



**INVESTIGATION ON RABIES KNOWLEDGE, PRACTICES AND DETERMINANTS
OF DOG VACCINATION AND PREVALENCE OF GASTRO INTESTINAL
HELMINTHES AMONG HOUSEHOLD WITH DOGS IN ADDIS ABABA CITY,
ETHIOPIA**

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DEDICATION

This thesis manuscript is dedicated to my instructors, friends and families those who are behind my success.

STATEMENT OF AUTHOR

First, I declare that this thesis is my authentic work and that all sources of materials used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for MVSc. degree at Addis Ababa University, College of Veterinary Medicine and Agriculture and is deposited at the University/College 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 certificate, diploma, or degree.

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LIST OF ABBREVIATIONS

AACG	Addis Ababa City Government
BC	Body condition
CI	Confidence interval
EPHI	Ethiopian Public Health Institute
GI	Gastrointestinal
KAP	Knowledge, attitude and practices
NaCl	Sodium Chloride
NMSA	National Metrological Service Agency
MgSO ₄	Magnesium Sulphate
MoARD	Ministry of Agriculture and Rural Development
OIE	World Organization for Animal Health
OR	Odds ratio
TV	Television
ZnSO ₄	Zink Sulphate
χ^2	Chi-square
WHO	World Health Organization

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ABSTRACT

A cross sectional study was carried out between November, 2019 to April, 2020 in Addis Ababa City, Ethiopia, with the aims of investigation on rabies knowledge, practices and determinants of dog vaccination and prevalence of gastro intestinal helminthes among household with dogs. On the study regarding questionnaire interview, a total of 230 households were enrolled and data collected using structured questionnaire and feecal samples was taken from those dogs reared by household interviewed at the same time. Males recruited for this study made up 47.39% (109/230) of all respondents with 121 (52.61%) females interviewed. The mean ages were 43.5 and with an age range of 18-79 years for all respondents. 87(37.83%) of all study participants had attained secondary education. Majority (38.26%) were privately employed. Factors significantly associated with a respondent having a vaccinated dog on included having higher education, when was their dog vaccinated (<6 months and 6-12 months), Rabies modes of transmission, right treatment when exposed to rabies (antibiotics and tetanus without anti-rabies and human post exposure vaccine) and practices Practice on suspected rabid dog (report to veterinary practitioner). In other hand the study aims at investigating the prevalence of the gastro intestinal helminthes of dogs. Out of 230 dogs sampled, 25.2% (n=58) were positive for *Ancylostoma spp.*, 20.4% (n=47), 10% (n=23), 7.8% (n=18) and 18.3% (n=42) were positive for *Dipylidium caninum*, *Taenia spp.*, *Trichuris spp.* and *Toxocara spp.* respectively. Study pointed out that 80 dogs were free of the above described parasites (65.22%). Concurrent infections with one species of helminthes were more common (53.48%) than infection with two (8.26%), three (2.17%) and four (1.30%) helminthes parasites species and there was no statistically significant difference ($P>0.05$) of *Ancylostoma spp.*, *Dipylidium caninum*, *Taenia spp.*, *Trichuris spp.* and *Toxocara spp.* between sex, age, breed and body condition groups.

Key words: *Addis Ababa City, cross sectional, dog Vaccination, gastro intestinal helminthes, Rabies*

1. INTRODUCTION

1.1. Background Information

Rabies is commonly disseminated across the world and is existent in all regions apart from Antarctica and certain areas which are mostly Islands and Peninsulas or due to efficacious eradication platforms and implementation of rigorous quarantine guidelines. In Africa, great rabies risk countries consist of Zambia, Angola, Namibia, Mozambique and Zimbabwe among others (Yousaf *et al.*, 2012). Worldwide, more than 15 million people accept post exposure prophylaxis treatment of rabies (WHO, 2010) with an approximated that 55,000 people dying from rabies per annum (Knobel *et al.*, 2005). Africa and Asia record the maximum deaths of human from rabies globally with predicted 24,500 yearly deaths of human being (Gsell *et al.*, 2012).

Similar to other big cities in developing country, the problem of rabies has been maximum in Addis Ababa where the disease had been well recognized and come to be endemic (Girma Teferra *et al.*, 2002; Paulos Abebe *et al.*, 2003). The studied rabies situation in Ethiopia, showed that 2172 cases of animal rabies had been confirmed in and around Addis Ababa during 1990-2000, where dogs set up 89.83 % with the incidence rate of 73.2 % (Eshetu *et al.*, 2002). During 1999-2002 an increasing in canine rabies incidence was observed in the city (Bethlehem Newayeselassie *et al.*, 2004; Paulos Abebe *et al.*, 2003). Furthermore, the authors reported that dogs were accounted for almost all the reported human deaths and most cases of human post exposure treatments in and around Addis Ababa (Eshetu Yimer *et al.*, 2002; Bethlehem Newayeselassie *et al.*, 2004; Paulos Abebe *et al.*, 2003).

Rabies virus is mainly transmitted through bites, but can also be transmitted through scratching and licking (Quinn, P.J., 2011). Transmission can also be through mucous membranes (Hemachudha, T., 2002). Human rabies is mainly caused by dog-transmitted rabies virus (WHO, South African).

Rabies deaths could be stopped by the application of appropriate prophylaxis on time (WHO, 2014). Awareness of community regarding rabies is very important in prevention and control of rabies (Expert consultation on rabies first report, 2005). Gap of knowledge among the public should be recognized and targeted for efficiently increasing awareness of rabies.

Irrespective of the accessibility of effective drugs to treat parasites, most dog parasites have extremely changed their life cycle that marks their eradication impossible. Furthermore, dogs are regularly infected with internal parasites, occasionally without superficial evidence of the incursion till it is very late. This means that a dog can have internal parasites whereas the result of fecal sample gives negative output (Barutzki and Schaper, 2003).

Meanwhile dogs live with human being closely, there are diseases that can be transmitted to humans and cause serious significances. The best common zoonotic helminth parasites of dogs that can be transmitted to human beings are, *Ancylostoma caninum*, *Strongyloides stercoralis*, *Dipylidium caninum*, *Toxocara canis*, *Trichuris vulpis* and *Echinococcus granulosus*. The transmission of zoonotic parasites could be through indirect contact with dogs excretions and secretions, infected food and water, and through contact with the dogs directly (Lappin, 2002).

In Ethiopia very little care was set for dog diseases and the works done up to now on the prevalence of the diverse gastrointestinal parasites of dogs are ample (Muktar, 1988; Temesgen, 1990; Shihun, 1994; Eshetu *et al.*, 2005; Yacob *et al.*, 2007).

1.2. Statement of the Problem

- What are the demographic characteristics of owners of dog in Addis Ababa?
- What proportion of owned dogs has been vaccinated against rabies within the past twelve months in the City?
- What is the level of knowledge and awareness of rabies among dog owners of the City and does this lead to appropriate practice of regular dog vaccination, and appropriate health searching behavior after a dog bite?
- What are some of the factors that encourage dog owners to have their dogs vaccinated against rabies in Addis Ababa?

1.3. Justification of the study

Rabies is an important disease that has been recognized for lots of periods and it is primarily a disease of dogs in Ethiopia. The first most important occurrences (outbreaks) in dog were reported in many

parts of Ethiopia in 1884 and reported in and around in Addis Ababa in August, 1903s (Windsor, 2004; Ali *et al.*, 2010; Deressa *et al.*, 2010; Esayas *et al.*, 2012). Overall 488 laboratory confirmed cases of human rabies in and around Addis Ababa had occurred in the middle of the period 1964 and 1975. The overall cases human fatality between 2001 and 2009 were 386 humans with annual range of 35 to 58 people (Hurisa *et al.*, 2013).

Coverage of vaccination is so a significant element of rabies prevalence with the World Health Organisation (WHO) recommending 70% vaccination coverage as adequate to prevent rabies outbreaks. Determinant aspects for vaccination of dog, vaccination coverage estimates and rabies knowledge are valuable elements for defining herd immunity and constructing effective strategies of controlling. Factors that will govern the acceptance of these vaccination campaign cycles have nevertheless not been estimated. Studies worked out in Eastern and Southern Africa have shown that for effective control of rabies, dog ecological/demographic records are important. This includes the population density of dog and the population characteristics of dogs which are mostly restriction of dog movement and dependency (Perry, 1993). An assessment of the proportion of dogs vaccinated within the past twelve months in the city and investigation of the elements that inspire families to have their dogs vaccinated will be important for the improvement of economical and effective rabies vaccination operational platforms.

Objectives

Specific Objectives:

- Investigation on rabies knowledge, practices and determinants of dog vaccination
- Estimating the prevalence of zoonotic gastro intestinal helminth parasites of dogs in Addis Ababa City.

General objectives:

- To investigate the demographic characteristics of dog owners of Addis Ababa City
- To assess the proportion of owned dogs that has been vaccinated against rabies within the past twelve months in Addis Ababa City.

- To assess the level of knowledge and awareness of rabies among dog owners of Addis Ababa City and investigating whether these lead to proper practice of regular dog vaccination and proper health seeking behavior after a dog bite
- To investigate factors that encourage dog owners to have their dogs vaccinated against rabies in the City

2. LITERATURE REVIEW

2.1. Rabies Definition as a Disease

Rabies virus disease is caused by the rabies virus which belongs to the genus *Lyssavirus*, the family *Rhabdoviridae* and the order *Mononegavirales* (WHO, 2004). Rabies is a communicable viral zoonotic disease that affects domestic and wild animals. It is usually transmitted to man through bites by an animal that is rabid or through close contacts with infectious material, typically the saliva or a scratch from an infected animal. As soon as indications of the disease develop, rabies is basically at all times fatal (WHO, 2012; OIE, 2011). Internationally, more than 15 million people obtain rabies post exposure prophylaxis treatment (WHO, 2010) with a predicted 55,000 people dying from rabies per annum (Knobel *et al.*, 2005). Africa and Asia record the maximum human rabies deaths internationally with an estimated 24,500 annual report human deaths (Gsell *et al.*, 2012).

