Review on Rabies Prevention and Control in Human and Animals in Ethiopia

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Summary: Rabies in Ethiopia is primarily a disease of dogs. However, many people receive post exposure anti-rabies treatment annually all over the country. Most people are at increased risk of being exposed to rabies, as man-dog contact is very common in the country. It is a fatal viral disease of all warm-blooded animals and humans. It gets infection via bites from infected animals. It is highly fatal with continuous increase of case in the world mostly developing country. Rabies continues to pose a severe burden to public health and is ranked one of the most fatal diseases. This is why I need to review about rabies virus disease in humans and animals. The virus is widespread in many regions of the world. Human rabies, transmitted by dogs is an important public health issue in Ethiopia. To-date, effective rabies control program still remains to be a reality and needs to be strengthened.
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1. Introduction

Rabies, a viral disease that affects all warm-blooded animals, is widespread in many regions of the world. Human rabies, transmitted by dogs is an important public health issue in Ethiopia. To-date, effective rabies control program still remains to be a reality and needs to be strengthened (1).

Rabies is an acute viral encephalomyelitis caused by Rhabdoviridae that principally affects carnivores and insectivorous bats, although it can affect any mammal. It is almost invariably fatal once clinical signs appear. Rabies occurs throughout the world. It is endemic to Ethiopia (2).

Approximately 10,000 people die of rabies annually in Ethiopia that makes the country one of the worst affected countries highest in the world. To that effect the Recorded fatal human rabies cases are considered as an underestimate of the actual problem (3).

Rabies is a viral infection transmitted in the saliva of infected mammals. The virus enters the Central nervous system of the host, causing an encephalomyelitis that is almost always fatal. Although all species of mammals are susceptible to rabies virus infection, only a few species are important as reservoirs for the disease in nature. In the United States, several distinct rabies virus variants have been identified in terrestrial mammals, including major terrestrial reservoirs in raccoons, skunks, foxes, and coyotes. In addition to the terrestrial reservoirs for rabies, several species of insectivorous bats also serve as reservoirs for the disease (4).

Rabies is a neurological disease of mammals that is almost invariably fatal once the clinical signs develop. Humans are usually infected when they are bitten by an infected animal, or exposed to its saliva or central nervous system (CNS) tissues. Although rabies is generally well controlled among domesticated animals in developed nations, canine rabies continues to be a serious problem in some areas of Africa, the Middle East, Asia and Latin America. Wildlife reservoirs have become increasingly important where canine rabies is under control. Rabies can be effectively treated if the exposure is recognized before the symptoms develop. However, people in impoverished countries do not always have access to post-exposure prophylaxis, and even in nations with good medical care, cases occur occasionally in people who do not realize they were exposed (5).

The increasing importance of canine rabies worldwide necessitates the adaptation of effective control measures to the existing epidemiological conditions in developing countries. Of Canine rabies ‘are several, Factors of influence to the epidemiology such as the prevalent virus reservoir, the degree of adaptation of rabies virus to dogs and related canines, the natural virus spread, the. Degree of virus excretion, the existence of asymptomatic carriers, the structure and dynamics of the dog population as well as the correlation of human and canine rabies (6).

Rabies was first reported in Ethiopia (Addis Ababa) in 1903 and currently human rabies is an immediately reportable disease with case definition. The surveillance data compiled since 2007 indicates that 15,178 exposure cases (3.4 /100,000 populations), 272 fatal cases with more than 88% of the exposure cases were due to dog bites. Among the exposed people 59.2% of the cases are males while 40.8% females. Out of the total exposure 98.9% (15,008) of exposure cases and 97.1% (264) of fatal cases were

from Addis Ababa, Oromia, Amhara, SNNPR, Tigray regions. The surveillance data also indicated that the national data indicates an exposure of 2.6/100,000 people. The highest incidence is registered from Tigray (11.4/100,000), followed by Oromia (3.5/100,000), Benshangul (3.3/100,000), Amhara (1.5/100,000), SNNPR (1.2/100,000) and Addis Ababa (0.8/100,000) (7).

In Ethiopia many people receive anti rabies post exposure treatments annually due to the wide Spread nature of dog rabies. There is, however, lack of sufficient information to scale the magnitude of rabies among domestic animals and also humans in the country (8).

