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Animals and animal products as medicines: A survey of Epie-Atissa and Ogbia people of Bayelsa State, Nigeria

[Animales y productos de origen animal como medicamentos: una encuesta de los pueblos Epie-Atissa y Ogbia del estado de Bayelsa, Nigeria]

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Abstract

Context: The importance of traditional medicine cannot be over emphasized as a quarter of prescription drugs globally are natural based. In this type of medicine, plants are mixed together or are sometimes used in combination with other materials such as animals and minerals, as remedy. While a considerable amount of documentation of indigenous knowledge of medicinal plants has been executed, there is paucity of similar studies on animals in Nigeria.

Aims: To carry out a survey of ethnozoology among the Epie-Atissa and Ogbia people of Bayelsa State, Nigeria, with a view to documenting species with zoo-therapeutic values.

Methods: Using a semi-structured questionnaire, information was gathered through personal interviews with traditional medical practitioners. The data were evaluated using some ethnozoological indices such as use value of the species, family use value, relative frequency of citation, relative number of use, relative importance index, and cultural importance (CI).

Results: A total of 43 species of animals belonging to three *phyla*, *Chordata* (66.7%), *Arthropoda* (22.2%) and *Mollusca* and *Pisces* (15.9%) were gathered in ten classes with *Mammalia* being the most mentioned (22.7%) followed by *Reptilia* (18.2%) and *Pisces* (15.9%). The most important diseases cited were inflammation/pain/arthritis (20.0%), ear/nose/throat (18.3%), reproductive purpose (16.7%) and convulsion/epilepsy (15.0%) while the most culturally important animals (CI) included *Agama agama* (0.85), *Protopterus dolloi* (0.45), *Testudo graeca* (0.23), *Gorilla gorilla* (0.17), *Hemachatus haemachatus* (0.14) and *Hemidactylus frenatus* (0.14).

Conclusions: The survey furnishes the populace including medicinal plant researchers and some other traditional medicine practitioners with a real wellspring of communicable knowledge. These medicinal animal materials could be included in the healthcare delivery system of the country.

Keywords: ethnozoology; traditional medicine; zootherapy.

Resumen

Contexto: La importancia de la medicina tradicional no puede ser más enfatizada ya que una cuarta parte de los medicamentos recetados a nivel mundial son naturales. En este tipo de medicamento, las plantas se mezclan o se usan a veces en combinación con otros materiales, como animales y minerales, como remedio. Si bien se ha llevado a cabo una considerable cantidad de documentación sobre el conocimiento indígena de las plantas medicinales, hay pocos estudios similares sobre animales en Nigeria.

Objetivos: Aplicar una encuesta de etnozoología entre los pueblos Epie-Atissa y Ogbia del estado de Bayelsa, Nigeria, con el fin de documentar especies con valores zoo-terapéuticos.

Métodos: Utilizando un cuestionario semiestructurado, se recopiló información a través de entrevistas personales con médicos tradicionales. Los datos se evaluaron usando algunos índices etnozoológicos como valor de uso de la especie, valor de uso familiar, frecuencia relativa de citas, número relativo de uso, índice de importancia relativa e importancia cultural (IC).

Resultados: Un total de 43 especies de animales pertenecientes a tres *phyla*, *Chordata* (66,7%), *Arthropoda* (22,2%) y *Mollusca* y *Pescis* (15,9%) se reunieron en diez clases, siendo *Mammalia* el más mencionado (22,7%) seguido de *Reptilia* (18,2%) y *Pisces* (15,9%). Las enfermedades más importantes citadas fueron inflamación/dolor/artritis (20,0%), oído/nariz/garganta (18,3%), propósito reproductivo (16,7%) y convulsión/epilepsia (15,0%) mientras que los animales más importantes culturalmente (IC) incluyeron *Agama agama* (0,85), *Protopterus dolloi* (0,45), *Testudo graeca* (0,23), *Gorila gorilla* (0,17), *Hemachatus haemachatus* (0,14) y *Hemidactylus frenatus* (0,14).

Conclusiones: La encuesta proporciona a la población, incluidos los investigadores de plantas medicinales y algunos otros profesionales de la medicina tradicional, una fuente real de conocimiento transmisible. Estos materiales de animales medicinales podrían incluirse en el sistema de prestación de asistencia sanitaria del país.

Palabras Clave: etnozoología; medicina tradicional; zooterapia.

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INTRODUCTION

Traditional medicine (TM) is emerging as imperative system of medicine as approximately three-quarter of drugs approved globally for cancer management and a quarter of prescription drugs worldwide are natural based (Sahoo et al., 2001), while units of TM are domiciled in over nine-tenth of general hospitals in China (Wachtel-Galor and Benzie, 2011). Apart from the belief that TM is more affordable, closely knitted to the ideology of patients and perceived to be naturally safe compared to synthetic drugs (Wachtel- Galor and Benzie, 2011), patients also view it as the only viable option because of the rising cases of chronic and debilitating diseases for which there is no cure. Scientific studies keep revealing that TMs are effective especially in HIV/AIDS and cancer patients. Sequel to this, the UN AIDS advocates for collaboration with TM practitioners in AIDS prevention and care in the Sub-Saharan Africa (UN/AIDS, 2000).

The use of whole animals or parts and their products is included in the description of traditional medicine (Oshikoya et al., 2011) and not restricted to plants alone. Animals may be incorporated with plants or employed alone and are known to be important components in the preparation of drugs (Adeola, 1992). They play significant roles in healing and ritual practices (Rosner, 1992; Lawal and Banjo, 2007) and their use as food, clothes, transport and medicine among others cuts across various cultures and religions (Adeola, 1992; Jaroli et al., 2010; Kim and Song, 2013).

Almost 9% of the global list of compiled essential drugs by the World Health Organization (WHO) and 18% of all prescription drugs in the United States are animal based (Costa-Neto, 2005). Zoological knowledge is a significant part of human cultural heritage (Alvin and Souto, 2015) and ethnobiological studies show that local populations are custodians of knowledge of the biological resources they make use of in their daily endeavors. Those that still retain this knowledge are people like hunters and fishermen because they encounter these resources directly and are connected to the reliability of some observations of these animals.

Ayurvedic system incorporates many animals with documented medicinal effects and China has more than 1500 documented in their Material Medica (1995). Nigeria on the other hand has approximately 55 species documented in a Southwestern State (Dedeke and Abayomi, 2006; Ajagun et al., 2007; Sowewu, 2008) and about 22 in a Northern State (Abubakar et al., 2005). Presently, there is no reported document on ethno-zoological surveys from any part of South-south region of Nigeria, and this necessitates the pilot study to be carried out among the Epie-Atissa and Ogbia communities of Bayelsa State of Nigeria.

