Study On Knowledge, Attitude And Practice Survey To Wards Rabies In Amuru Districts Of Horo Guduru Wollega Zone, Oromia, Ethiopia

Jimma, Ethiopia

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Abstract: This study was conducted in and around Amuru district, Horro Guduru Wollega zone, Oromia, West Ethiopia from April, 2018 to December, 2018 to assess the knowledge, attitudes and practices (KAP) of the community on rabies and associated risk factors. A cross-sectional study design and simple random sampling procedures were employed to select peasant association households for this study. Kebeles were selected using lottery method from list of kebeles in each administrative area, followed by selection of households from each kebeles using systematic random sampling method. The data were obtained from 384 households through face to face interview using pretested and structured questionnaires, which involves both close and open ended questions. Out of the 384 respondents interviewed, 53.9% of them were males and 46.1% females. The majority of the respondents 50.5% were protestant followed by Orthodox 20.3%. All of the respondents indicated that they had previously heard about rabies. Almost half of the study participants 62% had good level of KAP perception to rabies. There was strong association between KAP scores and age (x^2 =8.001, $p<0.05$); educational level (x^2 =11.409, $p<0.05$) and occupation (x^2 =14.307, $p<0.05$). Generally these findings indicate that the Amuru community has good knowledge about rabies. But it need for educational outreach in and around Amuru district to raise accurate knowledge on mode of transmission, symptoms and appropriate prevention and treatment measures.

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1. Introduction

Rabies is a fatal zoonotic central nervous system disease that is characterized by an acute encephalitis illness caused by rabies virus which is genus *Lyssa* virus in the family of *Rhabdoviridae* that affects virtually all mammals. Infected species invariably die from the disease once clinical signs are manifested (Jackson and Wunner, 2007). This disease affects all warm-blooded mammals including human and has been threatening the lives of mankind for more than 4,000 years (Schnell *et al*., 2010; Liu *et al*., 2011). Globally, it is estimated that at least 60,000 people die of rabies each year (Zhao *et al*., 2008; Matsumoto *et al*., 2010). This virus has a negative single-stranded RNA genome and the virions are bullet-shaped (Schnell *et al*., 2010). Dogs remain the primary reservoir in developing countries, whereas wildlife species serve as hosts in developed nations (Rupprecht *et al*., 2007). Dog rabies potentially threatens over three billion people in Africa and Asia and people most at risk live in rural areas, where vaccines and immunoglobulin are not readily available or accessible. The WHO considers rabies as neglected disease and declare it to be primarily a problem in areas troubled with a lack of economic resources (WHO, 2013), with over several deaths per year (Nilsson, 2014) and signs of it re-emerging (Depani *et al*., 2012).

In Ethiopia rabies has been known for centuries in society as Mad Dog Disease (Fekadu, 1997) and has been recorded scientifically since 1903 (Pankhrust, 1990). To date, rabies is an important disease in Ethiopia both in human and animals (Deressa *et al*., 2010, Teklu *et al*., 2017). In Four-Year Retrospective Study by (Teklu *et al*., 2017) in Northwestern Tigray the incidence of human rabies exposure cases calculated per 100,000 populations was 35.8, 63.0, 89.8 and 73.1 in 2012, 2013, 2014 and 2015, respectively.

The proximity of the site of the virus entry to the CNS increases the likelihood of a short incubation period (Yin *et al*., 2012). Following the bite of rabid animal the incubation period varies from 5 days to several years (usually 2–3 months; rarely more than 1 year) depending on the amount of virus in the inoculum, the density of motor endplates at the wound site and the proximity of virus entry to the central nervous system (WHO, 2013). In animal the initial clinical signs are often nonspecific and may include fearfulness, restlessness, anorexia or an increased appetite, vomiting, a slight fever, dilation of the pupils, hyperreactivity to stimuli and excessive salivation. The first sign of post-vaccinal rabies is usually lameness in the vaccinated leg. Animals often have behavioral and temperament changes, and may become either unusually aggressive or uncharacteristically affectionate (OIE, 2012).

Laboratory diagnosis of rabies in humans and animals is essential for timely post-exposure prophylaxis. Rabies diagnosis may be carried out either in vivo or post-mortem especially by diagnostic methods like direct fluorescent antibody, mouse inoculation technique, tissue culture infection technique and PCR (Yousaf, *et al*., 2012). There is no certain cure for rabies except supportive care. Rabies can be prevented before the latent symptoms can develop, consists of giving a person an injection of rabies immune globulin and another injection of rabies vaccine as soon as possible after the bite or exposure to saliva from an infected animal (Yousaf *et al.,* 2012).

Essential components of rabies prevention and control include on-going public education, responsible pet ownership, routine veterinary care and vaccination, and professional continuing education. The majority of animal and human exposures to rabies can be prevented by raising awareness concerning: rabies transmission routes, and avoiding contact with wildlife. Prompt recognition and reporting of possible exposures to medical professionals and local public health authorities is critical (Spickler, 2010). Even though rabies is the most fatal disease for both human public and veterinary public significance there is scarcity of information mostly in developing countries.

1.1. Objectives

However, there has not been any study done to assess rabies related to the knowledge, attitudes and practices of the community and its associated risk factors in the study area. Therefore, the objectives of this study were:

- ✓ To determine the knowledge, attitudes and practices of rabies in the study area.
- ✓ To identify the possible risk factors associated regarding dog bite with this problem.
- ✓ To assess the socio-demographic profile of study participants.

2. Literature Review

2.1. Etiology and Taxonomy

The word rabies is derived from the Sanskrit word rabhas, which means to range or from the Latin word rabere, which means to rave´ (Hankins and Rosekrans, 2004). Rabies virus (RABV) is the prototype virus of the genus *Lyssavirus* (from the Greek lyssa meaning 'rage') in the family *Rhabdoviridae* (from the Greek rhabdos meaning 'rod'). The prototype RABV is a genotype 1 virus (formerly recognized as serotype 1). Lagos bat virus (LBV, genotype 2/serotype 2), Mokola virus (MOKV, genotype 3/serotype 3), Duvenhage virus (DUVV, genotype 4/serotype 4), European bat lyssa virus type 1 (EBL-1, genotype 5), European bat lyssa virus type 2 (EBL-2, genotype 6) and Australian bat lyssa virus (ABLV, genotype 7) are rabies-related lyssa viruses that reflect the genotypic diversity of the genus Lyssa virus (Kuzmin *et al*., 2005). It is a disease of mammals, but the sensitivity to the virus can vary between different mammal hosts (Quinn *et al*., 2002).

Rabies is a fatal neurological infectious disease caused by of rabies virus (RABV) (Kaku *et al.,* 2011; Duana *et al*., 2012). This disease has been threatening the lives of mankind for more than 4,000 years (Schnell *et al*., 2010). The virions or virus particles have a bullet-shaped structure (75 nm diameter and 100-300 nm length), a single-stranded and negative-sense RNA genome of about 12 kb nucleotide (Houimel and Dellagi., 2009; Liu *et al*., 2011).