2. Etiology

Rabies is associated with the rabies virus of the genus lyssa virus of the family rahabidoviridae (9). The genus is composed of seven genotypes. It was recognized long ago that the strain of virus known as the street rabies virus differed in the some way 'fixed' strains which had been cultivated for vaccine production (grown in cell culture or passaged through serial generations of laboratory animals). it is now known that there are several strains of rabies virus, which are adapted to particular host species but remain infective for any warm blooded mammals (10). Seven distinct genetic lineages can be distinguished within the genus *Lyssavirus* by cross protection tests and molecular biological analysis namely the classical rabies virus itself (RABV, genotype 1, serotype 1), Lagos bat virus (LBV, genotype 2, serotype 2), Mokola virus (MOKV, genotype 3, serotype 3), and Duvenhage virus (DUVV, genotype 4, serotype 4). The European bat lyssaviruses (EBLV), subdivided into two biotypes (EBLV1, genotype 5 and EBLV2, genotype 6) and the Australian bat lyssavirus (ABLV, genotype 7), isolated in Australia (11).

3. Epidemiology

Rabies occurs in all warm blooded animals (12). The disease occurs in cattle, sheep, pigs, and horses in most countries, except the insular countries that exclude it by rigid quarantine measures or prohibition of the entry of dogs. Rabies occurs in most countries in the African continent, but the reported incidence is surprisingly low for an area with such a high population of wild carnivores. The incidence of rabies and the range of species involved are increasing in Africa, and a number of wild life hosts has been identified, including wild dogs, jackals and mongoose. Because of dislocation of civilian life, rabies in Zimbabwe has increased in prevalence and geographical distribution in recent years. Rabies is now a very serious zoonotic disease in south Darfur, Sudan (13). Over a 4-year period, of all the domestic animal rabies cases reported, cattle accounted for one half of the rabies cases in South Africa domestic animals. The mongoose accounted for 70% of the wild animals cases reported (14). Widespread distribution of the rabies virus occurs when the young mongooses are evicted from the parents' territory during the winter months, forcing them to scattered over a wide area. This increases the probability of domestic animals coming in contact with rabid animals (15).

In Ethiopia the Distribution of Rabies case in different animal species was showed 67%, 11% and 10%, for Dogs, Cats and Cattles, respectively. It was also observed that different challenges on vaccination and management of dog were due to lack of fund, low level of awareness on rabies, lack of legal frame work, and poor dog management almost at all regions (7).

Cats are the second most important sources of rabies for human next to dogs in Ethiopia. The Occurrence of rabies in wild animals was evidenced by the presence of laboratory confirmed rabies cases in hyenas, jackals, mongoose, cerval cat and cheetah. Although other domestic animals like cattle, sheep, goats and equines are involved, in all these species there was invariably a history of the animals having been previously bitten by a rabid dog. Hence, the occurrence of rabies in other domestic and wild animals could be due to spillovers of infection from canine rabies (16).

Epidemiological cycles

Rabies is maintained in two epidemiological cycles, one urban and one sylvatic. In the urban rabies cycle, dogs are the main reservoir host. This cycle predominates in areas of Africa, Asia, and Central and South America where the proportion of unvaccinated and semi-owned or stray dogs is high. It has been virtually eliminated in North America and Europe; although sporadic cases occur in dogs infected by wild animals, the urban cycle is not perpetuated in the canine population. The sylvatic (or wildlife) cycle is the predominant cycle in Europe and North America. It is also present simultaneously with the urban cycle in some parts of the world. The epidemiology of this cycle is complex; factors affecting it include the virus strain, the behavior of the host species, ecology and environmental factors. In any ecosystem, often one and occasionally up to 3 wildlife species are responsible for perpetuating a particular strain of rabies. The disease pattern in wildlife can either be relatively stable, or occur as a slow moving epidemic. Recent examples of epidemics include a fox rabies epidemic that moved slowly west in Europe, and a raccoon rabies epidemic that moved north along the east coast of the U.S. and into Canada (5). In Ethiopia domestic dogs are the principal reservoir of rabies (8).

4. Method Of Transmissions

The source of infection is always an infected animal, and the method of spread is almost always by the bite of an infected animal, though contamination of

skin wounds by fresh saliva may result in infection not all bites from rabid animals result in infection because the virus is not always present in the saliva and may not gain entrance to the wound if the saliva is wiped from the teeth by clothing or the coat of the animal (15).