2.2. Purpose of Dogs Socio-economy, demography and ownership status

The majority (equal to 98%) of dogs in African countries is kept for purposes of socio-economy comprising protecting livestock from predators, homestead from invaders, harvests (crops) from wildlife and hunting. Dogs are similarly used as domesticated animal (pets), earnings generation means and as a protein basis (Ratsitorahina *et al.*, 2009; Knobel *et al.*, 2008; Yimer *et al.*, 2013; Aiyedun, J. O. and Olugasa, O. B., 2012). Additionally, puppies younger than 3 months of age set up to 30% of the dog population (Gsell *et al.*, 2012). Male dogs take over the female dogs equal to 3.6 times in number within the population (Yimer *et al.*, 2013). Dogs mean age varies between 1.8 and 3.4 years. The percentage of ownerless dog ranges between 0.7% and 20% of a dog population within the 11 represented African countries on Studies regarding ownership of dogs. With the exception of a study in Tanzania (Gsell *et al.*, 2012) all studies described that more than two third of the free wandering dogs has a accountable owner (Ratsitorahina *et al.*, 2009; Yimer *et al.*, 2013; Aiyedun, J. O. and Olugasa, O. B., 2012; Van Sittert *et al.*, 2010; Kitala *et al.*, 2001; Kaare *et al.*, 2009) owned dogs with confined housing set up 18.5% to 60.9% of the dog population.

2.3. Human Rabies Occurrences in Ethiopia

The reports of the EPHI (Ethiopian Public Health Institute) shown that a total of 488 human deaths

had occurred from 1964 to 1975 yearly (Deressa *et al.*, 2010). In the period between 1996 and 2000, a total of 9593 post exposure, and a total of 153 fatal human rabies cases were documented. The cases were originated from Addis Ababa and its surroundings (122), and other regions in the country (31) (Yimer, 2001). Related study indicated that fatal human rabies cases in Ethiopia reached up to 322 from period 1990 to 2000 (Moges, 2015). Reports show that there is significant higher dog to human ratio, just about 1:6 and 1:8 in urban and rural areas, respectively. This type of great amount of dogs in both urban and rural sites beside with low vaccination indicate the risk of rabies transmission and spread to human and other domestic animal populations (Admassu and Mekonnen, 2014).

Alternative study result indicates a total of 11,017 (64%) humans from Addis Ababa and 6,187 (35.96%) humans from areas outside of Addis Ababa were recommended to receive post exposure anti rabies prophylaxis between 2001 and 2009. Yearly post exposure prophylaxis for human rabies extended from 1026 to 1580 and 300 to 1922 each year for the last nine years in Addis Ababa and for parts outside Addis Ababa respectively (Deressa *et al.*, 2010).

As indicated in the study shown by Yimer, (2001), dogs contributed to 91.6% of the fatal human rabies cases and 91.6% of the human rabies post exposure cases that demanded post exposure anti rabies treatments. This end result agreed with the study outcome in Ramos *et al.*, (2015). According to Fekadu, (1982), the study indicated that of the 488 humans who pass away of rabies, 136 (28 percent) of the patients were bitten on the head, 201 (41 %) on the upper extremities and 151 (31 %) on the lower extremities. This comes to an agreement with the consequence in Ali *et al.*, (2013) and Admassu and Mekonnen, (2014).

As stated by the study outcome in Yibrah and Damtie, (2015), a huge amount human rabies exposure cases were stated amongst children under 15 years of age (38.5%) and the agreed with the outcome in Yimer, (2001) and Fekadu, (1982).

Rabies is an urban human tricky in developing countries characterized by the occurrence of disease in domestic animals such as pet dogs and cats (Shite *et al.*, 2015). In Ethiopia, it is principally a disease of dogs and a lot of people are at increased risk of being exposed to rabies ever since man – dog interaction is very common (Hurisa *et al.*, 2013). Just about 10,000 people were expected to die

of rabies every year in Ethiopia which makes it to be one of worst affected (Moges, 2015). A different retrospective study of rabies in Addis Ababa from 1990- 2000 showed that an average of 2,200 people per year received post-exposure anti-rabies treatment whereas 95% of the stated fatal human rabies cases were due to dog bites (Admassu and Mekonnen, 2014).

2.4. Occurrences of Rabies in Ethiopia in Livestock and wildlife

In Ethiopia, a total of 7749 animals were detected and examined for rabies during the years (1996 – 2000) and 1228 of them found to be positive. Dogs constituted for 95% of the total animals studied. Most of the time, hyena, jackals, mongooses and cerval cats were animals that were met in the happening of rabies (Yimer, 2001).

A report of Reta *et al.*, (2013), also stated that 87.19% of the dogs examined were confirmed to be rabid. The proportion of rabid female dogs (87.5%) was higher than that of males (73.44%) and dogs 3 to 12 months old were diagnosed with rabies more recurrently (76.6%) than dogs belonging to other age category. The proportion of dogs diagnosed with rabies was 96.67% in dogs classified into this group. This outcome is similar with the result in Reta *et al.*, (2014).

Report by Ali *et al.*, (2010), showed that from 2517 animal brain tissue samples studied, 76.9% were positive for Rabies virus. The total of 1936 rabies laboratory confirmed cases in and around Addis Ababa in the course of 2003-2009, 1724 were dogs, 116 cats, 37 cattle, 13 Horses, 19 Donkeys, 13 sheep & goats, 7 Hyenas and 7 Monkeys. Assefa, (2012) and Yimer, (2001) have a similar with this end result.

2.5. Rabies Pathogenesis and transmission

Rabies virus come into the body through wounds or by direct contact with mucosal surfaces, nevertheless cannot cross intact skin. Rabies virus reproduces 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).

Rabies virus is typically communicated from animal to animal through bites (Windsor, 2004; Shite *et al.*, 2015). A rabies exposure is every bite, scratch, or other situation in which saliva, cerebral spinal fluid,

tears, or nervous tissue from a suspicious or identified rabid animal or person come into an open wound, is transferred into, or comes in connection with mucous membranes of a different animal or person. The common way 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 arises mostly when an animal that is shedding virus in its saliva bites another vulnerable animal or humans. Transmission of the disease is often periodic, with high incidence in late summer and autumn because of large scale movement of wild animals at the mating time and in search of food (Shite *et al.*, 2015). Rabies virus is transmitted by contamination of a fresh wound with infected saliva from the bite of a rabid animal or from licking scratched skin or mucous membranes. Respiratory and oral transmission can similarly happen. The highest contributing factor of transmission is the population density of non-immunized vulnerable vital host species that are free roaming within an environment (MoARD, 2010).

The animal frequently contracts rabies from the bite of an infected animal. The virus may as well come into the body if the mucous membranes (the wet portion of the eyes, nose, or mouth) or a abrasion or disruption in the skin have contact with saliva containing the rabies virus (Windsor, 2004; Deressa *et al.*, 2010). After the rabies virus come into the body, it starts to multiply in the area near the entry place (Deressa *et al.*, 2010; Moges, 2015).

Transmission frequently occurs by bite with rabid canine and also under uncommon situations by inhalation of huge amounts of aerosolized rabies virus and through organ transplantation from rabies infected patients (Jemberu *et al.*, 2013). Infected animals with rabies have rabies virus in their salivary glands at high titers which can be even greater than in the brain (Esayas *et al.*, 2012).

High population of dog presence with inappropriate management contributes for high endemic situation of canine rabies in Ethiopia. In canine rabies endemic countries like Ethiopia, rabies has also important economic meaning by its consequence on livestock, and in Africa and Asia, the annual cost of livestock losses as a consequence of rabies is predicted to be US\$ 12.3 million (Jemberu *et al.*, 2013; Serebe *et al.*, 2014; Guadu *et al.*, 2014).

Rabies is primarily rural transmitter, the hematophagous bat (*Desmodus rotundos*), that transfers the disease to herbivores, as these are the most common food basis. Cycle in wild disease is

transmitted to animals like fox, wolf, monkey, coon, skunk and the like. These animals can be a source of food for the hematophagous bat (Shite *et al.*, 2015). Transmission to people happens largely through infected animal bite or scratch as well as through their saliva through mucosa and broken skin (Tschopp *et al.*, 2015). Rabid dogs are the main sources for the transmission to human. The transmission virtually all the time happens by an animal bite that inoculates the virus into the wounds. Virus inoculated into a wound does not come into the bloodstream straightly bur is taken up at a nerve synapse to travel to the brain; it causes encephalitis (Serebe *et al.*, 2014).

2.6. Knowledge, Attitude and Practice of Community about Rabies and Management of Dog

Rabies knowledge and practices survey in Thailand indicated that over-all awareness of rabies transmission and severity was comparatively high of 106 participants, only 11 (10%) respondents called bats are bases of rabies. Similarly, dogs were described by 80 (76%), cats were described by 41 (39%), and other mammals (including rodents and large domestic animals) were described by 24 (23%). Fourteen participants (13%) were not capable to describe any animals as sources of rabies (Robertson *et al.*, 2011).

A study survey worked out in Addis Ababa on KAP indicated that majority of the respondent (87%) said that there is a risk of obtaining zoonotic disease from dogs. However, most of them (95.4%) knew only rabies and only 4.6% of respondents were aware of parasitic diseases (Kilfu *et al.*, 2016). A study accompanied by Muhairwa *et al.*, (2008) in Morogoro Tanzania described that intestinal helminthosis is common in dogs of all age groups and may be associated to poor husbandry practices of dogs which indicate that the community is at risk of obtaining the infections.