Rabies virus encodes five subgenomic mRNAs that encodes five structural proteins. The viral proteins include (i) the nucleoprotein (N), which encapsidates the genomic and antigenomic RNA to form the ribonucleoprotein (RNP) complex; (ii) the phospoprotein (P), which is the noncatalytic subunit of the RNA polymerase complex; (iii) the viral polymerase protein (L), which transcribes and replicates the RNA genome; (iv) the trans membrane glycoprotein (G), which is the surface spike protein involved in attachment to host cell; and (v) the matrix protein (M), which is the major structural protein involved in virion assembly and egress (Okumura and Harty, 2011). All rhabdoviruses have two major structural components i.e., a helical riboneucleoprotein core (RNP) and a surrounding envelope. The capsid is surrounded by the host cell-derived membrane that interacts with two viral proteins, the matrix protein and glycoprotein. The N, P and L together with the genomic RNA form the riboneucleoprotein complex (RNP) (Ando et al., 2005; Okumura and Harty, 2011). Among these, the rabies virus glycoprotein (G) is the only one that is exposed on the viral particle surface and can mediate viral entry into the host cell (Duana *et al*., 2012). The G protein is a key protein for both virus infectivity and eliciting protective immunity as an antigen. Nevertheless, the nucleoprotein (N) is also a significant rabies virus antigen (Yang *et al*., 2013). Rabies caused by rabies virus (RABV) genotype 1ist one of the most common fatal infections worldwide. However, the existence of Lyssa viruses that are closely related to rabies virus and that can also causes clinical diseases has been known for several decades (Both *et al*., 2012).

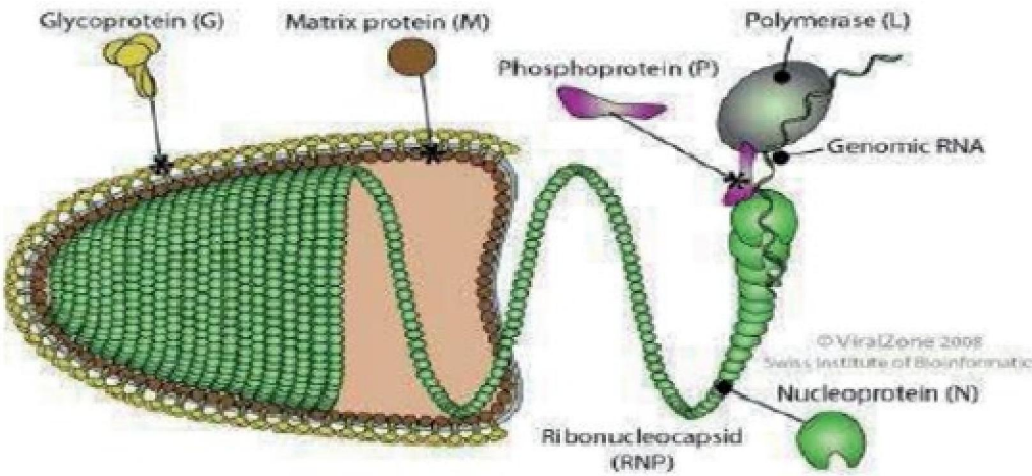

Figure 1: Schematic representation of *Rhabdovirus* virion Source: Bela-Ong *et al.* (2014).

Fundamentally, viruses are infectious nucleic acids that have evolved efficient mechanisms for shuttling their genomes between the host cells that they depend upon for replication (Bhella, 2015). The sequence of events in the RABV life cycle, i.e. replication in vitro and in vivo (in cell culture or animal) can be divided into three phases. The first or early phase includes virus attachment to receptors on susceptible host cells, entry via direct virus fusion externally with the plasma membrane and internally with endosomal membranes of the cell and uncoating of virus particles and liberation of the helical RNP in the cytoplasm. The second, or middle, phase includes transcription and replication of the viral genome and viral protein synthesis. The third, or late, phase includes virus assembly and egress from the infected cell. The early phase of the RABV life cycle, often regarded as the most difficult of the events in RABV infection to understand fully, has been studied in many different cell culture systems. These include neuronal and non-neuronal cell lines and primary, dissociated cell cultures derived from dissected pieces of nervous tissue (Frederick, 2007).

2.2. Epidemiology

2.2.1. Occurrence and distribution

Classical RABV occurs worldwide, with the exception of Antarctica, Australia and some island nations. Lack of reporting and underreporting by some countries undermines knowledge of the true impact of the disease. In Africa, five lyssa virus species in addition to RABV have been documented; these include Lagos bat virus (LBV) and Mokola virus (MOKV), which circulate widely across the continent, Duvenhage virus (DUVV), isolated from bats in southern Africa, Shimoni bat virus (SHIBV) and Ikoma virus (IKOV) To date, only single isolates of the last two species have been recovered, so their range is unknowns (Susan and Nadin, 2015).

Rabies is a classic example of a multi-host pathogen for which the identification of reservoirs has proven challenging (Johnson *et al*., 2003; Bernardi *et al*., 2005). In Africa and Asia, domestic dog rabies predominates among reported and confirmed cases and domestic dogs are the reported source of infection for over 90% of human cases (WHO, 2012); however, it has been argued that this may reflect surveillance bias and that the role of wildlife is poorly understood (Wandeler *et al*., 1994).

Rabies has a worldwide distribution, with only certain countries mainly islands and peninsulas, being historically free of the disease or having succeeded in eradicating it (WHO, 1991). In Western Europe, rabies was recognized as early as 1271 when it was prevalent among wolves. An outbreak of the disease in dogs was first confirmed in the Eastern Cape Province of South Africa in 1893 by inoculation of rabbits. In the developed world, rabies in dogs has been controlled, but the disease has established itself in the wildlife. In North America, various species of wildlife are involved including the fox, raccoon dogs and skunks, while in much of Europe; the fox is the principal reservoir (Finnegan *et al*., 2002). In spite of rabies been confirmed in a variety of wildlife species in Africa, the domestic dog still remains the most dangerous reservoir of the disease because of its close association with man (Taylor *et al*., 2001). In Kenya, rabies has been confirmed in a variety of wildlife species including the jackal, honey badger, civet rat, mongoose, hyena, ground squirrel, and in livestock (cattle, sheep, goats, donkeys) (Chong, 1993).

2.2.2. Host range and Excretion of rabies virus

The most important reason why rabies is still endemic is the huge global reservoirs, in both domestic and wildlife animals, all mammals are thought to be susceptible to infection, but reservoirs important to the maintenance and transmission of rabies virus are limited to the Carnivora and Chiroptera (Rupprecht *et al*., 2002).

The excretion of rabies virus and the levels of virus excreted are the most important factors for transmission. Rabies virus can be excreted in saliva of infected animals for many days after the onset of clinical signs of disease. Rabies virus has also been found in dog saliva up to seven days before signs of rabies were observed. Rabies virus has been isolated from the saliva of clinically normal dogs and dogs with transient paralysis. Fekadu *et al* (1982) found that saliva collected on day 42 and 169 from a dog that had recovered from experimental Ethiopian strain rabies inoculation produced fatal rabies in mice inoculated intracerebrally.

