JIMMA UNIVERSITY
COLLEGE OF AGRICULTURE AND VETERINARY MEDICINE
SCHOOL OF VETERINARY MEDICINE

COMMUNITY KNOWLEDGE, ATTITUDE AND PRACTICE ON RABIES AND RETROSPECTIVE SURVEY ON THE DISEASE IN AND AROUND LIMU KOSA DISTRICT JIMMA ZONE, SOUTHWEST ETHIOPIA

MSC THESIS

By

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Community Knowledge, Attitude and Practice on Rabies and Retrospective Survey on The Disease in and Around Limmu Kosa District Jimma Zone ,Southwest Ethiopia

M.Sc. Thesis

Submitted to the school of Veterinary medicine, Jimma University College of Agriculture and Veterinary Medicine in partial fulfillment of the requirements for the Degree of Master of science in Veterinary Public Health

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I have incorporated the suggestions and modifications given during the internal thesis defense and got the approval of my advisors. Hence, I hereby kindly request the department to allow me to submit my thesis for external thesis defense.

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We, the thesis advisor has evaluated the contents of the thesis and found it to be satisfactory, executed according to the approved proposal, written according to the standards and formats of the University and is ready to be submitted. Hence, we recommended the thesis to be submitted for external defense.

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DEDICATION

I dedicate this MSc thesis to my family who always are by my side in improving my academic career, especially to my dear mother Asnakech Ali Uma who has paid much scarification in every journey of my life to success.

BIOGRAPHICAL SKETCH

Konjit was born in Nonno benja district , Jimma zone , Oromia regional state on July, 1991 from her Mother Asnaqech Ali and from her father samirew Ayele . She attended her primary school at Sombo Dosha Primary and Junior Secondary School and Secondary School education at Ilu Galan Comprehensive Secondary School. Then she joined Alage ATVET College and graduated with diploma in animal health in 2011 . After her graduation, employed by the Nonno benja district Livestock and Fisheries Office as an Animal Health expert. Then she joined Jimma University in 2016 and graduated with BVSc in July 2017. She has been working in nonno benja Livestock and Fisheries development office until she got the chance to rejoin Jimma University in October 2018 to pursue her M.Sc. study in Veterinary Public Health.

STATEMENT OF AUTHOR

First, I declare that this thesis is my own work and that all sources of material used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced (MSc) degree at Jimma University, College of Veterinary Medicine and is deposited at the University library to be made available to borrowers under rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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LISTS OF ACRONYMS AND ABBREVIATIONS

CDC	Centers for Disease Control
CNS	Central Nervous System
CSA	Central Statistics Agency
DALYs	Disability Adjusted Life Years
EHNRI	Ethiopian Health and Nutrition Research Institute
HDCV	Human Diploid Cell Vaccine
KAP	Knowledge, Attitude and Practices
LKWHO	Limu Kosa District Health Office
PCEC	Purified Chick Embryo Cell
PEP	Post Exposure Prophylaxis
RIG	Rabies Immune Globulin
SPSS	Statistical Packaging for Social Science
WHO	World Health Organization

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ABSTRACT

Rabies is widely distributed viral zoonotic disease of major public health importance that affects human, domestic and wild animals. The public awareness play important role in preventing this fatal disease. A cross sectional and retrospective studies were conducted from March to November 2019 in Limu Kosa District, Jimma Zone, Southwest Ethiopia to assess the knowledge, attitude and practice of community on rabies and retrospective study of the disease. A multistage sampling procedure was used to select 250 respondents. Data were collected from respondents by face-to-face interview and four years retrospective data were obtained from registered casebook. Logistic regression was used to assessing the association of independent variable with knowledge, attitude and practices score. All of the respondents (100%) had previously heard about rabies. However, major of respondents have misunderstanding on the cause, incubation period and mode of transmission of the disease. Besides overall knowledge, attitude, and practice score, 55.6%, 50% and 41 % of the respondents had good knowledge, attitude and practices on rabies respectively. Moreover, the results multivariable logistic analysis indicated that good knowledge score was significantly higher in respondents from urban than rural area (OR=3.8; P=0.001), in male than female (OR=4.2 ; P=0.000), while, level of education (diploma and above) showed statistically significant association with knowledge, attitude and practice score ($p<0.05$). Besides, occupation (P=0.027) participant was also significantly associated with a higher good practices score. The retrospective result shows that 344 peoples were bitten by rabies suspected animals within the period of 2015-2018 and they was received post exposure vaccine. Most of the all recorded cases were bitten by dog (85%). Generally; there was a lack of awareness on knowledge, attitude, and practice of rabies and majority recorded cases were bitten by dog in the study area .Therefore, different non-governmental organization, government bodies, veterinarians and health professionals should be prepare deliver continuous and strategic community awareness programmes on prevention and control of rabies in the study area

Keywords: *Attitude, Knowledge, Practice, Rabies, Retrospective*

1. INTRODUCTION

Rabies is a widely distributed viral zoonotic disease of major public health importance that affects human, domestic, and wild animals. It is incurable and survivors are extremely rare (Burgos, 2011). It is one of the oldest known and most feared human diseases recognized since the early period of civilization. The Greeks called rabies *lyssa* or *lytta*, which means frenzy or madness. This disease affects all warm- blooded mammals including human and has been threatening the lives of humankind for more than 4,000 years (Schnell *et al*., 2010; Liu *et al.*, 2011).

The disease is characterizes by the development of severe nervous symptoms that lead to paralysis and death (Abera, 2015). Once symptoms of the disease develop, it is invariably fatal and deadly viral disease that can only be prevented rather it cannot be cured (Blackmore, 2014). Dogs remain the primary reservoir in developing countries, whereas wildlife species serve as hosts in developed nations (Rupprecht *et al*., 2007). The disease is to human transmits through close contact with saliva (bite or scratch) of infected animals (WHO, 2018). Carnivores such as dogs, cats, foxes, jackals, bats, raccoons and skunks are rabies reservoirs depending on the continents. However, dogs are responsible for more than 95% of all rabies transmission to humans in developing countries (Longo *et al*., 2012).

More than 3 billion people globally are living in countries/territories where dog rabies still exists and they are potentially exposed to the disease. In many countries of those continents, few activities are underway to prevent of rabies occurrence in humans and to control rabies in dogs, even when the number of human deaths is high (Shaw *et al*., 2014). Globally, it leads to over 3.7 million disability-adjusted life years and an estimated of 8.6 billion dollars economic loss annually due to premature death (55%) and direct cost of Post Exposure Prophylaxis (PEP) (20%) (Hampson *et al*., 2015).

Rabies is widely distributed across continents of the world. Globally, It causes around 60,000 human deaths per year despite more than 15 million people receive post exposure prophylaxis (PEP). Above 95% of deaths occur in Asia and Africa. Africa accounts for 44% of deaths. More than 40% of deaths occur in children under 15 years old (WHO, 2018). Rabies elimination is feasible through dog vaccination and prevention of dog bites. Dog vaccination is the preferred

method of controlling and eliminating rabies worldwide. According to world health organization (WHO), dog vacci nation coverage should at least 70% in rabies endemic zones to eradicate/block outbreak occurrence (WHO, 2013). In Ethiopia, rabies is an important disease that has been recognized for manycenturies

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 in both human and animals (Deressa *et al*., 2010; Yimer *et al*., 2012; Tschopp *et al.,* 2016; Teklu *et al.,* 2017). It was estimated that more than 2,700 human lives are lost estimated annually in Ethiopia (Hampson *et al*., 2015; Edukugho *et al*., 2018). Dogs were the reason for 97% of rabies related human deaths in Ethiopia (Kidane *et al.,* 2016). Ethiopia has one of the highest incidence levels of human rabies in Africa, with 3–7 deaths per 100,000 people annually (Beyene *et al*., 2018). Deressa *et al*.(2010)reported 35-58 annual human death due to rabies in Addis Ababa and its surrounding during 2001-2009 .The impact of rabies in Ethiopia is aggravated due to limited availability, accessibility, affordability, awareness and knowledge of rabies PEP after exposure to rabid dogs and other animals (Jemberu *et al*., 2013).

1.1.Statement of the problems

Rabies was reported to be one of the public health concerns that need formulation of intervention strategy in Ethiopia .In Ethiopia, rabies victim individuals especially from rural areas usually come to health institutions after failing traditional intervention and loss of life from family members (Deressa *et al*., 2010). The important components of rabies prevention and control include community awareness, responsible pet ownership, routine veterinary care and vaccination, and professional continuing education (Chernet and Nejash, 2016). The community knowledge, attitudes and practices are important both for prevention of human deaths due to rabies and for control of the disease in animals (Dhand *et al.,* 2012). There is a scarcity of information on rabies prevention and control practice and associated factors among community in Ethiopia; the same scenario is true in Limu Kossa district. Most studies indicated that people are familiar with prevention and control of rabies (Kidane *et al.,* 2016; Guadu *et al*., 2018). In most studies even though people were familiar with rabies, there is still a gap besides accurate quantitative information on rabies both in humans and in animals and little is known about the awareness of the

people about the disease to apply effective control measures in Ethiopia in general and in study area in particular. Even if there were reports of death of humans and animals in the study area, however, no prior studies were undertaken on the prevalence and public awareness towards rabies. Known the uncertain rabies situation in the Ethiopian, specifically in limmu kosa district, it was an important to assess the situation of the disease in the areas as well as knowledge, attitude and practice of the people towards rabies in general. Therefore, knowledge, attitude and practice of community on rabies and current information on rabies inhuman in Limu Kosa districts are important to understand the epidemiological situation of rabies. This was crucial for effective planning of rabies management, prevention or control.

1.2.Objectives of the Study

1.2.1. General Objectives

To assess knowledge, attitude and practice on rabies and retrospective study of the disease in and around Limu Kosa district, Jimma Zone, southwest Ethiopia.

1.2.2. Specific Objectives

- To assess the knowledge, attitude and practices of selected communities in the study area on rabies
- To identify factors associated with community knowledge, attitude and practice in the study area on rabies.
- To quantify retrospectively the distribution of rabies in the study area

1.3. Significance of the Study

The finding of this study is expected to benefit Limu kosa district health office as they plan to fill the gap that was identified regarding rabies KAP. This study will also help all the communities of Limu kosa district to take a measure on prevention and control of rabies. Furthermore, it provides base line information on the community knowledge, attitude and practices (KAP) of rabies in the study area. On top of this, the finding of the research also provides information for medical practitioners and public health policy makers to reduce the incidences of human exposures and prioritizing the use of PEP. Finally, it may help as reference for a researchers interested to study in other similar research theme.

2. LITERATURE REVIEW

2.1.The History of Rabies

Rabies is a lethal zoonotic disease with worldwide occurrence and is transmit mostly by carnivores to humans and livestock. It is known to cause large number of deaths in humans and animals each year. It is the most serious zoonotic disease caused by virus, which is released in the saliva of infected animals that someone might encounter (Deressa *et al.,* 2010; Reta *et al.,* 2014).