Study regarding cross-sectional survey scrutinizing the community knowledge besides attitudes and practices survey of rabies in Kandy District, Sri Lanka, amongst all the respondents, there was a high level of awareness (90%) that dogs are the most common rabies reservoir, that rabies can be prevented by vaccination (88%). Another study in Sri Lanka also indicate that the levels of knowledge with respect to adequate wound washing after dog bites (77.1%), awareness about home or traditional medications (0.2%), and the fatal nature of rabies (89.5%) (Matibag *et al.*, 2007).

A study in India indicates, all of the individuals were aware about rabies and 95% knew about its transmission by dog bite or 77% from a scratch of a rabid animal. 86.6% of individuals were aware

about anti-rabies vaccine but 19.2% were the believer of some religions and age old means of treatment like use of chili and only 31.1% of respondents knew correct first aid measure (wound washing with soap and water) and also 24.4% knew that pet dogs requires vaccine against rabies, 24.4% individuals knew about bites on vulnerable areas such as head, neck, face, and genitals (Choudhary, S. K. and Singh U.S., 2005).

An additional study conducted in Gelephu, south-central Bhutan, nearly 80% of the respondents had good knowledge about rabies, in total, 89.6% of the respondents had got knowledge of rabies. From those respondents who had heard of rabies the majority believed that rabies is a hazardous and fatal disease; that rabies can be transmitted by dogs and cats; that it could be prevented by systematic vaccination of dogs; and believed that there are no locally obtainable methods of treatment for bite wounds and rabies. The majority of respondents were also aware that animal bite wounds should be washed with soap and water (Tenzin *et al.*, 2012).

Another study conducted in KwaZulu-Natal, South Africa indicates that about 80% of the population (1716/1992) surveyed across the province had however heard of the disease even if they are unaware of the details surrounding transmission and consequences of exposure (Dodet, 2010). Some respondents indicated that they did not actually know the source of rabies or how to prevent it. Some respondents knew that vaccination of dogs was essential to the security of people in the public. Government veterinary facilities were reported most regularly as respondent source of rabies knowledge (Hergert and Nel, 2013).

Assessment on knowledge, attitude and practices among residents of in Osun State, Nigeria, among 679 individuals, only 33.4% of the respondents knew rabies could be prevented by vaccination, while 38.7% believed that the infection could be treated with herbs. Of the 387 victims of dog bite, 240 (62%) not ever required prophylactic post exposure treatment (Opaleye and Adesiji, 2006).

A different study in Nigeria, 52% of respondents had matched rabies with violent behavior and biting while only 8% of the separate groups associated rabies with paralysis. The people acquired information primarily from friends and at school 25.9%, on television 21.1%, radio 10.3% and 12.3% from other means while 4.4% not remember how learnt about the disease(Asabe *et al.*, 2012).

Dogs are widely held animals that survive in close friendly with humans and this living together lets the transmission of zoonotic parasites to humans (Amissah *et al.*, 2016). The risk may be high in societies with limited knowledge about zoonotic parasites in dogs in Ghana, found that knowledge of dog holders on zoonosis and pet management practices were humble (Amissah *et al.*, 2016). A report of Asmare and Mekuria, (2013) in Hawassa that community awareness on dog management and zoonotic parasites was poor as there was no treatment of dogs against parasites and none of the dog keeper was aware of zoonotic diseases from dogs. A study carried out in Addis Ababa Ethiopia on KAP indicated that majority of the respondent (87%) believed that there is a risk of obtaining zoonotic disease from dogs. Nevertheless, most of them (95.4%) knew only rabies and only 4.6% of respondents were aware of parasitic diseases (Kilfu *et al.*, 2016). A study carried out by Muhairwa *et al.* (2008) in Morogoro Tanzania described that intestinal helminthosis is common in dogs of all age groups and may be associated to poor husbandry practices of dogs which suggest that the community is at risk of getting the infections.

2.7. Knowledge, Attitude and Practice of Rabies Associated Factors

The study carried out in Flagstaff, Arizona, USA. on multivariate analysis identify Persons who had knowledge of rabies in Flagstaff were more probably to have knowledge of other features concerning rabies, male more likely to have knowledge of rabies than female, dog holders were more likely to have had contact with a sick domestic animal and to be aware of the rabies isolation than those who did not own pets, Pet ownership in general was related with knowledge of rabies (Bennett, 1991).

There was substantial relationship between age group. People have received educational messages about rabies which likely had a positive consequence on the magnitude of knowledge retained by community members (Andrea and Jesse, 2012).

Study carried out in Thailand indicates factors independently related with knowledge on rabies considered for inclusion in the multivariable model on the basis of biological credibility included age, sex, years of experience, education (Robertson *et al.*, 2011).

Additionally study conducted in Sri Lanka indicates result of educational achievement in common, there were no change in the participants knowledge (Matibag *et al.*, 2009). But the study carried out in India, Result of educational attainment in general, there were changes in the participants knowledge, attitude and practice associated to rabies transmission, danger areas of wound, pet dog needed vaccine, health services tools where they would like to visit, awareness that it can be healed by treatment , symptoms or rabies in dog, application of first aid actions such as wound washing with soap and water in case of animal bite, all are statistically significant based on educational level (Choudhary, S. K. and Singh, U.S., 2005).

The Study carried out in Bhutan, a multivariate logistic regression modeling indicated that better KAP of rabies was expected by gender, educational level and dog ownership status of respondents, whereas health seeking activities of animal bite injuries was predicted by dog ownership status, occurrence of children in the household and employment of the respondents (Tenzin *et al.*, 2012).

2.8. Rabies Prevention and Control

Rabies is a vaccine-preventable disease and it is the most cost-effective approach for preventing rabies in societies is by removing rabies in dogs through vaccination. Vaccination of animals most commonly dogs has reduced the number of human (and animal) rabies cases in many countries, principally in Latin America. Nevertheless, current increases in human rabies deaths in parts of Africa, Asia and Latin America recommend that rabies is re- emerging as a serious public health concern. Prevention of human rabies via control of domestic dog rabies is a accurate goal for large parts of Africa and Asia, and is accepted economically by the upcoming savings of stopping post-exposure prophylaxis for people (CDC, 2011; WHOa, 2010; WHOb, 2010). Wide-range strategies on control in dogs have been organized by the World Health Organization (WHO, 2004) and comprise report on suspected cases to authorities, demolition of dogs with medical signs and dogs bitten by a suspected rabid animal, reduction of contact amounts between disposed dogs by leash laws, dog movement control and isolation, mass vaccination of young dogs, homeless dog control

and demolition of unvaccinated dogs with low levels of dependency or restriction by man and dog record-keeping (Linda2006). In study conducted in Kenya the attempted control methods are a combination of dog vaccination, destruction by baiting of "homeless" dogs and restriction of dog movement. These have unsuccessful due to insufficient money leading to insufficiency of vaccines, the tremendously high dog income rate and insufficient community education on rabies (Karugah, 1999).

3. MATERIALS AND METHOD

3.1. Study area

The study was carried out from November 2019 to April 2020 in Addis Ababa City. Addis Ababa is the capital city and administration center for the Federal Democratic Republic of Ethiopia. Addis Ababa lies 9° 1'48'' North and 38° 44' 24'' East (AACG, 2013). It is located in the central highlands of Ethiopia at an altitude of 2500 meters above sea level. It has an average rainfall of 1800 mm yearly. The annual average maximum and minimum temperature is 26°C and 11°C, respectively; with an overall average of 18.7°C (NMSA, 2012). The city is divided into 10 sub-cities (Kifle Ketemas) outlined on the basis of geographical set up, population density, asset and service providers' distribution and convenience for administration. The sub-cities are also divided into woredas, which are the smallest administrative unit in the city. There are 116 woredas in the city administration (AACG, 2013).

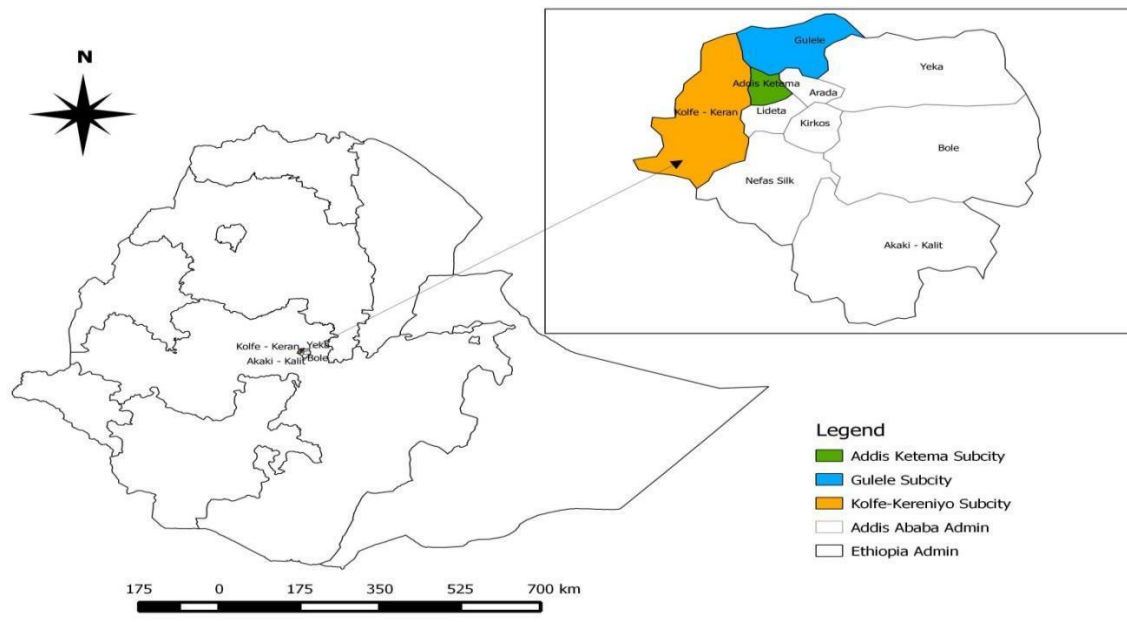


Figure 1: Map of study area

3.2. Study Design and Methodology

A cross-sectional study was carried out on the study concerning questionnaire interview of rabies knowledge, practices and determinants of dog vaccination and also on the study carried out to investigate the prevalence of gastro intestinal helminthes of dogs owned by households participated in questionnaire interview at the same time.