Fekadu *et al* (1982) also reported that viable virus could be isolated from the palatine tonsil of an experimentally infected dog up to 305 days after its recovery. Rabies virus can be excreted from the saliva of cats for one to three days and cattle for one to two days prior to onset of signs. The virus may be detectable earlier in wildlife than in dogs, in skunk up to four days prior to clinical disease onset, one to two days during which animals can transmit disease by excreting virus in saliva, can be found in dogs in foxes and 12 days in insectivorous bats. Virus can be excreted in urine and this may lead to transmission by aerosol in foxes and bats. Excretion in milk also occurs but is considered to not represent a major hazard because viral particles will be destroyed by enzymes present in the milk (Beran and Steele, 1994). It has also been shown that the virus can be excreted in urine and this may lead to aerosol transmission in foxes and bats (Finnegan *et al*., 2002).

All mammals are susceptible to rabies, but only a limited number of species also act as reservoir hosts. The most predominant rabies reservoirs are listed in table 1. They include members of the families Canidae (dogs, jackals, coyotes, wolves, foxes and raccoon dogs), Mustelidae (e.g., skunks), Viverridae (e.g., mongooses), and Procyonidae (raccoons), and the order Chiroptera (bats) (OIE, 2008). Rabies reservoirs are generally grouped into terrestrial (i.e., land-dwelling) species and bat species. Rabies can occur sporadically in individuals or can exist in an enzootic or epizootic state in animal populations. In enzootic state rabies is indigenous to a reservoir species in a locality and occurs with a relatively stable incidence rate. An epizootic occurs when the incidence of disease increases markedly in the reservoir species. Rabies that is transmitted sporadically from reservoir to non- reservoir species is said to spillover. These reservoir species are: raccoon (Procyon lotor), striped skunk (Mephitis mephitis), coyotes (Canis latrans; infected with the dog variant), gray fox (Urocyon cinereoargenteus), and Arctic fox (Alopex lagopus) and red fox (Vulpes vulpes) (Bruce and Margaret, 2001).

Table 1: Predominant global rabies reservoirs

Dogs Latin	Major susceptible host of rabies throughout the world, particularly Asia, America and Africa
Foxes	Europe, Arctic and North America.
Raccoons	Eastern United States.
Skunks	Midwestern United States, Western Canada
Coyotes	Asia, Africa and North America
Mongooses	Yellow mongoose in Asia and Africa; Indian mongoose in the Caribbean Islands.
Bats	Vampire bats from Northern Mexico to Argentina, insectivorous bats in North America and Europe

Source: (Fu *et al*., 1997)

2.2.3. Mode of transmission

The commonest mode of transmission in man is by the bite of a rabid animal or the contamination of scratch wounds by virus- infected saliva. However, other routes have been implicated in the past, such as through mucous membranes of the mouth, conjunctiva, anus and genitalia. Infection by aerosol transmission had been demonstrated in experimental animals and has been implicated in human infection in rabies-infected bat caverns and in several laboratory accidents (Andrews, 2015). Transmission of rabies virus usually begins when infected saliva of a host is passed to an uninfected animal. The most common mode of rabies virus transmission is through the bite and virus-containing saliva of an infected host. Though transmission has been rarely documented via other routes such as contamination of mucous membranes (i.e., eyes, nose, mouth), aerosol transmission, and corneal and organ transplantations.

2.3. Pathogenesis

Rabies is a central nervous system (CNS) disease that is almost invariably fatal (Dietzschold *et al*., 2005), except for few rare reported cases (Miah *et al*., 2005). Rabies-infected animals have high titers of the rabies virus in their salivary glands, which can be even greater than in the brain. There are marked differences between the different strains of virus and their ability to infect, spread within the body, and produce disease (Dietzschold *et al*., 2005). It has been suggested that the attenuated rabies viruses activate the host's innate immune and antiviral responses, while these responses are evaded by the pathogenic rabies viruses (Wang *et al*., 2005).

After the bite, the virus particles travel to the nearby nerves and then along the nerve fibers to the brain at a speed of a few millimeters per day (Jackson, 1991). It was suggested that the virus is propagated from the entry point to the CNS due to the interaction between the P protein of the rabies virus and the dynein light chain LC8 (Poisson *et al*., 2001). A bite on the head or neck will usually cause symptoms more quickly than a bite on the hind leg. However, when the virus has entered the nerve endings, it advances relentlessly up the nerve bodies until it reaches the spinal cord and eventually the brain. From the brain, the virus can spread to other tissues - the salivary glands, respiratory system, and the digestive tract (Krebs *et al*., 1995).

The proximity of the site of the virus entry to the CNS increases the likelihood of a short incubation period (Xinjian *et al*., 2011). Viruses can also enter motor axons in peripheral nerves directly during a penetrating injury. The incubation period varies from 5 days to several years (usually 2–3 months; rarely more than 1 year), depending on the amount of virus in the inoculum, the density of motor endplates at the wound site and the proximity of virus entry to the central nervous system (Ugolini, 2011). The incubation period is less than 50 days if the patient is bitten on the head or neck or if a heavy inoculum is transferred through multiple bites, deep wounds, or large wounds. A person with a scratch on the hand may take longer to develop symptoms of rabies than a person who receives a bite to the head. In dogs and cats, the incubation period is 10 days to 6 months; most cases become apparent between 2 weeks and 3 months. In cattle, an incubation period from 25 days to more than 5 months has been reported in vampire bat-transmitted rabies. In humans, the incubation period can be a few days to several years. Most cases become apparent after 1-3 months (OIE, 2012).

2.4. Clinical Signs

The clinical picture can be highly variable between different species, individuals of the same species, and even within the course of the disease in a particular individual. As the disease progresses, animals with rabies may show strange behavior. Any clinical suspicion of rabies must be confirmed by laboratory examination (Blackmore, 2014). The initial clinical signs are often nonspecific and may include fearfulness, restlessness, anorexia or an increased appetite, vomiting, diarrhea, a slight fever, dilation of the pupils, hyperreactivity to stimuli and excessive salivation. The first sign of post-vaccinal rabies is usually lameness in the vaccinated leg. Animals often have behavioral and temperament changes, and may become either unusually aggressive or uncharacteristically affectionate (OIE, 2012). In bats, the clinical signs of a Lyssa virus-infection include loss of body mass, lack of coordination, muscular spasms, agitation, increased vocalization, and overt aggression (Whitby *et al*., 2000; Shankar *et al*., 2004), but in many cases, rabies in bats can be clinically silent and left unnoticed before dead animals are found and laboratory tests are performed (Ronsholt *et al*., 1998). When bats were found alive, the clinical signs were generally described as paralysis, unprovoked vocalization, and aggression (biting) during handling. However, almost all bats will bite when handled (Vos *et al*., 2007).

2.4.1. Prodromal stage

After a certain incubation period, the onset of clinical symptoms follows. During this first stage which usually lasts for about 1-3 days minor behavioral changes might occur, i.e. aggressiveness in tame animals, daytime activities in nocturnal animals, no fear of humans in wild animals or abnormalities in appetite (WHO, 2013).