No cat-to-cat transmission of rabies has been recorded. Transmission is almost always by introduction of virus-laden saliva into the tissues, usually by the bite of a rabid animal. Contact with fresh wound or even intact mucous membrane may also transmit the disease. Virus may be present in the saliva and transmitted by an infected animal several days before onset of clinical signs (usually 3-5 days in domestic dogs and cats) (2).

The rabies virus is readily transmitted between mammals, whether they are the same or different species. This virus is usually spread in the saliva, when an infected animal bites another. Less often, an animal or person is infected by contact with infectious saliva or neurological tissues, through mucous membranes or breaks in the skin. The rabies virus is not transmitted through intact skin. There are also rare reports of transmission by other routes. A few cases have been reported after transplantation of organs, particularly corneas but also pancreas, kidneys and liver. Aerosol transmission has been documented in special circumstances, such as in laboratories and bat caves with an unusually high density of aerosolized, viable virus particles. Rabies viruses have been transmitted by ingestion in experimentally infected animals, and there is anecdotal evidence of transmission in milk to a lamb and a human infant. (More conventional routes of spread could not be ruled out in the latter case.) There is some speculation that ingestion could play a role in rabies transmission among wild animals. One epizootic among kudu may have spread between animals when they fed on thorn trees. There are no records of human disease acquired by this route. Nevertheless, in 2 incidents investigated by the U.S. Centers for Disease Control and Prevention (CDC), people who drank unpasteurized milk from rabid cows were given post-exposure prophylaxis. Pasteurized milk and cooked meat are not expected to pose a risk of infection, as the rabies virus is inactivated by heat; however, as a precaution, the National Association of State Public Health Veterinarians recommends against consuming tissues and milk from rabid animals (17).

5. Pathogenesis

Following the deep introduction of rabies virus by the bite of a rabid animal, initial virus multiplication occurs in striated muscle cells at the site. The neuromuscular spindles then provide an important site of virus entry into the nervous system. Entry into the nervous system may also occur at motor end plates. In the olfactory end organ in the nares, neuroepithelial cells are in direct contact with the body surface and these cells extend without interruption into the olfactory bulb of the brain. Following entry of the virus into nerve findings, there is invasion of the brain by passive movement of the virus within axons, first into the spinal cord then into the brain (15).

Immediately after infection, the rabies virus enters an eclipse phase during which it is not easily detected. During this phase, it replicates in non-nervous tissue such as muscle. It does not usually stimulate an immune response at this time, but it is susceptible to neutralization if antibodies are present. After several days or months, the virus enters the peripheral nerves and is transported to the central nervous system by retrograde flow in the axons. After dissemination within the CNS, where clinical signs develop as the neurons are infected, the virus is distributed to highly innervated tissues via the peripheral nerves. Most of the virus is found in nervous tissue, salivary glands, saliva and cerebrospinal fluid (CSF), which should all be handled with extreme caution.

Some virus has also been detected in other tissues and organs, including the lungs, adrenal glands, kidneys, bladder, heart, ovaries, testes, prostate, pancreas, intestinal tract, cornea, germinal cells of hair follicles in the skin, sebaceous glands, tongue papillae and the brown fat of bats. The rabies virus is contained within the neurons, and handling most body fluids or intact organs is thought to carry a low risk of infection. However, a puncture could theoretically pierce a neuron, and health care personnel are given post-exposure prophylaxis after a needle stick or other puncture wound received while caring for a rabies patient. Organ transplants also pose a (rare) risk, if the donor is not known to have been infected with rabies. Blood, urine and feces are not thought to be infectious; however, a few studies have suggested that viremia might occur at some point during the infection. A recent study in mice, using a polymerase chain reaction (PCR) assay, found viral RNA in mice when they were clinically ill, but not during the asymptomatic stage when virus was migrating to the CNS (5).

The rabies virus is released in the saliva of an infected animal. The animal usually contracts rabies from the bite of an infected animal. The virus may also enter the body if the mucous membranes (the wet part of the eyes, nose, or mouth) or a scratch or break in the skin have contact with saliva containing the rabies virus. Once the rabies virus enters the body, it begins to multiply in the area near the entry site. If the infection is not stopped at this point, the virus will eventually invade the nerve cells in the area. Once the virus is in nerve tissue, it travels along the nerve to the

center of multiplication (the brain). The virus may then spread to the salivary glands Or other parts of the body.