The questionnaire was directed to 230 households from 3 randomly selected kifle ketemas (kolfe-keraneo, Addis ketema and Gullele). Questions were responded only by a person aged 18 years and above from a given household participated on the interview. Any family member present and above 18 years of age participated in the study in the course of interview time. If all household members were present, the head of the family was questioned. Dogs were sampled randomly (simple) from the house in case where there were more than one dogs and faecal samples were collected from 230 dogs owned by households participated on the interview and brought to Addis Ababa University, College of Veterinary Medicine and Agriculture, Parasitology Laboratory and finally the samples were performed using flotation techniques. These dogs were never exposed to any deworming before. The history and sex of dogs were recorded during examination and approximate age of dogs was estimated using criteria described by Tizard, (1996). Those dogs less than one year were classified as young (n=37) and those over one year as adult (n=193). The numbers of male and female dogs were 109 and 121, respectively.

3.3. Determination of Sampling Size and Study Animals

The total number of family and dogs required for sampling has calculated on the formula given by Thrushfield, (2005), since there is no information about the prevalence of the parasites in the area, 50% expected prevalence was taken to calculate the sample size with 5% absolute precision.

Based on the aforementioned formula, the minimum sample size assumed to be collected was 384 but due to pandemic corona virus outbreak it was impossible to finalize within the scheduled time, so only 230 households were participated in the questionnaire interview and their dogs were sampled.

Any dog owners family member, 18 and above years from the households were participated in the questionnaire survey and at the same time their dogs were sampled for study regarding prevalence of GI

helminthes in other side. Dogs of all age groups and both sexes were randomly sampled.

3.4. Collection of Data and Study Procedure

A structured questionnaire was used to look for information on demographic characteristics of dog owners, determinants of dog vaccination practices such as dog restraint methods, time of vaccination campaign, frequency of vaccinating dog, accessibility of vaccination centers, dog vaccination status and other related dog demographic characteristics (Appendix 1). Any available household member above 18 years was interviewed. For purposes of assessing and scoring participants knowledge on rabies six questions were used and covered a description of rabies, its mode of transmission and the outcome of disease, the range of species affected and how it can be either prevented or controlled. The questions had a maximum score of 11 and any respondent who scored above the 7. Points were classified as having adequate knowledge of rabies (Appendix 1). To assess whether the practices of participants reflected their knowledge of rabies, four questions were used covering length of time taken to present to hospital, practice towards suspect rabid animals and practice to carcass of suspect rabid animal. Participants were scored according to the completeness and accuracy of answers with correct answers scoring a maximum of 10. Respondents who scored above the 6 points were classified as having proper practices towards rabies (Appendix 1). The questionnaire was translated into Amharic.

The samples were collected directly from the rectum of the dogs with gloved finger, kept in clean universal bottle containing 70% ethanol preservative then labeled and kept in icebox until its storage (stored in refrigerator at 4oC) until its processing in Addis Ababa University, College of Veterinary Medicine and Agriculture, Parasitology laboratory. During collection each sample was labeled with the dog's codes corresponding to owners name, date, age, breed, sex and date of collection. The presence of zoonotic helminth infections were confirmed by flotation technique. After laboratory examination, the result was considered as positive when at least one parasite egg was detected in one of the performed technique (Lorenzini *et al.*, 2007). Common salt (NaCl 350 g with 1,000 ml tap water), Zink Sulphate (ZnSO₄ 331 g with 1,000 ml of water) and Magnesium Sulphate (MgSO₄ 450g with 1,000 ml of water) was used as flotation fluid. The procedure given by Urquhart *et al.* (1996) was followed for the abovementioned parasitological methods. The eggs were recognized using ova identification keys (Soulsby, 1982).

3.5. Estimation of Age

Age was conservatively classified as young (0-3) month, sub-adults (3 month to 1 year), adult (1-8) year and old (>8) years (Tizard, 1996), but in this study, age was categorized into two types: young (0-1 year) and adult (>1 year).

3.6. Management and Analysis of Data

In the course of the interview, every respondent was given an identifying unique code that related the respondents to their individual characteristics and responses during the data analysis process. The raw data that were obtained from this study were entered into Microsoft excel data base system and calculation of descriptive statistics was carried out using Stata/IC 12.0. Descriptive statistics such as percentages, proportions and frequency distributions were applied to calculate some of the data. The prevalence of the parasites was calculated by dividing the number of dogs sheltering a given parasite by the number of dogs examined. Pearsons chi-square (χ^2) was used to measure association between prevalence of the parasite with the age and sex of dogs. In all the analysis, the confidence level was held at 95% and the outcomes were considered significant when $P < 0.05$.

4. RESULTS

4.1. Study Participants Socio-Demographic Characteristics

A total of 230 study participants were participated during the study period. Sub-cities selected for study were Kolfe-keranyo, Addis Ketema and Gullele. Most study participants interviewed from Kolfe-Keranyo Sub-Cities.

Table 1: Study Participants Location by Sub-Cities

Sub-cities selected	No. of study participants
Kolfe-keranyo	110
Addis ketema	60
Gullele	60
Total	230

4.1.1. Study participants distribution by Age and Sex

Males participated on the interview during the study period were 47.39% (109/230) and females were 52.61 % (121/230). The mean ages were 43.5 years with an age range of 18-78 years for all respondents. Majority age group participated on the interview were 30-45years and more females were participated on the study.

4.1.2. Study participants distribution by level of Education

Education level of study participants were recorded with most study participants attained secondary education 87 (37.83%), followed by primary level 70(30.43%), no formal education 39(19.96) and higher education 34(14.78) respectively.

4.1.3. Study participants Occupation and religion

A majority 88 (38.26%) of study participants interviewed were private employee followed by house wife 68 (29.57%), others 55(23.91) such as (farmers, students, guard, jobless, house, help, daily

worker), Government employee 11(4.78) and NGO employee 8(3.48) respectively. Among all study participants interviewed, 197 (85.65%) were Orthodox, 8(3.48%) were Muslim, 22(9.57) were Protestant and 3(1.30) were reported to be others such as (Catholic and Jehova witness).

Table 2: Study participants distribution by age, sex, level of education, occupation and religion

Study participants by age	No. of respondents	Percent (%)
18-29 years	41	17.83
30-45 years	36	41.74
>45 years	93	40.43
Study participants by sex		
Male	109	47.39
Female	121	52.61
Study participants by level of education		
No formal education	39	19.96
Primary	70	30.43
Secondary	87	37.83
Higher education	34	14.78
Study participants by occupation		
Government	11	4.78
NGO	8	3.48
Private	88	38.26
House wife	68	29.57
Others	55	23.91
Study participants by religion		
Orthodox	197	85.65
Muslim	8	3.48
Protestant	22	9.57
Others	3	1.30

4.1.4. Dogs proportion Vaccinated against rabies virus

From all the questioned household participated, dogs that had been vaccinated less than 6 months (<6 months) were 111/230 (48.26%, 95% CI 41.75-54.77%), dogs that had been vaccinated within 6- 12 months were 89/230 (38.70%, 95% CI 32.35-45.04) and 30(13.04%, 95% CI, 8.66-17.43) of them said they didn't vaccinated their dogs their dogs.

4.2. Study Participants Knowledge of Rabies

Rabies knowledge of interviewers participated on the study was evaluated based on the following six categories with an overall score of eleven. Respondents who scored seven and above (≥ 7) points were classified as having adequate knowledge (Appendix 1).

On rabies description, study participants those properly described rabies as a disease were 34 (14.78%, 95% CI 10.16-19.40%) with 130 (56.52%, 95% CI 50.07-62.98) describing rabies as a change in the behavior of dog or animal and 66 (28.70%, 95% CI 22.80-34.58) of them were replied I don't know or give wrong answer (unable to provide any description of rabies). The source of information on rabies for 172 (74.79%) interviewers was personal contacts (family, friends, neighbors, colleagues and societies), 22 (9.56%) got from the media (Television and radio) and 36 (15.65%) learned of rabies from school, community health workers and veterinary officials.

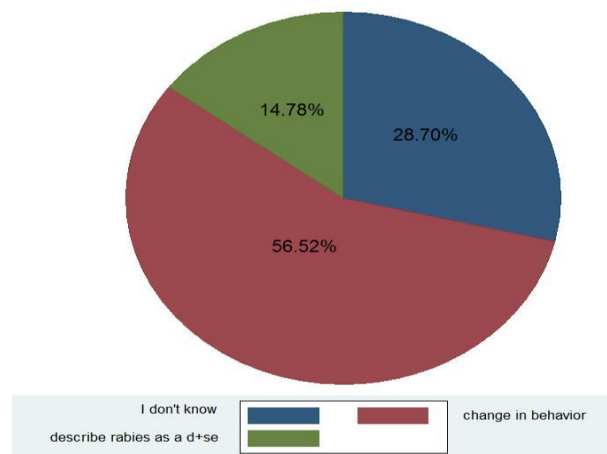


Figure 2: Responses of study participants on the rabies description

On mode of rabies transmission, a large proportion of the study participants 182 (79.13%) knew that rabies was transmitted through bites by suspect rabid animals, those who responded rabies can be transmitted through scratches were 42 (18.26%) and the rest 6 (2.61%) responded they don't know.