2.4.2. Excitement (Furious) phase

Eventually, the prodromal stage is followed by a period of severe agitation and aggressiveness. The animal often bites any material. Rabid dogs, for example, may develop a typical high barking sound during furious rabies. Death may follow convulsions even without the paralytic stage of the disease. The furious form is characterized by restlessness, wandering, howling, polypnea, drooling and attacks on other animals, people or inanimate objects. Affected animals often swallow foreign objects such as sticks and stones. Wild animals frequently lose their fear of humans, and may attack humans or animal species they would normally avoid (e.g., porcupines). Nocturnal animals may be visible during the day. In cattle, unusual alertness can also be a sign of this form (OIE, 2012). The furious form of rabies is characterized by hydrophobia: terror and excitation with spasm of inspiratory muscles, larynx and pharynx precipitated by attempts to drink, and episodes of hallucinations and excitement are common (Both et al., 2012).

2.4.3. Paralytic (Dumb) phase

The dumb form of rabies is characterized by progressive paralysis. In this form, the throat and masseter muscles become paralyzed; the animal may be unable to swallow, and it can salivate profusely. Laryngeal paralysis can cause a change in vocalization, including an abnormal bellow in cattle or a hoarse howling in dogs. There may also be facial paralysis or the lower jaw may drop. Ruminants may separate from the herd and can become somnolent or depressed. Rumination may stop. Ataxia, incoordination and ascending spinal paresis or paralysis are also seen (OIE, 2012). This stage is characterized by the inability to swallow, leading to a typical sign of foaming saliva around the mouth. Some animals may develop paralysis beginning at the hind extremities. Eventually, complete paralysis is followed by death (WHO, 2013).

2.5. Diagnosis

Laboratory diagnosis of rabies in humans and animals is essential for timely post-exposure prophylaxis. Rabies diagnosis may be carried out either in vivo or postmortem (Consales and Bolzan, 2007). Infection with rabies virus can be difficult to diagnose ante-mortem. Although hydrophobia is highly suggestive, no clinical signs of disease are pathognomonic for rabies. Historical reliance on the detection of accumulations of Negri-bodies is no longer regarded as suitable for diagnostic assessment because of low sensitivity and alternative laboratory-based tests based have been developed to conclusively confirm infection (Abera *et al*., 2015).

Most diagnostic tests for rabies virus in animals need brain material for diagnosis and as such are often only possible post mortem (Fooks, 2012). The diagnosis of rabies in animals can be made by taking any part from the affected brain. But in order to rule out rabies, the test must include tissues from at least two locations in brain, from the brain stem and cerebellum. There are many diagnosis methods for detection of rabies in animals like direct fluorescent antibody, mouse inoculation technique, tissue culture infection technique, and polymerase chain reaction (Yousaf, *et al*., 2012). Brain samples are most readily taken by breaching the skull and sampling directly. Brain smears or touch impressions are used for the detection of virus antigen with the fluorescent antibody test (FAT) for both human and animal samples. In animals the direct fluorescent antibody test (dFAT) is the recommended diagnostic test. This test detects the presence of rabies antigens in brain tissue. Other diagnostic techniques include reverse transcription polymerase chain reaction (RT-PCR), direct rapid immunohistochemistry test (dRIT) and serological tests (Fluorescent antibody neutralization test, rapid fluorescent focus inhibition test). In humans, the rabies recommended test is dFAT on brain tissue. Other diagnostic tests that have been used are RT-PCR and dRIT (Abera, *et al*., 2015).

Clinical diagnosis of rabies divided upon three stages in human; prodromal, excitement (furious) and paralytic (dumb). But all these stages cannot be observed in an individual. The very first clinical symptom is neuropathic pain at the site of infection or wound due to viral replication. Following by the prodromal phase either or both the excitement or paralytic forms of the disease may be observed in the particular species. It is also documented that cats are more likely to develop furious rabies than dogs (Yousaf *et al*., 2012). In some cases, no signs are observed and rabies virus has been identified as the case of sudden death (Boonlert, 2005). Diagnosis can only be confirmed by laboratory tests preferably conducted post mortem on central nervous system tissue removed from cranium (McElhinney, *et al*., 2008).

Rabies must be considered in the differential diagnosis of any suspected mammalian meningitis/ encephalitis, distemper, infectious canine hepatitis and cerebral cysticercosis (*Taenia solium*,) in dogs, sporadic bovine encephalomyelitis (*Chlamydia psittaci*), heartwater in cattle and sheep. Other conditions like mineral/ pesticide poisoning and Plant poisoning from Pennisetum clandestinum (kikuyu grass) in cattle, Cynanchum spp (monkey rope) in sheep should be considered (Bishop *et al*., 2003).

2.6. Prevention and Control

There is no certain cure for rabies except supportive care. Rabies can be prevented before the latent symptoms can develop, consists of giving a person an injection of rabies immune globulin and another injection of rabies vaccine as soon as possible after the bite or exposure to saliva from an infected animal (Yousaf *et al*., 2012). Essential components of rabies prevention and control include on-going public education, responsible pet ownership, routine veterinary care and vaccination, and professional continuing education. The majority of animal and human exposures to rabies can be prevented by raising awareness concerning: rabies transmission routes, and avoiding contact with wildlife. Prompt recognition and reporting of possible exposures to medical professionals and local public health authorities is critical (Spickler, 2010).

Human rabies can be prevented by a) eliminating exposure to rabies virus, b) providing appropriate rabies pre-exposure prophylaxis, and c) prompt local treatment of bite wounds combined with appropriate rabies post-exposure prophylaxis (CFSPH, 2012). Inactivated human vaccines are available for at risk veterinary staff, other animal handlers, wildlife officers, laboratory workers and others at high risk of exposure (MMWR, 2012).

2.6.1. Animal Rabies Control and Animal bites reporting

The primary components of a rabies control program for companion animals are: immunization and licensing; stray animal control; reporting, investigation, and isolation of animals involved in bite incidents; and public education. Multiple vaccines are licensed for use in domestic animal species. Vaccines available includes: inactivated or modified live virus vectored products; products for intramuscular and subcutaneous administration; products with durations of immunity from one to 4 years; and products with varying minimum age of vaccination (CFSPH, 2012).

The local health officer or designee shall be immediately notified of any person or animal bitten by or potentially exposed to a rabid or suspected rabid animal. In addition, the local health officer or designee shall be notified when any person is bitten by a mammal. Potential human rabies exposures are then evaluated and rabies post-exposure prophylaxis (PEP) recommendations made (Spickler, 2010; CFSPH, 2012).

2.6.2. Control of Stray and isolation of exposed to rabies

Stray dogs, cats, and ferrets should be removed from the community. Local health departments and animal control officials can enforce the removal of strays more effectively if owned animals are required to have identification and are confined or kept on leash. Strays should be impounded for at least 3 business days to determine if human exposure has occurred and to give owners sufficient time to reclaim animals (Catherine, 2011). Any animal bitten by, scratched by, or having direct contact with a wild mammal that is not available for rabies testing should be regarded as having been exposed to rabies. All livestock species-horses, cattle, sheep, goats, llamas/alpacas, and swine are susceptible to rabies infection. Cattle and horses are the livestock species most frequently diagnosed with rabies. Unvaccinated livestock bitten by or exposed to a rabid or suspect rabid animal should be euthanized (Spickler, 2010).

