

**RABIES PREVENTION PRACTICES AMONG DOG OWNERS IN
MUMIAS SUB-COUNTY, KAKAMEGA COUNTY KENYA**

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DEDICATION

I would like to dedicate and express my gratitude to my family for their unwavering and continuous support throughout our research endeavor.



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I want to express my gratitude to the Almighty God for granting me the privilege of witnessing the culmination of this research endeavor.

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ABBREVIATIONS AND ACRONYMS



| | |
|-----------------|---|
| CDC | Centre for Disease Control and Prevention |
| CIVIL | Central Veterinary Investigations Laboratory |
| DALY | Disability-Adjusted Life Years |
| DVS | Director of Veterinary Services |
| ESRC | Scientific and Ethical Review Committee |
| EPI | Expanded Program on Immunization |
| FAT | Fluorescent Antibody Test |
| FRD | Free-Roaming Dogs |
| IDSR | Integrated Disease Surveillance and Response |
| IESRC | Institutional Ethical and Scientific Review Committee |
| KNBS | Kenya National Bureau of Statistics |
| KPGH | Kakamega Provincial General Hospital |
| M of ALF | Ministry of Agriculture Livestock & Fisheries |
| NACOSTI | National Science and Technology Council |
| NGOs | Non-Governmental Organizations |
| OIE | Office International des epizooties |
| PEP | Post-Exposure Prophylaxis |
| PrEP | Pre-Exposure Prophylaxis |

SPSS Statistical Package for Social Sciences

UK United Kingdom

VIL Veterinary Investigation Laboratories

WHO World Health Organization

ZDU Zoonotic Disease Unit



OPERATIONAL DEFINITION OF TERMS

Rabies: is a zoonotic viral disease characterized by progressive and lethal inflammation of the brain and spinal cord.

Dog Ownership: An individual who possesses, maintains, exercises guardianship, holds a financial or property stake in, or exercises control or custody over a canine.

Dog keeping and husbandry: Encompass the techniques utilized to maintain a dog that prevents mistreatment and ensures the provision of safeguarding, companionship, and guidance.

Household dogs: Exhibit complete reliance on a household and are subject to partial limitations. On the other hand, limited dogs are entirely dependent and subject to complete limitations or supervision.

The feral dog: refers to a canine species that inhabits a state of wilderness, devoid of deliberate human provision of sustenance and shelter, and exhibits a persistent and pronounced aversion to direct human interaction.

Household members: refer to individuals who reside together in a single dwelling and utilize a common cooking vessel.

Dog immunization status: A canine is deemed immunized if the interval between the most recent and present vaccination dates does not exceed one year. This assertion can be substantiated by referring to the vaccination certificates.

National dog market: This is a countrywide auction of dogs in Lubao Market -Kakamega County. Buyers come from neighboring countries, including Uganda and Tanzania.

Target Population: Any household member present and above eighteen years of age residing in the Kakamega County Mumias sub-region.



ABSTRACT

Introduction: Rabies has a total case mortality rate once clinical signs appear; therefore, it is regarded as a zoonotic illness that poses significant concerns for public health. Domesticated dogs function as the principal carrier for the transmission of rabies. Human rabies has been prevalent in Kakamega County for many years, and the population of stray dogs keeps on increasing due to the presence of a dog market in the area. This study was designed to determine rabies prevention practices among dog owners in Mumias sub-county, Kakamega County, Kenya.

Methodology: An analytical cross-sectional design was used, and a sample size 385 was achieved using Fischer's formula. At each stage of the study, participants were recruited through a random sampling procedure, and data was collected using structured questionnaires.

Results: The majority (41.8%) of the sample population had a moderate level of knowledge of rabies prevention practices. Dog confinement methods (65.7%), vaccination services (44.2%), and treatment methods (85.7%) were revealed as common rabies prevention practices. Further, the study found an association between having a formal education, employment status, availability of veterinary personnel in the area ($P < 0.05$), the availability of vaccination points in the dog market ($P < 0.01$) and having a vaccinated dog.