On rabies after exposure outcome, for all respondents interviewed, 217 (94.35%) reported that exposure to rabies without treatment is fatal while 13 (5.65%) responded that didn't know fatal nature of rabies.

On rabies management, participants who answered that post exposure anti-rabies injection is given were 110 (47.83 %), 98(42.61%) answered antibiotics and tetanus injection is given, 22 (9.57%) answered they didn't know any treatment given.

Generally, participants who were categorized as having adequate knowledgeable on rabies after attaining a score ≥ 7 points from the above types were 189/230 (82.17%, 95 % CI 77.19-87.16%) while those who didn't meet the threshold for adequate knowledge on rabies were 41/230 (17.83%, 95% CI 12.84 - 22.81 %). This demonstrates more than 75% of the interviewers were above the score level as having good knowledge on rabies prevention and control.

4.3. Rabies related practices

Study participants practices associated rabies was evaluated based on the resulting four categories with an overall score of ten (10). Participants who scored ≥ 6 and above points were categorized as having good practices on rabies (Appendix 1).

On the study regarding first aid and medical attention, for respondents those if he/she or his/her family members will be bitten by a dog, 95/230(41.3%) of the participants said that they will clean the wound with soap, water and apply antiseptic after the bite incident, participants those said reporting to hospital were 126/230(54.78%) and those who said to reporting to police, village elder were 6/230(2.61%) and 3 (1.3%) said they do nothing.

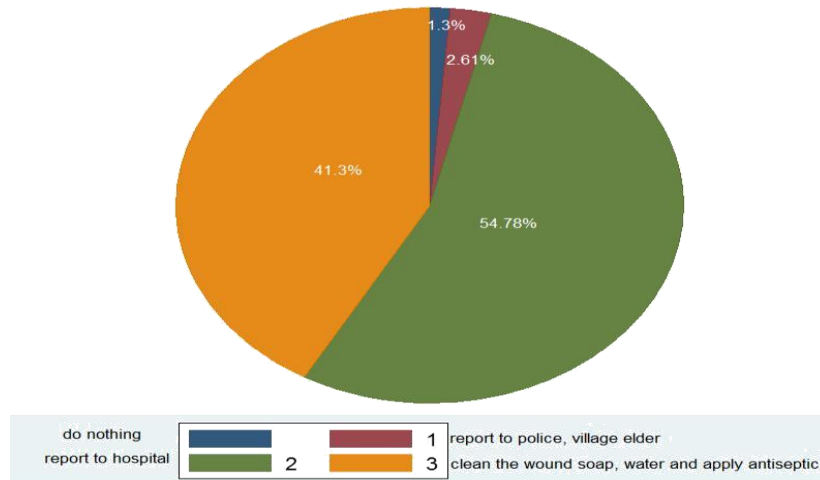


Figure 3: Respondents course of action they take or report they will take after bite incident.

For length of time taken to hospital presentation, participants who answered that they will present to hospital immediately after a dog bite incident were 189(82.17%) while 34(14.78%) said they will present to the hospital on the next day, 5(2.17%) said would present to hospital between 2-14 days and 2(0.87%) said reporting after 14 days from day of bite or do nothing.

For suspected rabid animal practices, in the case of a suspected rabid dog, 35(15.22%) of the participants answered that they will immediately kill the animal, 190 (82.61%) said they will report it to the veterinary officer while 5(2.17%) answered they will do nothing.

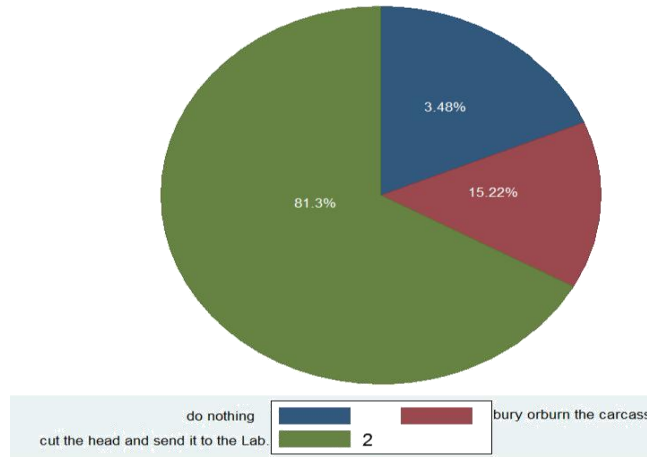


Figure 4: Study participants action on the rabid dog

4.4. Knowledge and practice Association

For association of knowledge with practice bivariate analysis was performed with all the four practices as the independent variables and knowledge of rabies as the dependent variable. The outcomes indicated that participants knowledge on rabies were not significantly ($P > 0.05$) associated first and medical attention practices, e.g. clean the wound with soap, water and apply antiseptic, 96(41.74%), OR=9.29, 95% CI 0.80-108.46) and handling practices of suspected rabid dog (kill the animal, 35(15.22%), OR= 0.12, 95% CI= 0.01-2.27), but participants knowledge on rabies were significantly ($P < 0.05$) associated with practice on rabid animal/dog (reporting to vet. Officer), 190 (82.61%, OR= 249.33, 95% CI=21.08-2948.89).

Table 3: Association of rabies knowledge with practices

Practices on knowledge	OR	95% CI	P-Value
First aid medical attention			
(clean the wound with soap, water and apply antiseptic)	9.29	0.80-108.46	0.07
(report to the hospital)	9.90	0.86-114.30	0.066
Practice on suspected rabid dog			
(report to vet. Officer)	249.33	21.08-2948.89	0.00*
(kill the animal)	0.12	0.01-2.268305	0.16
Hospital presentation after bite			
(report immediately)	7.37	0.60-90.29	0.12
(report to hospital next day after bite)	0.98	0.08-11.32	0.06

4.5. Dog Vaccination Determinant factors among dog owners interviewed

Bivariate analysis was done on the factors shortened in the tables below to find out whether they determined the vaccination status of the respondent's dog.

Table 4: Mode of transmission, Level of education, when dogs were vaccinated and participants right treatment finding when exposed to bite incident as vaccination determinant factors

Determinant Factor	OR	95% CI	p-value
EDUCATION LEVEL			
(higher education)	16.50	2.02-134.46	0.01*
(primary)	1.69	0.71-4.02	0.24
WHEN YOUR DOG VACCINATED?			
(< 1 year)	18.5	5.89-58.405	0.00*
(>=1 year)	6.20	2.39-16.13	0.00*
TRANSMISSION MODES			
(bites)	7.67	1.45-40.47	0.02
LOOKING FOR RIGHT TREATMENT WHEN EXPOSED)			
(antibiotics and tetanus without anti-rabies Rx.)	4.11	1.35-12.46	0.01*
(human post-exposure vaccine)	3.48	1.102-10.13	0.02*

Table 5: Dog source and restraint method as vaccination determinant factors

Determinant Factor	OR	95% CI	P-value
DOG SOURCE			
(Those born in household)	0.82	0.22-3.02	0.76
DOG RESTRAINT method			
(Partially leashed)	3.77	0.86 -16.71	0.08
(Not leashed but stays in compound)	1.64	0.53-5.08	0.39
(Freely roams)	1.55	0.18-12.96	0.69

For source of dog participated in the study, those who reported they bought their dogs were 3.48%, (n=8), those whose dog was given by a neighbor were 192 (83.48 %) , those who adopted a dog from the stray population were 12 (5.22 %) and participants who had dogs born in the family were 18 (7.83%).

For dog restraint means, participants who let their dogs roam freely were 9 (3.91%), those who stated to leash their dog the whole day were 142 (61.74 %) and those who leashed their dog for only part of the day were 41 (17.83%). The rest 38(16.52%) did not leash their dogs but described that the dog stayed within the compound. All factors mentioned above are insignificantly associated with vaccination (P>0.05) (Table 5).

Table 6: Method of dog feeding and age at first rabies vaccination as determinant factors

Determinant Factor	OR	95% CI	P-value
METHOD OF DOG FEEDING			
(Left over from the house)	0.92	0.40-2.08	0.84
(Scavenge for food)	1.14	0.123-10.13	0.905
AGE AT FIRST RABIES VACCINATION			
(At 1 year)	0.51	0.20-1.30	0.16

Owners of dog those who stated feeding their dogs on remains from the house were 141 (61.57%), those who described feeding on meat from licensed butcher or local market were 79 (34.50%) while 9 (3.93%) described their dog scavenges for food.

On dog vaccination services obtainability, out of all study participants with vaccinated dogs 200(86.96%), 68 (29.57%) took their dogs to government nominated vaccination centers while 128 (55.65%) had their dogs vaccinated in their home by a private veterinary technician, 4(1.74 %) responded not to know where to search for vaccination services.

Every year, Study participants those stated knowledge of only one government vaccination campaigns/clinics were 80% (n=184) or two were 15.22% (n=35), those that stated the veterinary personnel are always present for vaccination were 3.04% (n=7) and 4(1.74%) of them didn't have information about how many times vaccination campaigns are existing per year.

Study participants those stated that the first rabies vaccination should be performed when the dog is less than one year were 83.04 % (n=191) and those stated it should be done at 1 year were 14.35% (n=33) and 6(2.61%) of them stated they didn't know about at what age one dog should be first vaccinated.

Table 7: Incidents of dog biting as determinant factor of vaccination

Determinant factor	OR	95% CI	P-value
Dog biting someone history (yes)	1.21	0.51-2.86	0.67
Charged for victimized person Rx.? (yes)	0.97	0.37-2.53	0.95
Have you ever bitten by dog? (yes)	0.53	0.16-1.71	0.29
Has your family member ever bitten ?(yes)	1.22	0.44-3.39	0.70

On dog biting occasions, of all dog holders, 69 (30%) had their dog concerned to have bitten someone and out of these, 45(19.57%) participants were charged for the victimized person. Participants bitten by a dog at one point in their life were 19 (8.26%) while 44 (19.21%) answered having someone in their household having been bitten by a dog at some point in their lifetime.

