Rabies and its Folk Drugs Remedies in Ethiopia: A Review

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Abstract: Rabies, the most fatal of all infectious diseases, remains a major public health problem and causes severe economic impact in many developing countries especially in Ethiopia regardless of the availability of effective vaccines for its treatment. It was assumed that 10,000 persons per annum died of rabies in Ethiopia in which most fatal cases reported in children under age of 14 years. Animal rabies highest occurrence was at cold season (June to September). Where rabies vaccines are physically inaccessible and economically unaffordable, folk drugs (traditional herbal medicine) were options for rabies treatment in different parts of Ethiopia. About twelve traditional antirabies plants in different ethnic groups of Ethiopia were reported by different investigators for the treatment of rabies in animals and humans. A few efficacy trials of these folk drugs were undertaken. Some health institute in Ethiopia assumed the usage of these antirabies folk drugs remedies associated with adverse fatal side effects and inability to cure rabies infected animals and humans.

Key words: Rabies • Folk Drugs • Seasonal Occurrence • Ethiopia

INTRODUCTION

Rabies is a fatal viral zoonosis disease which causes encephalitis in all warm-blooded animals and humans. There have been indications about the occurrence of rabies from the time of Homer (Eighth century/850 B.C.) onwards and it is originated about 3000 B.C. from the word ‘rabha’ meaning violence and has been known for more than 4300 years [1]. Though the first appearance of the disease was in the fourth century B.C., precise diagnosis was not possible before the first century B.C. [2, 3] Rabies occurrence in man and domestic animals is well known and the importance of wild animals in its spread has not uncommon. Though all mammals are believed susceptible to rabies infection, canids have been determined to be the main hosts of the rabies virus in Africa; in most cases they are also responsible for transmission of the virus to humans. In addition to canids, mongooses, raccoons, skunks and bats are involved in rabies epidemics [4].

In Ethiopia rabies is an important disease that has been recognized for many centuries. According to the Ethiopian Health and Nutrition Research Institute (EHNRI), rabies has been endemic in Ethiopia since the early 17th century. The first major outbreaks of rabies in Ethiopia in dogs in many parts of Ethiopia (Tigrie, Begemder, Gojjam and Wollo) in 1884. The first case of an epidemic of rabies was reported in August 1903 and had a high prevalence in Addis Ababa. According to Ethiopian Health and Nutrition Research Institute (EHNRI) rabies in Ethiopia is primarily a disease of domestic animals, particularly dogs; however, the involvement of other domestic animals like cats, cattle, sheep, goats and equines were reported. Moreover, the occurrence of rabies in wild animals was evidenced by laboratory confirmed rabies cases by direct fluorescent antibody test (FAT) in hyenas, jackals, foxes, mongoose, monkeys, rabbits, leopards, Servical cat and cheetah at Pasteur Institute of Ethiopia [5].

Rabies infection in humans is still a major public health problem all over the world. By 1995, WHO estimated about 70,000 deaths of humans by rabies per year worldwide. Rabies kills an estimated 55,000 per year, mostly in Africa and Asia [6, 7]. Though there are significant numbers of rabies-related deaths in many developing countries, the economic impact of rabies is probably far greater than overt human mortality. Global economic cost of rabies is estimated to be more than $583 million which didn’t include the trauma that deaths from rabies inflict on families and communities. One must consider multiple facets of the impact of rabies when estimating the burden imposed on society.
Costs are incurred from the moment a suspect rabid animal is observed and include: (i) the response of local health authorities for restraint, sedation, euthanasia or quarantine of the animal; (ii) the collection of diagnostic specimens; (iii) the shipment and laboratory processing of tissues; (iv) the follow-up investigations; (v) the direct costs of post-exposure prophylaxis for exposed individuals and associated adverse effects; (vi) the patient’s time off work; (vii) associated human pain and extreme mental distress; (viii) the need for related public education; (ix) the loss of the animal resource itself and (x) the response of animal-control officials for population management [8, 9]. Although rabies can be well controlled among domesticated animals by different types of useful and widely available vaccines, canine rabies continued to be a serious problem in Africa, including Ethiopia.

