2008). Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria, Northern Spain. *Economic Botany* 62 (2008), 24–39. doi: 10.1007/s12231-007-9004-5.
- Trotter, R.T., Logan, M.H., (1986). *Informants consensus: a new approach for identifying potentially effective medicinal plants*. In: Etkin, N.L. (Ed.), *Plants in Indigenous Medicine and Diet*. Redgrave Publishing Company, Bedford Hill, NY, pp. 91–112.
- Vats, R. and Thomas, S. (2015). A study on use of animals as traditional medicine by Sukuma Tribe of Busega District in North-western Tanzania. *Journal of Ethnobiology and Ethnomedicine*, 11 (2015):38. 10.1186/s13002-015-0001-y
- Vitalini, S.; Tomè, F.; Fico, G. (2009). Traditional Uses of Medicinal Plants in Valvestino (Italy). *Journal of Ethnopharmacol.*, 121, 106–116. [CrossRef] [PubMed]
- Vitalini, S. M., Iriti, C., Puricelli, D., Ciuchi, A., Segale, G., Fico, (2013). Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, Italy) an alpine ethnobotanical study. *Journal of Ethnopharmacol.*, 145, pp. 517-529
- Whiting, M.J., Williams, V.L. and Hibbitts, T.J. (2010). Animals traded for traditional medicine at the Faraday market in South Africa: species diversity and conservation implications. *Journal of zoology*, 284:84–96.
- WHO, (2002). *Traditional Medicine Strategy 2002–2005*. World Health Organization, Geneva, 74 pp.
- Yirga, G. (2010). Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. *African Journal of Plant Science*, 4(1): 6-11.
- Yirga, G., Teferi, M., and Gebreslassea Y. (2011). Ethnozoological study of traditional medicinal animals used by the people of Kafta Humera District, Northern Ethiopia. *International Journal of Medicine and Medical Sciences*, 3(10): 316-320.
- Yirga, G., Teferi, M., and Gebreslassea Y. (2018). Ethnozoological study of traditional medicinal animals used by the people of Kafta Humera District, Northern Ethiopia. *International Journal of Medicine and Medical Sciences*, 7(11): 001-005.
- Zerabruk, S. and Yirga, G. (2011). Traditional knowledge of medicinal plants in Gindeberet District, Western Ethiopia. *South African Journal of Botany*, doi:10.1016/j.sajb.2011.06.006