Rabies, a viral disease that affects all warm-blooded animals and it is widespread in many regions of the world. The virus is shade in the saliva of clinically ill animals and transmitting through a bite (Deressa *et al.,* 2010). The virus affects virtually all mammals and infected species invariably die from the disease once clinical signs are manifesting. Once clinical symptom appear, it is almost 100% fatal. More than 97% of human rabies cases are due to dog bites and the rest associated with cat, fox and other carnivores (Windsor, 2004; Jemberu *et al.,* 2013; Admasu *et al.,* 2014; Aga *et al.,* 2015).

Rabies is a disease of brain causing encephalitis, almost inevitably fatal zoonotic disease. It has worldwide distribution.Beside poliomyelitis and pox, rabies is one of the longest known infectious diseases in human history. Rabies virus infection most commonly occurs when a rabid animal bites an animal or a person (Guadu *et al.,* 2014; Shite *et al.,* 2015) and causes an acute viral disease of the central nervous system (CNS) that affects humans and other mammals. The main reservoir for humans knows to be carnivores. Rabies is almost invariably fatal once the clinical signs develop (Reta *et al.,* 2013; Shite *et al.,* 2015) and it is endemic in developing countries of Africa and Asia where it is responsible for causing deaths in human and livestock. The annual cost of rabies in Africa and Asia was estimated at 60,000 million USD most of which is due to cost of (PEP) Ethiopia being one of the developing countries is endemic for rabies. Globally, human mortality from endemic canine rabies was estimated to be 55,000 deaths per year and 56% of the estimated deaths occur in Asia and 44% in Africa and responsible for 1.74 million (DALYs).

About 98% of the human rabies cases occur in developing countries that possess large number of dogs, many of which are stray dogs (WHO, 2004; Jemberu *et al.,* 2013; Guadu *et al.,* 2014; Moges, 2015).

2.2 .Etiology

The causative agent of rabies is a member of the *Lyssavirus* genus of the *Rhabdoviridae* family of bullet shaped viruses, which have a single-stranded RNA genome (Nilsson, 2014; Moges, 2015).. All the of *lyssaviruses* share many biological and physicochemical features as well as amino acid sequence characteristics that classify them with other *rhabdoviruses*. These include the bullet shaped morphology helical *nucleocapsid* or ribonucleoprotein core. The five structural proteins of the virion include nucleocapsid protein, phosphoprotein ,matrix protein, glycoprotein and RNA – dependent RNA polymerase or large protein (Jackson and Wunner, 2002).

Table 1: Rabies-related lyssa viruses; their serotype, hosts and geographical distribution

Serotype	**Host**	**Geographical occurrence**
Rabies virus (Lyssavirus type 1)	Canids, raccoons and skunks	World wide
Lagos bat virus (Lyssavirus type 2)	Fructivorous bats	Africa
Mokola virus (Lyssavirus type 3)	Fructivorous bats	Africa
Duvenhage virus (Lyssavirus type 4)	Fructivorous bats	South Africa
European bat virus type 2 (Lyssavirus type 5)	Fructivorous bats	Europe
European bat virus type 2 (Lyssavirus type 6)	Insectivorous bats	Europe
Australian bat virus (Lyssavirus type 7)	Flying foxes	Europe

Source: (Krauss *et al.,* 2003).

2.3 Epidemiology

Rabies remains a fatal infection in man and animals worldwide, except in some countries where there is strict quarantine system, rigorous eradication programme or natural barriers like mountains and rivers. Recently, the United States of America has declared free of canine rabies (Rupprecht *et al.* 2006) by 1995, the world estimate deaths were about 60,000 humans per year, which are about

200 humans each day worldwide. However, there are only about 35,000 notifications per year (CDC, 1999). Animal Rabies ranked 12th in the WHO list of from infectious and parasitic diseases those constitute the major causes of death (WHO, 2000). It was also rated the 11th cause o f human death due to infectious diseases in 2000 (Fitzpatrick *et al.*, 2012*)* .It has been reported that 98% of human rabies cases occurred in the developing countries of Asia, Africa and Latin America (Dacheux et *al*.,2012).

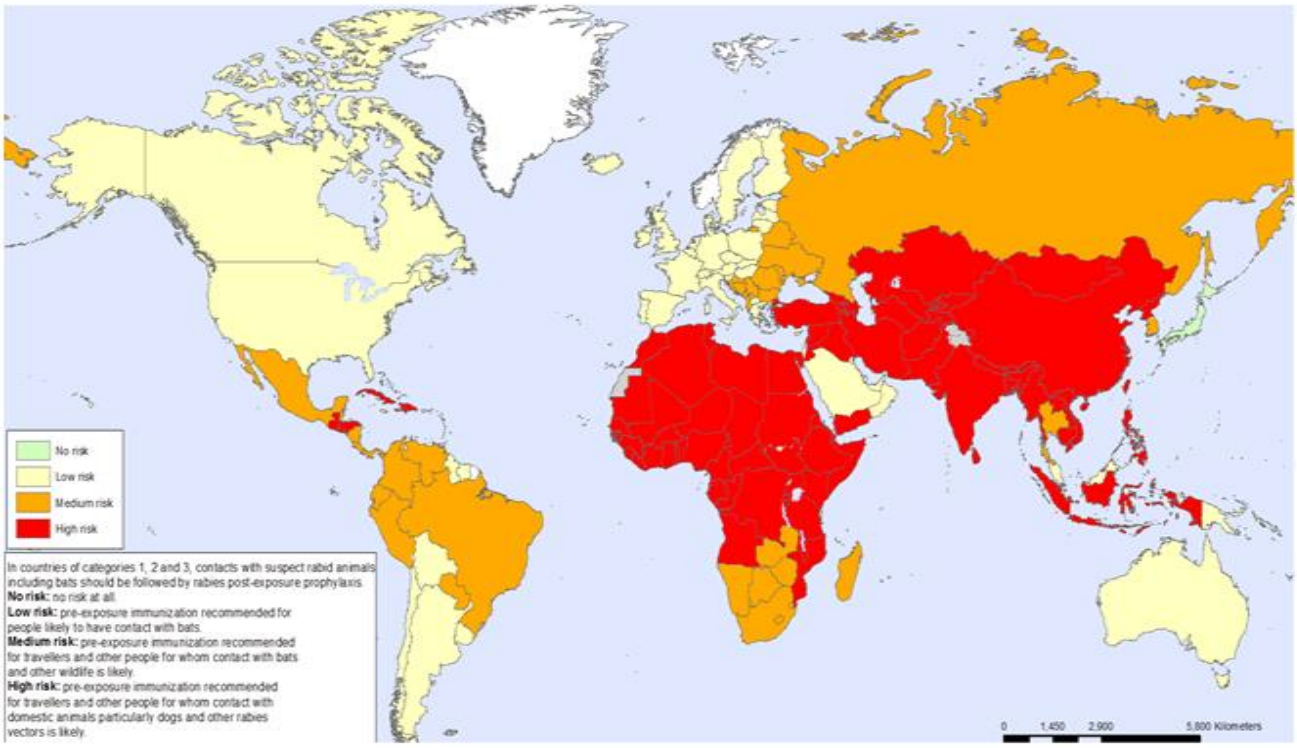

Figure 1: Distribution of rabies in the world

Source: WHO, 2018

2.3.1 Reservoir

In Africa, evidence indicates that the primary rabies virus maintenance cycle is among domestic dogs although other carnivores may be involved as non-maintenance populations (Lembo *et al.*,2012). This finding suggests that mass vaccination targeting domestic dogs would have the greatest impact in reducing the risk of infection in all other species including humans, livestock and wildlife (Lembo *et al.,* 2012). In the Americas, bats are the source of most human rabies

deaths while deaths following exposure foxes, raccoon's skunks, jackals, mongoose and other wild carnivores host species are rare. The role of bats and other carnivores inhuman rabies transmission in Africa appears minimal (Eyob *et al.*, 2015*)*

2.3.2. Prevalence and Seasonal Occurrence of Rabies in Ethiopia

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). A retrospective study of number of fatal human rabies cases studied in Addis Ababa and its surrounding from 2001-2009 were 386 with an annual range of 35 to 58 persons dying. Most fatal cases reported are children under 14 age groups (Deressa *et al*., 2010). Another retrospective study of rabies in Addis Ababa from 1990-2000 indicated that an average of 2,200 people per year received post-exposure anti-rabies treatment while 95% of the reported fatal human rabies cases was due to dog bites (Yimer *et al*., 2002). According to EHNRI laboratory data from 1990- 2010, out of 6,739 animal brain tissue samples examined by direct fluorescent antibody test (FAT), 4,939 (73.4%) were positive for rabies virus of which dogs represent 91.1% with the incidence rate of 89% and the remaining percent accounted by other domestic animals (Cats, cattle, sheep, goats and equines) and wild animals. Similarly, 97.3% of human rabies were due to dog bites and the remaining 0.2% and 2.5% were contributed by other domestic rather than dogs and wild animals, respectively (HNRI, 2011).

These statistics are indicative that rabies, which is maintained and disseminated mostly by dogs, is a threat to public health in Ethiopia. According to Ethiopian Health and Nutrition Research Institute (EHNRI), annual number of brain tissue samples examined between 1990 and 2010 ranges from 89 to 1,298 of which rabies positive samples ranged from 50.8% to 85.3%. Based on the above data, highest number of rabies cases were reported in cold season (June to September) though animal rabies occurred throughout the year. Although animal rabies throughout the year in Ethiopia, the highest seasonal occurrence was recorded at cold season(. This is most probably due to mass gathering and highest reproduction of dogs during the period which increases the contact between rabid and health dogs. Anti-rabies vaccine (Fermi-type nervous tissue vaccine) (NTV) distribution strategies, public educational campaigns and stray dog population control programmers through culling have not been successful in reducing cases of rabies in Ethiopia. In

addition, the Homeless Animals Protection Society proposed to implement the ABC program me, which is more humane dog population control strategy because dog were killed unnecessarily, but instead the Trap Neuter Release Method is used and it has had highly successful results in the USA and India. The ABC program was tried in Addis Community as Animals Pilot Project.

However, the program discontinued owning to the expensive cost associated with the implementation of the program me. At present, some on-going efforts of rabies survey are put in place at the national level by EHNRI and fragmented rabies prevention and control by distributing Fermi-type nervous tissue vaccine to few health centers are also practiced. Although the usage of NTV was recommended to be discontinued by WHO starting from 1984, it was produced and still used in Ethiopia for treatment of rabies owing to the expensive cost of modern cell vaccines than Fermi-type NTV produced at EHNRI. Ethiopian cell culture vaccine named as 'ETHIORAB' has been produced by Ethiopian Health and Nutrition Research Institute (EHNRI) and is of its clinical trial phase in dogs (EHNRI, 2011).