Principles of rabies prevention should focus on excluding wild animals from areas of human and domestic animal habitation and activity, and avoidance of contact with possibly rabid wild animals. Public education on the risks of rabies transmission from wild animals is paramount to effective disease prevention. Immunization of wildlife by widespread distribution of vaccine-impregnated oral baits has shown variable success toward arresting the propagation of rabies in raccoons and coyotes in other states. The use of oral rabies vaccines for the mass vaccination of free-ranging wildlife should be considered in selected situations (Spickler, 2010; CDPH, 2012).

2.6.3. Animal pre-exposure Vaccination and Post-Exposure Treatment

A number of recently developed, highly-effective, thermo stable, inactivated vaccines are available for veterinary use. The duration of immunity conferred varies from one to three years. Most veterinary vaccines are only registered for use in specific species, for example dogs. All rabies vaccines registered for human and animal use must conform to established potency standards. A minimum antigenic potency of 2.5 IU per dose is mandatory (WHO, 1992). The vaccines may be used in young pups, but they must be boosted at three months of age and again within the following year. Revaccination must be carried out every three years thereafter. Cattle and sheep may be vaccinated annually or every two to three years, depending on the vaccine manufacturer's instructions. Following an outbreak in domestic livestock, vaccination of animals without visible bite wounds is strongly recommended (Murray *et al*., 2009).

Rabies has a 100% case fatality rate; meaning that once clinical signs are manifest treatment will be futile and death will inevitably occur. Thus, it is very important that treatment be initiated immediately a person has been exposed to a suspect rabid animal. The World Health Consultation on Rabies (2004) drew up guidelines on the management of patients exposed to rabies suspect animals. Post-exposure treatment (PET) consists of local treatment of the wound, initiated as soon as possible after an exposure, followed by the administration of passive immunization, if indicated, and a potent and effective rabies vaccine that meets WHO criteria. The PET may be discontinued if the animal involved is a dog or cat that remains healthy for an observation period of 10 days after the exposure occurred; or if the animal is humanely killed and proven to be negative for rabies by a reliable diagnostic laboratory using a prescribed test. If the animal inflicting the wound is not apprehended, PET should be instituted immediately. The World Health Organization (WHO, 2012) and Centers for Disease Control (CDC, 2012) have guidelines for post exposure treatment and assessment of each category of exposure and level of risk. Two kinds of rabies immunoglobulins, human rabies immunoglobulin (HRIG) and equine rabies immunoglobulin (ERIG), are currently effective forms of passive immunization used in serious or high risk exposure cases except for the exposed person who has been vaccinated previously. The HRIG is given at 20 IU/kg and ERIG at 40 IU/kg by infiltrating one half around the wound and one half intramuscularly followed by five doses of cell culture vaccine one each on day 0, 3 7, 14 and 28 (Dreesen *et al*., 1996).

Findings from a study conducted by Hanlon *et al* (2002) suggested that 5 doses of canine rabies vaccine administered on days 0, 3, 14, 21 and 35 along with murine anti-rabies antibody on day 0 may be effective in protecting a previously unvaccinated animal exposed to rabies. Regardless of the age of the animal at initial vaccination, a booster vaccination should be administered 1 year later (Blackmore, 2014). If signs suggestive of rabies develop (e.g., paralysis, seizures, etc.), the animal should be euthanized and the head shipped for testing (Hanlon *et al*., 2002).

2.6.4. Vaccine strains and anti-rabies vaccines

Since the first rabies vaccination in 1885 by Louis Pasteur (Pasteur, 1885), significant progress has been made in improving the pre- and post-exposure treatment of human rabies (Dietzschold *et al.,* 2003). There are several types of vaccines: live attenuated, inactivated (killed), DNA-based, and vector vaccines. For the production of anti-rabies vaccines, a number of attenuated vaccine strains are employed: the Pasteur Virus (PV), Evelyn Rokitniki Abelseth (ERA), Street-Alabama-Dufferin (SAD), 3aG, Fuenzalida S-51 and S-91, Ni-Ce, SRV9, PM, Nishigahara, RC-HL, Kelev, Flury, Shelkovo-51, O-73 Uz-VGNKI, RV- 71, Krasnopresnenskii-85, and the RV-97 strain (Gruzdev and Nedosekov, 2001; Borisov *et al*., 2002). The PV is one of the first vaccine strains; it was isolated from a rabid cow in 1882 and attenuated by multiple passages in rabbits. The SAD strain was isolated from a rabid dog in Alabama (USA) in 1935 and adapted for cultivation in the mouse brain and in the baby hamster kidney cell culture. It has two main derivates: ERA and Vnukovo-32. Several variants of the SAD strain exist: SAD-Berne, SAD B19, SADP5/88 etc., and also non-virulent mutants SAG-1 and SAG-2. The vaccine strains belonging to the SAD group are widely used throughout the world. One of the most widely used oral anti-rabies vaccines is prepared from the SAD B19 strain, the high immunogenicity and relative safety of this strain has been demonstrated experimentally (Vos *et al*., 2000; Neubert *et al*., 2001).

Live attenuated vaccines are still in use in some developing countries for parenteral vaccination of animals and humans. These contain live attenuated rabies virus which has been developed in cell cultures or in live animals such as sheep. In the developed world, live attenuated vaccines are only used for the oral immunization of wild animals. Oral vaccines are widely used and several vaccine strains are used for the production of such vaccines: the SAD B19 and other SAD-strains, SAG1 and SAG2 – apathogenic deletion mutants, Vnukovo-32, and the VRG strain (Vos et al., 2000). The vaccine strain RV-97 is used in Russia for producing the oral anti-rabies vaccine Sinrab. This strain was obtained in the FGI Federal Centre for Animal Health (Vladimir, Russia) from strain RB-71. The ancestor to these two strains is the strain Sheep, derived from the PV strain. The strain Moscow is also believed to be a derivate of the PV strain (Gruzdev and Nedosekov, 2001), and was used in the former USSR for producing anti-rabies vaccine. The strain RV-97 is adapted for cultivation in cell culture BHK-21 (Borisov *et al*., 2002).

Complete inactivated rabies virus particles are highly immunogenic. The vaccines based on this principle are used for the pre- and post-exposure immunization of humans and domestic animals (Dietzschold *et al*., 2003). The inactivated chicken embryo vaccines and vaccines based on virus cultivated in cell cultures are used for veterinary and medical purposes (Benjavongkulchai *et al*., 1997).

DNA vaccines are based on plasmid vectors expressing rabies virus glycoprotein. These vaccines have been tested for their efficiency in several animal species (mice, dogs and nonhuman primates), and it has been found that the DNA vaccine develops VNA levels and offers protection comparable with those obtained with the inactivated vaccines (Lodmell *et al*., 2002). On the basis of the results of the study conducted in mice, a single administration of the rabies DNA vaccine may be as effective as at least five injections of the cell-culture derived vaccine (Bahloul *et al*., 2003).