4.6. Significant dog vaccination determinants Multivariate Analysis

For factors significant on bivariate analysis unconditional logistic regression was done ($P < 0.05$). The dependent /outcome variable was the dog vaccination status while the independent/covariates included was level of education (higher education), mode of rabies transmission (bites), Practices on rabid carcass (bury or burn the carcass), Practice on suspected rabid dog (report to veterinary officer) and when was respondents dog vaccinated their dogs. Factors that were found to be independently and significantly associated with having a vaccinated dog on running the Logistic model ($P < 0.05$) are summarized in table 8.

Table 8: Independently significant factors on Multivariate analysis

Determinant factor	OR	Z-statistics	P-value	95% CI
TRANSMISSION MODES				
(Biting)	1.25	0.19	0.85	0.12-13.27
PRACTICE ON SUSPECTED RABID DOG				
(report to vet. practitioner)	0.75	-0.19	0.85	0.04-15.55
EDUCATION LEVEL				
(primary education)	1.22	0.30	0.77	0.32-4.70
(higher education)	1.14	0.02	0.10	_____
WHEN WAS YOUR DOG VACCINATED?				
(< 6months)	2.03	0.02	0.99	_____
(6-12 months)	1.05	0.02	0.99	_____
FINDING FOR RIGHT RX WHEN EXPOSED TO BITE				
(human PEP)	6.51	1.98	0.05	1.02-41.6

4.7. Investigation on the Studies of Gastrointestinal Helminthes Prevalence

From the total 230 dogs sampled from households owning dogs participated on the interview, 58 of the dogs were found to be infected with *Ancylostoma spp.* (25.21%), *Diplidium caninum* 47 (20.42%), *Taenia spp.* 23 (10%), *Trichuris spp.* 18 (7.82%) and *Toxocara spp.* 42 (18.25%) from table 9.

Table 9: Overall prevalence of zoonotic helminthes in household owning dogs in the study area

Parasites	Positive	Prevalence (%)	95% CI
<i>Ancylostoma spp.</i>	58	25.2	19.56-30.87
<i>Diplidium caninum</i>	47	20.4	15.18-25.68
<i>Taenia spp.</i>	23	10	6.09-13.91
<i>Trichuris spp.</i>	18	7.8	4.33-11.32
<i>Toxocara spp.</i>	42	18.3	13.23-23.29

From out of the five zoonotic helminthes parasites encountered in the study, none of them revealed a significant differences ($P>0.05$) between both sex and body condition (Table 10).

Furthermore there was no significant different between both age and breed as shown in the table below (Table 10).

Table 10: The prevalence of gastro intestinal helminth parasites of dogs by sex and body condition

Parasites	Sex	Prevalence (%)	X^2	P-value	BC	Prevalence (%)	X^2	P-value
<i>Ancylostoma spp.</i>	M	19.57	0.05	0.83	Normal	19.13	3.85	0.15
	F	5.65			Fat	3.48		
<i>Diplidium caninum</i>	M	16.09	0.16	0.69	Normal	14.78	1.07	0.59
	F	4.35			Fat	3.91		
	Poor	1.74						
<i>Taenia spp.</i>	M	8.26	0.53	0.47	Normal	5.22	3.35	0.19
	F	1.4			Fat	2.61		
	Poor	2.17						
<i>Trichuris spp.</i>	M	6.09	0.02	0.90	Normal	4.78	0.57	0.75
	F	1.74			Fat	1.74		
	Poor	1.30						
<i>Toxocara spp.</i>	M	15.22	1.33	0.25	Normal	11.30	0.44	0.80
	F	3.04			Fat	4.78		
	Poor	2.17						

Table 11: The prevalence of gastro intestinal helminth parasites of dogs by age and sex

Parasites	Age	Prevalence (%)	X^2	P-value	breed	Prevalence (%)
<i>Ancylostoma spp.</i>	Young	3.48	0.02	0.89	Local	18.70
	Adult	21.30			Exotic	5.65
	Mixed	0.87				
<i>Diplidium caninum</i>	Young	3.48	0.04	0.84	Local	13.04
	Adult	16.96			Exotic	6.09
	Mixed	1.30				
<i>Taenia spp.</i>	Young	2.61	1.89	0.17	Local	7.39

Table 12: Prevalence of mixed helminthes infection in dogs

Infection with	Positive	Prevalence (%)	95% CI
One helminth parasites	123	53.48	46.98-59.97
Two helminth parasites	19	8.26	4.68-11.85
Three helminth parasites	5	2.17	0.27-4.07
Four helminth parasites	3	1.30	0.17-2.78

Concurrent infections with one species of helminthes were more common (53.48%) than infection with two (8.26%), three (2.17%) and four (1.30%) species of helminthes parasites and none of the dogs examined were positive for concurrent infections with the five species of the zoonotic helminthes investigated. Eighty six dogs (34.79%) were found to be free of any of the parasites of our interest (Table 12).

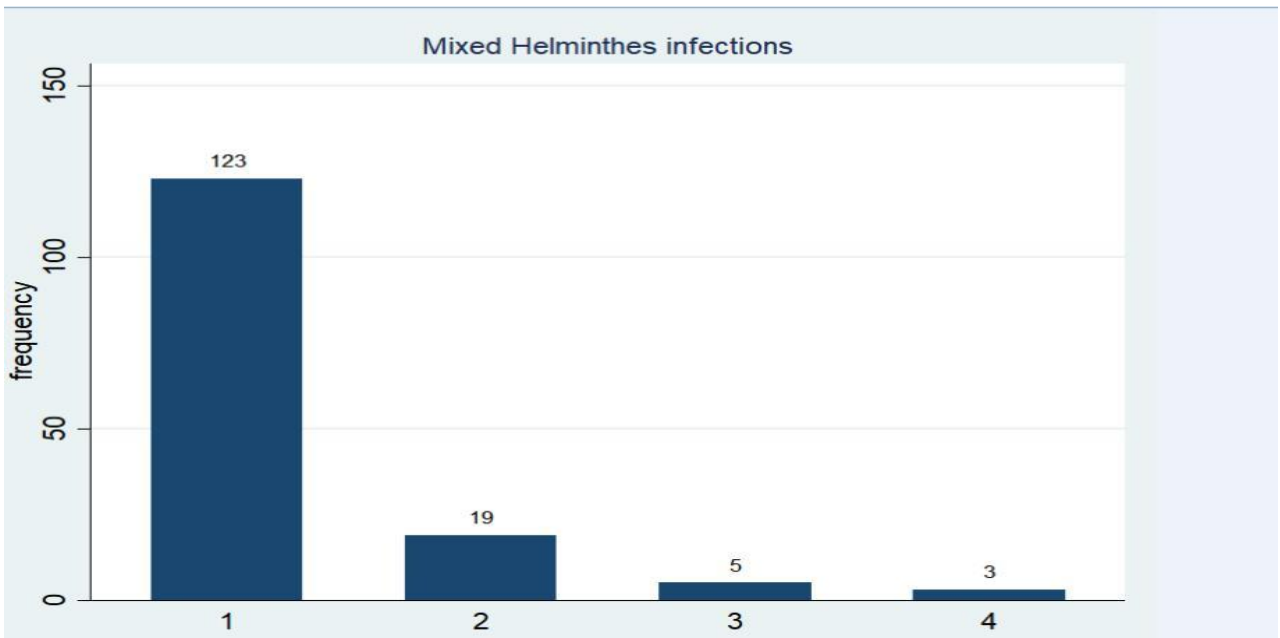


Figure 5: Prevalence of mixed helminthes infection in dogs by graph

5. DISCUSSION

5.1. Characteristics of Study Participants Demography

This study tells that all of the families questioned were found to possess one or more dogs with an owned dog population of 277 dogs. So this study reveals more females (52.61) were took part in the questionnaire interview than males. These outcomes are similar to a study done in Tanzania on Knowledge attitude and practices of dog holders had more females (55%) questioned than males (Sambo, 2012). The relationship could be as a cause of the traditional practices where more women stay at home in Tanzania along with in Ethiopia.

Most study participants for this study had secondary education (37.83%) for the reason most age groups took part in these study ranges 30-45 years that makes it factual in Ethiopian education perspective. Participants who stated they not ever went to school were 16.96%. On other hand study done by Sambo in Tanzania had more participants having only primary education (74%) and more participants with no education (16%) most likely due to the fact that most of this study participants came from rural areas (Sambo, 2012). But in this study, having a higher education was found to be significantly related with having a vaccinated dog in the household because due to awareness and availability of information from mass media in Addis Ababa ($p < 0.05$). A comparable study carried out in Tanzania (Sambo, 2012) and Pakistan (Wasay *et al.*, 2012) found that participants with secondary education were related with having better knowledge of rabies. This is maybe due to awareness and access to information on rabies and the necessities of dog vaccination.

Majority of the study partakers were private employee 88 (38.26%). Having private employment was not significantly related with having a vaccinated dog in the household ($p > 0.05$).

5.2. Rabies Vaccination Coverage

Dogs vaccinated within the last one year in this study made up 86.96% of the total dog owning households questioned. These outcomes are unlike from study conducted by Eshetu in Ethiopia where

33.3% of dogs from dog owning households had been vaccinated (Eshetu *et al.*, 2012) and another study conducted in Kenya (Machakos District where 29% of the owned dogs had been vaccinated (Kitala *et al.*, 2001).

