Ethnozoological Study of Traditional Medicinal Animals Used by the Kore People in Amaro Woreda, Southern Ethiopia

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Abstract
A total of 90 people (practitioners) were interviewed from 15 kebeles. 25% of the respondents were female and 75% were male respondents. Questioners were also randomly distributed among selected government employees working in different offices. A total of 60 people (90% male and 10% female) were interviewed using semi-structured questionnaire. Independent samples t-test to compare means of quantitative data between male and female informants were computed using SPSS version 20. Chi-square test was computed to see the significance of relationship between qualitative data. Fidelity Level (FL) and Relative Importance (RI) value were used to analyze species preference and importance. A total of 21 animal species were used to prepare remedies for 46 ailments; 14 (66.64%) were mammals, 3 (14.28%) were reptiles and 4 (19.04%) were birds. Among the different animal body parts used for remedial preparation, flesh has the highest proportion (33.8%), followed by fat (11.5%), bone (8.6%) and blood (8.6%). Stomach pain is the most frequently reported ailments with a frequency of 11.29% followed by wound (9.23%) and rheumatism (5.81%). The highest number of informants (27.3%) prepared the traditional remedies by cooking, 18% by mixing and 15.8% by heating. The large proportions of the drug (69.8%) are administered orally, 21.6% dermal, nasal (7.2%) and ear canal (1.4%). The study revealed that there is significant variation in the mean number of species used by male and female informant \( p < 0.05 \). The mean number of species used by male informants was 5.6 \( \pm \) 1.15 and by female informants was 2.6 \( \pm \) 0.73. Next to python, warthog has the highest RI index (0.8942) followed by crested porcupine (0.789) and bushpig (0.6838). Species which have a FL of 100 for the most frequently reported ailments are crested porcupine, Hare, Klipspringer, Leopard tortoise, Mourning dove and Rabbit. There was a significant association between academic status and knowledge of zoonotic diseases. The association was significant \( p < 0.05 \). From the total population of urban informants (government office employees), 37 (30 male and 7 female) (61.7%) individuals used traditional medicine and the rest 23 (38.3%) (21 male and 2 female) do not used traditional medicine. Chi-Square Test revealed that there is no significant relationship between sex and use of traditional medicine \( p > 0.05 \).

Keywords
Zootherapy; Ailments; Animal products; Traditional remedies; Amaro woreda

Introduction
People living in developing countries have relied on traditional medicinal systems to keep their well-being for thousands of years (Li et al., 2008; Robinson and Zhang, 2011). According to WHO (2002), majority of people (about 80%) living in developing countries use traditional medicine for treatment of different types of illness and diseases. Asia, Africa, Latin America and the Middle East countries are with the largest contributors of such practitioners (WHO, 2002; Robinson and Zhang, 2011).

The global contribution of plant parts and products in traditional medicine is enormous. However, animal parts and products constitute important elements of the medical practices (Alves and Rosa, 2005; Alakbarli, 2006).

Ethnozoology is the branch of ethnomedicine, which deals with the study of relationship between the human societies and the animal resources around them (Jarolí et al., 2010). Zootherapy is defined as the practice of treating human diseases by the use of therapeutics obtained or ultimately derived from animals (Costa Neto, 1999). Zootherapy is an important component of ethnozoology.
attention has been given for zootherapeutic research. The systematic investigation of medicinal animals has been started only in the past few decades and an awareness of the variety and importance of non-botanical remedies (of animal and mineral origin) is emerging. In spite of the recent surge in publications about zootherapeutics, the subject is still far from being well covered, and even more distant from being exhausted (Uniyal et al., 2006).

The importance of animal parts in the history of pharmacology in general has been studied since the beginning of the 20th century. In Ethiopia, the use of traditional medicine has a long history and most of the rural people are well acquainted with the practice (Wabe et al., 2011). However, little information has been recorded by few authors (Yirga et al., 2011). Like other animals, medicinal animal population share the threats caused by habitat alteration or loss (Anyinam, 1995). Besides, a given species of medicinal animals could be exploited for another purpose such as for food, cloth or ornament (Robinson and Bennett, 2000; 2002; Bennett et al., 2002). These different forms of direct uses of medicinal animals operate together with various indirect impacts such as climate change which have caused the decline or extinction of species in the past years. Hence, it is a timely endeavour to investigate, document and analyze traditional knowledge on medicinal wildanimals and associated knowledge drivers, so that sound medicinal wildanimals utilization and management practices can be maintained. Moreover, it provides the opportunity for recognition, promotion, management and protection of indigenous knowledge of a community on medicinal wildanimals as vital part of a nation’s heritage, besides calling policy makers, natural resource managers, stake holders and cultural practitioners for conservation actions.