Conclusion: Mumias sub-county residents have a moderate level of knowledge of rabies prevention practices. Mumias sub-county residents use dog confinement methods, vaccination services, and treatment methods as preventative measures. Demographic characteristics, preventative measures, the presence of a dog market in the region, and accessibility of veterinary personnel, were factors associated with compliance with rabies prevention practices among dog owners in the Mumias Sub-County Kakamega County Kenya.

Recommendations: Increase rabies awareness; Prevention, and dog population control programs, provide dog vaccination points in dog markets as well as formulate policies on unvaccinated dog trade and trafficking.

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

The Rabies virus exhibits a direct attack on the cerebral cortex of the host, resulting in neurological disorders and ultimately culminating in fatality. According to the Centers for Disease Control and Prevention (CDC, 2021), empirical evidence indicates that rabies may have an impact on a wide variety of animal species. However, it is more prevalent among bats, dogs, foxes, and cats.

Rabies is a substantial concern within the field of public health, resulting in an annual global mortality rate exceeding 60,000. According to Lugelo et al. (2022), Dog rabies is accountable for a substantial proportion of fatalities, over 95%, in the continents of Africa and Asia. Globally, there exists a lack of awareness among those who have had dog bites regarding the proper management of the ensuing wounds, thereby contributing to the dissemination of the virus along the central nervous system. The aforementioned phenomenon finally results in the mortality of around 60,000 individuals on an annual basis, with the regions of Africa and Asia exhibiting the highest prevalence of deaths (Lugelo et al., 2022).

Rabies is widespread worldwide in the continental regions of Africa, Asia, and Latin America. The global death rate is estimated to be close to 100%. As soon as a clinical sign appears, insufficient public awareness of rabies is one of the main obstacles to any prevention and control measures against the disease (Hagos, 2020). Even though rabies is preventable, only a few countries, including Australia, New Zealand, and the United Kingdom (UK), have conducted programs related to eliminating rabies, and now they are

free from this illness (Miranda, 2020). Rabies claims the lives of individuals at a rate of one per ten-minute interval, predominantly in developing nations. Specifically, Africa and Asia collectively bear the burden of over 90% of documented fatalities. According to the Zoonotic Disease Unit of Kenya (2014), individuals who are below the age of 15 have heightened susceptibility, with an estimated annual mortality rate of 2,000 Kenyans due to rabies (WHO, 2018).

In regions where rabies is prevalent, restricted accessibility of post-exposure prophylaxis (PEP) is a contributing factor to avoidable mortality rates in the human population (Mutunga, 2022). Determining whether to administer post-exposure prophylaxis (PEP) is contingent upon evaluating the risk of infection, which involves assessing many parameters. The elements that contribute to the epidemiological status of rabies in particular geographical areas include the exact location, intensity, bite location, status of individual vaccination, and the behavior displayed by the patient (Mutunga, 2022). Several African countries, like Kenya and other republics, demonstrate a higher prevalence of dog bites and rabies cases attributed to inadequate pet vaccination practices, leading to rabies virus transmission. The World Health Organization (2021) has reported that the primary source of human fatalities resulting from rabies is linked to canines, specifically dogs, which account for around 99% of all mortalities.

Documenting animal bite injuries in low- and middle-income countries is a significant responsibility undertaken by the World Health Organization (WHO), which accounts for a considerable proportion ranging from 76% to 94% of reported cases. The transmission of this virus to the human population is attributed to dogs. Rabies is a lethal disease that remains fatal until symptoms manifest. According to the research conducted by Njenga

(2022), it has been discovered that the rabies-related mortality rate in Kenya is approximately 2,000 individuals per year. Machakos and Kakamega counties are among the top five regions with the most significant incidence of dog attacks.

Appropriate dog mass vaccination campaigns in Kenya and Tanzania have successfully reduced canine rabies in densely populated urban and rural areas (Duamor et al., 2022). Although vaccination for rabies has been started, it still exists in Kenya, including Kakamega and Kisumu counties, due to inadequate vaccination coverage and a high turnover rate in dogs (Ferguson et al., 2020).