2.4 .Methods of Transmission

A rabies exposure is any bite, scratch, or other situation in which saliva, cerebral spinal fluid, tears, or nervous tissue from a suspect or known rabid animal or person enters an open wound, is transplanting into or met mucous membranes of another animal or person (Semayat and Bekele, 2017**).** The common mode of transmission of rabies in man is by bite of a rabid animal or the contamination of scratch wounds by virus infected saliva (Chernet and Nejash, 2016) and of both wild and urban rabies occurs mainly when an animal that is shedding virus in its saliva bites another susceptible animal or humans. Spread of the disease is often seasonal, with high incidence in late summer and autumn because of large-scale movement of wild animals at the mating time and in pursuit of food (Shite *et al.,* 2015).

Rabies virus is transmitting by contamination of a fresh wound with infected saliva from the bite of a rabid animal or from licking abraded skin or mucous membranes. Respiratory and oral transmission can also occur. The main determinant of transmission is the population density of non-immunized susceptible key host species that are free roaming within an ecosystem (MoARD, 2010). 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 (Deressa *et al.,* 2010). Once the rabies virus enters the body, it begins to multiply in the area near the entry site (Deressa *et al.,* 2010, Moges, 2015).

Usually transmission occurs by bite with rabid canine and under unusual circumstances by inhalation of large amounts of aerosolized rabies virus and through organ transplantation from rabies-infected patients (Jemberu *et al.,* 2013). Rabies-infected animals have rabies virus in their salivary glands at high titers, which can be even greater than in the brain (Esayas *et al.,* 2012).Rabies is mainly rural transmitter, the hematophagous bat (*Desmodus rotundos*), that transmits the disease to herbivores, as these are the most common food source. Cycle in wild disease is transmits to animals like fox, wolf, monkey, co on, skunk, among others.

These animals can be a source of food for the hematophagous bat (Shite *et al.,* 2015). Transmission to people occurs predominantly via infected animal bite or scratch as well as via their saliva through mucosa and broken skin (Tschopp *et al.,* 2015). Rabid dogs are the principal sources for the transmission to human. The transmission usually occurs by an animal bite that inoculates the virus into the wounds. Virus inoculated into a wound does not enter the bloodstream directly bur is takes up at a nerve synapse to travel to the brain; it causes encephalitis (Serebe *et al.,* 2014).

2.5 .Pathogenesis

Rabies virus enters the body through wounds or by direct contact with mucosal surfaces, but cannot cross-intact skin. Rabies virus replicates in the bitten muscle (local viral proliferation in non-neural tissue) and gains access (viral attachment) to motor endplates and motor axons to reach the central nervous system (Shite *et al.,* 2015, Chernet and Nejash, 2016). Virions are carrying in transport vesicles (Klingen *et al*., 2008) and travel to the central nervous system (CNS) exclusively by fast retrograde transport along motor axons, with no uptake by sensory or sympathetic endings (Hemachudha *et al*., 2013).

Follow centrifugal transport along efferent cranial nerves, the salivary glands become infect and virus particles were shed in the saliva. Infection of the brain commonly leads to behavioural changes that induce the host to bite other animals, thereby transmitting the virus. The widespread

central nervous system infection almost inevitably leads to death, usually through respiratory paralysis, but also through secondary circulatory, metabolic or infectious processes (Shite *et al*., 2015).Viruses can also enter motor axons in peripheral nerves directly during a penetrating injury (Chernet and Nejash, 2016). The incubation period varies from 5 days to several years (usually 2–3 months; rarely more than 1 year) depends on the amount of virus in the inoculums, the density of motor end plates 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 bites on the head or neck or if heavy inoculums are transfers 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 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 reports in vampire bat- transmitted rabies. In human, the incubation period can be a few days to several years. Most cases become apparent after 1-3months (CDC, 2004).

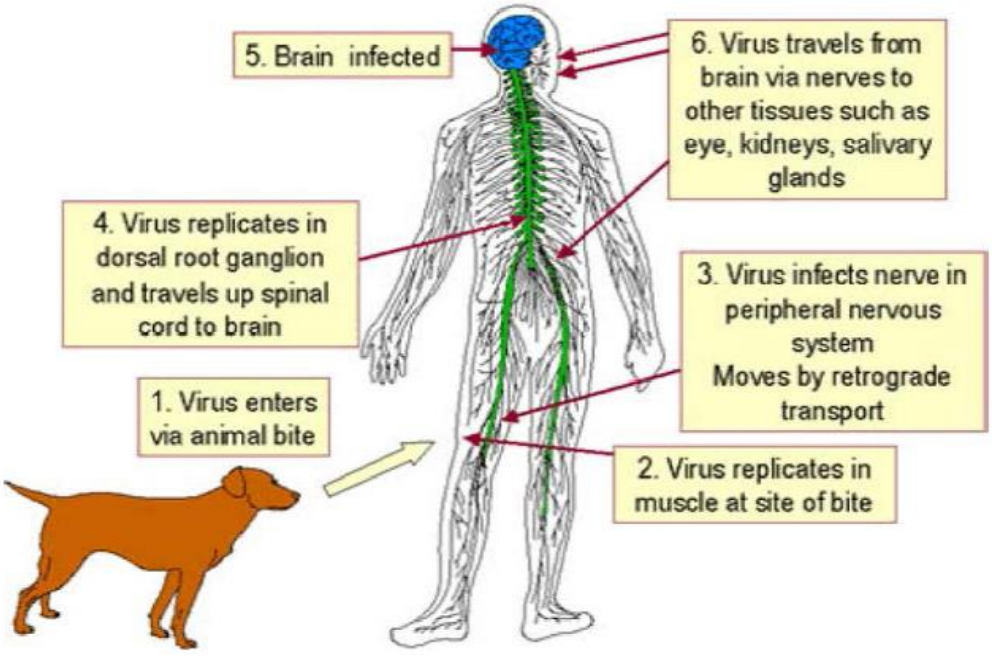

Figure 2: Pathogenesis and spread of rabies in parts of the body system.

Source :(Shite *et al*., 2015)

2.6. Clinical Presentation

Incubation Period in Animals: The incubation period is depending on the size of the viral inoculums. The proximity of the wound to large nerves and the length of the neural path from the wound to the brain (Giesen, 2015).Thus, it may be shorter following bites on the face and head and longer when the bites occur in the legs or the extremities. It may also be shorter in small breeds of dogs as compared with large breeds (Giesen, 2015).

The incubation period in animals can vary considerably: in dogs and cats, it is between 2 to 12 weeks, although longer incubation periods are reports. Studies on the pathogenesis of rabies in the CNS have shown that clinical signs where not observed until after several growth cycles of the virus had occurred and the virus had spread through the entire CNS with the involvement of numerous neurons. The clinical signs may be variable in dogs at the onset but by the time the animal dies, there usually have been enough characteristic signs, evident of the disease (Shite *et al.,* 2015).

Clinical Features in Animals: There are two distinct forms of rabies in animals, furious and dumb forms. Furious rabies is the classic "Mad-dog syndrome" and may be seeing in all species. The animal becomes irritable, may viciously and aggressively uses its teeth, claws, horns, or hooves to attack humans and other animals, without provocation. Such animals lose caution and fear of humans and other animals (Hemachudha *et al*., 2013).Dumb/paralytic rabies manifests with ataxia and paralysis of the throat and jaw muscles, often with profuse salivation and the inability to swallow. These animals may not be vicious. Rabid dogs or cats die within 10 days of onset symptoms (Tschopp *et al.*, 2015). Incubation Period in Humans: In humans, the incubation period for rabies is typically 1–3 months, but may vary from below 1 week to more than 1 year. The average incubation period of between 31 and 90 days has been report, but it can be as short as 7 days, although it could be as long as 25 years (Shankar *etal*, 2012).

Less than 1% of well-documented cases had incubation periods of between 1 and 5 years following exposure (Takayama, 2008).The incubation period is usually between 20 and 90 days and it is shorter if the site of bites is on the head (25-40 days(Hemachudha *et al*., 2013).

Clinical Features in Humans: The initial symptoms of rabies are fever and often pain or an unusual or unexplained tingling, pricking or burning sensation (Paraesthesia) at the wound site (Johnson *etal.*, 2010) .As the virus spreads through the central nervous system, progressive, fatal inflammation of the brain and spinal cord develops. Two forms of the disease can follow; furious or paralytic rabies. People with furious rabies exhibit signs of hyperactivity, excited behavior and hydrophobia (Fear of water) and death after a few days (NHS, 2012).

Paralytic rabies accounts for about 30% of the total number of human cases. This form of rabies runs a less dramatic and usually longer course than the furious form. The muscles gradually become paralyzing, starting at the site of the bite or scratch. A coma slowly develops and death eventually occurs. The paralytic form of rabies is often misdiagnosed, contributing to the under-reporting of the disease. Once symptoms of the disease develop, the disease is fatal (Bishop *etal*., 2003)

2.7 Diagnostic Techniques

Several techniques such as; demonstration of Negri bodies by direct FAT, latex agglutination test, Virus isolation in new born mice, virus isolation in cell cultures, ELISA, Electron Microscopy and recently molecular methods have been used to detect rabies antigen details of which have been published in many review articles (Fook *et al.*, 2009). However, FAT is gold standard recommended by both WHO and Office International des Epizooties (OIE) and the most widely used test for rabies diagnosis as it is highly sensitive, specific, cheap and gives reliable results providing results within few hours in more than 95-99% of rabies cases (OIE, 2008).

2.8 .Treatment

No certain cure for rabies except supportive care.Post exposure prophylaxis consists of immediate wound cleansing and disinfection, followed by rabies vaccination and the administration of human rabies immunoglobulin. The application of traditional medicine to veterinary medicine has been termed as *ethno veterinary* medicine. It is mainly concerned with *folk* beliefs, knowledge, skills, methods and practices, which are uses in the healthcare of animals (Fullas, 2010).

Traditional medicine is the sum total of the knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental and/or social imbalance

(Berhanu *et al.,* 2006). Most people use wide variety of traditional treatment in cases of bite by animals (mostly dogs) believed to be rabid (Aga *et al.,* 2015) and traditional medicine (TM) includes *folk* drugs composed of herbs, herbal materials, herbal preparations and finished herbal products (Contain as active ingredients of plant parts, or other plant materials). Herbal medicines include the medicinal products of plant roots, leaves, barks, seeds, berries or flowers (Admassu and Mekonnen, 2014, DACA, 2010). The effectiveness of and safety of these traditionally used *ant rabies folk* drugs in the country was not well demonstrated and understood. Some of *folk* drugs include *Datura Stramoniu, Cucumis ficifolius, Euphorbia abyssinica* and *Salix subserrata* (Adimasu and Mekonnen, 2014).

2.9. Control and Prevention

Rabies can be prevent 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).

Domestic animal vaccination: The primary components of a rabies control program for companion animals were immunization and licensing; stray animal control; reporting, investigation, and isolation of animals involved in bite incidents; and public education (Chernet and Nejash, 2016). Multiple vaccines are license for use in domestic animal species. Vaccines available include; 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 (Moges 2015, Shite *et al.,* 2015).

Animal control: 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. 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 (ORV) for the mass vaccination of free-ranging wildlife should be considers in selected situations (Hurisa *et al.,* 2013, Chernet and Nejash, 2016).