6. Disinfection

The rabies virus can be inactivated by lipid solvents (soap solutions, ether, chloroform, and acetone), 1% sodium hypochlorite, 2% glutaraldehyde, 45-75% ethanol, iodine preparations, quaternary ammonium compounds, formaldehyde or a low pH. This virus is also susceptible to ultraviolet radiation or heat of 1 hour at 50°C. It is rapidly inactivated in sunlight, and it does not survive for long periods in the environment except in a cool dark area (5).

7. Infections In Humans

Incubation Period

In humans, the incubation period of rabies is highly variable, ranging from days to years, with an average of 2±3 months, being influenced by: location, extent and depth of the wound; distance between the location of the wound and the central nervous system; concentration of inoculated virus particles and virus strain. The incubation period in children tends to be of shorter duration than adults (18).

Clinical Signs

Early symptoms include irritability, headache, fever and sometimes itching or pain at the site of exposure. Early symptoms are rarely diagnostic. The disease eventually progresses to paralysis, spasms of the throat muscles, convulsions, delirium and death. Some people develop a brief period of redness and pain at the injection site and other may have fever, headaches, or nausea. After exposure to rabies there is no contraindication to its use. Early symptoms of rabies are non-specific, but often include pain or parenthesis at the inoculation site. The disease progresses to an acute neurologic phase characterized by delirium, convulsions, muscle weakness, and paralysis. Spasms of the swallowing muscles can lead to a fear of water (hydrophobia), and may be precipitated by blowing on the patient's face (aerophobia). *Not all persons exposed to rabies virus develop disease,* but if symptoms do occur, rabies is almost invariably fatal -- usually within 10 days (19).

Communicability

Human saliva contains the rabies virus; person-to-person transmission is theoretically possible but rare. Activities that could pose a risk for exposure include bites, kisses or other direct contact between saliva and mucous membranes or broken skin, sexual activity, and sharing eating or drinking utensils or cigarettes. It is not known how long humans can shed the virus before becoming symptomatic; the CDC recommends post-exposure prophylaxis for anyone who had at-risk contact with a person during the 14 days before the onset of clinical signs. The CDC also recommends prophylactic treatment after a needle stick or other sharp object injury during an autopsy or during patient care, due to the possibility that the object could have passed through nervous tissue. Feces, blood, urine and other body fluids are not thought to carry the virus. A few cases of transmission have been reported in corneal transplants or transplanted internal organs (5).

Diagnostic Tests

Rapid and accurate laboratory diagnosis of rabies in humans and other animals is essential for timely administration of post-exposure prophylaxis. If the animal is not rabid, prompt diagnosis may save a patient from unnecessary physical and psychological trauma, as well as financial burden (20).

In Ethiopia currently there exists only one referral laboratory (EHNRI) for rabies diagnosis service, which is based on animal clinical observation under quarantine period & laboratory confirmation. The facility has got a post-mortem and incinerator. The laboratory confirmation is done using Fluorescent Antibody test (FAT), and Mouse Inoculation Test (MIT). Furthermore, the Institute has introduced Direct Immunohistochemistry Test (dRIT) that detects antigen. There is no established diagnosis on human rabies at the EHNRI except clinical observation and Pre Exposure Prophylaxis (PEP) (7).

Treatment

In Ethiopia people have clear understanding on the danger of the disease but believe to cure with different traditional and religious treatment rather than seeking effective post exposure prophylaxis. Most people use wide variety of traditional treatment in cases of bite by animals (mostly dogs) believed to be rabid. The significance of the disease is evident from the continued existence of traditional specialists in rabies treatment within the community. Pre exposure vaccination is indicated for persons whose occupation, travel, or recreational activities place them at higher risk of exposure to rabies. Occupational groups include veterinarians, veterinary technicians, animal control officers, bat researchers, wildlife workers, and animal disease laboratory workers. International travelers are recommended to receive pre-exposure vaccination if they are likely to come in contact with animals in countries where canine or other animal rabies is prevalent, and immediate access to appropriate medical care, including rabies vaccine and immune globulin, might be limited (19).

According to the WHO standard, animal bite victims were supposed to be vaccinated 0.5 c.c. on days zero, seven, twenty eight or twenty one (0, 7, 28 or 21) as pre-exposure prophylaxis, where as rabid animal and human contact and/or bite victim individuals took the full course of treatment on days zero, three, seven, fourteen and twenty eight (0, 3,7,14 and 28) as post exposure prophylaxis. In cases of

Fermi type anti-rabies vaccine produced at EHNRI a dose of 5 c.c. subcutaneous injections around the umbilicus for fourteen consecutive days and a booster dose of 5 c.c. within ten days interval was used as a prescription (1).