Vector vaccines are based on recombinant viruses, and several viruses have been tested for these purposes. The VRG vaccine was designed on the basis of poxvirus (vaccinia virus) expressing SAD strain glycoprotein and used for oral immunization of wildlife (Meslin *et al*., 1994). The Adrab.gp - vaccine is based on the adenovirus expressing the ERA strain glycoprotein and was found capable of inducing an immune response in dogs (Tims *et al*., 2000). The canine herpesvirus (CHV) expressing the glycoprotein of rabies virus has also been used successfully as an anti-rabies vaccine (Xuan *et al*., 1998). A raccoon poxvirus (RCNV) recombinant vaccine for the immunization against feline panleukopenia and rabies has been developed and tested in cats. A recombinant rabies virus vaccine carrying two identical glycoprotein (G) genes (SPBNGA-GA) has also been constructed (Faber *et al*., 2002).

The rabies virus vaccine strain based on vectors have shown great promise as vaccines against other viral diseases such as human immunodeficiency virus type 1 (HIV-1) infection and hepatitis C, but a low residual pathogenicity remains a concern for their usage (McGettigan *et al*., 2003). Plant-derived antigens can also be used for the immunization against rabies. The coat protein of alfalfa mosaic virus has been used as a carrier molecule to express the antigenic peptides from rabies virus. The in vitro transcripts of the recombinant virus with sequences encoding the antigenic peptides have been synthesized from DNA constructs and used to inoculate tobacco plants. The plant-produced protein (virus particles) has been purified and used for the immunization of mice, and specific anti-rabies virus neutralizing antibodies in immunized mice have been found; spinach has also been used for this purpose (Koprowski, 2002). The transgenic maize expressing the G protein of the Vnukovo strain has also been obtained and tested in mice. It was shown that the mice developed virus neutralizing antibodies which were able to provide protection of 100% against the challenge of a vampire bat strain (Loza-Rubio *et al*., 2007).

2.6.2.5. *Oral vaccination of wildlife against rabies*

Before the era of oral vaccines, the only feasible measure for controlling rabies in wildlife was the depopulation of reservoir species (Aubert, 1994); but currently rabies is the only zoonosis hat can be controlled by the oral vaccination of wildlife. The idea of conducting active immunization of wildlife appeared in the last century but many difficulties, such as the form of the vaccine, methods of distribution and uptake control, and possible residual pathogenicity have to be surpassed. Since then, several laboratory and field trials have been conducted, and different delivery methods including vaccine traps and wool getters were designed (Matter *et al*., 1998). Initially, plastic vessels containing the vaccine were attached to chicken heads, but recently different types of modern vaccine baits and different meal mixtures for producing these were developed and tested. The vaccine based on the strain SAD B19 is one of the most widely used in Europe: 70 million vaccine baits were used between 1983 and 1988 (Vos *et al*., 2000). Studies on the immunogenicity and efficacy of the SAD B19 attenuated rabies virus vaccine in foxes were conducted under laboratory conditions (Neubert *et al*., 2001).

Vos *et al*. (1999) studied the safety of the SAD B19 vaccine in 16 animal species by different administration routes; a low residual pathogenicity was observed only for certain rodent species, but transmission of the vaccine virus to control animals was not demonstrable, since no vaccine virus was detected in the saliva of the six mammal species examined. Furthermore, the genetic stability of the SAD B19 vaccine was shown through passage in neural tissue of dogs, foxes, and mice. From those results presented here on the innocuity and stability, it can be concluded that the SAD B19 rabies vaccine is suitable for the oral vaccination campaigns of carnivores against rabies (Vos *et al*., 1999). Nevertheless, several rabies cases have been caused by live attenuated viruses (Wandeler, 2000), so the development of new, safer vaccine strains is a very important issue. Two mutant vaccine strains were obtained by directed mutagenesis of the strain SAD. The SAG-1 contains one nucleotide substitution, while the SAG-2 has two substitutions at amino- acid position 333 of the rabies virus glycoprotein (Follmann *et al*., 1996). These vaccine strains are apathogenic for adult mice inoculated by the intracerebral route (Flamand *et al*., 1993). The SAG-2 based vaccine was demonstrated as a safe and effective vaccine for the oral immunization of canines (Masson *et al*., 1996; Bingham *et al*., 1997, 1999; Lambot *et al*., 2001).

The vector-based VRG vaccine is another candidate for the oral application to immunize wild carnivores. The pathogenicity of a vaccinia recombinant virus expressing the rabies glycoprotein was tested with the red fox, wild boar, Eurasian badger, different species of mice and voles, common buzzard, kestrel, carrion crow, magpie, and jay. During the observation period, the 107 animals given the vaccine orally did not show any clinical signs (Brochier *et al*., 1989). Experiments have demonstrated the efficacy of a vaccinia rabies recombinant virus administered by the oral route in foxes. Because of its safety and heat-stability, this recombinant virus could be an excellent alternative to the attenuated strains of rabies virus currently used in the field (Lambot *et al*., 2001). The high thermo stability of the commercially produced Raboral VRG bait allows its use during the summer for emergency vaccination campaigns (Masson *et al*., 1999), and is being used for the vaccination of wild raccoons in the USA (Olson *et al*., 2000).

The most common strategy for conducting oral vaccination campaigns is to use vaccine baits at a density of approximately 25 baits per square km, twice a year, during the spring and autumn, to avoid the negative influence of temperature on vaccine baits and to reach adult foxes (in spring) and juvenile foxes before they disperse (in autumn) (Vos, 2003). However, further studies on the population dynamics of the red fox, the onset and progress of the reproductive season, and maternal immunity and the immune response of fox cubs to oral vaccination have shown that it was necessary to optimize the old strategy and conduct two spring vaccinations: first in March, and then before the end of May to cover young foxes (Vos *et al*., 2001). There are two ways of distributing vaccine baits in nature: manually and by air (helicopters, airplanes). Presently, aerial distribution is widely used and special computer models have been developed to plan the distribution of vaccine baits taking into account many factors including landscape and terrain details (Thulke *et al*., 2004).

2.7. Status of Rabies in Ethiopia

In Ethiopia, rabies is an important disease that has been recognized for many centuries. The first major outbreak of rabies in Ethiopia in dogs in many parts of Ethiopia (Tigrie, Begemder, Gojjam and Wollo) was recorded 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 public health Institute 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 (EPHI, 2011).

The number of dog to human ratio is approximately assumed 1:6 and 1:8 in urban and rural parts of Ethiopia, respectively. The total population of dogs in Addis Ababa is estimated between 150,000 and 200,000, of which 50% are stray dogs (EPHI, 2011). 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 (Wunner and Briggs, 2010) 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 (EVA, 2012).

According to Ethiopia public health institute, annual number of brain tissue samples 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 throughout the year. 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 (EPHI, 2011).

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 anti-rabies 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 (Pritchard and Dagnatchew, 2010).

3. Methodology And Materials

3.1. Description of study area

The study was conducted from April 2018 to December, 2018 in Amuru district Horo Guduru Wollega zone, Oromia regional state, Ethiopia. Amuru district is placed 431 kilometers western of Addis Ababa, which lies at altitude of 2100 meter above sea level. The average maximum and minimum temperature of the area vary between 22°c-30.7°c and12.3°c-17.1°c respectively. The region receives a bimodal rain fall, the average annual precipitation being 1800mm. The short rain occurs during the month of March, April and May, while the long extends from June to September. The farming system practiced in the area is the mixed type with crop and livestock productions rearing are applied with extensive and semi extensive farming activities. According to data obtained from agricultural bureau MOA (2010), different animal types and species reared including both local and exotic cattle breeds are available in Amuru district.