Public health education: Understanding communities' perceptions of cause, mode of transmission, symptoms, treatment and possible intervention measures of rabies is an important. Step towards developing strategies aimed at controlling the disease and determining the level of implementation of planned activities in the future (Ali *et al.,* 2013) and creating responsible pet ownership, routine veterinary care and vaccination, and professional continuing education. Having about controlling animal and human exposures to rabies can be prevents by raising awareness concerning rabies transmission routes, and avoiding contact with wildlife. Public education on the risks of rabies transmission from wild animals is paramount to effective disease prevention (Aga *et al.,* 2015, Shite *et al.,* 2015, Chernet and Nejash, 2016).

Vaccines**,** antiviral drugs such as ribavirin, interferon-alpha, passively administered anti-rabies virus antibodies (human immunoglobulin or monoclonal antibodies), ketamine and/or the induction of a coma have been tried in the past, but were usually ineffective (Shite *et al.,* 2015). It is better to register, license and immunize all dogs in enzootic countries, collect and euthanize ownerless animals and stray dogs. To create awareness, pet owners and the public should be educated to educate about the importance of restriction for dogs and cats and advise them against keeping wild animals as a pet (Moges ,2015).

According to Chernet and Nejash, (2016), rabies control strategies include quarantine, confirmation of diagnosis, determining the origin and spread of an outbreak, and specific measures to terminate transmission. All local jurisdictions should incorporate stray animal control, leash laws, animal-bite prevention and training of personnel in their programs (Shite *et al.,* 2015).

2.10 .Human Rabies Vaccination

Human rabies can be prevent 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 (CDPH, 2012).The human diploid cell vaccine (HDCV) that contains inactivated rabies virus is available for both pre and post-exposure vaccination using 1.0ml intramuscular dose. Pre-exposure vaccination may also be doing with a smaller dose of 0.1ml intra dermally (Warrell and Warrell, 2015).

Other types of vaccines include Purified Chick Embryo Cell Vaccine (PCEC), Purified Vero Cell Rabies Vaccine (PVRV) and Purified Duck Embryo Vaccine. Post- exposure treatment with HDCV is recommending for people with known or probable exposure to rabies virus (WHO, 2007). Immediate post-exposure use of modern vaccines combined with proper wound care and Rabies Immune Globulin (RIG) is almost 100% effective in preventing rabies, even following high-risk exposure (WHO, 2007). The rare-risk category includes the entire human population. Pre- exposure vaccination is not recommends for this category (WHO, 2007). Pre-exposure vaccination recommended for people in the other three categories. People in the continuous-risk category are laboratory workers in research and biologics production who work with virulent rabies virus in high concentrations on a regular basis. People in the frequent-risk category include rabies diagnostic laboratory workers, spelunkers, veterinarians, veterinary technicians, and animal control and wildlife workers in areas with epizootic rabies. The infrequent-risk category includes people in the frequent-risk category but in areas of low rabies endemicity, in addition to travellers or workers in foreign countries with epizootic rabies (WHO, 2007). The primary pre-exposure vaccination consists of three doses on day 0, 7 and 21 or 28 (Warrell and Warrell, 2015; WHO, 20015). People in the continuous and frequent risk categories should have their rabies antibody titres periodically monitored and have a single boster dose of HDCV when titres are below significant levels. Routine boosters are recommended every two or more years. Booster dose is not recommending for people in the infrequent-risk category (WHO, 2007).

For people who have had pre-exposure vaccination, only two doses of post-exposure vaccine are needed 3 days apart regardless of the time since the vaccination (Warrell and Warrell, 2015). For those without pre-exposure vaccination, 5 doses of post-exposure vaccine are needed, on days 0, 3, 7, 14 and 28, in combination with one dose of rabies immune globulin at a dosage of 20 IU/ kg on day 0 (WHO, 2007; Warrell and Warrell,2015). Since twentieth century B.C., the owner of a mad dog whose bite caused human death faced strict penalties. Today, dog owners whose dog bites a person are charging with the responsibility of providing PEP (Balogh *et al.*, 2001).

Most often than not, PEP is not available in government hospitals in African countries and

victims of dog bites have to get them from private clinics at high costs. Victims are also force to travel long distances to look for PEP. Since such victims ends up not receiving the appropriate PEP, wound washing with soap and water should be emphasizing to reduce the risk of developing rabies (Balogh *et al.*, 2001).Community surveys show high level of negligence by both the victim and the health care providers, as most victims of dog bites do not get PEP (Abbas *et al.*, 2011). Poor households cannot afford the PEP, and this affects its delivery. Moreover, many remote health facilities in Africa do not stock PEP. Victims of animal bites are therefore force to travel long distances to obtain treatment, further increasing the costs (National Rabies Elimination Strategy, 2014).

2.11 .Stray Dogs and Rabies

They are also refers to as “free ranging” or “stray” dogs and include both owned and unowned dogs (Jamlick, 2016).There is an enduring misperception that a large proportion of dogs in Africa are ownerless or “stray” dogs that are not accessible for vaccination (Lembo *et al.*, 2010). These has led to policy makers being reluctant to invest in dog vaccination campaigns and are directing resources towards ineffective strategies, such as culling (Cleavaland *et al.*, 2014). Dog ecology studies shows that ,although most dogs in Africa are free-roaming, the number of ownerless dogs remains very low as majority are owned, and at least one household claims some responsibility, including presentation for vaccination (Lembo *et al.*, 2010). The level of dog ownership and accessibility is sufficient to enable control of rabies through mass vaccination of dogs (Cleavaland *et al.*, 2014).

Human behavior and attitude facilitates the existence of unowned dogs, and, in reality, "stray dogs" belong to the community (Ratsitorahina *et al.*, 2009). In most of the African communities, the issue on roaming dogs seems not to be one of a lack of ownership, but rather an inability or unwillingness by owners to confine their dogs (Lembo *et al.*, 2010). Roaming dogs suffer welfare problems and presents a human health risk, most notably rabies (Hiby *et al.*, 2011). Increase in the number of stray dogs leads to an increase in dog bites and rabies cases in humans (Abbass *et al.*, 2011). Advocating for responsible dog ownership and immunization of all dogs are important areas that rabies control efforts should target. Eshetu *et al*., (2002) reported that all available data indicate that dogs are responsible in maintaining as well as dissemination of rabies

in Ethiopia and are primary cause for fatal human rabies cases.

2.12. Management of Human Bitten by Dog Exposed to Rabies

A dog showing neurological signs at the time it bit someone, or stray dog that bites a human euthanized immediately and its brain submitted to a diagnostic laboratory for rabies diagnosis. If rabies virus is not detected in the brain of the dog, the bitten person is considered unexposed. If the virus detected, the bitten human should given PEP immediately (Jamlick, 2016).If the dog that bit a human is healthy and owned, it confined for 10 days and observed for signs of rabies. This 10-day observation period helps to determine whether the bitten person is exposed to rabies. This determination is because dogs shed rabies virus in saliva only for a few days before development of clinical rabies (Jamlick, 2016). Six (6) days before onset of clinical signs is the earliest, that rabies virus detected in saliva of dogs and therefore, if the dog remains healthy for 10 days after biting a human, such people are considered unexposed (Jamlick, 2016).

3. MATERIALS AND METHODS

3.1. Descriptions of the study area and study period

The study was conducted between the periods of March to November 2019 in Limu Kosa district, Jimma Zone, Southwestern Ethiopia. Limu Kosa district is located 425 km and 75 km southwest of Addis Ababa, the capital of Ethiopia, and Jimma, the capital city of Jimma Zone, respectively, lying between Latitude of 7°50′ and 8°6′ North and Longitude of 36°44′ and 37°29′ East. The altitude of the district ranges from 1200m to 3020m above sea level. It has an area of 2770.5 km ^{2}(CSA, 2016). According to the Population and Housing census conducted in 2007, Limmu Kosa, has a total population of 161, 389 (CSA, 2017). It is bounded by Chora botor in the East, Gomma in the west, Limu Saka in the North and Kersa in the South. With regard to climate, Limu Kosa District is classified into *Dega(*high land*)* (10%), *Woina –Dega*(mid land*)* (65%) and *kola(*low land *) (*25%) zones. Natural and manmade forests are available in the district. Limu Kosa constitutes 40 rural Kebeles and 4 town administrations that all surround the main town of Limu Genet. This area is mainly known for its coffee production as a major cash crop in the area. Limu kosa has a livestock population of cattle (243,431), sheep (193,386), goat (77,171), poultry (480,578), donkey (30,466), cat (2868) , mule (17901) and dogs (7520) (CSA, 2009).

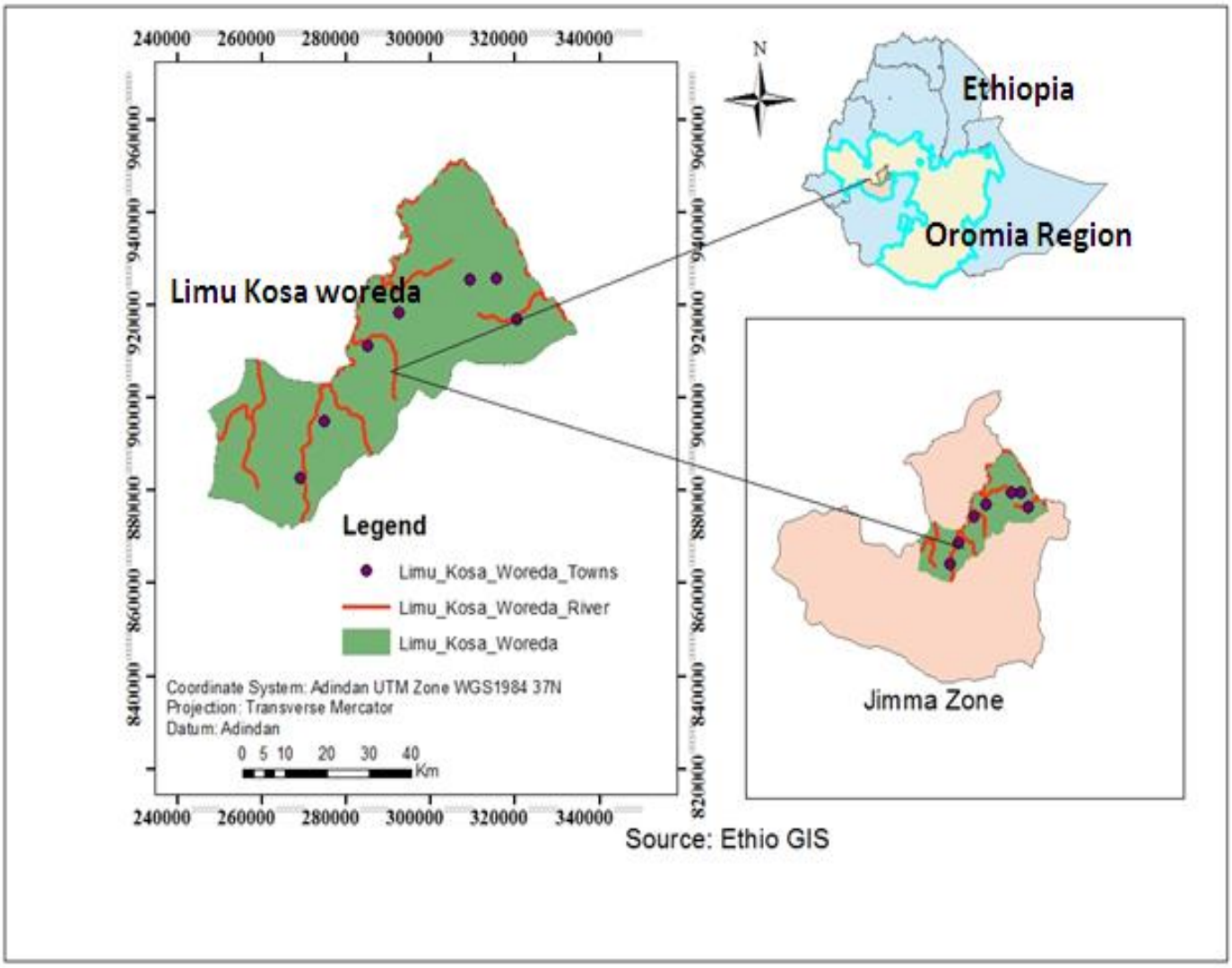

Figure 3: Map of the study area

3.2. Study design

The research design for this particular study was cross-sectional survey and retrospective records reviewed from Limu Genet hospital.