Prevention

Domesticated animals (especially dogs, cats and ferrets) should be vaccinated to prevent them from becoming infected and transmitting rabies to humans. Stray animals should also be controlled. Dogs, in particular, act as reservoirs for a canine variant of the rabies virus. Cats are readily infected by rabies, but a cat- specific variant does not occur in feline populations. Wild animals should not be handled or fed; wildlife behaving abnormally should particularly be avoided. Bats should be kept out of houses and public buildings. In some areas, wild animals are vaccinated orally, using baits. Veterinarians and animal control officers should handle potentially rabid animals with extreme caution. Protective clothing such as thick rubber gloves, eye goggles and a plastic or rubber apron should be worn when doing autopsies or in other circumstances when exposure to infectious tissues could occur (5).

Morbidity and Mortality

In 1998, more than 33,000 people died worldwide because of rabies (21). Ethiopia's current population is estimated at 1,100 million and above. The fatal human cases in 2001-2009 were 386 humans with annual range of 35 to 58 percent and different animals with different ratio also exposed, in the ten years a minimum of 6,263 and a maximum of 21, 832 doses of the human rabies vaccine were produced and distributed every year (22).

According to the retrospective study of rabies in Ethiopia from 1990-2000 were 322 human fatal rabies cases recorded and 95% of these were acquired from dogs (8).

The last five years data record from 1999 to 2004 E.C. showed that High percentage of Human Rabies Death in Amhara (33.6%) and Oromia (25.6%) as well as High Human Anti-Rabies vaccination was covered by Amhara region, i.e. 57%, followed by Oromia, SNNP and Tigray Regions i.e. 23%,14%, and 4%, respectively (7).

8. Infections In Animals

Species Affected

All mammals are susceptible to rabies. There are many strains of the rabies virus; each strain is maintained in particular reservoir host (s). Important maintenance hosts include members of the Canidae (dogs, jackals, coyotes, wolves, foxes and raccoon dogs), Mustelidae (skunks, martens, weasels and stoats), Viverridae (mongooses and meerkats), and Procyonidae (raccoons), and the order Chiroptera (bats). Cat-adapted rabies variants have not been seen, although cats are often infected with rabies viruses from other hosts, and they can readily transmit the virus (5).

Although all species of mammals are susceptible to rabies virus infection, only a few species are important as reservoirs for the disease in nature. In the United States, several distinct rabies virus variants have been identified in terrestrial mammals, including major terrestrial reservoirs in raccoons, skunks, foxes, and coyotes. In addition to the terrestrial reservoirs for rabies, several species of insectivorous bats also serve as reservoirs for the disease (4).

Occurs in all farm animals worldwide except Australia and New Zealand. Major zoonoses transmitted by bites of infected animal. Many different wildlife are vectors depending on geographic location; vampire-bats in South America, foxes in Europe and North America, skunks in North America, mongoose in Africa, raccoon in the United States recently (15).

Figure: Distribution of Major Terrestrial Reservoirs of Rabies
Source:http://www.cdc.gov/rabies/exposure/animals/wildlife_reservoirs.html (23).

Incubation Period

The incubation period of rabies in dogs can vary from 10 days up to several months. The majority of dog cases occur within 21 to 80 days after exposure. For quarantine purposes an important observation is that, in the past, dogs have succumbed to rabies even after a 6 month observation period (6).

Among farm animals, cattle are most commonly affected. The incubation period in naturally occurring cases is about 3 weeks, but varies from 2 weeks to several months in most species, although incubation periods of 5 and 6 months have been observed in cattle and dogs. In one large -scale outbreak in sheep, deaths occurred 17-111 days after exposure (15).

Clinical Signs

The clinical manifestations are commonly classified as furious and dumb rabies,, though most infected dogs show symptoms common to both types such as a short period of sudden excitability followed rapidly by depression and paralysis. During the prodromal stage dogs show a change in their disposition and become either increasingly alert or apathetic. Fever, dilatation of the pupils, and an increasing muscle tonus may be noticed. The excitement stage is characterized by an unusual restlessness, a watchful apprehensive look, snapping. At invisible objects, aimless running, and unprovoked aggressiveness of unexpected strength. Difficulties in swallowing and a characteristic change in the bark or growl are early signs of the subsequent paralytic stage. In the paralytic stage the dog is unable to take food or swallow water. Paralysis of jaw and tongue, drooling of saliva and paralysis of the hind quarters becomes obvious and death occurs within 3-7 days after the initial ‘symptoms (6).