MATERIAL AND METHODS

General methodological information

Anthropology

Bayelsa State was one of the six states created in Nigeria on October 1st, 1996, with the name coined from the three former local government areas (Brass, Yenagoa and Sagbama) in the then old Rivers State. However, Ogbia came into existence in 1972 when it was agreed to establish a community in a pristine jungle to unify the Ogbia brotherhood. Crude oil was first discovered in Ogbia in West Africa and the Ijaw national leader, Isaac Boro had his origin from one of her villages. The only president of Nigeria from the south geographical region is an indigene of Ogbia. The Epie-Atissa community is a marriage of two different migrants from Ijaw and Egenni that decided to live together as one many years ago. They share and reside within the same region along the creek of Epie-Atissa river in Yenagoa, Bayelsa State.

Study area

Bayelsa is one of the nine states that make up the Niger Delta region of Nigeria with headquarter situated at Yenagoa. It is bounded in the North, South, East and West by Rivers, Delta, Lagos States as well as the Atlantic sea, respectively (Fig. 1). It is an oil rich state comprising eight local gov-

ernment areas with a population of 1,703,358). Basically, the State is made up of mangrove and lowland rainforests. The indigenous people are mainly occupied in fishing and farming. The four main languages spoken are Izon, Nembe, Epie-Atissa and Ogbia. The study was carried out among eight Epie-Atissa and five Ogbia speaking communities in Yenagoa and Ogbia local government areas, respectively (Fig. 1).

Ethnozoological survey and data collection

Regular field tours were made between December, 2017 and February, 2018 to the study area. The ethnozoological survey was carried out with the aim of documenting animals and animal products used for medicinal purpose.

Informants were thirty-five renowned traditional medicinal practitioners. The methods used included interviews with these informants guided by a semi-structured questionnaire and observation/informal conversation on site. An experienced guide who understood the culture and language of the people was also engaged. Informed consent was obtained orally from all participants before the administration of the questionnaires and commencement of interview (Appendix 1). Detailed information on the local names, animal parts used and methods of preparation and use amongst others were documented. The scientific names of the animals were obtained from recognised database such as http://reptile-database.reptarium.cz/species/, http://www.iucnredlist.org/details/, http://www.uniprot.org/taxonomy/, http://www.cabi.org/isc/mobile/datasheet, and http://www.marinespecies.org/.

Ethical consent

Consent was informally sought from the participants.

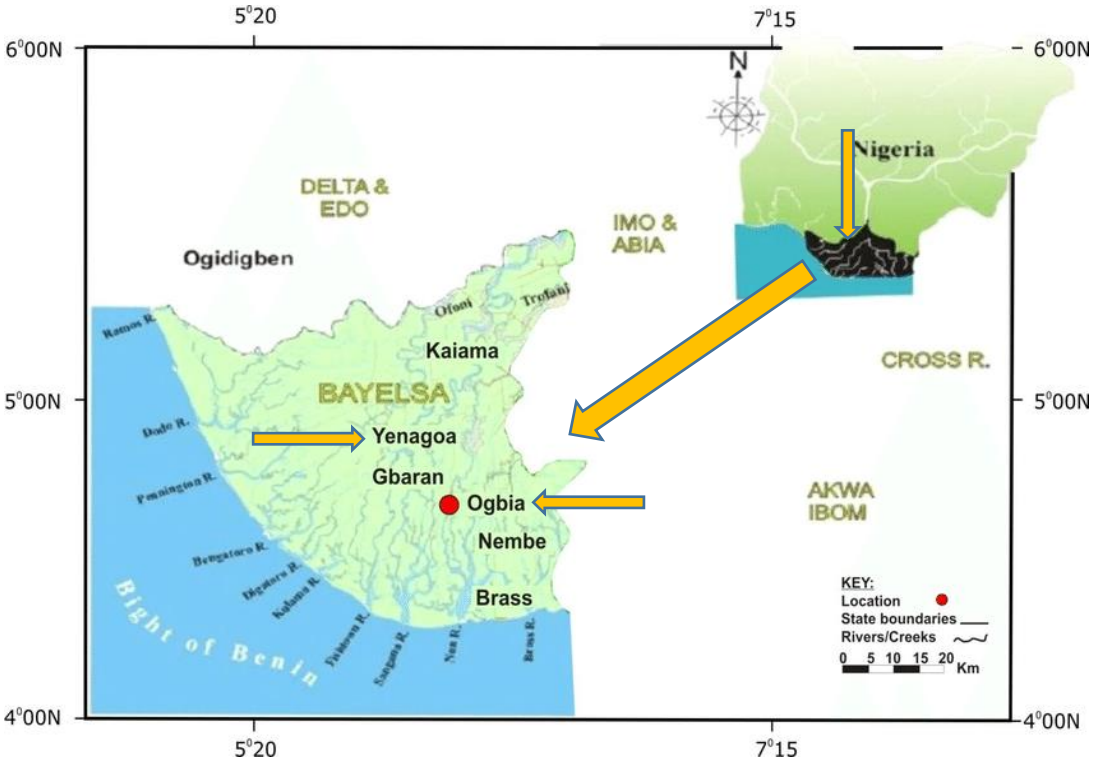

Figure 1. Map of Bayelsa showing the local government areas including Yenegoa and Ogbia.

Arrows show the study area. Source: Google image.

Statistical analysis

Data were analyzed using descriptive statistics such as frequencies, percentages, mean, standard deviation and standard error of mean. Also, the following ethnozoological indices as previously reported (Tardio and Pardo-de-Santayana, 2008) were calculated.

Use value of the species (UVs) indicates the relative medicinal importance of animals known locally expressed as:

$$UVs = Us/N \quad [1]$$

Where Us denotes the number of the mentioned medicinal uses by each informant for a given animal and N denotes the total number of informants.

Family use value (FUV) determines the importance of a family reporting various animals for their therapeutic potential. It is expressed as:

$$FUV = \Sigma UVs/ns \quad [2]$$

Where ΣUVs is the use values of all the species reported by each family and ns is the total number of species within a given family.

Relative frequency of citation (RFC) is expressed as the number of informants who mentioned the use (FCs) divided by the total number of informants (N) in the survey:

$$RFC = FCs/N \quad [3]$$

RFCmax is the relative frequency of citation for a species divided by the maximum value of RFC in the survey.

Relative number of use (RNUs) is the total number of uses for a given species and RNUsmax is obtained by dividing the RNUs by the maximum value in the entire survey. Relative importance index (RIs) is expressed as the sum of RFCsmax and RNUsmax values divided by 2:

$$RIs = (RFCsmax + RNUsmax)/2 \quad [4]$$

Cultural importance (CI) is the sum of the proportion of informants that mention each species use and obtained by the formula:

$$CI = \Sigma URui/N \quad [5]$$

Where ΣURui is the sum of all the use reports

Cultural value index (CVs) was determined by:

$$CVs = [Nus/NC] \times [FCs/N] \times [\Sigma URui/N] \quad [6]$$

Where NUs/NC is the relationship between the number of uses for a species and the total number of uses in the survey, FCs/N is the relative frequency of citation while URui is the sum of all the use reports for the species.

