JOURNAL OF COMPLEMENTARY MEDICINE RESEARCH, 2018
VOL 8, NO. 1, PAGE 32–39
10.5455/jcmr.20180329091359

Original Research

Survey of zoological materials used in traditional medicine in Sabon Gari and Zaria Local Government Areas, Kaduna State, Nigeria

Salome K. Timothy, Danmalam U. Habib, Ayeni E. Ayodeji
Department of Pharmacognosy and Drug Development, Ahmadu Bello University, Zaria, Nigeria

ABSTRACT

Background/Aim: Animals and their derivative products constitute essential ingredients in the preparation of drugs used in traditional medicine. Their utilization and practices continue to receive high patronage from all works of lives among developing countries with little or no comprehensive health assurance coverage. The aim of this study is to document some zoological materials used as medicine in Sabon Gari and Zaria local government areas, Kaduna State, Nigeria.
Methods: In-depth survey was used to document some ethnozoological materials in the study areas. Seventy-one herbal and traditional medicinal practitioners were interviewed in Hausa language using semi-structured and key respondent interview approach.
Results: The findings showed that the respondents were above 18 years of age and claimed that the ethnozoological usages of some animals and derived parts such as giant African snail shell, Iguana lizard, rock python, peacock, African elephant etc. were inherited from their parent and grandparent. Twenty animal species with their ethnomedicinal uses, Hausa names, parts used, and the photographs of readily available animal parts have been documented. The results showed that some animal parts or products are used in the treatments of snake bites, hypertension, ulcer, pain, aches, cold, and respiratory diseases. Their ethnomedical practices as protection from nightmare, ability to tame wayward women, worn for shield and strength, and tendencies to prevent promiscuity are some significant findings in the study.
Conclusion: The findings showed the rich ethnozoological materials usages of Sabon Gari and Zaria local government areas (Kaduna State) for indigenous medicinal purposes towards meeting and complementing their primary health care system and with the hope that further work will be conducted to evaluate their safety and therapeutic profiles.

ARTICLE HISTORY

Received March 29, 2018
Accepted May 08, 2018
Published May 26, 2018

KEYWORDS

Zootherapy; ethnomedicine; herbal and traditional practitioners; Kaduna, Nigeria

Introduction

Animal and animal derivative products are natural products used in the treatment of various human diseases and health conditions among many cultures [1–4]. Animal-based medicines have played a significant role in the healing practices, magic rituals, and religions of societies all over the world too [5–8]. Many animal products are also used during ceremonial and religious practices as well as fetishes and charms purposes [8]. Many human tribes and communities with structured medicinal systems utilize animals as medicines [1,3,4,9]. Traditional medicine as practiced today continues to receive high patronage from all works of lives including the rich and the poor especially in developing countries where the traditional medical practitioners even made new discoveries, which have cured major ailments in the society [10,11]. Such discoveries from the consistent efforts of traditional healers to eradicate dangerous diseases which have plagued the society including epilepsy, cancer, convulsion, paralysis, snake bites, mental illness, and even other ailments having hereditary origins are being cured by traditional medicine [2,12,13]. Different animal body parts

Contact Ayeni E. Ayodeji ayeniemmanuel91@yahoo.com Department of Pharmacognosy and Drug Development, Ahmadu Bello University, Zaria, Nigeria.