According to Bitek al. (2019), Kenya is currently adopting a comprehensive strategy to eliminate rabies, aiming to eliminate all human fatalities resulting from this disease by 2030. The primary strategies for combating rabies consist of several key elimination measures. These steps involve the execution of a large-scale yearly vaccination campaign aimed at dogs, with a minimum coverage rate of 70% in each designated region. Furthermore, it is effective to guarantee timely provision of post-exposure prophylaxis (PEP) to those who have experienced bites from animals that may carry the rabies virus. Public awareness initiatives targeting disseminating knowledge regarding the hazards and mitigation strategies associated with rabies are paramount. In addition, it is crucial to implement comprehensive surveillance systems for effectively tracking the incidence and transmission of the disease. In conclusion, it is imperative to maintain ongoing monitoring and surveillance initiatives to guarantee a proficient response to the onset of the disease (Zoonotic Disease Unit, 2014). Prior research has emphasized the necessity of tackling the obstacles related to the provision, accessibility, and financial implications of healthcare services inside medical establishments (Wambura et al., 2019).

1.2 Problem Statement

The vaccination rates for dogs in the sub-Saharan African region, specifically in Kenya, fall significantly below the recommended level of 70%, as indicated by Muriuki (2016). The research conducted by Gichohi et al. (2019) in Machakos County, Kenya, revealed that the vaccination rate for dogs was a mere 29%.

In Kenya, most victims inform veterinary offices about suspected incidents of rabies rather than taking the expected treatment and prevention measures. Therefore, post-exposure prevention strategies may be ineffective (Wamuswa, 2019).

Mumias sub-county Kakamega County experiences a high population of free-roaming dogs due to a dog market in the area, where traders come from neighboring countries like Uganda and Tanzania. The abovementioned element underscores dog care's significance, raising knowledge about rabies, and implementing efficient rabies prevention measures.

Kakamega, Bungoma, Vihiga, Busia, Siaya, and Kisumu counties in Kenya are considered high-risk locations for rabies since they fall under the designation of a rabies control area. This classification is mainly attributed to the escalated trafficking of dogs across the country, resulting in the unrestricted movement of animals that are susceptible to the disease (Bitek et al., 2018). The presence of numerous sugar bushes and expansive forest coverage provide significant ecological support for wild dogs, which serve as crucial vectors in the spread of rabies.

Despite the availability of rabies vaccine and veterinary services in the study area, the uptake of dog vaccination and other rabies prevention practices in Mumia Sub-County is

unknown. According to Wamuswa (2019), a notable concentration of canines is not adequately supervised and requires sufficient vaccination. There is a need to establish whether the residents know about the different rabies prevention practices. Therefore, the main aim of this research was to determine the extent of knowledge, assess the implementation of measures for preventing rabies, and identify the factors that affect adherence to rabies prevention practices in the Mumias Sub-County, situated in Kakamega County, Kenya.

The results of this study will provide specific recommendations to pertinent entities and stakeholders to alleviate the spread of rabies. Without prompt action, the prevalence of rabies will increase sustainably. Moreover, a precise assessment of the magnitude and consequences of the disease burden is essential to establish disease priorities, which presents inherent difficulties.

1.3 Study Objectives

1.3.1 Broad Objective

The broad objective of this study was to examine the rabies prevention practices, level of knowledge, and factors associated with compliance among dog owners in the Mumias sub-county, located in Kakamega County, Kenya.

1.3.2 Specific Objectives

- i. To assess the level of knowledge on rabies prevention practices in the Mumias sub-county of Kakamega County, Kenya.
- ii. To identify preventive rabies practices among dog owners in the Mumias sub-county, Kakamega County, Kenya.

- iii. To identify factors associated with compliance with rabies prevention practice in Mumias sub-county, Kakamega County, Kenya.

1.3.3 Research Questions

- i. What is the level of knowledge on rabies prevention practices among dog owners in Mumias sub-county, Kakamega County, Kenya?
- ii. What preventative practices do dog owners in Mumias sub-county apply to prevent rabies in Kakamega County, Kenya?
- iii. What factors are associated with compliance with rabies prevention practices among dog owners in Mumias sub-county, Kakamega County?

1.4 Justification of the Study

Rabies is classified as a neglected disease, with infrequent occurrences of fatal cases being documented. The prevalence of the disease is frequently observed in geographically remote rural settlements, lacking preventive measures to mitigate the transfer of the disease from dogs to humans. Additionally, the Kakamega region lacks accurate reporting regarding rabies, hindering resource distribution from various financing entities (Gichohi, 2019). This study holds significant value as it provides crucial epidemiological data that can be used to influence policymakers within the country regarding the public health implications of rabies in Mumias sub-county, Kakamega County.