Traditional medicine (TM) include folk drugs composed of herbs, herbal materials, herbal preparations and finished herbal products (Contain as active ingredients of plant parts, or other plant materials) [10]. Most developing countries, especially those in Asia, Africa, Latin America and the Middle East, 70%-95% of their population rely on traditional medicines for treatment of different diseases [11]. Herbal medicines include the medicinal products of plant roots, leaves, barks, seeds, berries or flowers that can be used to promote health and treat diseases in humans and animals [12]. The beneficial medicinal effects of folk drugs typically result from the combinations of secondary products present in the plant which used as sources of medicines throughout history and continued to serve as the basis for many pharmaceuticals used today [13]. However, their potential as the source of drugs is still unexplored [14].

In Ethiopia TM have been using since time immemorial, with 90% of population dependent on TMs for the management diseases in both humans and animals [11]. The wide spread use of traditional medicine among both urban and rural population of Ethiopia could be attributed to cultural acceptability, physical accessibility and economic affordability as compared to modern medicine. Various traditional antirabies folk drugs were reported in different indigenous people and parts of Ethiopia which were used for the treatment of rabies in both humans and animal. Therefore, the aim of the paper is to review the situation of rabies in Ethiopia and common folk drugs remedies against rabies in both humans and animals.

Prevalence and Seasonal Occurrence of Rabies in Ethiopia: In Ethiopia the number of dog to human ratio is approximately assumed to be 1:6 and 1:8 in urban and rural areas, respectively. The total population of dogs in Addis Ababa is estimated between 150,000 and 200,000, of which 50% are stray dogs [5]. Thus, an increasing number of stray dogs in Ethiopia and the absence of legislation to determine and certify the status of vaccinated and non-vaccinated dogs create difficulty to control the disease. Moreover, lack of utilization of modern antirabies vaccines, low level of public awareness, lack of nationwide animal rabies surveillance and poor attention and resource allocation by government are major important problems that hinder the control of rabies in Ethiopia [15].

Although it is presumed that rabies is very much widespread throughout Ethiopia, the actual figure of the incidence of the disease is not well known throughout the country. In 1998 Ethiopia reported the highest number of human rabies deaths [16] in Africa and in 2012 it was assumed that approximately 10,000 persons/annum die of rabies which makes one of the highest rabies deaths in Africa [17]. A retrospective study of number of fatal human rabies cases studied in Addis Ababa and its surrounding from 2001-2009 were 386 with an annual range of 35 to 58 persons dying. Most fatal cases reported are children under 14 age groups [18]. Another retrospective study of rabies in Addis Ababa from 1990-2000 indicated that an average of 2,200 people per year received post-exposure antirabies treatment while 95% of the reported fatal human rabies cases was due to dog bites [19]. According to EHNRI laboratory data from 1990-2010, out of 6,739 animal brain tissue samples examined by direct FAT, 4,939 (73.4%) were positive for rabies virus of which dogs represent 91.1% with the incidence rate of 89% and the remaining percent accounted by other domestic animals (Cats, cattle, sheep, goats and equines) and wild animals. Similarly, 97.3% of human rabies were due to dog bites and the remaining 0.2% and 2.5% were contributed by other domestic animals rather than dogs and wild animals, respectively [5].

These statistics are indicative that rabies, which is maintained and disseminated mostly by dogs, is a threat to public health in Ethiopia. According to EHNRI, annual number of brain tissue samples examined between 1990 and 2010 ranges from 89 to 1,298 of which rabies positive samples ranged from 50.8% to 85.3%. Based on the above data, the highest number of rabies cases was reported in
cold season (June to September) though animal rabies occurred through out the year (Figure 1). Although animal rabies through out the year in Ethiopia, the highest seasonal occurrence was recorded at cold season. This is most probably due to mass gathering and highest reproduction of dogs during the period which increases the contact between rabid and health dogs.