have also been reported as sources of food medicines [14,15]. World Health Organization estimated that out of the 252 essential chemicals discovered from natural products about 9% came from animals [9]. Also, with the fact that over 70% of many developing nations depend solely on traditional medicines to meet their basic and primary health care need [16,17]. Zootherapy, also known as animal therapy, is a process of healing human ailments by using medicines prepared from different animals or animal derivative products [18]. It constitutes a significant substitute among many other known therapies practiced worldwide [19]. For example, In Latin America, 584 animal species (belonging to 13 taxonomic categories) were recorded with traditional therapeutic value, while 283 species were reported to be used for the treatment of various ailments in Brazil [20,21]. In traditional Chinese medicine, more than 1,500 animal species have been reported to be of some medicinal importance [22]. Lev and Amar [23] documented the use of 20 animal species as traditional drugs in Israel. Alves et al. [24] stated that the global traditional uses of reptiles revealed that at least 165 reptile species, belonging to 30 families and 104 genera, are used in traditional folk medicine around the world. Zoological materials have served as medicinal foods since ancient times and have played a significant role in healing practices especially in European and African cultures, where many of products used as food often also serve as medicine [16,25]. Some studies have also reported ethnozoological materials used as medicines [26,27]. In Nigeria, Soewu documented some wild animals used in ethnozoological practices in Southwestern part [2]. This author also posits its implication on biodiversity conservation. However, the knowledge on the use of different animal materials in traditional medicine by different ethnic communities is largely passed orally from one generation to another and this knowledge is undocumented and sometimes lost with the death of the elderly knowledgeable person or lack of interest by the children to continue in the folkloric claims. Therefore, the study documented some ethnozoological materials used among the people of Sabon Gari and Zaria local government areas (Kaduna State, Nigeria) as medicine towards meeting their primary health demand.

Methodology

The study area

The survey focused on two major herbal markets in Sabon Gari and Zaria local government areas of Kaduna State called "Bayan Gidan Iya" (Sabon Gari) with a coordinate of 13°46′83″ N 5.0183° E and "Kasuwan Armaru" (Zaria city) with a coordinates of 11°04′00″ N 7°42′ E [28].

Geographical locations

Zaria herbal market is popularly known as *Armaru* market located in Zaria city with about 2 km away from the Emir's of *Zazzau* palace. It is one of the major herbal markets well known in Zaria for traditional medicinal materials trading, including animal products. It usually opens once in a week (every Mondays). The market populations cover all ages including nursing mothers, aged ones, educated and uneducated, and even young ladies who may be seeking for natural medication and treatments. *Bayan Gidan Iya* is also a popularly known herbal market in *Sabon Gari*. This market operates on a daily basis as traditional healers reside within the settlement and own the shops in which the business is operated.

Materials and some instrument used

Tape recorder, GPS camcorder, pen, recording sheets, semi-structured questionnaire tools, cabinet, and tags for labeling purposes.

Data collection and sample population

The study was conducted in December 2016–March 2017. Seventy-one key respondents were interviewed using semi-structured questionnaires during the study. The ethnozoological materials (local names of animals, body parts used, and ethnomedicinal uses) were noted and documented.

Consent approval

The respondents consented willingly to participate in the study. The respondents were interviewed in Hausa language at their convenient times and interviewers were ensured that their sales were not interrupted. Some agreed to be interviewed in their houses without any hesitation.

Collections and identification of samples

The animal parts readily available were collected, labeled, and enclosed in a sample cabinet. They were transported and identified in the Department of Zoology, Ahmadu Bello University, Zaria, Nigeria for future references.

Table 1. Socio-demographic characteristics of the respondents (n = 71).

Variables	Sabon Gari (Bayan gida Iya)	Zaria (Armaru)
Gender		
Male	21 (58.30)	23 (65.70)
Female	15 (41.70)	12 (34.30)
Total	36 (100.00)	35 (100.00)
Age (years)		
18–30	10 (27.80)	3 (8.60)
30–45	15 (41.70)	11 (31.40)
45–60	7 (22.20)	17 (48.60)
60 and above	4 (8.30)	4 (11.40)
Total	36 (100.00)	35 (100.00)
Nature of business		
Herb seller	23 (63.90)	17 (48.60)
Traditional practitioner	13 (36.10)	18 (51.40)
Total	36 (100.00)	35 (100.00)