Research and data show that rabies has increased in Kakamega County (Gichohi et al., 2019). Out of the total number of patients in Kakamega General Hospital, dog bites

accounted for more than 25% (Muriuki, 2016). However, this research does not show the steps taken by management to prevent this disease.

According to Wamuswa's (2019) findings, the predominant factor leading to rabies occurrences in Kenya is the domestic dog market, accounting for 89% of instances involving episodes of human-animal attacks. The World Health Organization (WHO, 2021) has highlighted the potential link between immunization rates and the prevalence of rabies as a matter of apprehension.

The investigation's findings will be communicated to a broader audience through the channels of healthcare experts and the delivery of health messages through outreach initiatives. These factors will contribute to generating precise suggestions for the study region, thereby enhancing the efficacy of application and execution.

In addition, this study will offer specific recommendations to pertinent stakeholders involved in the management and prevention of rabies, such as county health departments and regional organizations responsible for livestock and agriculture.

1.5 Scope and Limitations of the Study

This study aimed to investigate the rabies prevention behaviors among dog owners in Mumias sub-county, located in Kakamega County, Kenya. The study was limited to addressing its specified objectives as outlined. This study aimed to investigate the social-demographic characteristics. Although the research offered insights on practices of preventing and controlling rabies as well as evaluating vaccination-associated factors, individuals who own dogs evaluate their knowledge regarding rabies prevention practices,

assess their level of compliance with these practices, and identify factors that are associated with compliance in Mumias sub-county, located in Kakamega County, Kenya, focusing on prevention strategies and partially on treatment options. Moreover, it is crucial to acknowledge that the applicability of the study's results may be restricted to the particular circumstances under which the research was carried out, as variations in social-economic aspects and backgrounds across different countries or locations can influence the applicability of the results.

1.6 Study Assumptions

This study had assumptions that helped in upholding the relevance of objectives for the efficiency of the findings, which included;

- i. Dog vaccination coverage against rabies in the Mumias sub-county, Kakamega County, was not optimal.
- ii. People get knowledge and information from different sources due to the country's digital era and the widespread use of information through various transmission and communication vessels in the 20th century.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter offers a comprehensive examination and integration of fundamental principles related to the significance of implementing rabies prevention methods within the research domain.

2.2 Literature Review

The literature was revised by considering various studies, concepts, and reports on awareness about rabies, practices for its prevention, assessment of preventive practices, and identification of factors influencing compliance with rabies prevention measures. Rabies is a contagious illness resulting from a viral infection, characterized by the capacity to transmit between domesticated and wild animal communities. The major means by which the virus is transmitted to people is typically through the bite of an animal that is infected with rabies or through direct contact with infectious material, such as the saliva or wound of a rabid animal (WHO, 2020). As the World Health Organization (WHO, 2018) stated, the rabies mortality rate is consistently unavoidable once symptoms become apparent. The World Health Organization's 2010 study states that the global population of individuals receiving post-exposure rabies prophylaxis exceeds 15 million. Furthermore, Miranda (2020) has observed an anticipated annual fatality rate of 55,000 individuals attributed to rabies. Based on the findings of Ferguson et al. (2020), it can be shown that Africa and Asia demonstrate the highest fatality rates attributed to rabies on a global scale. This leads to an approximate yearly mortality count of 24,500 on both continents.

2.3 Rabies Burden

The prevalence of rabies exhibits a non-uniform distribution among different societal categories. Based on the findings of the World Health Organization (2018), a considerable percentage of deaths, namely 84%, occur in economically disadvantaged rural areas. Moreover, it is worth mentioning that individuals below the age of 15 comprise a significant proportion, anywhere from 30% to 50%, of the impacted demographic. Cleaveland et al. (2018) reported a higher prevalence of dog bites resulting in rabies infection among youngsters than adults.

Moreover, it has been observed that youngsters are more prone to being bitten in the head and neck regions, heightening their vulnerability to acquiring the disease. Based on the research conducted by Bitek et al. (2019), it was found that the number of individuals who lost their lives due to rabies in Ethiopia surpassed 10,000.