RESULTS

All the respondents were married and almost half (49%) of them had primary (basic) education, 14.3% had tertiary education while a quarter had no formal education (Table 1). The highest age range fell within 61-70 years (34%) followed by 41-50 (26%) and the lowest (11.4%) were those less than or equal 40 years (Table 1) and the number of female TMPs (67%) was more than the male among the respondents (Table 1).

Approximately six-tenth of the respondents acquired the knowledge by inheritance, 14% had it as a gift from the creator and about one-tenth got it through training, some however combined inheritance with training (14.3%), which took mainly about 5-10 years (Table 2). Raw materials were only sourced from the wild and market, which is a major threat to conservation of these animals (Table 2). About three-quarter of them were aware of scarcity of these raw materials and the main reasons opined are those of oil exploration/spillage, uncontrolled deforestation, hunting and urbanization (Table 2).

A total of 43 species of animals were mentioned for traditional medicines (Table 3) belonging to three phyla, which are *Chordata* (66.7%), *Athropoda* (22.2%) and *Mollusca* (11.1%) (Fig. 2), spreading across ten classes with *Mammalia* being the most mentioned had the highest citation (22.7%) followed by *Reptila* (18.2%) and *Pisces* (15.9%) (Fig. 3) all within 37 families (Table 4). The families with the highest family use values (FUVs) included *Aganidae* (0.14), *Testudinidae* (0.09), *Elepidae* (0.09), *Spirostreptidae* (0.09) and *Hominidae* (0.07).

Table 1. Demographic character of the respondents.

Demography	Category	Frequency	Percentage
Gender	Male	11	31.4
	Female	24	68.6
Age	≤ 40	4	11.4
	41-50	9	25.7
	51-60	5	14.3
	61-70	12	34.3
	71-80	5	14.3
Marital status	Single	0	0
	Married	19	54.3
	Widow(er)	13	37.1
	Divorced	3	8.6
Occupation	Farming/fishing/hunting	0	0
	Trading	0	0
	Civil servant/TMP	2	5.7
	TMP	18	51.4
	TMP/farming/fishing	15	42.9
Education	No formal education	9	25.7
	Primary	17	48.6
	Secondary	4	11.4
	Tertiary	5	14.3
Language	Ijaw	3	8.6
	Atissa	3	8.6
	Epie	1	2.9
	Ogbia	3	8.6
	Combination	24	86.6
Residency	≤ 20	13	37.1
	21-40	3	8.6
	41-60	8	22.9
	61-80	11	31.4

TMP: Traditional medicine practitioner.

Table 2. Ethnomedicinal information of the respondents.

Ethnomedicinal information	Category	Frequency	Percentage
Year of practice with animal inclusion	≤ 20	9	25.7
	21-40	16	45.7
	41-60	6	17.1
	61-80	1	2.9
	Nil	3	8.6
Category of use	Traditional medicine practitioner (TMP)	27	77.1
	Patient	0	0
	TMP/patient	8	22.9
	Layman	0	0
Purpose of use	Prevention	0	0
	Therapeutics	0	0
	Both	32	100
Preferred treatment	Traditional	35	100
	Modern	0	0
Reason	Affordability	0	0
	Acceptability	0	0
	Availability	0	0
	Effectiveness	0	0
	All	35	100
Source of knowledge acquisition	Apprenticeship	3	8.6
	God's gift	5	14.3
	Inheritance	22	62.9
	Apprenticeship/inheritance	5	14.3
Years of training	1-4	2	25
	5-10	4	50
	11-20	2	25
Sourcing of animals	Wild	14	43.8
	Cultured	0	0
	Market	0	0
	Wild/market	18	51.4
Knowledge of scarcity	Yes	23	76.7
	No	3	10
	No idea	4	13.3
Reason for scarcity	Uncontrolled deforestation/hunting	20	32.9
	Agricultural practices	2	3.3
	Oil spillage/exploration	19	31.1
	Urbanization	12	19.7
	Increase in use of animal parts/poor conservation	8	13.1

Table 3. Animals cited for use in traditional medicine.

Scientific name	Family	Common name	Local name	Ailment	Diagnosis	Part used	Methods of preparation	Mode of Administration/Dosage	No of citation	Conservation status
Achatina achatina (Linnaeus, 1758)	*Achatinidae*	Giant land Snail	Ibika (Ogbia) Ochi (Ijaw)	Conjunctivitis/ inflamed eyes	Signs, Massaging	Tail	Collect fluid from the tail	Instill into the eyes twice daily	1.7	A
Agama agama (Linnaeus, 1758)	*Aganidae*	Agama lizard	OnobhiriAdigbe (Ogbia)	Stroke	Sign, Massaging	Whole animal	Extract live lizard in illicit gin for 3 days	About 50 mL twice daily for 7 days	2.6	A
				Cough	Sign	Whole animal, head only or flesh minus head and intestines	Extract live lizard in illicit gin for 3 days or cut into pieces and prepare as pepper soup	About 50 mL 2-3 times daily for 7 days or eat as pepper soup twice daily	10.4	
				Asthma	Sign	whole animal	Extract live lizard in illicit gin for 3 days	About 50 mL twice daily for 7 days	2.6	
				Hemorrhoid/pile	Sign	Egg	Cook egg in palm oil until it bursts open	Apply externally as needed	2.6	
				Convulsion	Sign	Whole animal	Drain the blood of freshly killed animal and extract the animal in illicit gin	2-5 mL orally twice daily for 3 days	0.9	
Antilocapra americana (Ord, 1815)	*Bovidae*	Antelope	Etu (Yoruba)	Convulsion	Signs	Intestine	Grind and mix with maize pap or custard	Drink orally once daily as needed to prevent attack	0.9	LA
Apis mellifera (Linnaeus, 1758)	*Apidae*	Bees	Agama (Ogbia)	Stomach ulcer	Massaging	Honey	Mix honey with exudate of 4 unripe fruits of *Caricapapaya*	15-25 mi orally 2-3 times daily	1.7	LA
Archispirostreptus gigas (Peters, 1855)	*Spirostreptidae*	Giant African Millipede	Enormorti (Ogbia)	Hiernia	Signs, Massaging	Whole animal	Pound 14 together.	Rub on the affected area twice daily	0.9	A
				Appendix	Signs, Massaging	Whole animal	Pound 14 together.	Rub on the affected area twice daily	0.9	
				Easy delivery	Signs, Massaging	Whole animal	Pound 14 together with undescribed plants or wrap in edible leaf	Chew during labor	3.5	
Boa constrictor (Linnaeus, 1758)	*Boidae*	Boa snake	Orduma (Atissa)	Swelling/ inflammation	Signs, Massaging	Fat	Kill and collect oil by pounding in a mortar, cook until it solidifies	Apply topically twice daily	0.9	S
Bos taurus (Linnaeus, 1758)	*Bovidae*	Cow	Evein, Malu (Ijaw)	Convulsion	Sign, Massaging	Urine	Collect urine	Bathe the patient with urine	0.9	A
Capra aegagrus (Erxleben, 1977)	*Bovidae*	Domestic goat	Eneli (Ogbia0	Lower jaw pain Inflammation	Massaging	Jaw bone	Dry and powder with alligator pepper	Rub twice daily	0.9	A

Table 3. Animals cited for use in traditional medicine (continued…).