Results and Discussion

The socio-demographical details of the respondents (Table 1) showed more male practitioners (65.70%) in Zaria than in Bayan gida Iya in Sabon Gari local government area (58.30%). But there was more female practitioners (41.70%) in Baya gidan Iya (Sabon Gari) when compared with (34.30%) female practitioners in Zaria (Armaru market). This high indication of male practitioners could be as a result of dominancy of male [15]. Also, Hausa community in Nigeria believes that male children protect cultural heritage than female. This result is in lined with [29,30] who reported similar trends in their findings in India. The respondents (48.60%) were within the ages of 45–60 years in Zaria (Armaru market) while 41.70% were between 30 and 45 years. These aged groups of the society were observed to be more knowledgeable about traditional medicinal uses than that of younger generation. This trend was very similar to the observations in other region of Assam in India made by Verma et al. [30] and also indicated that the aged people were more experienced in zoo-therapeutical practices which were passed to them by their elders. Jansen [31] also confirmed that traditional healing is known as a knowledge of professional secret that should be known by elderly ones mainly for male practitioners [32,33]. The reason of less traditional medicinal knowledge among the younger generation could be due to urbanization and assimilation of alien culture [15]. These also include some disapproval among western beliefs (super impose extra-terrestrial religions front-runners) to young generation. There was high percentage of herbal sellers (63.90%) in *Bayan gida Iya* (Sabon Gari) when compared with (48.60%) herb sellers in Zaria local government area. This high proportion may be due to the closeness of herbal sellers to the popularly known Sabon Gari (Baya gida Iya) market. Similarly, traditional practitioner (51.60%) in Zaria showed higher proportion when compared with practitioner (36.10%) in *Bayan gida Iya* market (Sabon Gari). This is probably due to the fact that the knowledge based traditional practitioners may be self-importance to people in the Zaria to guide the cultural heritage and ensure correct diagnosis and treatment using different zoo therapeutics.

Furthermore, the study documented 20 ethnozoological materials alongside with their different local names, parts used in Hausa language as well as their diseases treated and ethnomedicinal uses (Table 2).

Generally, many of the zoological materials survey are used as food. The meat from giant African snail *Archachatina marginata* is used as herbal remedy when mixed with food and the shell is being used in the treatment of ulcer, hypertension, rheumatism, and other internal diseases.

The oral application of Honey bee *Apis mellifera* is used to dress wound, treat snake bites, burns, hair loss, hemorrhoid, and treatment for arthritis. When honey is mixed with cinnamon powder and lime water, it is used to treat cough.

The shell of the tortoise *Aldabrachelys gigantean*, besides being used as decoration and ornament, is prepared as charm to tame a wayward woman. It is ingested orally after grinding to a powdered form, which is added to food.

The head of *Agama agama* (Red lizard) when prepared as herbal remedy is used for the treatment for chronic cough and the tail when prepared is used orally for the treatment of severe chest pain. Also, *Bucorus abyssinicus* (Ground hornbill) feather is used to enhance beauty when applied topically as a powder on the face.

Apart from the *Crocodylus niloticus* (Nile crocodile) being used as source of food, leather bags, coats, shoes, and wrist watches making, the skin and bones are being used in treating stiffness of joints and muscular disorders. The bones are grounded and soaked in water before drinking and the tooth is usually worn as charm during battle as amulet around waist. It is seen as a symbol for strength and stamina; hence, it is prepared as herbal remedy to give strength (Fig. 1b).

Crocuta crocuta (Spotted hyena) skin is prepared as charm which is usually burnt with wood ash at

Table 2. Animal species, derivative products, and parts used in traditional medicines in Sabon Gari and Zaria local government areas (Kaduna State, Nigeria).