1 Survey Methods
1.1 Study area
Amaro Woreda is located in the Southern Nations and Nationalities and People Regional State of Ethiopia. It is one of the three Woredas under the Segene Surrounding People Zonal Administration, situated 105 km south of Dilla. It lies in the coordinates between 5°50’20”N and 37°54’20”E. Thirty rural kebelse and one urban kebele are situated within the woreda boundary and bordered in the east and north by Oromia regional state, in the south by Burji Woreda, in the west by Derashe Woreda, Konso Woreda, Lake Chamo and Nechsar National park. The woreda covers an area of 170980 km² and contain three types of Ethiopian ecological zones (30% Dega, 38% Woynadega and 32 % Kola).

According to the 2004 National Population and House Census, the population size of the woreda was 133, 445 (49% male and 51% female), among these 6.2% are urban dwellers and 93.8% live in rural areas. Large segment of the people living in the area live primarily on agriculture including animal rearing and cultivation. Coffee, teff, chat and other root crops are the major agricultural products of the area.

1.2 Preliminary survey
Preliminary survey were conducted in January, 2013 to contact the woreda’s concerned officials to brief them about the objective of the research and mobilize the target group of the research to develop trust and friendship approach for the successful implementation of the study. Sample size was determined based on the size of the target population.

1.3 Data collection
Data were collected through semi-structured interview from March-January 2014 in 15 kebeles (Martin, 1995). Selection of months for data collection is based on suitability; most of the farmers have spare time for non-agricultural activities. From each Kebele 6 traditional medicine practitioners were selected for interview. Surveys were conducted through semi-structured questionnaires and in cases where the respondents were uncomfortable with the questionnaires, discussion and informal interviews were employed, and in the process, information on different zootherapeutic uses were noted and documented (Alexiades, 1996; Huntington, 2000). Participants were interviewed in isolation from others in the community to satisfy the requirement of statistical independence (Hoffman and Gallaher,
Age (above 30 years), years of previous stay in the area (above 10 years) and history of traditional medicine practitioners (who involve in preparation) were used as criteria of selecting people for semi-structure interview. A total of 90 people were interviewed from 15 kebeles. 25% of the respondents were female and 75% were male respondents. Photographic pictures of animals used in traditional medicine preparation were taken for further verification of species identification.

Questioners were also randomly distributed among selected government employees working in different offices. The selected offices were woreda health office, woreda agricultural office and woreda administrative office. The main purposes of these questioners were to assess the knowledge, access and experience of these segments of the society regarding the use of zootherapy. A total of 60 people (90% male and 10% female) were interviewed using semi-structured questionnaire.

1.4 Data analyses

Descriptive statistics for analysis of qualitative data and inferential statistics for analysis of quantitative data were used. One sample t-test to compare sample and population means of quantitative data of single population, and independent samples t-test to compare means of quantitative data between male and female informants were computed using SPSS version 20. Chi-square test was computed to see the significance of relationship between qualitative data.

The FL quantifies the importance of a species for a given purpose. It refers to the percentage of informants claiming the use of a certain animal species for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

\[
FL = \frac{I_p}{I_u} \times 100\%
\]

Where \(I_p\) is the number of informants that claim a use of animal species to treat a particular disease, \(I_u\) is the total number of informants that use the species as a medicine to treat any given disease (Friedman, 1986).

Relative Importance (RI) value, a measure of diversity of medicinal application, was computed for each claimed medicinal animals using the formula RI = NP + NCS. NP is calculated by dividing the number of properties (in this case, specific ailments treated) attributed to a species divided by the total number of properties attributed to the most versatile species (species with the highest number of properties). NCS is computed by dividing the number of body systems (ailment categories) treated by a given species by the total number of body systems treated by the most versatile species. The highest possible RI value for a given species is 2.