The reported number of deaths caused by rabies in Tanzania was roughly 1,500, while Uganda reported 440 fatalities; this led to a mortality rate of 1.26 deaths per 100,000 inhabitants (Christian et al., 2023). According to the Zoonotic Disease Unit (2014), Kenya experienced a yearly mortality rate of 2,000 individuals as a result of rabies. The subsequent figures present a comprehensive summary of the influence of rabies on the respective populations during the calendar year 2014.

The prevalence of rabies has significant implications for human populations, as interactions with rabid dogs and cats can lead to severe injuries or even death. The prevalence of dog bites worldwide ranges from 40 to 288 occurrences per 100,000 people, according to a 2018 study by Cleaveland et al. (2018) found that severe dog bites, particularly those that

occur in the head and neck regions, result in clinically unpleasant symptoms and have the potential to have fatal consequences. The effects mentioned above not only result in significant psychological distress for impacted families, communities, and healthcare professionals but also give rise to unfavorable economic consequences.

The estimated yearly fatality rate attributed to rabies on the African continent is roughly 24,000 fatalities. Chuchu et al. (2022) argue that adopting mass dog vaccination initiatives, coupled with the prompt provision of post-exposure prophylaxis (PEP) to those whom dogs have bitten, is of utmost importance in eradicating human fatalities caused by rabies. The execution of a proficient healthcare team, together with the convenient availability and accessibility of rabies biological products inside healthcare facilities, constitutes essential interventions to reduce the mortality rate associated with rabies. Chuchu et al. (2022) conducted a study to investigate the extent of healthcare Workers' understanding and expertise regarding rabies and its control. Additional investigation was conducted to assess the accessibility and usage of post-exposure prophylaxis (PEP) in rural areas of eastern Kenya.

2.4 The Theoretical Framework

The close relationship between rabies and dog bites has long been known to man (Mutunga, 2022). To eliminate dog-caused rabies, this study used the One Health approach as a theoretical foundation for developing the conceptual framework.

Based on the findings of Bitek et al. (2018), it has been anticipated that the annual mortality rate attributable to this particular disease amounts to 59,000 globally. It is noteworthy that people from socioeconomically challenged segments of the population have heightened

vulnerability to this ailment. The transmission of the disease is primarily facilitated through the bite of a stray dog, as indicated by the research conducted by Yoder et al. (2019). According to the WHO (2018), the rabies virus is naturally found in wild animals and bats. However, the domestic dog, scientifically known as *Canis lupus Quenis*, serves as the primary host and origin of human infection.

On a global scale, the treatment of canine-transmitted rabies varies between nations due to various factors, including resource availability, governmental prioritization of the sickness, and the extent of public knowledge. The World Health Organization (WHO) launched a comprehensive program in 2018 to provide guidance and promote nationwide efforts to eliminate canine rabies (WHO, 2018).

2.4.1 One Health Approach as a Theoretical Framework

The One Health approach acknowledges the interconnectedness of human health, animal health, and the wider ecological system. The One Health approach is essential in understanding the interconnectedness between humans, animals, plants, and the environment. The worldwide human population is currently undergoing tremendous expansion, leading to the occupation of geographical regions that were previously unpopulated. As a result, there has been a growing trend of individuals living close to wild and domestic animals, including pets and cattle. Animals play a crucial role in the lives of humans, spanning various areas, including food production, textile manufacturing, economic support, transportation, leisure activities, knowledge acquisition, and friendship. The closeness and shared habitat of animals and humans create multiple possibilities for the spread of illnesses between these species (Kaswa et al., 2023).

The earth has experienced alterations in climatic patterns and land utilization, including deforestation and the intensification of agricultural practices. Changing environmental and ecological circumstances can provide novel avenues for transmitting animal diseases (Kaswa et al., 2023).

The mobility of individuals, fauna, and animal-derived commodities has experienced a notable surge due to the expansion of tourism and international commerce. Consequently, the transmission of diseases can occur swiftly across national boundaries and have a global reach. The modifications mentioned above have led to the dissemination of established or recognized zoonotic illnesses, as well as novel or developing zoonotic diseases that can be transmitted between animals and humans. Zoonotic diseases have a significant global impact, affecting millions of individuals, both humans and animals, annually (Kaswa et al., 2023).