Antirabies vaccine (Fermi-type nervous tissue vaccine) distribution strategies, public educational campaigns and stray dog population control programmes through culling have not been successful in reducing cases of rabies in Ethiopia. In addition, the Homeless Animals Protection Society proposed to implement the Animal Birth Control (ABC) programme, which is more humane dog population control strategy because dogs are not killed unnecessarily, but instead the Trap Neuter Release Method is used and it has had highly successful results in the USA and India. The ABC programme was tried in Addis Community as Animals Pilot Project. However, the program was discontinued owning to the expensive cost associated with the implementation of the programme. At present, some on-going efforts of rabies survey are put in place at the national level by EHNRI and fragmented rabies prevention and control by distributing Fermi-type nervous tissue vaccine to few health centres are also practiced. Although the usage of nervous tissue vaccine was recommended to be discontinued by WHO starting from 1984, it was produced and still used in Ethiopia for treatment of rabies owing to the expensive cost of modern cell vaccines than Fermi-type NTV produced at EHNRI. Ethiopian cell culture vaccine named as ‘ETHIORAB’ has been produced by EHNRI and is of its clinical trial phase in dogs [5].

Folk Drugs Remedies Against Rabies in Ethiopia:
According to Parkhurst [20] the Ethiopians employed a wide variety of traditional treatment in addition to folk drugs in cases of bites by dogs believed to be rabitic. Though attention was primarily centred on human patients, dogs and other domestic animals were also treated. Previously cures were assumed based on the purgative action of administered materials through gastro intestinal tract. Several authors have reported the use of different traditional herbal medicines (Folk drugs) for the treatment of rabies in animals and humans by indigenous traditional healers of Ethiopia. These plant parts used by traditional healers and their preparation in different ethnic groups of the country were summarized in Table 1. The effectiveness and safety of these traditionally used antirabies folk drugs in the country was not well demonstrated and understood.

Though there is a lack of published evidences on overall problems posed by these traditionally used antirabies folk drugs remedies, adverse fatal side effects and cases of rabies deaths after traditionally treated were the most problems reported by some health centres/institutes in Ethiopia including Ethiopian Health Research Institute (EHNRI) owing to the non-standardization of constituents, quality and efficacy of these traditionally used antirabies herbal remedies. On the other hand, people and traditional rabies healers in Ethiopia claim that these traditional plants can cure both animals and humans that are exposed to rabies. Moreover, a new plant-derived antirabies compound investigation is of paramount importance not only in combating rabies in humans and animals but also helps in the progress of biomedical research.
Table 1: Folk drugs used for treatment of rabies in different parts of Ethiopia.