3.3. Study population

The study populations were household heads or their spouses of ≥18 year's age that lived at least for six months as permanent resident in the study area, animal health workers and human health workers were included in the study.

3.4. Sample size and Sampling Methods

A multistage sampling technique was used for selection of the sampling units. At the first stage Limu kosa districts was selected purposively from 21 districts of Jimma zone to collect retrospective data from Limu Genet hospital. At the second stage, five *kebeles*, namely (Limmu Genet 01, Wirtu sokore, Babbu, Walake and Sunxu) were selected randomly from Limu kosa district to gather information on KAP of respondent regarding to rabies. Finally, simple random sampling method was employed to select the respondents from different parts of the town and peasant associations around the rural. . Respondents were included in the survey based on willingness and informed consent. The number of respondent to be included in each administrative area was determined by population proportion to size based on the total number of household found in each kebele .The sample size of this particular study was calculated based on the formula given by Arsham (2005).

$N = 0.25 / SE^2$

Where N= sample size, S= standard error, 5%. Accordingly, 100 respondents should be selected, however, to increase the precision and representativeness, the sample size was increased to 250.
In addition to survey collected from the respondents, retrospective data from 2015 to 2018 year was also reviewed from the casebook of Limu Genet Hospitals.

3.5. Method of Data Collection

Data was collected using pre-tested semi structured questionnaire. The questionnaire was developed based on the information gathered from literatures and what the community is practicing. Semi-structured face-to-face interviewee with pre-tested questionnaire on 10 respondents having both open and close questions was made with 250 respondents (Appendix -1). The questionnaire was designed to obtained demographic characteristics of respondents (age, residence, sex, education level, religion and occupation) and every randomly selected participants were interviewed to get information regarding his/her general experience on knowledge (cause, transmission, symptoms and prevention), attitudes and practices towards rabies disease. For assessing the community knowledge, attitude and practices (KAP) twenty-three questions were asked each respondent regarding cause, source and mode of transmission, clinical sign and symptoms, prevention practices and treatment measures of rabies. The number of questions for

which respondents give correct answer was counted and scored strictly. Then, the scores were pooled together and the mean score was computed to determine the overall knowledge, attitude and practice of respondents. The respondents who score greater than or equal to the mean value grouped to good KAP and less than the mean value were grouped as Poor KAP level. Furthermore, the four-year (2015 to 2018) retrospective data were obtained from registered casebooks of admitted persons for the rabies case in Limu Genet hospital. A retrospective data-collecting format, which contains date, age, sex, source and season of exposure, was prepared and used. Eight trained health extension workers and two supervisors (health officers) collected the data for this research.

3.6. Data Management and Analysis

The data collected were cleaned and checked for its completeness and entered into Microsoft Excel 2007, then, the data were coded and entered in to (SPSS) version 23.0. Descriptive statistics like percentage and frequency distribution were used to estimate the proportion of independent and dependent (KAP) variables. Logistic regression used was for calculating the association between independents variable and dependent variable (knowledge, attitude and practices scores) of community regarding rabies. Odds ratio was used to assess the strength of association in all the analyses, confidence level was held at 95% and $P < 0.05$ were considered as significantly.

3.7 Ethical Considerations

Approval of the study was obtained from the Board of postgraduate studies of Jimma University College of Agriculture and Veterinary Medicine (JUCAVM). Then the University was sent a letter informing the Limu Kosa district Administrations and Hospital administrators about the study and hence permission obtained from the Hospitals. Informed consent of the participants in the study was obtained and respondents were assured of confidentiality of information supplied. Only voluntary participants were involved in the study. All the information obtained from the study participants were kept confidential.

3.8. Inclusion and Exclusion Criteria

Respondent who had lived at least 6 months as the permanent resident in the study area were included in this study and respondents who cannot explain themselves and less than 18 years were excluded from this questioner survey. Exposed cases from Limu Genet hospital, which were incompletely recorded, were also excluded from retrospective survey.

3.9. Operational definitions

Attitudes: Is a favorable or unfavorable evaluation of something, positive or negative evaluation of people, object or idea. In this, study the concept was used to refer to community members' evaluation of rabies and how it is perceived as a public health problem.

Knowledge: Awareness of or knowing cause, symptoms, mode of transmission and available prevention strategies of rabies disease

Practices: Conscious effort and behaviors of community members undertaking to avoid contracting the rabies disease

Retrospective study: Means to look back the study events that have already occurred.

Community: Include individuals aged 18 years and above living study area.

4. RESULTS

4.1.Socio-Demographic Characteristics

The profiles of the respondents from rural and urban area were 191(76.4%) and 59(23.6%) respectively. Among the 250 respondents, males were 181/250(72.4%) and females were 69(26.6%) and majority of age ranges from 18-49 years, of these participants 98 (39.2%) of the respondents have attended primary school. Most of the respondents were Muslims 191(76.4%) and majority of respondents were farmer 200 (Table2).

Table 2: Socio- Demographic information of the study respondents

Variables	Category	Urban (%) n=59	Rural (%) n=191	Total(%)n=250
Sex	Male	37(63)	181(72.4)	144(75)
	Female	22(37)	69(26.6)	47(25)
Age	18-49	31(53)	128(51.2)	97(51)
	50-64	19(32)	105(42)	86(45)
	Above 64	9(15)	17(6.8)	8(4)
Marital status	Single	10(17)	17(6.8)	7(4)
	Married	36(61)	207(82.8)	171(90)
	Divorced	5(8)	9(3.6)	4(2)
	Widow	8(14)	17(6.8)	9(5)
Education Level	Non-educated	19(32)	77(30.8)	58(30)
	Primary	21(36)	98(39.2)	77(40)
	Secondary	9(15)	58(23.2)	49(26)
	Diploma and above	10(17)	17(6.8)	7(4)
Religion	Muslim	17(29)	191(76.4)	174(91)
	Protestant	23(39)	23(9.2)	0(0)
	Orthodox	19(32)	36(14.4)	17(9
Occupation	Farmer	21(36)	200(80)	179(94)
	Health Workers	5(8)	8(3.2)	3(2)
	Animal health workers	4(7)	7(2.8)	3(2)
	Merchant	29(49)	35(14)	6(3)

4.2. Knowledge of Participants Related to Rabies

All of the respondents 250 (100%) have heard of rabies and it is locally known as *'dhukuba sare maratu*, which mean madness or disease of the mad dog. However, only 60(24%) of the respondents know causative of rabies. Regarding the source of information on rabies 183 (74%) of the respondent were got the information of rabies from their family, 36 (14%) learned of rabies from animal health worker, while 19 (8 %) got from media and 12 (5%) knew of rabies from neighbor (Figure 4). Moreover, regarding the seasonal distribution of rabies, about 82(32.8%) answered as rabies disease occurred in autumn season more and it is less occurred in spring season 23(9.2%). More than half of the respondent (54.4%) mentioned as rabies can affect human and other domestic animals. Majority of respondents 223 (89.2 %) understood that rabies can transmit from animal to human. Regarding to mode of transmission, respondents who said rabies is transmitted through bites were 168 (67.2%) and through scratching and saliva contact were 39(15%.6) and 21(6.8) through raw meat and milk. The rest 2% said they do not know how about its transmission. Most participants were able to identify the main clinical signs of rabies in animals and humans. Respondents stated that rabid animals biting and change in behavior, stop eating and drinking are common in rabid animals and human and 291 (79.08%) knew the fatal nature of the disease. Regarding to the incubation period of rabies disease 122 (48.8%) of the respondents reported that the incubation period of rabies are less than 40 days. Table 3 below shows the knowledge of the participants of rabies disease.

Table 3: Knowledge of respondents related to rabies

Variable	Category	Frequency	Percentage
Have you ever heard of rabies	Yes	100	100
	No	0	0
What is the cause of rabies?	Virus	53	21.2
	Starvation and thirst	37	14.8
	Hereditary	43	17.2
	Germs	57	22.8
	Don't know	60	24
In which season rabies is more common	Summer	79	31.6
	Autumn	82	32.8
	Winter	66	26.4
	Spring	23	9.2
Which species more affected by rabies	Dog only	46	18.4
	Dog and human	58	23.2
	Human and domestic animals	136	54.4
	Do not know	10	4.0
Source of rabies	Dog	142	56.8
	Dog and cat	46	18.4
	Dog and wild canine	50	20.0
	Don't know	12	4.8
Rabies transmit from animal to human	Yes	223	89.2
	No	27	10.8
How is rabies transmitted ?	Bite by any rabid animal	168	67.2
	Scratching and saliva contact	39	15.6
	Raw meat and milk	5	2.0
	Rabid animal respiration	17	6.8
	Do not know	21	8.4
Signs and symptom of rabies in human	Salivation	69	27.6
	Biting and change in behavior	47	18.8
	Stop eating and drinking	90	36.0
	Puppy movement in abdomen	22	8.8
	Don't know	22	8.8
	Paralysis	68	27.2

	Salivation	45	18.0
Signs and symptom of rabies in animals	Stop eating and drinking	91	36.4
	Sudden change in behavior	23	9.2
	Don't know	23	9.2
Is rabies fatal?	Yes	199	79.6
	No	37	14.8
	Don't	14	5.6
Incubation period	Immediate	52	20.8
	_<40 day	122	48.8
	<90 day	26	10.4
	Don't know	50	20.0