Scientific name	Family	Common name	Local name	Ailment	Diagnosis	Part used	Methods of preparation	Mode of Administration/Dosage	No of citation	Conservation status
Canis lupus familiaris (Linnaeus, 1758)	*Canidae*	Dog	Obu (Ijaw) Agbou (Ogbia) Abua (Atissa)	Rheumatism	Massaging	Ankle and knee joint bones	Burn to ash and mix with illicit gin to form a paste	Rub once daily	1.7	LA
Clarias anguillaris (Linnaeus, 1758)	*Clariidae*	Mud fish	Olomor (Atissa) Orobhu (Ogbia)	Tightness of fetus	Massaging	Whole fish	Cook with leaf of an un-mentioned plant	Eat as food for 7 days between 3 – 8 months of pregnancy	0.9	LA
Clarias gariepinus (Burhell, 1822)	*Clariidae*	North African cat fish	Innas (Ogbia)	Ear inflammation	Signs	Gall bladder	Puncture gall bladder	Instill 2-3 drops into the ear twice daily	0.9	A
Crassostrea rhizophorae (Guilding, 1828)	*Ostreidae*	Oyster	Ikpakuru (Ogbia) Igbown (Ijaw)	Burns	Signs	Shell	Burn the shell	Dust on the wound twice daily	0.9	LA
Crocodylus niloticus (Laurenti, 1768)	*Crocodylidae*	Crocodile	Aseingi (Ogbia)	Acute inflammation of leg and head	Massaging, Signs	Stool	Moisten stool to form a paste	Rub once daily	0.9	S
Crocodylus porosus (Laurenti, 1768)	*Crocodylidae*	Crocodile	Aseingi (Ogbia)	Acute inflammation of leg and head	Massaging, Signs	Stool	Moisten stool to form a paste	Rub once daily	0.9	S
Crocidura nigeriae (Dollman, 1915)	*Soricidae*	Long mouthed rat	Awudu (Ogbia)	Convulsion	Signs, Massaging	Whole animal	Freshly killed animal is cooked as pepper soup	Take as pepper soup regularly to prevent attack or take as food during attacks	0.9	
Dasypus novemcinctus (Linnaeus, 1758)	*Dasypodidae*	Armadilo	Epin (Ijaw), Adiayin (Ogbia), Adiain (Atissa)	Abnormal/wrong folding of fetus head	Massaging	Shell	Make a necklace from bored shell using a rope.	Wear necklace extending to the position of fetus	1.7	LA/S
Dasyatis garouaensis (Stauch& Blane, 1962)	*Dasyatidae*	Sting ray	Owuru (Ogbia)	Easy delivery	Massaging	Tail or whole fish	Cook or smoke	Eat in pregnancy or during labor as required.	3.5	S
Felis catus (Linnaeus, 1758)	*Felidae*	Cat	Pusi (Atissa) Apusi (Ogbia)	Cough	Massaging, Signs	Mouth	Cat is allowed to drink water and the remaining water is used	Drink the water 2-3 times daily	0.9	LA
Fenneropenaeus indicus (H. Milne Edwards, 1837)	*Penaeidae*	Prawn	Oproo (Ijaw) Orgaga (Ogbia)	Foreign object like nail in the body	Signs, Massaging	Flesh	Roast the flesh partially and pound	Apply topically at the point of piercing for 24-48 hr.	0.9	A

Table 3. Animals cited for use in traditional medicine (continued…).

Scientific name	Family	Common name	Local name	Ailment	Diagnosis	Part used	Methods of preparation	Mode of Administration/Dosage	No of citation	Conservation status
Gallus gallus domesticus (Linnaeus, 1758)	*Phasianidae*	Fowl/ Hen	Adizenuru, Adigbe (Ogbia), Okpekpe, Egeregere (Atissa)	Asthma	Massaging	Egg	Mix raw egg and castor oil	20-30 min orally once daily for 2-5 days	0.9	A
Gorilla gorilla (Savage, 1847)	*Hominidae*	Gorilla		Low sperm count	Signs, Massaging	Whole animal	Cook flesh as pepper soup	Eat orally once daily for 2-5 days	0.9	R
				Convulsion		Whole animal	Cook flesh as pepper soup	Eat orally once daily for 2-5 days	0.9	
				Asthma		Whole animal	Cook flesh as pepper soup	Eat orally once daily for 2-5 days	0.9	
Hemachatus haemachatus (Bonnaterre, 1970)	*Elapidae*	Cobra	Akpandara-sindiebi (Atissa), Obilo (Ogbia)	Snake bite	Signs, Massaging	Head and tail	Soak head and tail of freshly killed snake in illicit gin and allow to extract	Drink 5-30 mL once a day for 3-5 days	0.9	S
				Poisoning		Flesh	Flesh of freshly killed animal is extracted in illicit gin	Take 5-30 mL orally once a day for 2-5 days.	0.9	
				Charmed illness	Massaging	Head and tail	Dry and grind with an un-mentioned leaf	Rub on the affected area	0.9	
Hemidactylus frenatus (Schlegel, 1836)	*Gekkonidae*	Wall gecko	Okolomotu (Ogbia)	Cough	Signs, Massaging	Whole animal	Freshly killed animal is made into pepper soup	Eat as such 1-2 times daily or take soup alone 1-2 times daily	1.7	A
Homo sapiens (Linnaeus, 1758)	*Hominidae*	Man	Owei (Ijaw) Orni (Ogbia)	Convulsion	Signs, Massaging	Urine from non-menstruating women	Collect fresh urine	Bathe the patient with urine/ drink the urine as needed	0.9	
				Infection	Signs, Massaging	Urine from non-menstruating women	Collect fresh urine	Bathe the patient with urine/ drink the urine as needed	1.7	A
Hydrocynus goliath (Boulenger, 1898)	*Alestidae*	Tiger fish	Pormu (Ijaw) Orim (Ogbia)	Painful/ inflamed breast	Signs	Tooth	Remove teeth	Make incision with it and other things can be added	0.9	LA
Limicolaria aurora (Jay, 1839)	*Achatinidae*	Garden snail	Okoso (Ogbia)	Cough	Signs, Massaging	Slimy fluid	Slightly heat	Suck the fluid from the shell 2-3 times daily	0.9	A
Lanistes ovum (Peters, 1845)	*Ampullariidae*	Apple snail	Okpaamu (Atissa) Ekpoormu (Ogbia)	Cough	Signs, Massaging	Slimy fluid	Puncture the flesh and obtain the fluid	1 table spoonful twice daily	1.7	A

Table 3. Animals cited for use in traditional medicine (continued…).