<table>
<thead>
<tr>
<th>Scientific name (Local name)</th>
<th>Part and its preparation</th>
<th>Author(s)</th>
<th>Place or ethnic group used in Ethiopia</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Cucumis ficifolius</em> (Yemidir Embuay/Est Melecot)</td>
<td>Powder of roots eaten with ‘Teff kita’</td>
<td>Teklehaymanot and Giday [23]</td>
<td>Zegie Peninsula</td>
</tr>
<tr>
<td><em>Datura stramonium</em> (Banjii)</td>
<td>Crushed and homogenized leaves drunk with water</td>
<td>Wondimus et al. [24]</td>
<td>Around ‘Dheeraa’ town (Arsi Zone)</td>
</tr>
<tr>
<td><em>Dorstenia barnimiana</em> (Work Bemeda)</td>
<td>Powder of roots taken with skimmed milk or noug orally in the morning for seven days</td>
<td>Teklehaymanot and Giday [23]</td>
<td>Zegie Peninsula</td>
</tr>
<tr>
<td><em>Dracaena steudneri</em> (Atsu)</td>
<td>Leaves taken orally</td>
<td>Giday et al. [25]</td>
<td>Sheko ethnic group</td>
</tr>
<tr>
<td><em>Euphorbia abyssinica</em> (Qulqwal, kuda)</td>
<td>Powder of roots or leaves mixed with water and taken orally</td>
<td>Wondimu and Mesraunente [26] and Giday et al. [25]</td>
<td>Bahir Dar Zuria district; Sheko ethnic group</td>
</tr>
<tr>
<td><em>Gnidia glauca</em> (Beto)</td>
<td>Powder of roots mixed with skimmed milk and taken orally for seven days</td>
<td>Teklehaymanot and Giday [23]</td>
<td>Zegie Peninsula</td>
</tr>
<tr>
<td><em>Justica schimperiana</em> (Dhumuugaa)</td>
<td>Roots and leaves are pounded together and mixed with water and taken orally</td>
<td>Amenu [27]</td>
<td>Ejaji area (West Shoa)</td>
</tr>
<tr>
<td><em>Phytolacca dodecandra</em> (Endod, Shibit, Haranje, Handode)</td>
<td>Powder of roots or leaves mixed with water or domestic alcohol given orally to humans and animals</td>
<td>Teklehaymanot and Giday [23], Giday et al. [25, 28, 29], Yirga [30], Amenu [27] and Admasu et al. [21]</td>
<td>Zegie Peninsula; Bench; Meinit and Shko ethnic groups; Central Zone of Tigray; Ejaji area, Chelya Woreda (West Shoa), Oromia</td>
</tr>
<tr>
<td><em>Salix subserrata</em> (Alelu)</td>
<td>Leaves from the tree given orally</td>
<td>Deressa et al. [22]</td>
<td>Bereh-Alelu Woreda</td>
</tr>
<tr>
<td><em>Silene macrosele</em> (Wegert)</td>
<td>Roots from herbs given orally</td>
<td>Deressa et al. [22]</td>
<td>Bereh-Alelu Woreda, Oromia</td>
</tr>
<tr>
<td><em>Vigna membrancea</em> (Hidda hantuta)</td>
<td>Dried powder of roots backed with ‘Teff’ given to cattle orally</td>
<td>Amenu [27]</td>
<td>Ejaji area (West Shoa), Oromia</td>
</tr>
<tr>
<td><em>Zehneria scabra</em> (Korisinbira)</td>
<td>Pounded roots taken orally</td>
<td>Amenu [27]</td>
<td>Ejaji area (West Shoa), Oromia</td>
</tr>
</tbody>
</table>

The efficacy of some of these ethno-medicinal and ethno-veterinary plants against rabies where evaluated with modern pharmaceutical practices by few researchers in the country. Admasu et al. [21] evaluated the efficacy of antirabies activities of hydroethanolic extract of roots and leaves of *P. dodecandra* in mice in which the leaves of this plant showed some antirabies effect at higher dose rate. In addition, Deressa et al. [22] evaluated the efficacy of antirabies activities of crude extracts of *Salix subserrata* and *Silene macrosele* plants in mice which improved the survival rates of experimental mice compared to control group infected with rabies virus.

**CONCLUSIONS**

In Ethiopia, rabies is an important disease that has been recognized for many centuries. Lack of utilization of modern antirabies vaccines, low level of public awareness, lack of nationwide animal rabies surveillance and poor attention and resource allocation by government are major important problems that hinder the control of rabies in Ethiopia. The highest number of rabies cases was reported in cold season (June to September) in Ethiopia. The treatments recommended for people bitten by rabid animals mainly dogs was traditional remedies of which folk drugs rabies treatment was the most widely practiced in different parts of Ethiopia. The folk drugs include: *Cucumis ficifolius*, *Datura stramonium*, *Dorstenia barnimiana*, *Dracaena steudneri*, *Euphorbia abyssinica*, *Gnidia glauca*, *Justica Schimperiana*, *Phytolacca dodecandra*, *Salix subserrata*, *Silene macrosele* and *Vigna membrancea* and *Zehneria scabra*. Of these folk drugs, only three (*Salix subserrata*, *Silene macrosele* and *Phytolacca dodecandra*) were evaluated in vivo to see their efficacy against rabies virus. The remaining plants should have to be evaluated in similar manner. Finally, evaluation of antirabies activities of combinations of these all folk drugs by modern pharmacological practice may come up with magic bullet for rabies virus in Ethiopia.

**REFERENCES**