Scientific names (English common names)	Hausa names	Parts or product used	Diseases treated/Ethnomedical uses
Archachatina marginata Swainson (1821) (Giant African snail)	*Dodon kodi*	Shell	Treatment for ulcer, hypertension; Rheumatism and internal diseases.
Apis mellifera Linn (1758) (Honey bee)	*Kudan zuma*	Honey/bee wax	Treatment of snake bites; Heal burns, hair loss, and hemorrhoid; Treatment for arthritis; To treat coughs
Crocodylus niloticus Laurenti (1768) (Nile crocodile)	*Kada*	Skin/Bones	Treatment against stiffness of joints and bone dislocation;
		Tooth	Worn during battle as amulet around waist.
Naja nigricollis Hallowell (1857) (Black cobra)	*Bakin maciji*	Skin	Concoction preparation
		Venom	To treat rheumatism.
		Oil	The oil is used to treat high blood pressure, skin rashes, eczema, arthritis, hypertension, and rheumatoid.
		Teeth	Worn as amulet on neck, waist, and wrist to stop nightmares.
Python sebae Gmelin (1788) (Rock python)	*Mesa/Mai hadiya*	Skin/oil	Treatment of backache; Spinal cord disorders
		Meat	Eating as food; Added as ingredient for herbal preparation and eaten orally as charm
		Tooth	Worn as amulet to scare away snakes
		Venom	Used to treat snake bites/poisoning
Typhlops trinitatus Richmond (1965) (Trinidad burrowing snake)	*Tandara/shanono*	Venom	An antidote to snake bites;
		Oil	Used as a treatment to stop nightmares It is applied in food or water and ingested orally.
Crotalus basilicus Cope, (1864) (Viper)	*Kassa*	Skin	Prepared as charm for strength;
		Venom	Treat insomnia (sleeplessness) Applied on snake bite
Iguana iguana Linn (1758) (Iguana lizard)	*Damo*	Head/Skin/Tail	Epithet applied to a long suffering patient
			Applied topically and also ingested orally
Varanus niloticus Linn (1758) (Bosch monitor lizard)	*Patan tsari*	Skin/head	Used to strengthen teeth after it is soaked in water before bathing.
			Used to treat teething sickness in children.
		Tooth	Prepared as charm and worn as amulet on the waist and neck.
Agama agama Linn (1758) (Red lizard)	*Jan gwada*	Head	Treatment for chronic cough
		Tail	Treatment of severe chest pain
Aldabrachelys gigantean Schweigger (1812) (Tortoise)	*Kunkuru*	Shell	To tame a wayward woman
		Head/Shell	Decoration and ornaments.
Bucorus abyssinicus Boddaaert (1783) (Ground hornbill)	*Burtu (mai bawa)*	Feather	Used to enhance beauty.
Pavo cristatus Linn (1758) (Peacock)	*Dawisu* (*Tsun-tsun Makka*)	Head	Wards off evil people It is ingested orally after mixing with honey and wood ash.
		Meat	Serve as a source of food
		Feather	For decoration at home and museums for tourist attraction.
Stephanoeatus coronatus Brown (1968) (African crowned Eagle)	*Mikiya*	Head/Feather	Prepared as charm for renewal of strength/ endurance; Worn as talisman
		Egg	For renewal of skin Superstitious belief for regeneration

(Continued)

Table 2. Animal species, derivative products, and parts used in traditional medicines in Sabon Gari and Zaria local government areas (Kaduna State, Nigeria). (Continued)

Scientific names (English common names)	Hausa names	Parts or product used	Diseases treated/Ethnomedical uses
Tyto alba Scopoli (1769) (Barn owl/ Bird of wisdom)	Mujiya	Feather	Used for beautification
		Tooth	Prepared as charm to ward off evil attacks
		Beak	Hung on the wall for decoration Worn on the neck as a symbol of wisdom
Upupa epops Linn (1758) (Cameroon hoopoe)	*Alhuda-huda*	Feather	Prepared as part of herbal remedy to increase wisdom and enhance intelligence in a person. It is grounded to powder and mixed with honey and talisman (huntu) and ingested orally.
Loxodonta Africana Linn (1758) (African Elephant)	*Giwa* (*katon Nama*)	Dung (feces)	Remedy for nose bleeding Repellant for mosquitoes
		Tusk	Treatment for head ache and tooth ache.
		Skin/Meat Bones	For strength and stamina
Crocuta crocuta Erxleben (1777) (Spotted hyena)	*Kurah*	Skin; Hair; Tooth	Used to cure skin rashes; Prepared as charm for self-control against adultery and promiscuity; Worn as amulet on wrist and waist.
Felis pardus Linn (1758) (Leopard)	*Damisa*	Skin	Anti-snake venom; Treatment for convulsion; General body weakness
Atelerix albiventris (Wagner, 1841) (Four-toed hedgehog)	*Bushiya*	Hair; Thorn; Head	Wards off evil spirit; Treat skin rashes; Treatment for respiratory problems and cold.

night to cure skin rashes while the spotted hyena hair is used as charm for self-control against adultery and promiscuity, and the tooth worn as amulet on wrist and around waist for strength and endurance (Fig. 1e).