3.2. Sample Size Determination

The required sample size for this study was estimated by considering 50% of population knowing about Rabies since there is no awareness study about rabies and prevention among communities of the area before so by considering 95% confidence interval, 5% absolute precision sample size calculated as (Thrusfield, 2005). The sample size determined by using this formula indicated below, a total of 384 samples were considered for collection is calculated:

$$n= \frac{(1.96^2(Pexp\ (1- Pexp)}{d^2}$$

Where: n=required sample size, Pexp = expected prevalence and d = desired absolute precision (5%).

3.3. Study Design and Data Collection

This was a community based study, conducted from April, 2018 to December, 2018 in the community of Amuru district and surrounding area. Cross sectional study was carried to assess knowledge, attitude and practice livestock owners and assessment of knowledge gap of the community about of rabies characteristics in both animal and human cases at study area.

Questionnaire survey was conducted using semi-structured questionnaire by face to face interview to randomly selected respondents to assess the public awareness and practices about the disease. Community of all age groups and both sexes were asked. The questionnaire was designed to collect information about the respondents' knowledge of the disease, treatment and prevention practices as well as household information. The totals of 384 respondents from four kebele's were selected with based on willingness and informed consent as well as purposevily.

3.4**. Data management and Analysis**

The data collected from questionnaire survey was entered into Microsoft Excel 2007 spread sheet. The data was cleaned and data generated were analyzed using the Statistical Package for Social Science (SPSS) Version 16.0 to carryout descriptive analysis like percentage. Chi-square was used to evaluate the statistical significance of the di□erences in responses between the respondent from the study areas. A p value < 0.05 were considered significant.

4. Results

4.1. Socio-Demographic Characteristics

A total of 384 of the participants responded to the questionnaire yielding a response rate of 100%. Of these, 62% and 38% were males and females respectively. 38.8% of the participants were aged between 25 and 35 years. The majority of the respondents, 50.5% were Protestants followed by orthodox 29.16% and 20.3% Muslim. Concerning educational status, 28.6% of the participants attained at elementary school level and 4.95% were higher education as indicated below.

Table2. Socio-demographic characteristics of the study participants in Amuru district, 2018

Characteristics	**Frequency percent**
Sex	
Male	238 62
Female	146 38
Age	
18-25	71 18.5
25-35	149 38.8
36-45	121 31.5
>45	43 11.2
Educational status	
Illiterate	86 22.4
Informal education	90 23.4
Elementary	110 28.6
High school	79 20.6
Higher education	19 4.9
Religion	
Orthodox Protestant	112 29.16 194 50.5
Muslim	78 20.3

N= 384

4.2. Association of Dog bite and Management

Out of the 384 households visited, a total of 171 dogs were owned by the respondents, with a ratio of approximately one dogs per household. Majority of the respondents 253 (65.8%) kept dogs for protection and 131 (34.1) served as hunting. Only 35 (9.11%) had specially constructed cages for their management of dogs and 349 (90.8%) let their dogs roam freely within the neighborhood.

Table3. Associations of dog owners with dogs' management in Amuru district

Association item	Number of respondents N=384 Specific rates (%)
Number of dogs owned	
One	171 44.5
Two	138 35.9
≥three	75 19.5
Reason for keeping dogs Protection	253 65.8
Hunting	131 34.1
Dog bite information	
Yes No	349 90.8 35 9.11

Table 4: Knowledge of participants related to cause, ways of getting rabies, clinical signs and health care of rabies in Amuru district 2018.

Characteristics	Frequency	Percent
Causes of rabies		
Virus	242	63
Spiritual	67	17.5
I do not know	75	19.5
Animal involved in transmission		
Dog	373	97.1
Cat	8	2.1
Ruminant	0	0
Equine	3	0.8
Ways of getting rabies		
Contact /bite	140	36.45
Eating rabid animal meat	44	11.45
Living with rabid animal	21	5.6
All	197	46.6
Symptom of rabies in human		
Hyper salivation	91	23.7
Puppy movement in abdomen	167	43.5
Paralysis	105	27.3
Hydrophobia	21	5.5
Rabies signs in animals		
Salivation	176	45.8
Paralysis	61	15.8
Hydrophobia	13	3.4
All	134	34.9
Curing rabies		
Wound washing or traditional medicine	137	35.7
Praying	13	3.38
PEP	234	61.5
How a person is prevented from getting rabies?		
Avoiding being bitten	136	35.4
Vaccinating pets	241	62.7
Via good nutrition	7	1.8
If not treated		
The person survives	11	2.9
Healed but not as before	19	4.9
The person dies	354	92.2

Table 5: Relationships between KAP scores about rabies and some key independent variables among study respondents of Amuru district, 2018

Variable	Good	Poor	χ^2	P-value
Sex				
Male	138(58%)	100(42%)	1.058	0.4202
female	100(68.5%)	46(31.5%		
Age				
18-25	31(43.7%)	40(56.3%)		
25-35	100(67.1%)	49(32.9%)	7.041	0.041
36-45	100(83)	21(17%)		
>45	33(76.7%)	10(23.3%)		
Educational status				
Illiterate	10(12.5%)	70(81.4%)		
Informal education	11(12.8%)	75(87.2%)		
Elementary	89(81%)	21(19%)	5.945	0.115
High school	63(80%)	16(20%)		
Higher education	15(79%)	4(21%)		
Religion				
Orthodox	59(53)	53(47 %)		
Protestant	118 (60.8)	76(39.2%)	1.882	0.154
Muslim	47(60.3)	31(39.7%)		

5. Discussion

Rabies virus is generally pathogen in nature as it has the ability to infect wide range of species and cause major host mortality. Rabies in dogs poses a threat to more than 3.3 billion people. It is estimated that 55,000 people die from dog-mediated rabies annually in Africa and Asia (Awoke *et al*., 2015). Despite its considerable negative effects, rabies in Ethiopia is among the neglected zoonotic diseases. In reality people in developing countries, may not receive lifesaving treatments either because of people may not visit the hospital for treatment owing to lack individual's depth of rabies knowledge or, there is a lack of understanding in the response to dog bites and lack of health facilities. In addition to this, there is little awareness regarding the disease and most prefer traditional managements either for the dog or their bites (Awoke *et al*., 2015; Tolessa and Mengistu, 2017).