Communicability

All species can transmit the virus to humans and other animals, but the efficiency of transmission varies with the host species and the form of rabies. Animals with the furious form of rabies are more likely to disseminate rabies than animals with the paralytic form. Carnivores are also more efficient vectors, in general, than herbivores. Herbivore-to-herbivore transmission is uncommon. Insectivorous bats have been implicated in most recent human cases in the U.S. Virus shedding occurs in 50-90% of animals, depending on the host species and the infecting strain; the amount of virus found in the saliva varies from a trace to high titers. Shedding can begin before the onset of clinical signs. Cats excrete virus for 1 to 5 days before the signs appear, cattle for 1 to 2 days, skunks for up to 14 days and bats for 2 weeks. Virus shedding in dogs is usually said to be limited to the 1 to 5 days before the onset of clinical signs; however, in some experimental studies (using viruses of Mexican or Ethiopian origin), the virus was present in the saliva for up to 13 days before the first clinical signs. Asymptomatic carriers are thought to be very rare among domesticated animals. Possible cases have been reported among dogs in Ethiopia and India, including one experimentally infected dog that recovered from clinical rabies and carried the virus in her saliva and tonsils, but not the brain or other organs (5).

Post-Mortem Lesions

No gross post-mortem lesions can be considered pathognomonic in domestic or wild animals. The typical histological signs, found in the central nervous system, are multifocal, mild, polioencephalo-myelitis and craniospinal ganglionitis with mononuclear perivascular infiltrates, diffuse glial proliferation, regressive changes in neuronal cells and glial nodules. Negri bodies Can be seen in some but not all cases (24).

Diagnostic Tests

In animals, the rabies virus is usually identified by immunofluorescence in a brain sample taken at necropsy. The virus might also be found in other tissues such as the salivary gland, skin (tactile facial hair follicles) and corneal impression smears, but detection is less efficient. Immunofluorescence can identify 98-100% of cases caused by all genotypes of the rabies and rabies-related viruses, and is most effective on fresh samples. Other tests to detect the virus include immunohistochemistry and enzyme-linked immunosorbent assays (ELISAs). RT-PCR is also useful, particularly when the sample is small (e.g., saliva) or when large numbers of samples must be tested in an outbreak or epidemiological survey. Histology to detect aggregates of viral material in neurons (Negri bodies) is nonspecific, and it is not recommended if more specific techniques are available. Serology is occasionally used to test seroconversion in domesticated animals before international travel or in wildlife vaccination campaigns. It is rarely useful for the diagnosis of clinical cases, as the host usually dies before developing antibodies. Serological tests include virus neutralization tests and ELISAs. There is some cross-reactivity between the rabies virus and rabies-related viruses (5).

The evaluation of two rapid diagnostic tests for rabies diagnosis under field and laboratory conditions in Nigeria study that one hundred samples each of saliva and brains were collected before and after slaughter from apparently healthy dogs brought for slaughter. Saliva was subjected to rapid immune chromatographic test (RICT) while the brain tissues

were subjected Direct Fluorescent Antibody Test (DFAT) and direct Rapid Immunohistochemistry Test (dRIT). Five (5%) tested positive for rabies antigen with the use of the three tests. This study therefore recommends the use of RICT and dRIT for rabies virus screening under field and laboratory conditions (20).

Treatment

No treatment should be attempted after clinical signs are evident. If the bite is seen, immediately after exposure, irrigation of the wound with 20% soft soap solution or a solution of Zephiran may prevent the establishment of the infection. Immediate and thorough washing of all bite wounds and scratches with soap and water is perhaps the most effective measure for preventing rabies in veterinarians bitten by rabid animals (15).

Prevention

Rabies can be prevented in domesticated animals by vaccination and by the avoidance of contact with rabid wild animals. Rabies vaccines are available for dogs, cats, ferrets, cattle, sheep and horses. Both inactivated and modified live vaccines are effective, but rare cases of post-vaccinal rabies have been reported with the modified live vaccines in dogs and cats. Vaccines have not been validated in rabbits or rodents, although they might be used extralabel in petting zoos or other facilities where animals are in contact with many people. Wild animals can be immunized with oral vaccines distributed in bait. In countries with large stray dog populations, similar vaccines may be useful. Conventional rabies vaccines do not seem to protect animals against rabies-related viruses in phylogroup II (Mokola virus and Lagos bat virus); these viruses have caused fatal disease in vaccinated animals. Some cross-protection seems to exist with rabies-related viruses in phylogroupI (5).