Crotalus basilicus (Viper) skin is used as charm for endurance in people when ingested and the venom treat insomnia (sleeplessness) and act as antidote that cure snake bites when mixed with wood ash (Fig. 1j).

Felis pardus (Leopard) skin is being used in treatment of convulsion, general body weakness, worn as talisman around the neck for protection, the venom as antidote for snake bite, and when mixed with some herbs as body ointment.

The head, skin, and tail parts of *Iguana iguana* (Iguana lizard) when applied topically or ingested orally are being used to ease long suffering patient.

The *Loxodonta Africana* L. (African elephant) is used as food, the meat and bones when consumed are considered as symbol of stamina and strength. The feces (dungs) are used for nose bleeding and as mosquito repellant when burnt, while the tusk is being used for the treatment for head and tooth aches.

Naja nigricollis (Black cobra) skin is used in concoction preparations and the venom when applied topically as herbal remedy to treat rheumatism. The oil is used to treat high blood pressure, skin rashes, eczema, arthritis, hypertension, and rheumatoid. The teeth when worn on neck, waist, and wrist help to prevent nightmares (Fig. 1h).

The hair of *Atelerix albiventris* (Four-toed hedgehog) is used to ward off evil spirit around people and environment. The powder form of the thorn is used to treat skin rashes and the head is used in the treatment for respiratory problems and cold when prepared.

Pavo cristatus (Peacock) feathers are used for decoration at home and museums for tourist attraction. The head when mixing with honey and wood ash and ingested orally wards off evil people and the meat serve as a source of food.

The *Python sebae* (Rock python) skin and oil are used in the treatment of back ache as well as spinal cord disorders. The meat is added as an ingredient for herbal preparation and eaten orally for charm. Teeth are worn as amulet to scare away snakes and the venom as antidote to bites and poisoning (Fig. 1d).

Stephanoeatus coronatus (African crowned eagle) the head and feather is being prepared as charm for renewal of strength and endurance and worn as talisman. The egg when swallowed raw has

Figure 1. Examples of animals and derivative products used in the ethno-medicine of Sabon Gari and Zaria local government areas (Kaduna State, Nigeria). (a) Shell of the giant African snail (*Archachatina marginata*). (b) Skin of Nile Crocodile. (c) Skin of Trinidad burrowing snake. (d) Skin of rock python. (e) Skin of spotted hyena. (f) Feather of Cameroon hoope. (g) Skin of Bosch monitor lizard. (h) Skin of black cobra. (i) Feather of barn owl. (j) Skin of carpet viper.

superstitious belief for regeneration and egg when rubbed on skin renew the skin.

Typhlops trinitatus (Trinidad burrowing snake) skin is being used for leather coats, bags, shoes, watches etc. The venom is also used as an antidote to snake bites when applied topically. Ethnomedically, the snake oil is used as a treatment to stop nightmares when mixed with food or as drop in water and ingested orally (Fig. 1c).

Tyto alba (Barn owl/Bird of wisdom) feather and the beak is used for beautification and decoration, tooth is prepared as charm to ward off evil attacks and worn on the neck as a symbol of wisdom (Fig. 1i).

Upupa epops (Cameroon hoopoe) feather is used during preparation part of herbal remedy to increase wisdom and enhance intelligence in a person. It is grounded to powder and mixed with honey and talisman (huntu) and ingested orally (Fig. 1f).