The One Health concept offers a holistic and effective strategy for tackling health issues that emerge from the interconnectedness between humans, animals, and the environment. This approach encompasses zoonotic diseases as a prominent element. The One Health method involves the collaboration of experts in various sectors, including human, animal, and environmental health, as well as allied disciplines. Its primary objective is to effectively monitor and manage public health hazards while also investigating the transmission of diseases among humans, animals, plants, and the environment (Kaswa et al., 2023).

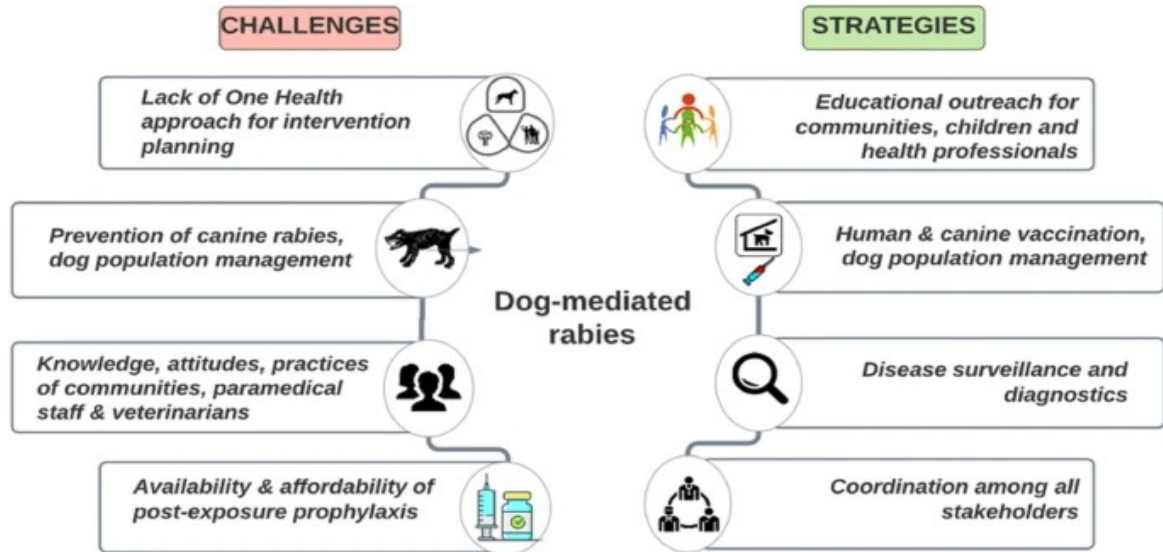
The achievement of effective public health initiatives necessitates the collaboration and engagement of stakeholders across human, animal, and environmental health domains.

Effective communication, collaboration, and coordination among professionals in several domains, including human and animal health, are vital. Additional stakeholders in the One Health concept include law enforcement agencies, lawmakers, agricultural entities, the local community, and even individuals responsible for pet ownership. Resolving issues arising from the interaction between animals, humans, and the environment necessitates collaborative efforts among individuals, organizations, and regions (Kaswa et al., 2023).

One health method facilitates the prevention of zoonotic diseases transmitted between animals and humans. This approach aims to enhance health outcomes and food security while also mitigating the prevalence of antibiotic-resistant infections. The One Health concept plays a significant role in enhancing global health security by effectively addressing the health requirements of both human and animal populations. Promoting collaboration across multiple disciplines helps achieve these objectives (Kaswa et al., 2023).

This review aims to investigate the knowledge, attitudes, and practices about eradicating rabies. This study will primarily concentrate on preventative practices that are pertinent to the research objectives, specifically ascertaining the extent of knowledge on rabies prevention practices. The study aimed to assess the rabies protection practices implemented by dog owners and afterward determine the elements contributing to adherence to rabies prevention measures in Mumias sub-county, located in Kakamega County, Kenya (Kaswa et al., 2023).

The conceptual framework for the study presented in Figure 2.3 below is taken from Figure 2.1 below.



(Tiwari, et al. 2021)

Figure 1: Diagram presenting challenges and strategies for dog-mediated rabies eradication in countries where the disease is endemic.