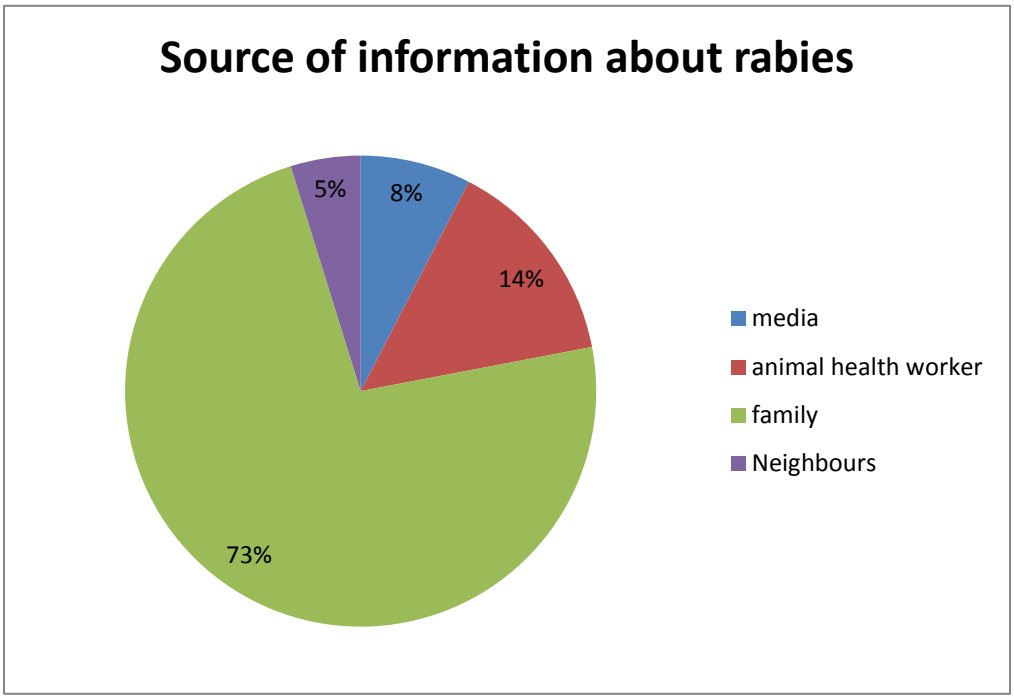

Figure 4: source of information about rabies

4.3. Attitudes of Respondents on Rabies

More than half of the respondents (59.6%) did not accept rabies prevention by vaccinating dog and about (66.8%) of the respondent believed, that post exposure prophylaxis can prevent rabies development. Around 135 of the respondent reported that eating roasted meat of animal died of rabies could be medicine for rabies. Majority of respondents (53.2%) answer that stray dog are important in rabies transmission. Ninety one percent of the respondents believe that rabies is fatal after onset of clinical signs in humans and about 53.6% of them responded as if eliminating stray dogs or confining dog helps to prevent rabies (Table 4).

Table 4: Attitudes of respondents on rabies

Variable	Category	Frequency	Percentage
Rabies is preventable by vaccination of dog	Yes	54	21.6
	No	149	59.6
	Don't know	47	18.8
Do you think post exposure prophylaxis prevent development	Yes	167	66.8
	No	61	24.4
	Don't know	22	8.8
Eating roasted meat of animal died of rabies could be medicine for rabies	Yes	135	54.0
	No	99	39.6
	Don't know	16	6.4
Do you thinks stray dog rabies transmission	Yes	133	53.2
	No	117	46.8
Treatable or curable after onset of symptom	Yes	7	2.8
	No	228	91.2
	Don't know	15	6.0
Eliminating stray or confining dog helps to prevent rabies	Yes	134	53.6
	No	90	36.0
	Don't know	26	10.4

4.4. Practice of the Community on Rabies

About 96(38.4%) reported that, they immediately tying with cloth as a first aid for bitten humans. Additionally, 97(39%) of the respondents present exposed person to the near by hospital/health centers next day after being bitten, while, about 49 (20%) of the respondents were present to hospital between 2 to 14 day after being bitten were summered in (Table 5).

Table 5: Community Practice regarding rabies:

Variable	**Category**	**Frequency**	**Percentage**
	washed the wound with soap and water	86	34.4
Immediate action for bitten human	Tying with cloth	96	38.4
	went to traditional	68	27.2
	Immediately after being bitten	47	19
Going to hospital after bite	Next day after being bitten	97	39
	Between 2 to 14 day after being bitten	49	20
	After 14 days	43	17
	Would do nothing	14	6
Rabies suspected dog bite is managed	Post exposure prophylaxis	132	52.8
	Traditional treatment	94	37.6
	Spiritual healer	24	9.6
Action for rabid animal	Tie	101	40.4
	Killed by community	114	45.6
	Don't know	35	14.0
Carcass of suspected rabid animal	Throw it away	211	84.4
	Burn	11	4.4
	Bury	23	9.2
	Cut head and send to livestock office	5	2.0

4.5. Community KAP Level about rabies in study area

The data show that 55.6% of the participants involved in this study were found to have good knowledge about rabies and 44.4% were found to have poor knowledge level (Mean = 21.9, SD = 3.58). Relating to the attitude scores, 50% of participants had a good attitude, whereas 50% was found to have poor attitude score (Mean=7.48, SD=1.72). In addition, 41% of respondents were found to have good practices and 59% were found to have poor practice (Mean=9.95, SD=2.188).

Table 6: Frequency and means of respondents according to KAP levels on rabies

Variables	**Mean**	**SD**	**Greater than mean (Good)**		**Less than mean (Poor)**	
KAP Score			Frequency	Percentage	Frequency	Percentage
Knowledge	21.9	3.58	139	55.6	111	44..4
Attitude	7.48	1.72	125	50.0	125	50.0
Practice	9.95	2.188	149	59	101	41

4.6. Factors associated with knowledge, attitudes and practices towards rabies

Association between independent variables and knowledge, attitudes, and practices scores on rabies was calculated using logistic regression (Table 7, 8 and 9). Table 7: shows the multivariable logistic regression analysis output of factors associated with knowledge regarding rabies. Accordingly, residence of the respondents was significantly associated with the higher good knowledge score of the respondents in which higher good score was found respondents from urban (80%) than rural (48.1%). Thus, urban was about 3.8 times more likely to have higher good knowledge score than rural (OR=3.8, CI=1.723-8.496, P=0.001). The gender of respondents was also found to be significant associated with higher good knowledge score male (65.2%) than female (30.4%).Male respondents were about 4.2 time more likely to have higher good score than female (OR=4.2 CI=2.021 8.82 P=0.000). Although educational level of the respondents was significantly associated with knowledge scores (OR=21.65, $p < 0.05$). All respondents with education level greater than or equal to diploma had good knowledge of rabies than those of non-educated and elementary education level (Table 7). While there was no significant association ($p>0.05$) between knowledge score of different age group, marital status and occupation of the respondent. As shown in table 8, there was significant association between attitude scores and education level of the respondents ($p < 0.029$), where respondents holding diploma and above level of education were found to have 14.679 times more good attitude score than non –educated. Education (P=0.012) and occupation (P=0.027) showed statistical significant association with practices score .In which health profession has good practices level (87.5) than farmer (33) respondents. Whereas, there is no significant association of practices score with sex, age residence, marital status (Table 9).

Table 7: Multivariable logistic regression analysis output of factors associated with knowledge

Variables	Category	Good (%)	Poor (%)	OR (95% CI)	*P*- value
Residence	Rural	93(49)	98(51)	3.826 (1.723-8.496)	0.001
	Urban	46(78)	13(22)		
Age	18-49	69(54.3)	58(45.7)	-	
	50-64	61(57.5)	45(42.5)	0.658(0.323-1.338)	0.247
	Above 64	9(53)	8(47)	0.454(0.323-1.2)	
Marital	Single	8(47)	9(53)	-	
Status	Married	119(57.5)	88(42.5)	1.928(0.540-6.877)	0.312
	Divorced	5(55.6)	4(44.4)	2.391(0.294-19.431)	
	Widow	10(58.9)	7(41.1)	1.034(0.190-5.629)	
Sex	Male	116(64)	65(36)		
	Female	23(33)	46(67)	4.224(2.021-8.828)	0.000
Education	Non-educated	19(24.7)	58(75.3)	-	
Level	Primary	62(63.3)	36(36.7)	6.797(3.180-14.525)	0.000
	Secondary	46(79.3)	12(20.7)	16.004(6.219-41.187)	
	Diploma and above	12(71)	5(29)	21.65(2.664-176.050)	
Occupation	Farmer	87(43.5)	113(56.5)	-	
	Health Workers	5(62.5)	3(37.5)	0.268(0.023-3.112)	0.293
	Veterinarian	5(71.4)	2(28.6)	0.213(0.018-2.500)	
	Merchant	19(74)	16(26)	0.555(0.229-1.342)	

Key: CI = Confidence interval; OR=Odd ratio ; - =reference point

Table 8: Multivariable logistic regression analysis output of factors associated with attitude

Variables	Category	Good (%)	Poor (%)	OR (95% CI)	*P*- value
Residence	Rural	96(50.3)	95(49.7)	0.912 (0.481-1.729)	0.777
	Urban	29(49.2)	30(50.8)		
Age	18-49	71(55.9)	56(44.1)	-	-
	50-64	47(44.3)	59(55.7)	0.640(0.352-1.164)	0.143
	Above 64	7(41.2)	10(58.8)	0.433(0.141-1.327)	
Marital Status	Single	11(64.7)	6(35.3)	-	-
	Married	104(50.2)	103(49.8)	0.656(0.213-2.018)	0.462
	Divorced	4(44.4)	5(55.6)	0.509(0.85-3.045)	
	Widow	6(35.3)	11(64.7)	0.264(0.58-1.208)	
Sex	Male	88(48.6)	93(51.4)	0.787(0.424-1.461)	0.447
	Female	37(53.6)	32(46.4)		
Education level	Non-educated	29(37.7)	48(62.3)	-	-
	Primary	50(51)	48(49)	1.817(0.92-3.434)	0.029
	Secondary	34(58.6)	24(41.4)	2.556(1.210-5.396)	
	Diploma and above	12(70.6)	5(29.4)	14.679(1.320-163.247)	
Occupation	Farmer	103(51.5)	97(48.5)	-	-
	Health Workers	6(75)	2(25)	0.428(0.029-6.286)	0.536
	Veterinarian	3(43)	4(57)	0.93 (0.006-1.524)	
	Merchant	13(37.1)	22(62.9)	0.563(0.254-1.245)	

Key: CI =confidence interval; OR=odd ratio; -=reference point

Table 9: Multivariable logistic regression analysis output of factors associated with practice