Varanus niloticus (Bosch monitor lizard) skin and head parts are used to strengthen human teeth after soaked in water before bathing and the tooth is used to treat teething sickness in children, prepared as charm, and worn as amulet on the waist and neck (Fig. 1g).

However, these animal parts or products if subjected to extraction for possible validation of their ethnomedicinal uses may lead to drug discovery and development. Since World Health Organization reported that some essential chemicals were also from animals and animal products origin [9,15]. Some readily available pictures of the zoological materials used were also documented (Fig. 1) that could guide further identification and future studies. This ethnozoological materials survey documented in the two local government areas of Kaduna State has similar findings to different studies carried out in different part of the world [2–4,15,34,35].

Conclusion

This study is the first effort to document the zootherapeutic resources used in traditional medicines among the indigenous people surrounding Sabon Gari and Zaria local government areas (Kaduna State, Nigeria) to the best of our knowledge. The high implication of some animal parts or products are used in the treatments of snake bites, hypertension, ulcer, pain relief, aches etc. are major findings in the study and their roles in treating human illnesses and diseases. Some ethnomedical usages and belief such as protection from night mare, ability to tame wayward women, prevent adultery and besides, is mysterious utilization when worn for protection, staminal, strength, and stopping promiscuous tendencies are fact findings in the study. The therapeutic knowledge of medicinal plants is complemented with animals and animal derivative products for indigenous medicinal purposes in ensuring meeting their primary health care system of Africans and Nigerians with little or no comprehensive health provision. This study also provides the bases for further scientific validation of the therapeutic efficacy of various zootherapeutic materials by these people.

Acknowledgments

We are immensely grateful for the efforts and participation of key respondents (traditional practitioner and herbal sellers) in Sabon Gari and Zaria city for the information provided during the study.

Conflict of Interests

The authors declare no conflict of interest.

Funding

This research had no funding support.

References

[1] Negi CS, Palyal VS. Traditional uses of animal and animal products in medicine and rituals by the Shoka Tribes of District Pithoragarh, Uttaranchal, India. Stud Ethno Med 2007; 1(1):47–54.

[2] Soewu DA. Wild animals in ethnozoological practices among the Yorubas of southwestern Nigeria and the implications for biodiversity conservation. Afr J Agr Res 2008; 3(6):421–7.

[3] Mishra N, Rout SD, Panda T. Ethno-zoological studies and medicinal values of Similipal Biosphere Reserve, Orissa, India. Afr J Pharm Pharmacol 2011; 5(1):6–11.

[4] Yirga G, Teferi M, Gebreslassea Y. Ethnozoological study of traditional medicinal animals used by the people of Kafta-Humera District, Northern Ethiopia. Int J Med Med Sci 2011; 3(10):316–20.

[5] Adeola MO. Importance of wild animals and their parts in the culture, religious festivals, and traditional medicine, of Nigeria. Environ Conservat 1992; 19:125–34.

[6] Anageletti LR, Agrimi U, Curia C, French D, Mariani-Costantini R. Healing rituals and sacred serpents. Lancet 1992; 340:223–5.

[7] Rosner F. Pigeons as a remedy (Segulah) for jaundice. N Y StateJ Med 1992; 92:189–92.