Scientific name	Family	Common name	Local name	Ailment	Diagnosis	Part used	Methods of preparation	Mode of Administration/Dosage	No of citation	Conservation status
Littorina littorea (Linnaeus, 1758)	*Littorinidae*	Periwinkle	Esiemu (Ogbia) Iseru (Epie)	Inner ear inflammation	Sign	Fluid	Crack the shell at the tail of live animal and collect the fluid	Instill 1-3 drops twice daily	0.9	A
Macrobrachum ohione (Smith, 1874)	*Astacoidae/ Parastacoidae*	Cray fish	Elata (Ogbia) Uturumo (Epie)	Easy delivery/making the child cry after delivery	Massaging	Whole Cray fish	Smoke Cray fish	Chew regularly in pregnancy	0.9	A
Malapterurus electricus (Gmelin, 1789)	*Malapteruridae*	Electric cat fish	Otikiri (Ogbia)	Convulsion	Signs, Massaging	Whole fish	Cook as pepper soup	Eat as food 1-2 times daily	0.9	S
Myrmelon sp. (Linnaeus, 1767)	*Myrmeleontidae*	Ant-Lion	Alakpata (yoruba) Ezige (Ogbia)	Severe back pain	Massaging	Whole animal	Grind 7 animals	Rub on incised part of the back	0.9	LA
Pachygrapsus marmoratus (Fabricus, 1787)	*Grapsidae*	Crab	Okoota (Ogbia) Orvilor (Epie)	Non-kicking foetus	Sign, Massaging	Whole crab	Cook as pepper soup	Eaten by pregnant women twice daily	0.9	LA
Palaemon hastatus (Aurivillius, 1898)	*Astacoidae/ Parastacoidae*	Cray fish	Elata (Ogbia) Uturumo (Epie)	Easy delivery/making the child cry after delivery	Massaging	Whole cray fish	Smoke Cray fish	Chew regularly in pregnancy	0.9	A
Parachanna africana (Steindachner, 1879)	*Channidae*	Snake head fish	Edebu (Atissa) Obortor (Ogbia)	Retarded pregnancy development	Massaging, Signs	Whole fish	Cut into bits, add one slice of plantain and *Amaranthus viridis* leaf, then cook	Eat once daily for 4 days	0.9	LA
Periplaneta americana (Linnaeus, 1758)	*Blattidae*	Cockroach	Afori, feru (Ijaw) Ebhuebhele (Ogbia)	Nail injury	Signs, Massaging	Whole insect	Grind live cockroach	Place on affected area topically overnight for 2 days	1.7	A
				Inflammation	Signs, Massaging	Whole insect	Grind live cockroach	Place on affected area topically overnight for 2 days	0.9	A
Piaractus brachypomus (G. Cuvier, 1818)	*Serrasalmidae*	Piaractus	Kobio (Ijaw), Afeike (Ogbia)	Cataract	Signs, Massaging	Gall bladder	Puncture fresh gall bladder	Instill into the eyes once daily	0.9	LA
Polydesmus angustus (Latzel, 1884)	*Polydesmidae*	Flat-backed millipede	Ewalawala (Ogbia)	Heart burn	Signs, Massaging	Whole animal	Grind in to pieces	Rub and place on the chest	0.9	

Table 3. Animals cited for use in traditional medicine (continued…).

Scientific name	Family	Common name	Local name	Ailment	Diagnosis	Part used	Methods of preparation	Mode of Administration/Dosage	No of citation	Conservation status
Protopterus dolloi (Boulenger, 1900)	*Protopteridae*	Lung fish	Ebieseni (Ijaw, Ogbia)	Poisoning	Massaging	Gall bladder	Puncture the gall bladder into illicit gin/ other leaves may be added	15-35 mL daily 1-2 times daily	2.6	LA
				Epilepsy/ convulsion		Dark stomach lining and heart	Pound with *Talinumtriagulare* leaf	5-20 mL daily p.o.	0.9	
				Epilepsy/ convulsion		Whole fish	Cook without the intestine	15-30 mL daily p.o.	0.9	
				Ear inflammation		Gall bladder	Puncture and instil into the ear	1-3 drops twice daily	0.9	
				Spiritual attack		Bone	Make into neck lace	Wear bone as neck lace prn.	0.9	
				Stomach ulcer/ dyspepsia	Signs, Massaging	Gall bladder	Puncture the gall bladder into illicit gin or extract whole in illicit gin	Take –20 mL 1-2 times daily	1.7	
Python sebae (Gmelin, 1789)	*Pythonidae*	Python	Ordimu (Atissa, Ogbia)	Skin rashes/ diseases	Signs	Fats	Extract oil from freshly killed animal	Rub on the skin	0.9	LA
				Convulsion	Signs	Fats	Extract oil from freshly killed animal	Rub on the body	0.9	
Rattus rattus (Linnaeus, 1758)	*Muridae*	Rat	Okeita, Owuromo (Ogbia)	Easy delivery	Massaging	Feces	Wrap dry feces in leaf of un-mentioned plant	Chew regularly in pregnancy	0.9	LA
Sceliphron spirifex (Linnaeus, 1758)	*Sphecidae*	Mud dauber	Ovunuvunu (Ogbia)	Inflammation of legs and jaws/ arthritis	Massaging, Signs	Larva/Muddy house	Collect the house/larva/insects and make into slurry with water	Rub on affected area twice daily	2.6	A
				Cough		Muddy house	Collect the house and make into slurry with water	Take orally 5-30 mL 2-3 times daily	0.9	
Testudo graeca (Linnaeus, 1758)	*Testundinidae*	Tortoise	Erefawei (Ijaw) Adulei (Ogbia) Iwiri (Epie)	Waist/back pain	Massaging	Shell	Burn to ash and mix with illicit gin to form a paste	Rub once daily on incised part	0.9	LA
				Stomach ulcers/ dyspepsia	Signs, Massaging	Gall bladder	Puncture and pour in illicit gin	Take 5-25 mL orally 1-2 times daily	2.6	LA
				Poisoning	Massaging	Gall bladder	Extract in illicit gin	Take 5-30 mL orally 1-3 times daily	4.3	
Varanus niloticus (Linnaeus, 1758)	*Varanidae*	Nile monitor	Abaedi (Atissa)	Asthma	Massaging, Signs	Gall bladder	Puncture it and pour the content into 75 mL of illicit gin	Take 5-30 mL orally once daily	0,9	LA

Sources of taxonomic characterization: http://reptile-database.reptarium.cz/species/, http://www.iucnredlist.org/details/, http://www.uniprot.org/taxonomy/, http://www.cabi.org/isc/mobile/datasheet, http://www.marinespecies.org/
Conservation status: A: abundant; LA: less abundant; R: rare; S: scarse.