Stray dogs that are not accessible to mass vaccination can reduce the coverage achievement. Oral vaccines that could reach ownerless dogs are not yet on the market. Non-selective elimination of stray dogs to reduce the reservoir population is no longer recommended as a strategy against rabies by WHO, since it increases population turnover and decreases herd immunity, while public opposition to dog removal can lead to the failure of rabies control programs (1).

The most successful form of rabies prevention is pre-exposure vaccination. In human medicine, there are no reported cases of rabies deaths in anyone who has had pre-exposure vaccination followed by a booster vaccination if exposed (15).

Pre-exposure immunization has been used on domesticated and wild populations. In many jurisdictions, domestic dogs, cats, ferrets, and rabbits are required to be vaccinated. Dog aside from vaccinating humans, another approach was also developed by vaccinating dogs to prevent the spread of the virus. Researcher in different time and place produced developed a dog vaccine that gave three-year immunity from rabies (25).

Control measures should be applied to canine rabies, irrespective of the presence or absence of rabies reservoirs in wildlife. Where wildlife rabies persists (e.g. in bats, mongooses, skunks, foxes or racoons), sporadic cases of canine rabies may continue to appear. Such spillovers of the infection from wildlife show, however, less tendency to spread with in the canine population than outbreaks originating from a canine rabies reservoir. Rabies virus strains show a certain degree of adaptation to the principal reservoir species although this appears never to be absolute (26).

Morbidity and Mortality

Based on the 10 days clinical observation at the Ethiopian health and nutrition research institute, dogs were the first most important sources of rabies and cats are next to dogs in Ethiopia. This was evident from the 3,261 total dog brain samples collected for the last nine years out of which 2,458 (75%) were positive cases. Among 121 cat brains examined 91 (72%) were positive for the same period. The laboratory confirmed rabies cases in other wild (hyenas, foxes) and domestic (dog, cattle, donkey and horse) animals showed 60% positive cases. Hence, the interface of wild and domestic animals in grazing areas, water points and backyard waste disposal areas can facilitate the circulation of the virus in the country (1).

The distribution of a total of 40774.41 doses of human and 95160 doses of animal vaccine during the last 5 years period of 1996 " 2000 to the various regions is a strong indicator of the wide Spread nature of rabies both in humans and animals throughout the country (8).

9. Conclusion And Recommendations

Since rabies frequently occurring and the disease is life threatening, affects all warm blooded mammals, and its occurs is worldwide mostly in developing country Asia and Africa more death recorded. In Ethiopia, the disease is endemic and a threat to both urban and rural community due to large numbers of stray dogs and varieties of wild carnivores. Rabies is a major public health problem in most parts of the country, where the dogs play a principal role as a reservoir and transmitters of the diseases to humans. The most effective method of preventing, the entry of rabies into a country free of the diseases is important of a, quarantine period 4-6 months on all imported days. Controlling access of wild life species which are likely to come into contact with the farm live stock in particular areas or through vaccination of the wild life.

Rabies has a vaccine but not treatment, so prevention by pre exposure vaccine is best for source animal and high risk population. mass vaccination of dog population have greater role so, should be carried out as much as possible in the world mostly in developed country. The recent data for rabies diagnosis, post exposure prophylaxis and fatal human cases were underestimated due to the absence of rabies diagnosis laboratory across the country. It is of a paramount importance to assess and map the national picture of rabies within a given time interval to launch a national rabies control strategy. Generally, mass vaccination of dogs, proper post exposure management, appropriate surveillance system, and increasing the awareness of the community about the disease needs special attention for prevention and control of the disease, vaccination as prevention is better than curing especially for rabies due to its fatality.

By keeping the above conclusion to prevent and control rabies, the following recommendations are forwarded:

- Creating awareness about its fatality and vaccine importance.
- Post exposure treatment should be given after immediately exposure to bite or scratch by rabid animals.
- Establish a regular quarantine system for the entery of animals from abroad of country.
- Wider scale prevalence study should be needed to determine the actual magnitude of the problem to launch proper control strategy.
- Aggressive interventions that include regular canine mass vaccination campaigns, regular campaigns to remove stray dogs and massive education in communities and primary school will cared on.

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