2 Results and Discussion

2.1. Medicinal Animals

The study revealed that a total of 21 wild animal species were used by the kore people for traditional medicinal practices (Table 1). Out of the 21 species, 14 (66.64%) are mammals, 3 (14.28%) are reptiles and 4 (19.04%) are birds.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lizard (Skinks)</td>
<td>Scincidae (family)</td>
</tr>
<tr>
<td>Aardvark</td>
<td>Orycteropus afer</td>
</tr>
<tr>
<td>African civet</td>
<td>Civettictis civetta</td>
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<tr>
<td>African rock python</td>
<td>Python sebae</td>
</tr>
<tr>
<td>Black backed jackal</td>
<td>Canis mesomelas</td>
</tr>
<tr>
<td>Burchell's zebra</td>
<td>Equus quagga burchellii</td>
</tr>
<tr>
<td>Bushpig</td>
<td>Potamochoerus larvatus</td>
</tr>
<tr>
<td>Common duicker</td>
<td>Sylvicapra grimmia</td>
</tr>
<tr>
<td>Common mole rat</td>
<td>Cryptomys hottentotus</td>
</tr>
<tr>
<td>Crested porcupine</td>
<td>Hystrix cristata</td>
</tr>
<tr>
<td>Hare</td>
<td>Lepus (genus)</td>
</tr>
<tr>
<td>Klipspringer</td>
<td>Ouretragus oreotragus</td>
</tr>
<tr>
<td>Leopard tortoise</td>
<td>Stigmochelys pardalis</td>
</tr>
<tr>
<td>Mourning dove</td>
<td>Zenaida macroura</td>
</tr>
<tr>
<td>Ostrich</td>
<td>Struthio camelus</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Leporidae (family)</td>
</tr>
<tr>
<td>Thick billed raven</td>
<td>Corvus crassirostris</td>
</tr>
<tr>
<td>Vervet monkey</td>
<td>Chlorocebus pygerythrus</td>
</tr>
<tr>
<td>Vesper bats</td>
<td>Vespertilionidae (family)</td>
</tr>
<tr>
<td>Warthog</td>
<td>Phacochoerus africanus</td>
</tr>
<tr>
<td>Yellow-billed oxpecker</td>
<td>Buphagus africanus</td>
</tr>
</tbody>
</table>

Other researchers in different countries have identified equivalent number of vertebrate species used for traditional medicine (El-Kamali, 2000; Alves et al., 2010; 2012). The highest proportion of mammalian species in zootherapeutic activity was also observed by Felipe et al., 2013, in Brazil. The number of
species used for medicinal purposes is not related to the quantity of species available in the country, since taxa with greater species richness in Ethiopia, such as birds showed fewer species representation in medicinal preparation. Similar trends have been observed in Nigeria and South Africa (Simelane and Kerley, 1998; Ngwenya, 2001).

Among the bird species used by the Kore as traditional medicine, Thick-billed raven (Corvus crassirostris) is endemic to Ethiopia. Other recorded medicinal animal species are neither endemic to the country nor found in the IUCN Red Data List. Where rare and endangered species are concerned, the use of biodiversity for traditional medicine can have potentially significant impacts on global populations that are already under pressure (Mander et al., 2007). This implies that the traditional medicinal practices of the study area could have little global effect due to the fact that the recorded medicinal animal species are commonly found in other places. However, the practice could have negative impact on the local population of the species. The high proportion mammalian species could be attributed to the fact that Carnivore diet (eating meat or animal part) is the precursor of animal-based remedies for the treatment of illness in the prehistoric human age (Nakanishi, 1999). Most of the medicinal animal species used by the kore people also served as a source of food since ancient time, and hence the people are well acquainted with mammals than birds or reptiles.

2.2 Ailments treated, animal parts used and modes of remedy preparations

Kore people use 21 animal species to prepare remedies for 46 ailments. Different body parts were used during preparation (Figure 1).

Among the different animal body parts used for remedial preparation, flesh has the highest proportion (33.8%), followed by fat (11.5%), bone (8.6%) and blood (8.6%). The highest proportion of flesh in traditional remedies preparation has been observed by Sajem (2013) in Northeastern India. Stomach pain is the most frequently reported ailments with a frequency of 11.29% followed by wound (9.23%) and rheumatism (5.81%). Alves and Rosa (2007) had found that gastrointestinal (stomach) disease was one of the most frequently quoted categories of ailments. The high frequency of stomach pain is due to the living style of the people in the rural area where there is less access to clean water and people have low level of understanding about personal hygiene (Dhawan and Desai, 1996).