Table 4. Various families of animals mentioned for traditional medicine.

Family	Number of species	UVs	FUVs
Achatinidae	2	0.06	0.03
Aganidae	1	0.14	0.14
Alestidae	1	0.03	0.03
Apidae	1	0.03	0.03
Astacoidae/Parastacoidae	2	0.06	0.03
Blattidae	1	0.06	0.06
Boidae	1	0.03	0.03
Bovidae	3	0.09	0.03
Canidae	1	0.06	0.06
Channidae	1	0.03	0.03
Clariidae	2	0.06	0.03
Crocodylidae	2	0.06	0.03
Dasyatidae	1	0.03	0.03
Dasypodidae	1	0.03	0.03
Elapidae	1	0.09	0.09
Felidae	1	0.03	0.03
Gekkonidae	1	0.03	0.03
Grapsidae	1	0.03	0.03
Hominidae	2	0.14	0.07
Littorinidae	1	0.03	0.03
Malaptridae	1	0.03	0.03
Muridae	1	0.03	0.03
Myrmeleotidae	1	0.03	0.03
Ostreidae	1	0.03	0.03
Penaeidae	1	0.03	0.03
Phasianidae	1	0.03	0.03
Picidae	1	0.03	0.03
Polydesmidae	1	0.03	0.03
Protopteridae	1	0.03	0.03
Pythonidae	1	0.06	0.06
Serrasalmidae	1	0.03	0.03
Soricidae	1	0.06	0.06
Sphecidae	1	0.03	0.03
Spirostreptida	1	0.09	0.09
Testundinidae	1	0.09	0.09
Varanidae	1	0.03	0.03

UV: use values of each species; FUV: family use value.

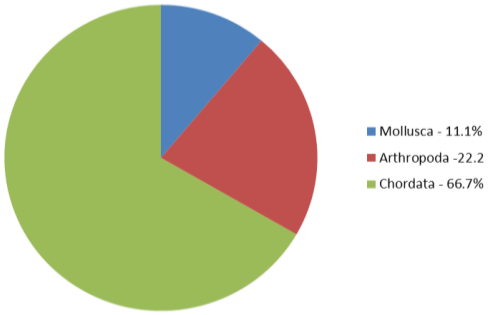

Figure 2. Distribution (%) of the phyla used in traditional medicine.

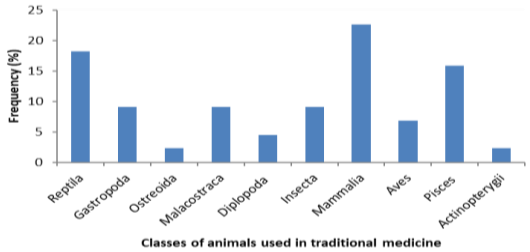

Figure 3. Distribution of the classes used in traditional medicine.

The most important disease cited was inflammation/pain/arthritis (20.0%) and the most employed animal to treat it was *Sceliphron spirifex* (mud dauber), followed by ear, nose and throat (18.3%) having *Agama agama* (agama lizard) as the most mentioned for its treatment, while easy delivery of babies (reproductive purpose) (16.7%) treated with *Archispirostreptus gigas* (giant African millipede) and *Dasypus novemcinetus* (armadillo) as well as epilepsy/convulsion (15.0%) managed mostly by *Protopterus dolloi* (lung fish) also had a high mention (Fig. 4).

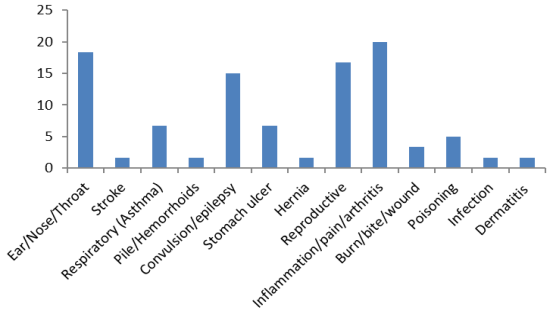

Figure 4. Major diseases treated with animals.

Protopterus dolloi (UVs, 0.17) had the highest use value followed by *Archispirostreptus gigas, Hemachatus haemachatus, Hemidactylus frenatus, Gorilla gorilla and Testudo graeca* each with a use value of 0.09. Animals with the highest relative frequency of citation (RFCs) included *Agama agama* (RFCs, 0.63), *Protopterus dolloi* and *Testudo graeca* (RFCs, 0.26) and *Archispirostreptus gigas* (RFCs, 0.17). Animals with the highest Relative Importance (RI) were *Agama agama* (RI, 1.00), *Protopterus dolloi* (RI, 0.61), *Testudo graeca* (RI, 0.51), *Hemachatus haemachatus* (RI, 0.37), *Gorilla gorilla* (RI, 0.37) and *Hemidactylus frenatus* (RI, 0.35). *Agama agama* (CVs, 0.203490) had the highest cultural value index (CVs) followed by *Protopterus dolloi* (CVs, 0.036270), *Testudo graeca* (CVs, 0.013754), *Hemachatus haemachatus* (CVs, 0.02898), *Hemidactylus frenatus* (CVs, 0.02898), and *Gorilla gorilla* (CVs, 0.013754), while the cultural importance index (CI) values showed that *Agama agama* (CI, 0.85), *Protopterus dolloi* (0.45), *Testudo graeca* (CI, 0.23), *Gorilla gorilla* (0.17), *Hemachatus haemachatus* (CI, 0.14) and *Hemidactylus frenatus* (CI, 0.14) had high values. Generally, the most important species of animals in decreasing order are *Agama agama, Protopterus dolloi, Testudo graeca*, *Hemachatus haemachatus, Hemidactylus frenatus, Gorilla gorilla* and *Archispirostreptus gigas* (Table 5). Interestingly, dangerous snakes such as *Python sebae* and *Boa constrictor* were cited to cure skin diseases and inflammation. However, in some instances, it was mentioned that any kind of snakes could be employed to treat snakebite regardless of the actual type that bit the patient (Table 2).

Only the oral (54.3%) and topical (45.7%) routes of administration (Fig. 5) were adopted while the most employed methods of preparation included cooking (17.9%), pounding (16.4%) and tincture (16.4%) followed by using them raw (13.4%) and paste (3.0%) was the least used (Fig. 6).

DISCUSSION

Traditional medicine practices are inherently not gender biased, but lately are readily represented as feminized probably because of the fact that historically, women tend to be caring and show

familial care to the extent of pampering people (Doel and Segrott, 2003; Ruggie, 2004; Sointu, 2011).

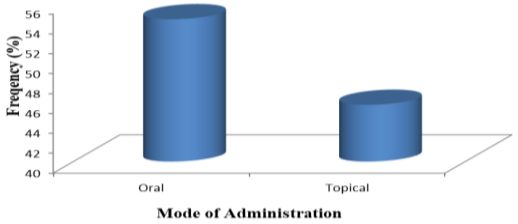

Figure 5. Mode of administration of preparation.