5.3. Knowledge and Awareness of Rabies

Family unit that knew of a disease called rabies were not significantly related with having dog vaccinated ($p>0.05$) whereas most of them (94.35%) knew that the disease is deadly if untreated compared with participants in Sri Lanka (89.5%) and New Delhi (84.0%), who knew of the deadly nature of rabies and significantly related having dog vaccinated (Matibag *et al.*, 2009; Agarwal and Reddaiah, 2003). So in this study, 74.79% of the participant's knowledge source on rabies was from family, friends, societies, neighbors and colleagues with a study carried out in Tanzania having 70% of participants report neighbors, parents and friends as their central rabies knowledge source. Only 56% and 28.5% in Pakistan and Sri Lanka respectively informed friends and neighbors as their source with 36% of participants in Thailand study recording verbal propaganda as their rabies source of knowledge (Sambo, 2012; Wasay *et al.*; 2012; Matibag *et al.*; 2009; Kongkaew *et al.*, 2004). Radio and TV had minimum response rates of 9.56% for this study, but 17% in Pakistan and 37% in Thailand. This indicates that the mass media (Radio and TV) which is more reachable to a broader population has not been well employed as a source of disseminating rabies awareness and knowledge.

Participants who supposed rabies was mostly transmitted through animal bites were 182 (79.13%) significantly related with having dog vaccinated ($P<0.05$). This is perhaps due to the awareness that if their dog was not vaccinated and terminated with biting somebody, they would have to recompense for the sufferers treatment. A comparable study done in Ethiopia found that 73.4% of participants stated animal bites as main rabies transmission mode and in Tanzania 81% recording the same (Eshetu *et al.*, 2012; Sambo, 2012).

5.4. Rabies related practices

Practices related to rabies were evaluated using four questions noticed as indicated in Appendix 1.

In terms of searching medical responsiveness instantaneously after bite of dog incident and that the treatment for dog bite was anti-rabies were insignificantly related with having a dog vaccinated for the reason that rabies prevention knowledge could not stem from having practiced a dog bite incident either in the household or neighbors.

For this study, 28.7% of participants replied they would leash their dogs as rabies prevention methods despite the fact in Thailand 20.1% described they would leash their dogs for observation. Family members who replied that they would report a rabid dog to the veterinary professionals were significantly related with having dog vaccinated. On other hand study conducted in Tanzania, only 7% replied they would report cases of rabies to livestock officer.

Similarly in this study , 79.57%(n=183) of participants replied they would leash their dogs the whole day and partially as prevention of rabies while in Thailand 20.1% replied they would leash their dogs for observation. Household members who responded that they would report a rabid dog to the veterinary officers 190(82.61%) were not significantly related with having dog vaccinated.

For this study, most of participants 187 (81.3%) replied cut and send head to the Veterinary laboratory analysis as the action they would take after killing the dog with 75 % of participants in Tanzania reporting that they would bury or burn the carcass(Sambo, 2012; Matibag *et al.*, 2009). Only 35 (15.22%) questioners in this study replied they would bury or burn the carcass.

5.5. Determinant factors for dog vaccinations in households

A number of reasons were found to decide vaccination status of dog in a household took part in the questionnaire. Nevertheless in terms of dog source, having a dog born in the household was not significantly related with having dog vaccinated ($P>0.05$) most likely due to lack of better awareness about lengthy dog ownership leading to profits of regular vaccination of dog.

Dog holders who prepared meat from qualified butcher/ local market for their dog (34.78%) were not significantly related with having dog vaccinated ($P0.05$) and others such as, remaining from the house and scavenger for food were not significantly related with dog vaccinated. Another study done in

Thailand found that 56% of households prepared food explicitly for the dog (Kongkaew *et al.*, 2004). Vaccination of dogs by these families could consequently be an extension of the humane dog treatment through appropriate dog food preparation and feeding.

Participants who had knowledge of one or two government vaccination centers or private veterinary clinic annually and those who replied the veterinary workers are always available to vaccinate their dogs anytime were not significantly related with having dog vaccinated in their household ($P>0.05$).

Household participants who thought that the first rabies vaccination should be conducted when the dog is less than one year old and those who thought that it should be conducted at one year /above were not significantly related with having dog vaccinated. This could be as a result of lack of awareness about lengthy dog ownership which leads to knowledge of the proper age of first vaccination. Only 36.2% of participants in the KAP survey done in Sri Lanka replied first rabies vaccination be carried out when the dog is less than one year (Matibag *et al.*, 2009).

Families those said their dog had at some point been implicated to have bitten someone were not significantly related with having dog vaccinated ($P>0.05$) perhaps due to not having to deal with the bite victim. The families which were charged for the victim's treatment after the bite incident were similarly not significantly related with having dog vaccinated.

5.6. Investigation on the Study of gastro intestinal helminthes prevalence

The study indicates an overall prevalence of helminthes infection to be 65.21%. The study shows that *Ancylostoma spp.* (25.21%), *Diplidium caninum* 47 (20.42%) were the dominant zoonotic helminth parasites of dogs of in the study area. The finding is different from previous reports from African countries.

The prevalence stated *Toxocara spp.* (18.3%) was different from reports of Ugochukwu and Ejimadu, (1985a); Haralabidis *et al.*, (1988); Vanparijs and Hermans, (1991) and Totkova *et al.*, (2006) who described the prevalence of 24.3, 24.6, 25.4 and 25.8%, respectively. A Prevalence of *Trichuris spp.* (7.8%) in the present study was different from the findings of Yacob *et al.*, (2007); Haralabidis *et al.*,

(1988); Oliveria-Segueira *et al.*, (2002) and Senlik *et al.*, (2006).

The insignificant higher prevalence of helminth infection with *Ancylostoma spp.* and *Diplidium spp.* in young dogs as compared to adult is different from previous studies (Haralabidis *et al.*, 1988; Overgaauw, 1997; Ugochukwu and Ejimadu, 1985b). The higher prevalence acquired in adult than young.

The study indicated that there was no significant difference ($P > 0.05$) in frequency of intestinal helminthes of dogs between male and female dogs. The results are consistent with previous works (Yacob *et al.*, 2007; Haralabides *et al.*, 1988; Fontanarrosa *et al.*, 2006). More than one species of GI helminthes in a single host were detected with prevalence of 63.3%. It might be due to the fact that the dogs serve as scavenger and do not get regular veterinary care.

The occurrence of different helminth parasites species in a single host, as well as high prevalence of these parasites in the study area needs serious attention due to pathogenic influence of the parasites and their zoonotic significance. Hence, a strategic deworming of dogs using broad-spectrum anthelmintics and community education on the care and management of dogs to create awareness of the transmission and control of zoonotic diseases is of vital significance.

6. CONCLUSION AND RECOMMENDATIONS

For the study got from this finding, participants who had higher education were significantly related with dog vaccinated. During this stud time, 86.96% of the total household owned dogs by interviewed respondents had been vaccinated. Factors that were found to inspire families to vaccinate their dogs included were having higher education, respondents who described their dogs were vaccinated less than 12 months, those who described biting mode of transmission for rabies and those replied human post exposure vaccine as right treatment when exposure to rabies happened. From this study it can be determined that there are many dogs owned by households participated in the study and the cause for having dogs is for the purpose of guarding and companion. Ownership to dogs is very poor means that feeding, housing and health care by the households were not trained completely. The study indicated that there was knowledge of the risk of rabies transmission through bites of dogs and prevention measures of rabies upon exposure of human.

For the study carried out for prevalence of gastro intestinal helminthes indicated that helminth parasites occurring were *Ancylostoma species*, *Diplidium caninum*, *Taenia species*, *Trichuris species* and *Toxocara species*. The predominant parasites were *Ancylostoma species* and *Diplidium caninum*. Similarly for this study adult dogs were found to be more infected than young because most of them feed raw meat. Sex, age, breed and body condition were statistically not significantly related with the level of infection with helminthes parasites and concurrent infection with two gastro intestinal helminthes parasite species was common than single species of infection.

Based on the study findings the following points are recommended:

- ✓ The Addis Ababa City Government, Farmers and Urban Agriculture Development Commission should increase the number of veterinary professional to be present consistently across the cities, and ensure the community is aware of the frequency, location and availability of veterinary services, government vaccination centers and encourage all residents to report all rabid or suspected cases of rabies to the veterinary clinic centers.

- ✓ As Addis Ababa City is the Africa Union Headquarters, there is an urgent requirement for a coordinated control of rabies by making a standing committee or any other relevant body. A fruitful rabies control pilot programme in Addis Ababa could serve as a model to cover adjacent towns, other urban and rural areas in Ethiopia also.
- ✓ There must be adequate enforcement demanding the ownership registration and licensing of dogs legislation, a measurement often taken as the bases for mass immunization and control strategies of dog population.
- ✓ Regular dog vaccination campaigns should be wisely trained and this should be connected with continuation of vaccination techniques for young dogs obtainable. Vaccinated dog must be recorded in order to motivate removal of non-vaccinated dogs. The catching and impoundment of homeless dogs should be reinforced with good strategy. Well sophisticated rabies diagnostic equipment should be in place and accessible at central places to help utilizing areas.
- ✓ Suspected dog should be quarantined for 10 days (WHO, 1996). Dogs that show clinical symptoms of rabies or have been in close contact or bitten by a rabid/suspected rabid dogs should be destroyed at all.
- ✓ Although there was a certain awareness level of rabies in the society, in addition further public educations are still necessary and mandatory. Posters, brochures, newspapers, radio and television advertisements should be used for health education to create awareness among the society. The major plan of education should depend on first aid support that should be sought immediately after bite and also on inducing a national sense of aim to teach communities that dog biting should be washed immediately, even if no soap or vaccine is available at a time.
- ✓ There must be coordinated systems which allow the various participants for awareness creation on the risk of gaining rabies and zoonotic dog parasites and other pets.