Traditional medicine practitioners used different preparation techniques to make traditional remedies (Figure 2). The techniques are grouped in to eight categories (cooking, drying, cooking and powdering, drying and powdering, fresh, heating, mixing and powdering). These preparation techniques have been reported by Yirga et al. (2011) with different frequency. The highest number of informants (27.3%) prepared the traditional remedies by cooking, 18% by mixing and 15.8% by heating. Cooking refers to both dry and wet cooking. Heating usually applies during the treatment of ailments. Honey, blood and stomach contents are frequently used to mix during preparation.
Routes of administration
The study has revealed four major methods (routes) of traditional medicine administration practiced by the traditional healers in Kore people (Figure 3). The large proportions of the drug (69.8%) are administered orally, 21.6% dermal, nasal (7.2%) and ear canal (1.4%). The highest frequency of oral administration has also been reported by Yirga et al. (2011). The highest proportion of oral administration is attributed to the highest frequency of stomach and intestinal diseases. Such diseases are characteristics of rural communities in developing countries (Dhawan and Desai, 1996). Attempts have been made to collect data on the presence and absence of standard dosage during administration. Almost all practitioners have no experience and skill to use standard dosage. However, they use non standard dosage between adult and children during administration.

2.3 Knowledge of informants
The study revealed that there is significant variation in the mean number of species used by male and female informant (P<0.05). The mean number of species used by male informants was 5.6 ± 1.15 and by female informants was 2.6 ± 0.73. The male informants have more knowledge about the medicinal animal species in the area. This might attributed to the hunting practices and high mobility of male informants. Besides, the traditional knowledge in the family or community is passed from male parent to his first-born son (Tilahun and Miruts, 2007).

2.4 Relative Importance of Specie (RI) and Fidelity Level (FL)
Relative importance of species refers to the relative use of species in the preparation of remedies. African rock python used to prepare remedies for nineteen ailments (the most versatile species) and used to compute the relative importance index. Next to python, warthog has the highest RI index (0.8942) followed by crested porcupine (0.789) and bushpig (0.6838) (Table 2).

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesper bats</td>
<td>Vespertilionidae (family)</td>
<td>0.2104</td>
</tr>
<tr>
<td>Common duiker</td>
<td>Sylvicapra grimmia</td>
<td>0.526</td>
</tr>
<tr>
<td>Aardvark</td>
<td>Orycteropus afer</td>
<td>0.6312</td>
</tr>
<tr>
<td>Bushpig</td>
<td>Potamochoerus larvatus</td>
<td>0.6838</td>
</tr>
<tr>
<td>Crested porcupine</td>
<td>Hystrix cristata</td>
<td>0.789</td>
</tr>
<tr>
<td>Warthog</td>
<td>Phacochoerus africanus</td>
<td>0.8942</td>
</tr>
</tbody>
</table>

Alves et al. (2009) has revealed that different parts of a single species provided the raw material to prepare different remedies, which were prescribed to treat various diseases. Fidelity level is calculated for the most frequently reported diseases or ailments by the informants (Figure 4). The most frequently reported ailments are stomach pain (gastro-intestinal ailments), wound, rheumatism and headache. Fidelity Level (FL) ranges from 6.7 (porcupine for wound and headache ailments) up to 100 (those species that used to prepare remedy for specific type of disease). Species which have a FL of 100 for the most frequently reported ailments are crested porcupine, Hare, Klipspringer, Leopard tortoise, Mourning dove and Rabbit.

2.5 Possibility of using various remedies for the same ailments
The possibility of using various remedies for the same ailment is popularly valued (Ngokwey, 1995), due to the increased options for treatment that it affords,
particularly given the non-consistent availability of particular species (Alves and Rosa, 2006). According to Alves and Alves (2011) some medicinal animals are being used for the same purpose suggest that different species can share similar medicinal properties and might indicate the pharmacological effectiveness of these zootherapeutic remedies.

2.5 Risk of zoonotic disease
The knowledge of zoonotic disease (disease transmitted between human and animals) was assessed during the survey. Out of the total informants, 41 (45.55%) have the knowledge of zoonotic disease. From the total female informants, 9 (40.9%) have the knowledge of zoonotic ailments. From the total male population 35 (51.5%) have the knowledge of zoonotic disease. From the total population of male informants, 35 (51.47%) are literate (can read and write) and from the total female informants 10 (45.45%) can read and write. Pearson Chi-Square test was computed to see whether there exist significant association between academic status and knowledge of zoonotic diseases. The association was significant ($p < 0.05$). This implies that those informants who can read and write have less risk of being infected with zoonotic disease than those informants who are illiterate. The use of medicinal animals is often considered healthy by consumers, nevertheless, zoonotic diseases have been increasingly mentioned in the literature (van Vliet and Mbazza, 2011), as exemplified by Schnurrenberger and Hubbert (1981), who drew attention to the possibility of transmission of serious and widespread zoonotic diseases such as tuberculosis or rabies, an aspect that should be considered whenever animal tissues from unknown sources are handled and used as remedies (Bishaw, 1990; Tesfu et al., 1995).