Variables	Category	Good (%)	Poor (%)	OR (95% CI)	*P*- value
Residence	Rural	73(39.8)	118(61.2)	1.400 (0.718-2.731)	0.324
	Urban	28(47.5)	31(52.5)		
Age	18-49	52(40.9)	75(59.1)	-	-
	50-64	42(39.6)	64(60.4)	0.754(0.402-1.419)	0.382
	Above 64	7(41.2)	10(58.8)	0.776(0.244-2.466)	
Marital	Single	5(29.4)	12(70.6)	-	-
Status	Married	87(42)	120(58)	1.980(0.590-6.642)	0.268
	Divorced	4(44.4)	5(55.5)	1.589(0.222-11.381)	
	Widow	5(29.4)	12(70.6)	0.974(0.187-5.082)	
Sex	Male	74(40.9)	107(59.1)		
	Female	27(39.1)	42(56.5)	1.061 (0.552-2.039)	0.860
Education	Non educated	34(44.2)	43(55.8)	-	-
Level	Primary	27(27.5)	71(72.5)	0.434(0.222-0.849)	0.012
	Secondary	26(44.8)	32(55.2)	1.034(0.490-2.184)	
	Diploma and above	14(82.4)	3(17.6)	4.517(0-574-35.532)	
Occupation	Farmer	64(33)	136(67)	-	-
	Health Workers	7(87.5)	1(12.5)	3.178(0.219-46.201)	0.027
	Veterinarian	6(85.7)	1(14.3)	3.085(1.476-7.312)	
	Merchant	22(62.9)	13(37.1)	1.187(0.103-3.727)	

Key: CI = Confidence interval; OR=Odd ratio ; - =reference point

4.7. Retrospective study on rabies

A retrospective study was conducted to assess the incidence of human rabies from 2015 to 2018. A total 344 rabies-suspected patients cases were recorded from 2015 to 2018 rabies registration book from study area. It was observed that the distribution of human rabies suspected cases increased from year to year. According to the information obtained from the study district, 71, 83, 86 and 104 humans bitten by rabid animals and other were reported in 2015, 2016, 2017 and 2018, respectively. Rabid animal bitten human cases were reported throughout the year, the highest 131 human rabies cases were recorded in the autumn season. Whereas, the lowest cases were recorded in the spring seasons (Figure 5).The sex specific distribution showed that the majority of rabid animal bitten cases were among males (222/344, 64.5%).Majority of suspected cases were registered people from rural areas(234/344,68%). In contrast, a person from urban areas was low 32%. Moreover, children less than 15 years of age were the most affected (47.4%). Almost all recorded cases were bitten by dog (295/85%) followed by cat bites (30/8.7) (Table 10) (Limu Genet Hospital, 2019).

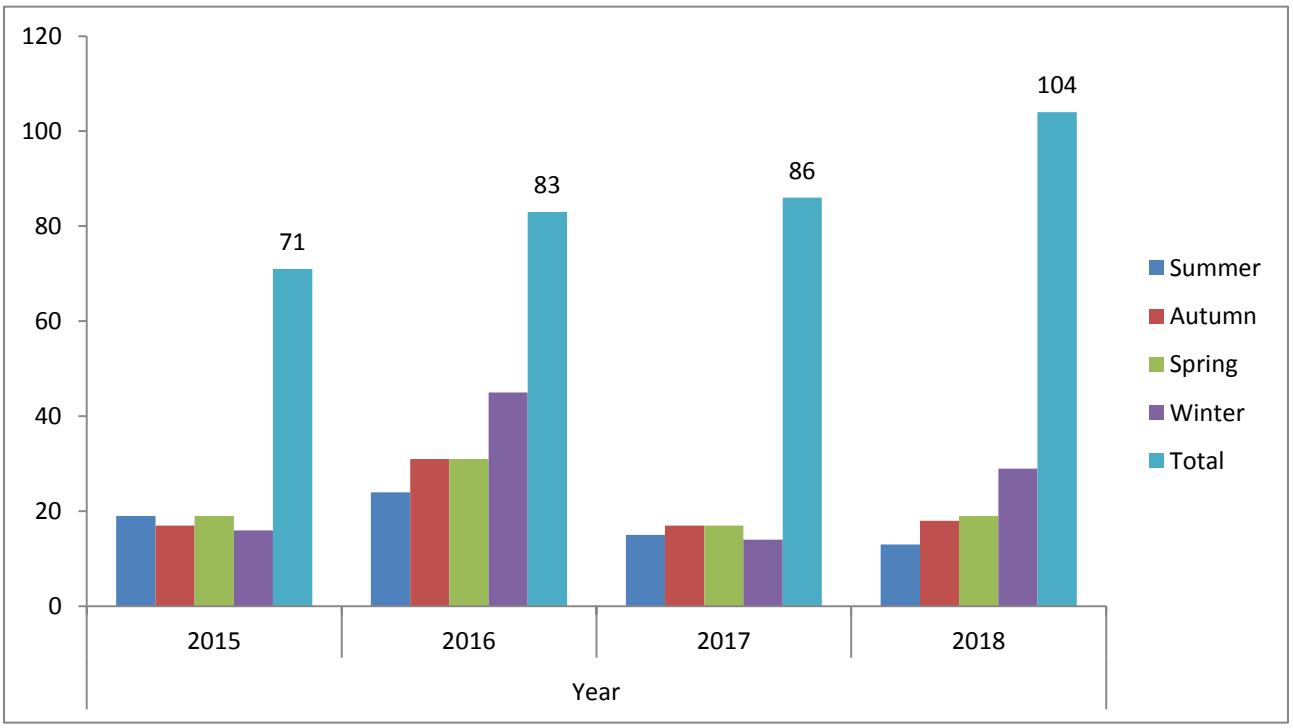

Figure 6: Year and seasonal distribution of reported rabies cases in human

Table 10: Retrospective study on rabies suspected case in the study area (from year 2015 to 2018)

Variables		**Number of cases rabidanimal bitten**	**Percentage(%)**
Sex	Male	222	64.5
	Female	122	35.5
Residence	Rural	234	68.0
	Urban	110	32.0
Age	Children(2 -15)	163	47.4
	Young(16-29)	98	28.5
	Adult(30-43)	68	19.8
	Old(44-70)	15	4.4
Sourceof Exposure	Dog	295	85.8
	Cat	30	8.7
	Equine	13	3.8
	Bovine	6	1.7

Note .Children = 2-15; Young = 16-29; Adult = 30-43; Old = 44-70

7

5. DISCUSSIONS

The result of present study revealed that rabies is a significant disease of both human and animals in the study area. All of 250(100%) of the respondents have heard about rabies from different sources such as Media, animal health workers, family and neighbors. This revealed that communities of the study area were aware of presence of rabies and likely reflects the popularity of the disease in this area. The result of this study was consistent with Tadesse *et al.* (2014), Moran *et al.* (2015) and Abdela *etal* .(2017) who reported 99.0%, 99.0% and 100 % of the respondents have heard about rabies from different sources respectively. Whereas around 183 (73.2%) of the respondents heard about rabies from their family, 36(14.4%), 19(7.6%) and 12(4.8%) of the respondents had heard the information of rabies from animal health workers, Media (Radio and Television) and neighbors respectively. Radio and TV had low response rates of 7.6% for this study; this result shows that the medi a (Radio and TV) which is more accessible to a wider population has not been well make the most of as a source of dispersed knowledge and awareness of rabies.

In the current study, about 53(21.2%) of the respondents knew as virus is the cause of rabies. This was consistent with the finding of Shumuye *et al.* (2014) who reported 18% of the respondents knew as causal agents of rabies is virus. Moreover, regarding the seasonal distribution of rabies, about 82(32.8%) answered as rabies disease occurred in autumn season more and it is less occurred in spring season 23(9.2%). This could be because of large-scale movement of wild animals at the mating time and in search of food. The result was difference from Shite *et al. (*2015) who reported spread of the disease is often seasonal, with high incidence in late summer and autumn.

In the present finding, 54.4% respondents knew that rabies could affect human and other domestic animals. This finding is in line with Abdela *et al*. (2017) who reported 57% respondents knew that rabies affect human and other domestic animals. Most of the respondents were tried to identify sign and symptom of the rabies disease for both animals and humans. Less than half, 91 (36.4%) stated that rabid animals stop eating and drinking, notable change in behavior and salivation are common in rabid animals and 199(79.6%) knew the fatal nature of the disease.

This suggests that, they practiced this due to frequently occurrence of rabies disease in the study area. This is consistent with previous reports from Ethiopia (Yimer *et al*., 2012; Newayeselassie *et*

al., 2012) and other countries (Matibag *et al*., 2007). About 122 (48.8%) of the respondents reported that the incubation period of rabies are less than 40 days. This was also in agreement with the report of several scholars from different area of Ethiopia (Digafe *et al*., 2015; Kabeta *et al*., 2015; Yalemebrat *et al*., 2016; Abdela *et al* ., 2017) . The incubation period of rabies in humans varies depending on the site of the bite, severity of the wound and amount of virus introduced into the wound and ranges from a few days to several years; in most cases signs develop after one to three months (WHO, 2018). Toward is, the incubation period is not limited to 40 days. Therefore, this is misunderstanding about the incubation period might be originating from family (neighbor) and traditional healer. Because of this understanding, the chances of rabies-infected persons are death 100% after development of clinical signs. In the current study, besides the attitudes of respondents regarding rabies, more than half of the respondents 149 (59.8%), do not believe in rabies prevention by vaccinating dog and about 167(66.8%) of the respondent believed, that post exposure prophylaxis can prevent rabies development. These results were contrast with studies in other countries that people wouldn't seek traditional practices instead of modern post-exposure prophylaxis treatment (Sekhon *et al*., 2002; Sudarshan *et al.,* 2007; Rumana *et al.,* 2013).

In the present study, 54% of the participants reported as eating roasted meat of animal died of rabies could be medicine for rabies. However, this finding was higher than the result of Awoke *et al.* (2015) who reported 32.8%, which may be due to degree of awareness. In addition, majority of the respondents 134 (53.6%) responded as eliminating stray dogs or confining dog helps to prevent rabies. However, eliminating stray dogs is not a useful means of reducing the number of rabies cases but vaccination dog and awareness creation in community is helpful to prevent rabies.
In the current study, 34.4 % among immediate action taker for bitten human that they would wash the wound with water and soap as a first aid. In contrary to this finding, 76.5% of the respondents from a study conducted in North Gondar, preferred wound washing with soap and water (Yalemebrat *et al.,* 2016) and this could be due to the difference in awareness level of participants.

In this study, 97(39%) of the respondents present the rabies infected person to the hospital/health centers next day after being bitten, while, about 49(20%) of the respondents present to hospital between 2 to 14 day after being bitten. This finding was in line with (Abdela *et al.,* 2017) and higher as compared to the study conducted in Gondar zuria district (30.7%) (Digafe *et al.,*

2015).This difference could be due to existence of health center in the area and associated with awareness level of the community.

Regarding to the managing of rabies suspected person 44.4%, 38.4% and 18.2% of participants responded post exposure vaccine, traditional treatment and spiritual healer, respectively. This finding agrees with another study from Ethiopia recorded in Debark district, which was 42.1% (Yalemebrat *et al*., 2016) and 45% study result reported from Munesa district (Abdela *et al*., 2017). This suggests that there is less community awareness about PEP and traditional practices might be arises from easy access to traditional medicine. In the current study, Christian religion followers believed that holy water locally termed as *"Tsabel"* is used as a medicine. Even community use as prevent when rabid dog or fox bitten their animal or human. This suggests that, they believed in holy water (a spiritual practice) or it might be a lack of education regarding effective prevention of rabies.