2.5 Epidemiology of Rabies

Rabies is a widespread occurrence on a global scale, except for Antarctica and other geographical areas predominantly characterized by islands and peninsulas. Numerous countries have successfully attained disease elimination through stringent vaccination and control measures. The British Isles, Japan, Australia, and New Zealand are among the notable instances. The combined continents of Africa and Asia are responsible for about 95% of global mortality. According to a study by Ferguson et al. (2020), the distribution of the burden is not uniform, as it is subject to the influence of socioeconomic variables that provide an advantage to individuals who possess the financial means to procure a treatment regimen including five vaccination doses administered over one month (Mutunga, 2022). According to Duamor et al. (2022), rabies has a significant worldwide

impact, resulting in 59,000 deaths each year or 3.7 million disability-adjusted life years (DALY). This impact has a 95% confidence interval from 1.6 to 10.4 million. Moreover, it is projected that the economic impact linked to rabies amounts to around \$8.6 billion, with a 95% confidence interval ranging from 2.9 to 21.5 billion. The precise figures for morbidity and mortality in Kenya are not readily available but estimates indicate approximately 523 deaths per year (95% CI 134–1100) (Chuchu et al., 2022). Nevertheless, Kenya's Zoonotic Diseases Unit (ZDU) estimates that the annual human mortality rate might exceed 2,000 (Zoonotic Disease Unit, 2014). Estimations of the disease load in Africa and Asia have been reported in the canine rabies epidemiological charts. To confirm the model's estimations, it is necessary to obtain standardized active surveillance data from several nations in the region (Chuchu et al., 2022). Rabies is a multidisciplinary challenge for medical practitioners and the veterinary profession, necessitating coordination between these two groups to accurately assess the disease burden extent (Christian et al., 2023). Rabies continues to pose an acute economic challenge, particularly in impoverished rural areas of regions where the disease is prevalent. In these places, individuals affected by rabies encounter substantial financial barriers to accessing pre-exposure prophylaxis (PEP) therapy. They are less likely to receive it than their urban counterparts (Cleaveland et al., 2018).

Diseases are transmitted and disseminated throughout wildlife populations by a wide variety of animal species, most of which are found in their natural habitat (Roberts et al., 2021), have shown that the management of fox rabies has been successful in Western Europe. Nevertheless, the frequency of skunks and raccoons remains significant in some areas of Canada and the United States. Multiple bat populations in Africa, Central and

Southeast Asia, Europe, and the Americas are affected by rabies and its associated diseases. Chang-Richards et al. (2019) reported a decrease in the prevalence of rabies cases attributed to the existence of several wild animal species. The prevalence of canine rabies is extensive in developing nations spanning Central and South America, Africa, and Asia. The territories stated above are also the main areas where the bulk of human rabies cases worldwide are reported. Africa and Asia account for 90% of worldwide human rabies infections, as reported by the (WHO, 2023). Farm dogs are responsible for 90% of these cases. Rabies is transmitted throughout Africa, with domestic dogs being the main carrier (Lugelo et al., 2022). The viruses in question have a notable level of host promiscuity, as they can infect a diverse array of hosts, including but not limited to dogs, cats, bats, and wild predators. The World Health Organization states that wrath and irritation are commonly observed signs of fury (WHO, 2023). Bitek et al. (2019) state that Kenya is implementing a plan to eradicate rabies, aiming to eliminate human deaths caused by this illness by 2030. The failure to carry out annual mass immunization campaigns for dogs, aiming for a minimum coverage of 70% in all areas, represents a significant oversight. Furthermore, the timely administration of post-exposure prophylaxis (PEP) to individuals bitten by rabid animals, the improvement of public awareness regarding rabies, and the establishment of an effective system for monitoring and responding to outbreaks are also notable omissions (Zoonotic Disease Unit of Kenya, 2014). Previous studies have emphasized the need to address the challenges related to the delivery, availability, and cost-effectiveness of healthcare services within medical facilities (Wambura et al., 2019).