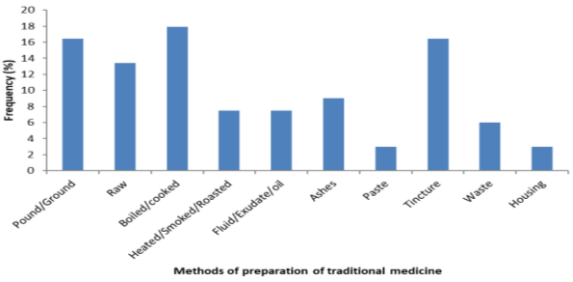

Figure 6. Methods of preparation of traditional medicine.

The result of this study corroborates several reports that the knowledge of traditional medicine is domiciled with the older population who may be unwilling to pass it to the younger generation or that the latter are not interested in acquiring it because it seems obsolete and socially backward. The existing knowledge is mostly confined to older generation who embodies a wealth of wisdom and experiences of nature gained over time from direct and indirect observations and are mainly transmitted orally over generations for those that care to learn (Mazzocchi, 2006). The United Nations has however, advocated conservation approaches of this knowledge before it finally goes into extinction since traditional medicine is the first level of contact for rural people. Thus, government needs to introduce the use of traditional medicine to supplement primary health care (Vedavathy, 2003).

The education status of TMPs is still low in Nigeria and as such they cannot imbibe the modern techniques of processing drugs and updated knowledge of diseases and diagnosis is far from them (Adebo and Alfred, 2011).

As obtained from this study, inheritance also dominated a study in Ekiti and Ondo States of Nigeria in which the majority of the herbal traditioners interviewed obtained their knowledge through inheritance (Adebo and Alfred, 2011). Most TMPs see this knowledge as their own family inheritance, which must continue to run in their lineage and any reason to divulge it by training outsiders will amount to being prodigal and where they train, some things are kept away from their apprentices, which their progeny has as an edge (Adefolaju, 2011).

Sourcing of animals from the wild and market is a threat to their sustainable use as medicine. These poorly managed collection practices could lead to the extinction of the endangered species (Wachtel-Galor and Benzie, 2011). Culturing of endangered species is advocated.

Mammals, reptiles, aves, pisces and amphibians have been employed in traditional medicine worldwide for several purposes. However, mammals seem to be much used compared to others (Vats and Thomas, 2015) probably due to the fact that man is also a mammal and so may share some characteristics that can be filled if deficient in human as a result of illness. Globally, at least 165 reptile species belonging to 104 genera and 30 families are used in traditional medicine and 53% of these are already included on the lists of endangered species (Alves et al., 2008). It has also been reported that the use of reptiles may have significant impact on their conservation in Mozambique (Williams et al., 2006). Also, 85 species of fish (Pisces) were indicated for medicinal purposes in Brazil (El-Deir et al., 2012) and several in India (Teronpi et al., 2012). It is not surprising to have fish as one of the most important animals cited in the study area because it is a coastal land and fishing is a major occupation of the indigenes.

Table 5. Ethnozoological indices of the mentioned animals.

Scientific name	UVs	RFCs	RFCmax	RNU	RNUmax	RI	NUs/NC	UR/N	CVs	CI
Achatina achatina	0.03	0.06	0.10	1	0.20	0.15	0.08	0.03	0.000144	0.03
Agama agama	0.14	0.63	1.00	5	1.00	1.00	0.38	0.85	0.20349	0.85
Antilocapra americana	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Apis mellifera	0.03	0.06	0.10	1	0.20	0.15	0.08	0.03	0.000144	0.03
Archispirostreptus gigas	0.09	0.17	0.27	3	0.60	0.42	0.08	0.03	0.000408	0.08
Boa constrictor	0.03	0.03	0.05	1	0.20	0.15	0.08	0.03	0.000072	0.03
Bos Taurus	0.06	0.06	0.10	2	0.40	0.25	0.15	0.11	0.000990	0.11
Capra aegagrus	0.03	0.06	0.10	1	0.20	0.15	0.08	0.03	0.000144	0.03
Canis lupus familiaris	0.03	0.09	0.14	1	0.20	0.17	0.08	0.03	0.000216	0.03
Clarias anguillaris	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Clarias gariepinus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Crassostrea rhizophorae	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Crocodylus niloticus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Crocodylus porosus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Crocidura nigeriae	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Dasypus novemcinctus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Dasyatis garouaensis	0.03	0.06	0.17	1	0.20	0.19	0.08	0.03	0.000144	0.03
Felis catus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Fenneropenaeus indicus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Gallus gallus domesticus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Gorilla gorilla	0.09	0.03	0.14	3	0.60	0.37	0.23	0.17	0.001173	0.17
Hemachatus haemachatus	0.09	0.09	0.14	3	0.60	0.37	0.23	0.14	0.002898	0.14
Hemidactylus frenatus	0.09	0.09	0.10	3	0.60	0.35	0.23	0.14	0.002898	0.14
Homo sapiens	0.06	0.06	0.10	2	0.40	0.25	0.15	0.11	0.000990	0.11
Hydrocynus goliath	0.06	0.06	0.10	2	0.40	0.25	0.15	0.11	0.000990	0.11
Limicolaria aurora	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Lanistes ovum	0.06	0.06	0.10	2	0.40	0.25	0.15	0.09	0.000810	0.09
Littorina littorea	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Macrobrachum ohione	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Malapterurus electricus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Myrmelon sp.	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Pachygrapsus marmoratus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Palaemon hastatus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Parachanna africana	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Periplaneta americana	0.06	0.06	0.10	2	0.40	0.25	0.15	0.09	0.000810	0.09

Table 5. Ethnozoological indices of the mentioned animals (continued…).

Scientific name	UVs	RFCs	RFCmax	RNU	RNUmax	RI	NUs/NC	UR/N	CVs	CI
Piractus brachypomus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Polydesmus angustus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Protopterus dolloi	0.11	0.26	0.41	4	0.80	0.61	0.31	0.45	0.036270	0.45
Python sebae	0.06	0.06	0.10	2	0.40	0.25	0.15	0.09	0.000810	0.09
Rattus rattus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03
Sceliphron spirifex	0.03	0.09	0.14	1	0.20	0.17	0.08	0.03	0.000216	0.03
Testudo graeca	0.09	0.26	0.41	3	0.60	0.51	0.23	0.23	0.013754	0.23
Varanus niloticus	0.03	0.03	0.05	1	0.20	0.13	0.08	0.03	0.000072	0.03

UVs =use values of each species; RFCs = relative frequency of citation; RI = relative importance; CVs = cultural value index of species; CI = cultural importance of the species.

Table 6. Descriptive statistics of the results obtained (n = 43 animal species).