2.6 Attitude of urban inhabitants towards use of traditional medicine
A total of 60 individuals (85 % male and 15 % female) of urban inhabitants were interviewed using semi-structured questionnaire to assess their attitudes towards traditional medicine practices. Out of the 60 informant, 36 (60%) (35 male and 1 female) have first degree and 24 (40%) (8 female and 16 male) have diploma.

From the total population of informants, 37 (30 male and 7 female) (61.7%) individuals used traditional medicine and the rest 23 (38.3%) (21 male and 2 female) do not used traditional medicine. Chi-Square Test was computed to see the significance of relationship between sex of informants and use of traditional medicine. The test revealed that there is no significant relationship ($p > 0.05$). This might be due to equivalent academic and living status between male and female population of informants. Verma et al. (2014) has reported that the difference in proportion of traditional medicine user is resulted from the difference in economic and academic status among people.

Those who used traditional remedies have different reasons, 11 (29.7%) answered due to accessibility of remedy, 13 (35.1%) due to curability and 13 (35.1%) due to affordability. The wide spread use of traditional medicine among both urban and rural population in Ethiopia could be attributed to cultural acceptability, efficacy against certain type of diseases, physical accessibility and economic affordability as compared to modern medicine (Tilahun and Miruts, 2007). Those who have rejected to use traditional remedies have also different reasons, 3 (13%) answered due to lack of standard dosage, 13 (56.5%) due to inaccessibility, 5 (21.7%) due to less curability and 2 (8.7%) due to associated risk factors such as zoonotic disease and other infectious diseases that could easily transmitted.

Among the 37 informant who reported to use traditional remedies, 14 (37.8%) prefer dermal application (administration) and 23 (62.2%) prefer oral administration of remedies.

The knowledge of zoonotic disease among the informants of rural inhabitants was surveyed. From the total informant population, 42 (70%) have basic knowledge about zoonotic disease and 18 (30%) did not have the knowledge at all. Chomel et al. (2007) and Taylor et al. (2001) described that approximately 75% of emerging infectious diseases are caused by zoonoses. More than 800 human pathogens are zoonotic (Taylor et al., 2001; Woolhouse and Gowtage-Sequeria, 2005). Some of these pathogens may cause serious diseases in wild animals but, in some cases, the animals act as reservoirs, without
showing any clinical symptoms (Weiss 2001, Williams et al., 2002).

3 Conclusion and Recommendations

Traditional medicines are one of the alternative medicinal practices commonly used in developing countries. Like any other rural inhabitants of developing countries, Kore people have traditional medicinal practitioners who use wild animal species for remedial preparations. The animal species used for preparation of remedies are mammals, reptiles and birds. Mammals are with the highest frequency. One species (Thick-billed raven) is endemic to the country and the other species are least conservational concern. Almost all practitioners collect animals and their products from the wild. Their primary source is hunting which could have local effect on the distribution and abundance of wild animal species used for medicinal purposes. Specific conclusion might not be possible on the trends of medicinal species diversity, abundance and distribution in the study area in the absence of systematic ecological inventory prior to the present study.

Large numbers of ailments were identified (46 ailments) during the survey. Some of the symptom of ailments overlapped and given a common and general name. For example, stomach pain is given for both gastro and intestinal diseases.

The indigenous knowledge of the practitioners is dependent on sex and age of the informants. Males have more knowledge than female about medicinal animal species. The proximity of the area to Nechsar National park also created access to interact with diverse wild animal species.

Large proportions of urban inhabitants (government employees) in the study area use traditional medicine. This indicates that traditional medicine plays significant role in filling the modern health services gap in the area.

Based on the present study, the following recommendations are forwarded regarding traditional medicinal practices in the area:

- Some of the practitioners do not have knowledge about zoonotic disease and do not use any protective method. Practitioners should be organized in association and should be trained by concerned governmental and non governmental bodies.
- This study provides baseline data for chemists and pharmacists to undergo further and detailed study on the analysis of active ingredient and other pharmacological aspects.
- Comparative wild animal population abundance should be conducted at different geographic areas to see the local effect of the traditional medicinal practices.

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