[8] Gaski LA, Andrea J, Kurt A. Prescription for extinction: endangered species and patented oriental medicines in trade. Traffic USA 1994; 300.
[9] Dedeke GA, Soewu DA, Lawal OA, Ola M. Pilot survey of ethnozoological utilization of vertebrates in southwestern Nigeria. Afr J Indigenous Knowl Syst 2006; 5:87–96.
[10] Sofowora EA. Medicinal plants and traditional medicine in Africa. John Wiley and Sons Ltd, Chichester, UK, 1982.
[11] Owumi BE, Jerome PA. Traditional medicine in national healthcare reforms in Nigeria: which way? Proceedings of National Conference on Social Dimensions of Reforms in Development NASA Sokoto; 2008. pp 149–60.
[12] Odu MO. The art of traditional healing in Nigeria. National Concord, 1987. Nigeria, pg.5
[13] Sawandi T. Yorubic medicine: the art of divine Herbology. 2006 [Online Articles]. Available via www.planetherbs.com (Accessed 12 October 2017).
[14] Alves RRN, Oliveira TPR, Rosa IL. Wild animals used as food medicine in Brazil. Evid Based Complement Alternat Med 2013; 2013:1–12; doi:10.1155/2013/670352
[15] Borah MP, Prasad SB. Ethnozoological study of animals based medicine used by traditional healers and indigenous inhabitants in the adjoining areas of Gibbon Wildlife Sanctuary, Assam. India J Ethnobiol Ethnomed 2017; 13(39):1–13; doi:10.1186/s13002-017-0167-6
[16] World Health Organization. Guideline on the conservation of medicinal plants. Geneva, Switzerland, 1993.
[17] Elujoba AA, Odeleye OM, Ogunyemi CM. Traditional medicine development from medical and dental primary health care delivery system in Africa. J Tradition Med CAM 2005; 2:46–61.
[18] Costa-Neto EM. Healing with animals in Feira de Santana city, Bahia, Brazil. J Ethnopharmacol 1999; 65:225–30.
[19] Alves RRN, Rosa IL. Why study the use of animal products in traditional medicine? J Ethnobiol Ethnomed 2005; 1:1–5.
[20] Alves RRN, Alves HN. The faunal drugstore: animal-based remedies used in traditional medicines in Latin America. J Ethnobiol Ethnomed 2011; 7:1–43.
[21] Alves RRN, Rosa IL, Santana GG. The role of animal-derived remedies as complementary medicine in Brazil. Bio Sci 2007; 57(11):949–55.
[22] China National Corporation of Traditional and Herbal medicine. Materia medica commonly used in China Beijing. Science Press, Beijing, China, 1995.
[23] Lev E, Amar Z. Ethnopharmacological survey of traditional drugs sold in Israel at the end of the 20th century. J Ethnopharmacol 2000; 72:191–205.
[24] Alves RRN, Vieira WLDS, Santana GG. Reptiles used in traditional folk medicine: conservation implications. Biodiv Conserv 2008; 17:2037–49.
[25] Trivedi PC. Ethnobotany: an overview. In: Ethnobotany. Aavishkar publisher, Jaipur, India, 2002.
[26] Alfred JRB. Faunal diversity in India: an overview. Faunal Diversity India 1998; I–VIII:1–495.
[27] Puri SK. Biodiversity profile of India (Text Only). Availablr via http://ces.iisc.ernet.in/hpg/cesmg/indiabio.html (Accessed 20 June 2007).
[28] Jolijn G, Niger Bradt UK/Globe Pequot Press USA. ISBN 978-1-84162-152-4 2006.
[29] Chetri D, Chetri R, Hoolock G. Conservation in India. Gibbon J 2011; 6:7–12.
[30] Verma AK, Prasad SB, Rongpi T, Arjun J. Traditional healing with animals (zootherapy) by the major ethnic group of Karbi Anglong district of Assam. India Int J Pharm Sci 2014; 6:1–8.
[31] Jansen PCM. Spices, condiments and medicinal plants in Ethiopia: their taxonomic and agricultural significance. Centre for Agricultural Publishing and Documentation, Wageningen, The Netherlands, 1981.
[32] Yirga G. Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. Afr J Plant Sci 2010; 4(1):6–11.
[33] Zerabruk S, Yirga G. Traditional knowledge of medicinal plants in Gindeberet District, Western Ethiopia. S Afr J Bot 2011; 78:165–9; doi:10.1016/j.sajb.2011.06.006
[34] Alves RRN, Rosa IL. Animals in traditional folk medicine: implications for conservation. Springer, Berlin, Germany, 2013.
[35] Vats R, Thomas S. A study on use of animals as traditional medicine by Sukuma Tribe of Busega District in North-western Tanzania. J Ethnobiol Ethnomed 2015; 11:38.