Statistical parameter	Use value	Relative frequency of citation	Relative importance index	Cultural value index	Cultural importance
Minimum	0.0300	0.0300	0.0300	7.200 e-0.05	0.300
Maximum	0.1400	0.6300	0.1000	0.2035	0.8500
Mean	0.0460	0.0714	0.2171	0.0064	0.0841
SD	0.0276	0.1032	0.1679	0.0317	0.1433
SEM	0.0043	0.0159	0.0259	0.0049	0.0221

Traditional medicine is regarded as part of human lifestyle and so cooking it (as mentioned in the study) as food may make it efficacious, it may also be the most preferred probably for its simplicity in Africa (Semenya and Potgieter, 2013), and water is also readily available and cheap. Pounding is a cumbersome process compared to cooking, but it preserves the bioactive constituents because heat is not involved while tincture is also used frequently probably for preservative effect of alcohol present in it (Alade et al., 2016). The use of raw animals was reduced, and this is a welcome approach to preventing a disease like Ebola virus disease, which can be transmitted by hunting and butchering wild life for food or medicine that may expose man to blood and other fluids of potentially infected animals or from consumption of raw meat (Mann et al., 2015). The oral and topical routes of drug administration are mostly used for the convenience and non-invasiveness of patients. These are the most common routes in African TMs. they do not require high technology for preparation nor do they need experts to administer. They are safe for patients in their homes and therefore reducing the cost of healthcare resources for patients and this will also reduce complications that may arise from the TMPs that lack expertise in the area of advanced modern technology of drug administration (Bhattacharyya et al., 2010; Verma et al., 2010). Summarily, the cultural importance of this ethnozoological study was 0.300 ± 0.022 (Table 6).

Transportation was one of the major limitations of the methodology. A good number of the communities are riverine and means of transportation is by canoe, which is more expensive and of a higher risk than road means. It was not easy to obtain information from the informants on the field who had to be induced to gain their cooperation. Some of them tried to prevaricate, thus cultural importance and other forms of indices were used to ascertain their level of truth or consensus. The tribes of some residents were not homogeneous with the study area tribes, although they speak the prevailing language because of their long stay

there. We nursed one bias that the informants are expected to have a form of traditional knowledge of animals including fish and other riverine creatures due to their location. Despite the problems encountered, the aims of the study were still achieved.

CONCLUSIONS

The survey furnishes the populace including medicinal plant researchers and some other traditional medicine practitioners with a real wellspring of communicable knowledge. These medicinal animal materials may be included in the healthcare delivery system of the country. It will also help in conservation of plant resources if alternatives can be obtained from animals.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTION:

Contribution	Alade GO	Frank A	Ajibesin KK
Concepts or ideas	x		x
Design	x		x
Definition of intellectual content	x	x	x
Literature search	x	x	x
Experimental studies	x	x	x
Data acquisition		x	
Data analysis	x	x	x
Statistical analysis	x	x	x
Manuscript preparation	x	x	x
Manuscript editing			x
Manuscript review	x	x	x

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Annex 1. Survey questionnaire.

DEPARTMENT OF PHARMACOGNOSY AND HERBAL MEDICINE

NIGER DELTA UNIVERSITY, WILBERFORCE ISLAND, BAYELSA STATE.

Dear Sir/Ma

A Questionnaire on Ethnozoological Survey of Bayelsa State.

All information will be treated as confidential and strictly for research and documentary purposes.

A. DEMOGRAPHIC INFORMATION

LGA _____ Town/Village _____

1. Name _____ 2. Gender: Male ☐ Female ☐ 3. Age_____Years

4. Marital status: (a)Married ☐ (b)Single ☐ (c)Divorced ☐ (d)Widow/Widower ☐

5. Occupation: (a)Farming/Fishing ☐ (b)Artisan ☐ (c)Trading ☐ (d)Civil Servant ☐ (e)TMP ☐ (f)Others ☐

6. Formal education: (a)None ☐ (b)Primary ☐ (c)Secondary ☐ (d)Tertiary ☐

7. How long have you been living in this area? _____Years

8. Mention the languages you speak _____

E. ETHNOMEDICINAL INFORMATION

9. How long have you been using Traditional remedies (to include animal parts)? _____Years, as a (a)Practitioner ☐ (b)Patient ☐ (c)Layman ☐

10. What are the main purposes of your taking Traditional remedies? (a)Therapeutics ☐ (b)Prevention ☐ (c)Others ☐

11. In case of illness, which form of treatment would you prefer? (a)Traditional remedies ☐ (b)Modern/synthetic drugs ☐

12. What reason(s) can you give for your preference: (a)Affordability ☐ (b)Acceptability ☐ (c)Availability ☐ (d)Effectiveness/potency ☐ (e)Others ☐

13. List the Traditional preparations that contain purely animal parts: _____

14a. Please list the prevalent diseases that you treat with Traditional preparations involving animal parts: _____

14b. What role(s) does/do the animal(s) component(s) play in the remedy: _____

15. How did you acquire the knowledge of healing properties? (a)Apprenticeship ☐ (b)Inheritance from parents and family members ☐ (c) Others ☐

16. What is the duration of your training? _____ Years.

17. What are the sources of your animal & mineral cultured materials? (a)Wild ☐ (b)Cultured ☐ (c)Market ☐ (d)Others ☐

18. Do you know if there is scarcity of animal parts used in your practice in your environment? (a)Yes ☐ (b) No ☐ (c) No idea ☐

19. If yes, list the animals (or parts) that have become scarce and their uses: _____

20. What factors do you think are responsible for the scarcity in your area? (a) Uncontrolled deforestation ☐ (b)Agricultural expansion ☐ (c) Oil exploration/spillage ☐ (d) Uncontrolled hunting ☐ (e) Poor preservation methods ☐ (f) Increased usage of animal parts ☐ (g) Urbanization ☐

21. How do you replenish the sources of your animals? _____

22. What animals or their parts do you use to treat the following diseases? (Please list overleaf)	Malaria	Jaundice	Sickle cell anemia	Abscess	Aphrodisiac	Asthma	Boil	Burns	Cancer	Catarrh
	Chest pain	Chicken pox	Cholera	Conjunctivitis	Convulsion	Cough	Diabetes	Diarrhea	Dysentery	Fibroid
	Fracture	General debility	Gonorrhea	Hemorrhoid	Hepatitis	Hypertension	Infertility	Itching	Laxative	Measles
	Mental illness	Oral hygiene	Rheumatism	Skin diseases	Small pox	Sore throat	Stomach ache	Tooth ache	Ulcer	Vermifuge
	Waist pain	Whitlow	Weaning agent	Wound	Yellow fever	Yaw				

23. Kindly complete the table below:

S/N°	Name of animal	Local names	Diseases treated/ ethnozoological uses of animals	Diagnosis	Part used	Methods of preparation	Mode of administration and dosage	No of citation	Conservation status. A-abundant LA-Less A S-Scarce R-Rare
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
Name of interviewer/Date _____ / _____									