In this study, action for rabid animal killed was the first choice by 114 (45.6%) community. These result have also been reported by Mucheru *et al.*, (2014) and show a negative practice that must be fight against. It is recommended that suspect animals that have made contacts with humans but are not showing signs of disease not be considering immediately but isolated and observed for development of clinical rabies to aid diagnosis (Radostits *et al.,* 1994).
Moreover, killing suspect animals implies that many cases of rabies go unreported and thus the true situation of rabies is greatly under- reported in official records (Cleaveland *et al.*, 2001; Zdu, 2014). The findings of this study indicated that, about 55.6%, 50 % and 41% had good knowledge, good attitude and adequate practices on different variables associated to rabies.
This, finding lower than compared study by Ali *et al*., (2010) who reported about 75.2% had good level of knowledge, good levels of attitude were (52.3%), and levels of appropriate practices were 67.0%. This difference could be due to his difference in sample size and level of awareness of community in study area. In this study ,Multivariable logistic regression analysis revealed higher good knowledge score to be significantly associated with residence in which higher good score respondents from urban were 3.8 time more likely to have higher good score than rural residents.

This findings was also agrees with the report of several scholars from different area of Ethiopia (Digafe *et al*., 2015; Yalemebrat *et al*., 2016; Abdela *et al*., 2017) .This might be rural respondents have less information access from media or health center than urban respondents about rabies .
The gender of respondents was also to be significantly associated with higher good knowledge score in male (65.2%) than female (30.4%).

The high statistically significant difference in knowledge score between males and females might be due to increased activity of males in their daily life compared with females and better chance of acquiring correct information. This finding was supported by the previous studies finding of Yalemebrat *et al*., (2016) and Abdela *et al*,. (2017). statistically significant association (P<0.000) was observed between knowledge score and educational levels respondents whereby diploma and above associated with higher knowledge score than the none educated. This findings agree with Dabuma *et al*.,(2017) who reported the respondents who have completed higher education has the highest knowledge scores .This might be educated person acquire information from learning and easily understand about disease .

The study also revealed statistically significant association between attitude scores and educational level. There was significant association between educational level and attitude score (P=0.029). This result was in agreement with Ali *et al*., (2010) and Dabuma *et al*., (2017). Besides, the association of education level with overall practice about rabies revealed statically significant difference (*P*=0.012). The respondents who were at diploma and above education level had founded to have 4.5 times more good practice score about rabies than non- educated person. There was statistically significant association (p=0.012) between practice score and occupation which, there was statistically significant association between occupation and level of practice of respondents, with those who were veterinarian and health professional higher practice level. This might be getting information from learning and works experience.

This study showed that, more rabies exposure cases (234/344, 68%) were observed in people from rural areas. This might probably the majority of Ethiopian population or 85 % of populations living in rural area. The other reason may probably due to the more communication rate among domestic dogs and wild animal important to increased risk of rabies occurrence and

spread to the rural area. This finding is similar with the work done in Gondar (Yalemebrat *et al*., 2016) and New York (Blanton *et al*., 2005).

In this study, majority (64.5%) of the people who used post exposure treatment of rabies were males, signifying that male were more affected than female in the area. This result was in line with a previous study in Ethiopian(Deressa *et al*., 2010 ;Digafe *et al.,* 2015) and Nigerian (Abubakar and Bakari ,2012) who reported the majority of cases and deaths in males as compared to females. This could be because men have activities outside their homes while women have activities inside the home and thus remain relatively protected. In the same way children under 15 years of age were the most affected (125/344, 31%). This is in conformity with Kabeta *et a*l.(2014) who reported that, the most fatal cases (65.8%) were from the age group 1-14-category and while small numbers above 50 years old. Other studies have found that children and young people were the most susceptible group for animal bites (Dodet *et al.,* 2008; Shumuye *et al.,* 2014). This could be because of children are closely playing with dog at home and even in road. This finding was in agree with the result by Abdela *et al*.,(2017) who reported (48%) that rabies could affect children than other the age. In addition, Assefa *et al.* (2010) has reported that elders are well aware of the danger of rabies and look for medical care than children. The WHO also reported that, Children are at the greatest risk of rabies suspected and approximately 40% of PEP is given to children aged 5–14 years old (WHO, 2017). Almost all suspected cases were bitten by dog (295/85.8%) followed by cat bites (30/8.7%). This result is almost in line with a study conducted in the Gondar district reported that dogs are the most source of rabies followed by cats (Reta *et al*., 2015). In fact, dogs are known to be responsible for more than 90 % of all human rabies cases worldwide (WHO, 2014).

In the current study, the majorities of suspected cases were recorded in autumn season (131/344) and in contrast lowers in spring season (63/344). This finding similarly with, Yibrah and Damtie (2015) who reported the majority of rabies case occurs during autumn and winter .Unlike this finding, studies from New York, Tanzania, and Nigeria reported high incidence of rabies exposure during spring and summer season (Blanton *et al*., 2015; Abubakar and Bakari, 2012). General results of retrospective data have indicated that there was an annual increments record of rabies cases in the study area. This increased incidence may be due to higher free-roaming dog population densities and the absence of a sustained vaccination program me in the study area.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

In conclusion, the result of present study revealed that rabies is a significant disease of both human and animals in the study area. The level of knowledge about the fatal nature and clinical signs of rabies in animals and humans is good. However, several knowledge gaps on the cause, incubation period and mode of transmission of rabies were found; while, the incidence of rabies was increased, due to factors like lack of; community awareness, vaccination coverage, regulation for stray dog control, coordination mainly between health and veterinary sectors as well as community in the study area. Majority of the respondents had poor attitude towards eating roasted meat of animal died of rabies could be medicine for rabies. Moreover, the majority of respondents were not aware of any first line of action after animal bite at home level, immediate visits to health facilities, and use of anti-rabies post exposure prophylaxis, which might be due to lack of awareness. Residence, sex and educational status of the respondents were the variables found to be significantly associated with knowledge on rabies. Beside the residence of the respondents, urban inhabitants can get rabies related info from different sources than those from rural area. On the other hand, there is high statistically significant difference in knowledge score between male and females. Furthermore, education level of the respondents has positively, and statistically significant association with knowledge, attitude and practice score. The retrospective study indicated that, there was an annual increasing record of rabies cases in the study area and rural resident and children were found more infected of rabies cases.

6.2. Recommendations

- ✓ To raise the level of knowledge and awareness of the community on rabies, awareness campaigns should be carried out in different social institutions such as, schools, church, mosque services and through media to sensitize the community on rabies cause, incubation period, mode of transmission, important first aid measures and use of anti-rabies post exposure prophylaxis.
- ✓ Regular intervention targeted on controlling stray dogs and vaccination of dogs should be developed in the study area to control the disease.
- ✓ Different NGO, government organizations, veterinarians and health professionals should be prepare and deliver continuous and strategic community awareness programmes on prevention and control of rabies in the study area
- ✓ Limmu kosa Health Office should be give training programs to raise community knowledge on rabies and provide perfect information targeted to females, farmers, to people who have lower educational level and rural residence a in order to improve their knowledge about rabies.

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APPENDIX

Questionnaire No_____

JIMMA UNIVERSITY

COLLEGE OF AGRICULTURE AND VETERINARY MEDICINE

SCHOOL OF VETERNARY MEDICIENE

Part 1: Socio-demographic data, Knowledge, attitude and practice of the respondents

1. Address: Zone_____ District _____ Kebele_____
2. Residence: 1. Urban 2. Rural
3. Age of respondents----------
4. Sex: 1 male 2.female
5. Marital: 1. Single 2. Married 3. Widow 4. Divorced
6. Educational status: 1. non educated 2. Primary 3. Secondary 4. Diploma and above
7. Religion: 1. Muslim 2. Protestant 3. Orthodox
8. Occupation: 1.Farmer2.Health profession 3Veterinarian 4.Merchant

Part II: Knowledge related questions on rabies.

1. Have you ever heard of Rabies? 1. Yes 2. No
2. from where you heard of rabies? 1. from media 2.animal health workers 3. Family 4. Religious leader's 5. Teachers 6.other_____
3. What do you think causes the disease? 1. Virus 2. Germs 3. Hereditary 4. Witch craft5. Do not know 6. Other_____
4. In which season Rabies is more common?
   1. Summer 2. Autumn 3. Winter 4. Spring
5. What is the source of Rabies?
   1. Dog 2. Dog and cat 3. Dog and wild canine 4. I do not
6. Which species commonly are affected by rabies?
   1. Dog only 2. Dog and human 3. Dog and human 4.Human and other domestic animals
7. Do you think rabies transmitted from animal to human? 1. Yes 2.no
8. If yes, how it is transmitted? 1. Bite by any rabid animal 2. Contact with saliva 3. Raw meat and milk 4. Rabid animal respiration 5. Do not know
9. What are the signs and symptoms of a person bitten by a rabid dog?

1. Paralysis 2. Stop eating and drinking 3. Hyper salivation 4. Puppy movement in abdomen

10. What are the sign and symptoms rabies in animal?

1. Paralysis 2.Salivation 3. Stop eating and drinking 4 Sudden change in behavior

11. Do you know about the fatal nature of Rabies?

1. Yes 2. No 3. Do not know

12. What is incubation period rabies? 1. Immediate 2. <40 day 3. <90 day 4. Do not know

PART III: Attitude of the community on rabies

13. Do you think rabies is preventable by Vaccination dog 1 .Yes 2. No

14. Do you think Post exposure prophylaxis prevent disease development.

1. Yes 2. No

15. Eating roasted meat of an animal died of rabies could be medicine for rabies

1. Yes 2. No

16. Do you think free roaming/stray dogs are important in rabies transmission?

1= Yes 0= No

17. Do you think, treatable or curable after onset of symptom? 1. Yes 2.no 3.dont knows.

18. Do you think, eliminating stray or confining dogs help to prevent rabies?

1. Yes 2. No 3. Do not know

PART IV: Communities practice on rabies disease

19. What First aid applied following bite by suspected rabid animal?

1. Immediately washed the wound with soap and water. 2 tying with cloth

3. Went to traditional 4 nothing

20. When would you present to hospital after bite?

1. Immediately after being bitten 2. Next day after being bitten

3. between 2 to 14 days after being bitten 4. After 14 days 5. Would do nothing

21. How rabies suspected bite is managed?

1-Herbal remedies 2-Post exposure prophylaxis

3 - Holy water 5-I don’t know

22. What Action for rabid animal or infect animal by rabies?

1. Tie 2. Killed by community 3. Do not know

23. If your answer above is to kill the rabid animal, what action would you take with the Carcass that died from rabies

1-Throw it away 2-Burn 3-Bury 4- cut head and send to livestock office

Part 2: Retrospective hospital/ Health center based survey of dog/ other animal bites.

No	**Date/Month/Year**	**Sex**	**Age**	**Kebele/ District**	**Residence**	**season**	**Source of exposure**
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2							
3							
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