The current study revealed that almost all respondents were aware of rabies. Of these respondents, 36% had misunderstanding of the cause of rabies, indicating that most of respondents believe that the disease in dogs is caused by spiritual and unknown cause. This KAP analysis revealed that 92.2% of respondents recognize rabies as danger and a fatal disease. This result is almost consistent with a study conducted in the city of New York, USA, Debre Tabor and Nekemte reporting that 94.1%, 63.8% and 88.5% of the study participants know rabies as a killer disease (Hosmer and Lemeshow, 2000; Awoke *et al.,*2015; Tolessa and Mengistu, 2017) respectively. And 97.1 % of the respondents identified that dogs are major sources for the spread of rabies in human population (Hosmer and Lemeshow, 2000; Awoke *et al*., 2015). The little difference may be due to presence of education on rabies in the town at this year. 97.1% of the respondent knows that dogs are the most transmitters (source) of rabies. This result is almost consistent with a study conducted in the Gondar district reported that almost all respondent knows that dogs are most source of rabies followed by cats (Reta *et al*., 2015; Tolessa and Mengistu, 2015). In this study, about 34.9% of the respondents were aware of common clinical signs of rabies in animals. This finding is supported by studies done in Debre-Tabor and Nekemte (Awoke et al., 2015; Tolessa and Mengistu, 2017). This study revealed that, 35.6% of the respondents know wound washing as an immediate action to mitigate the unnecessary outcomes after a dog bite. This result is higher than that of studies done in Bhutan, Debre Tabor and Nekemte where majority of respondents were aware of wound washing with soap and water after animal bite (Tenzin *et al*., 2012; Awoke *et al*., 2015; Tolessa and Mengistu, 2017) respectively. In this assessment 35.67% participants of this study had strong belief on traditional medicine. The majority of the respondents indicated regular vaccination of dogs is effective measure for controlling the disease that supported studies in Debre Tabor and Nekemte (Awoke *et al*., 2015; Tolessa and Mengistu, 2017). This finding was not in lined with results recorded in Sir Lanka and Bahir Dar in which the majority of the participants were in favor of rabies control programs that mainly focused on stray dog population control (Matibag *et al*., 2009; Tadesse *et al*., 2014). The difference may be due to increased health extension activities, prevalence of rabies and participants were heads of household living in rural areas in study areas and importance of dog vaccinations as compared to mass killing.

The findings of this study indicated that, about 62% of the respondents had good level of knowledge, attitude and practices about rabies. This find slightly in lined with studies conducted in Debre Tabor and Nekemte (Awoke et al., 2015; Tolessa and Mengistu, 2017). In contrast to this finding, higher knowledge, more positive attitudes and higher scores in practice indicators regarding rabies was reported from Sri Lanka (Matibag *et al*., 2009). This difference probably might be explained by the lack of health education programs, lack of awareness and vicinity to health services about rabies in Ethiopia.

The current study indicated an association between KAP and Sex; male (58%) female (68.5%) with ($p<0.4202$), and educational status ($p<0.115$), which statistically significant association not observed. In this study the good KAP scores were highest in age group of 36-45 (83%) among other age groups of >45 (76.7%), 25-35 (67.1%), and 18-25 (43.7%) The statistically significant difference ($P<0.046$) in KAP score among age groups might be due to increased reading capacity and egger to search new thing as being student about rabies and better access to get information. The other factor that compared with age groups and better chance of acquiring identified to be significantly associated with knowledge on rabies was educational status. This result is also supported by the result of the studies conducted in Flagstaff, Bahir Dar, Debre Tabor and Nekemte (Andrea and Jesse, 2012; Tadesse *et al*., 2014; Awoke *et al*., 2015; Tolessa and Mengistu, 2017).

6. Conclusion And Recommendations

Rabies is a well-known disease in the study area and is considered to be a disease of significant public health importance. Information on local beliefs and practices can identify knowledge gaps that may affect prevention practices and lead to unnecessary deaths.

This study reveals important knowledge gaps related to, and factors influencing the prevention and control of rabies in study area. Despite this fact, still there are some KAP gaps in the community regarding the modes of rabies transmission, clinical signs, and prevention methods after suspected animal bite, first action taken in the home after bitten by a suspected animal and attitude to anti-rabies vaccine and traditional healer. Of the participants, 36% misunderstood the cause of rabies and 92.2% knew rabies as a dangerous as well as lethal disease. Age of the respondents were the variables found to be significantly associated but sex, educational and religious status not statistically significant association observed on KAP rabies.

Therefore, based on the above conclusion the following recommendations are forwarded:

✓ Raising the community awareness through continuous education, increase knowledge regarding wound washing immediate action after bite by animal.

✓ Seeking post exposure prophylaxis and the need to vaccinate dogs, collaboration between veterinary and human health professionals/offices, provision of pre and post exposure vaccines and creating rapid means of communications are suggested.

✓ Provide periodic education to raise community knowledge on rabies and provide accurate information targeted to people who have lower educational level, housewives or females more commonly present at home and small number of children in the household (limited social communication).

✓ Design accurate and urgent Community based rabies education program with emphasis on mode of transmission, clinical signs and immediate benefits of wound management and need for Anti-rabies vaccine following dog bite.

✓ Integrated work in cooperation with information sources like radio, television programs and newspapers to forward information related to rabies for enhancing the level of knowledge of the community about the deadly nature of the disease and the availability of preventive measures like vaccinations both for human and animals.

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8. Appendiexes

Assessment of knowledge, attitude and practice of livestock owners to wards on understanding of rabies

Name of respondent____________________zone ________________________

District ______________________kebele/village____________date:_____________

A. Sociodemographic characteristic of livestock owners/respondent

1. Age [in years]: A/ 18-25 B/ 25-35 C/ 36-45 D/ >45 years
2. Gender: (A) male (B) Female
3. Education: (A) illiterate (not able to read and write) (B) primary level (grade 1-8) (C) High school (grade 9-12) (D) diploma or degree

4. How many (in numbers) your family sizes are? _________

5. Which species and how many animals do you keep?

A/ Cattle______B/ chicken_____C/ Goat_____ D/ sheep___ E/ dog___ F/ others____

B. Dog management and care

1. What do you feed your dogs? Buy dog food Same food as family
2. Is your compound fenced? YES NO
3. Does the fence completely restrain the dog (s)? YES NO
4. Do you provide shelter for your dog (s)? YES NO
5. Who is primarily responsible for your dog (s)?

(A) Adults (B) Children (C) Employee (D) Everyone (E) No one

6. Do you seek veterinary services for your dog (s)? Yes No
7. Who provides the veterinary services for your dog (s)?
   Private Veterinarian Gov. Veterinarian Others Specific
8. Why don't you seek veterinary services? Expensive don't Know about it Veterinary Centre It is too far Cultural Beliefs I treat it myself I don't have a reason

C. Dog bite information

1. Has anyone in your household been bitten by a dog in the last 12 months? Yes No
2. Was the household member bitten by a known or unknown dog? Known Unknown
3. Which part of the body was the household member bitten?
   Leg and foot Hands Head and neck others sites
4. Do you know the owner of the dog that bit the household member? YES, No
5. Do you know of any animals that have been bitten by the dog that bit the household member? Yes, Please No
6. Do you know anyone who has died of rabies in your village or county in the last one year? Yes, No

D. Healthcare

1. What measure did the household member take immediately after being bitten?
   washed the wound with water and soap Bandage the wound didn't do anything
   Painkiller Traditional medicine Antibiotics other
2. Did the household member seek immediate medical attention after the dog bite?
   Yes No
3. How a person is prevented from getting rabies?

A/ Avoiding being bitten **B**/Vaccinating pets **C**/via good nutrition **D**/ others specifies

4. How person are prevention from getting rabies?
   Eliminate stray dogs Vaccination Herbal medicine application

Thank you very much for participation in this study

3/20/2019