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8. APPENDICES

Appendix 1: Scoring Techniques form used in the questionnaire interview

Reference questions used in the interview under appendix 1	Questions that was used in the questionnaire	Answers replied by participants	Overall score used to balance participants answer	Binary outcome used
*27	Rabies description	Those described rabies as a disease	2	N/A
		Those described rabies as behavioral change of dog or animal	1	N/A
		Those replied don't know or don't give wrong answer	0	N/A
*30	Describe animals that can be infected by rabies	Those participants who can described more than 3 animals	2	N/A
		Those who described 1 or 2 animals	1	N/A
		Those described nothing	0	N/A
*32	Rabies mode of transmission to individual or to other animals	biting	2	N/A
		Aerosol	1	N/A
		Those replies don't know or give wrong answer	0	N/A
*42	Rabies knowledge that its end result is fatal	Those participants who know rabies fatal nature	1	N/A
		Those participants who do not know rabies fatal nature	0	N/A

*43	Those participants who know right treatment when someone exposed to rabies	Those who described human PEP	2	N/A
		Those who described antibiotics and tetanus without ant rabies Rx.	1	N/A
		Those described don't know or advice from medical technician	0	N/A
*44	Rabies control knowledge in Animals	Those who described 3 or 4 ways	2	N/A
		Those who described 1 or 2 ways	1	N/A
		Those who replied don't know or give wrong answers	0	N/A
	Rabies knowledge	Those who scored >7 of overall of score of ($\geq 7/11$)	≥ 7	1
		Those who scored <6 of ($\leq 6/11$)	≤ 6	0
	Unknowledgeable about rabies		11	N/A
	Overall score			N/A
	PRACTICES OF RABIES			
*36	First aid and medical attention practices	Those who replied cleaning of the wound with soap, water and antiseptic application	3	1
		Those who replied reporting to the hospital	2	1
		Those who replied reporting to the police, elders of the village	1	0
		Those who replied nothing to do	0	0
*37	Presentation to hospital after dog biting	Those who stated reporting upon biting immediately	3	1
		Those who stated reporting after biting on the following day	2	1
		Those who stated reporting 2 to 14 days after biting	1	1
		Those who stated reporting after 14 days or nothing to	0	0

		do with		
49				
*45	Suspecting rabid dogs or animals practices	Those participants stated that they report to veterinary officials	2	1
		Those participants stated that they kill the rabid dogs or animals	1	1
		Those participants stated that they nothing to do	0	0
*46	Suspecting rabid carcass of dogs or animals practices	Those who replied they cut the head of rabid animals and then send to vet. Lab. for diagnosis	2	1
		Those who replied they burn or buy the carcass of rabid animals	1	1
		Those who replied they do nothing with carcass of rabid animals	0	0
	Proper practices	Those participants scored =>6 from overall score of (=>6/10)	1	1
	Improper practices	Those participants scored <6	0	0
	Overall practices		10	0

This tables was accepted from Sambo: (Sambo, 2012)

Appendix 2: Study questionnaire format

Date of interview: _____

Code no. _____

Title: Investigation on Rabies knowledge, practices and determinants of dog vaccination in Addis Ababa city.

I). STUDY PARTICIPANTS IDENTIFYING INFORMATION

City: _____

Sub city: _____

Woreda: _____

House number: _____

II). STUDY PARTICIPANTS INFORMATION ON SOCIO-ECONOMY (HOUSEHOLD MEMBERS)

Age : _____ Gender: _____

What is the maximum level of education you have completed?

- A. No formal education
- B. Primary education
- C). Secondary education
- D). Higher education

What is your present employment you are doing?

- A). Government
- B). NGO
- C). Private (e.g. Business)
- C). House wife
- D). Other _____

What is your religious organization?

- A). Orthodox
- B). Muslim
- C). Protestant
- D). Others: _____

How far do you live from your nearest health center or hospital?

- A). 0-5 km
- B). 5-10 km
- C). > 10 km

III). STUDY PARTICIPANTS DEMOGRAPHIC DETAILS (OWNED DOGS)

Number of dogs owned _____ Age of dogs _____

Sex of dogs _____ breed _____

Body condition _____

Why you keep dogs (reason for having dogs)?

- A). for companionship
- B). for guarding purpose
- C). For both companionship and guarding purpose

What is the housing condition of your dogs?

- A). Confined (indoor)
- B). Semi confined (partial).
- C). Not confined (outdoor)

At what intervals do you clean the house of your dogs?

- A). every one week C). Two weeks up to one month

What kind of meat you take to your dogs?

- A). Raw B). Cooked C). Both

Where does your dog spend most of the time?

- A). All of its time in the house C). Stay in the living house with us
B). Half the time in the house D). Stay outside the compound

How do you dispose the feces from your dogs?

- A). Dispose the feces of the dogs in the garbage of the household found in the compound
B). Dispose dog feces in the toilet
C). Burn feces of dog as the disposal system
D). Other_____

IV). RABIES VACCINATION DETERMINANTS

1. How many of the following animals you have?

- A). Cattle D). Chicken
B). Sheep E). Cat
C). Goat F). Others_____

2. For families with cats, have you ever been vaccinated your dog?

- A). Yes B). No

3. How did you get your dog?

- A). Born in the house D). We adopted from homeless dogs
B). we got from neighbor or friend E). Others_____

4. How can you restrain your dog?

- A). by leashing the whole day C). Stays in the compound but not leashed
B). by leashing half of the day D). Freely roaming

5. Do you think that dogs should be leashed?

- A). Yes B). NO

6. If yes or No, why you think that it should be leashed or not leashed?

7. Are all the your family members be able to restrain?

- A). Yes B). No

8. What do you take or feed to your dogs?

- A). Meat from legally licensed butcher C). Food left from the house

- B). Meat gained or bought from locally available market D). Scavenge for food
9. Has your dog ever been vaccinated against rabies before? (skip to question No 16 if your answer is No here)
- A). Yes B). No
10. If yes, when your dog was vaccinated for the last time?
- A). <12 months ago C). Not vaccinated
B). => 12 months ago.
11. Did you receive certificate for your dog vaccination service?
- A). Yes B). No/don't know
12. If no, why has your dog never been vaccinated against rabies?
- A). I don't know where the vaccination center is obtainable
B). No one available at home when vaccination obtained at campaigns
C). Vaccination cost is very high
D). Vaccination center is so far
E). Others _____
13. Who took your dog to vaccination campaign to be vaccinated?
- A). Family member
B). Veterinarians home to vaccinate by themselves
C). Others _____
14. How far vaccination campaign from your home?
- A). < 5kms B). > 5kms
15. Were you paid for the vaccination service? (If No, skip to 21)
- A). Yes B). No
16. Were the payment too cost for you? (If No, skip to 21)
- A). Yes B). No
17. How many times in a year are the vaccination campaigns available?
- A). Once D). I don't know
B). twice E). other _____
C). The veterinarians are always there to vaccinate
18. At what age should a dog be vaccinated against rabies for the first time in your opinion?
- A). < 1 year B). at 1 year C). more than 1 year
19. How many stray dogs do you see in a day approximately?
- A). One B). More than one C). None
20. Has your dog ever been implicated to have bitten someone?

- A). Yes B). No
21. If Yes, were you paid for the treatment of victimized people?
A). Yes B). No
- V). KNOWLEDGE AND AWARENESS OF RABIES**
22. Do you know a disease called rabies? (if No skip to Q. 34)
A). Yes B). No
23. How can you describe the disease? _____
24. If yes, where did you get knowledge of it?
A). Radio and TV D). Community Animal Health workers
B). Family, friends, neighbors and colleagues E). Other
C). School
25. What do you think that causes rabies?
A). Virus E). Don't know
B). Bacteria F). Other (specify) _____
C). Hereditary
26. Which animals are affected by rabies in your opinion? (Check all described)?
A). Dogs E). Sheep
B). Cats F). Man
C). Cattle G). All the above
D). Goats H). Other (specify)
27. Can animals transmit rabies to human being?
A). yes B). No
28. How rabies can be transmitted? (See all that apply)?
A). through bites C). Do not know
B). Through scratches
29. Has your any family members or have you ever bitten by a dog?
A). Yes C). No
30. What action will you take if you or your family member bitten by a dog ?(seen all the mentioned)
A). Wash the wound with soap and water immediately
B). Apply antiseptic to the wound D). Other (specify): _____
C). Go to the hospital E). Did nothing
31. When will you take to hospital after dog biting?
A). immediately after being bitten D). After 14 days
B). next day after being bitten E). Would do nothing

C). between 2 to 14 days after being bitten

32. Why would someone bitten by a dog not go to the hospital in your opinion?

- A). Hospital is far
B). Cost of treatment is high
C). It is unnecessary to go
D). Traditional healers are preferred
E). Other (specify) _____

33. Have you ever seen a person infected with rabies?

- A). Yes
B). No

34. If yes, where did you see it?

- A). Television
B). Real life
C). others _____

35. Do you think that rabies can be cured in your opinion?

- A). Yes
B). No

36. Could rabies exposure with no medical treatment lead someone to death?

- A). Yes
B). No

37. How can someone prevent himself/herself from getting rabies?

- A). Avoid all rabid dogs
B). burn all suspected rabid dog carcasses
C). Go for treatment immediately after being bitten by any animal
D). Vaccinate dogs annually
E). bury all suspected rabid carcasses
F). Do not know

38. What will you do if you suspect that one dog is rabid?

- A). immediately kill the animal
B). Report to the veterinary officer
C). I will not take any action
D). Others _____

39. What action will you take with the killed animal if your answer for above question is killing the rabid animal?

- A). Burn or burn
B). Cut the head and send to the veterinary officer
C). Throw it away/ I don't know

40. What are the signs and symptoms of rabid dog or animal?

- A). Maniacal behavior
B). Salivation
C). Biting inanimate objects
D). Anxious
E). Other (specify) _____

Overall rabies knowledge

A). Knowledgeable

B). Not knowledgeable

Rabies knowledge score _____

Practice score _____