2.6 Rabies in Dogs

The World Health Organization states that dogs, rabbits, skunks, bats, and foxes are the main means of transmitting rabies from animals to humans through zoonotic means (WHO, 2023). Miranda (2020) asserts that canines play a crucial role as the principal reservoir and carrier of the rabies virus, hence serving as a substantial mode of transmission in the cumulative count of 60,000 annual deaths caused by rabies across Asia and Africa. Infected animals can retain the virus within their saliva and transmit it to other animals, even before the onset of clinical symptoms, for a duration spanning multiple days.

According to the Zoonotic Disease Unit of Kenya (2014), the virus's replication commonly occurs within muscle cells and connective tissue at the site of immunization. It then infiltrates peripheral neurons at the neuromuscular junction and propagates afferently toward the spinal cord. Ultimately, it enters the cerebral cortex, where the phenomenon of replication occurs.

Centrifugal propagation occurs through peripheral nerves, including several organs inside the human body, such as the salivary glands. Mutunga (2022) states that when an animal can transmit rabies by saliva, the virus can be detected in the brain. Gichohi et al. (2019) found that domestic dogs are the main vectors of rabies in Kenya, responsible for 63% of confirmed cases and 89% of occurrences involving human-animal bites.

Dogs account for the bulk of human rabies cases in countries where domestic animals are not vaccinated against the disease (Shepherd, 2018). The misdiagnosis and underreporting of rabies cases are prevalent, particularly in non-industrialized countries (Miranda, 2020).

According to Christian et al. (2023), the administration of vaccines to dogs has demonstrated significant efficacy and efficiency in mitigating the incidence of human-caused rabies. If a dog bite is suspected, the wound should be properly cleaned with soap and water before seeking medical attention. The administration of rabies immune globulin (RIG) treatment, along with immunization, is contingent upon the severity of the bite (Mwangi, 2016).

The successful inhibition of clinical symptoms associated with rabies is achieved using post-exposure prophylaxis (PEP). Nevertheless, the presence and ease of access to post-exposure prophylaxis (PEP) provide notable challenges, especially in rural areas, exacerbating the general population's vulnerability to rabies (Hampson et al., 2019).

The control and prevention of rabies face significant challenges, including the difficulties in developing and implementing large-scale dog vaccination campaigns within tight time constraints (known as vaccination delay). Additionally, the high prevalence of dogs hinders interrupting transmission cycles (Hasselbeck et al., 2021). The probability of contracting this potentially fatal illness is heightened by several factors, such as the degree of travel, the remoteness of the area, the absence of personal protective equipment (PEP) in medical facilities, and the length of time it takes to secure sufficient funding for treatment (Hasselbeck et al., 2021).

According to Gichohi (2019), in countries where pets are not vaccinated against rabies, dogs account for 99% of deaths caused by human transmission of the illness. The underestimation and inadequate documentation of rabies cases are frequently observed, particularly in less developed countries (Mutunga, 2022). A study conducted in Kenya

revealed a substantial disparity between the confirmed number of animal cases and the number of cases found by passive surveillance methods, with the former being about 40 times higher (Hampson et al., 2019). Cleaveland et al. (2018) found that dogs infected with the rabies virus are responsible for more than 98% of human rabies cases.

The Kabete Central Veterinary Investigations Laboratory in Kenya documented a cumulative count of 120 verified instances of canine rabies between the years 2010 and 2012, as stated by CIVIL (2013). Between the years 1981 and 1990, a cumulative count of 8,027 individuals experienced incidents of dog attacks. Nevertheless, it is important to highlight that the total number of patients receiving post-exposure therapy within Machakos County was merely 4,947. As a result, many cases have not been documented (Gichohi et al., 2019).

2.7 Level of Knowledge on Rabies among Dog Owners

According to a study conducted by the World Health Organization (2023), it was established that the act of being bitten by an animal or engaging in direct contact with an animal might have detrimental effects on one's well-being. In the event of a suspected case of rabies in an animal, it is necessary to enforce a mandatory quarantine period of ten days. The findings of the survey indicated that a considerable number of participants lacked knowledge about the extent of their dogs' vaccination coverage. This aligns with the results of a prior investigation conducted in Kisumu, which discovered that veterinary personnel faced difficulties in identifying the specific regions where vaccinations were administered (Mwangi, 2016). Understanding the extent of canine rabies coverage is crucial for evaluating its effectiveness in relation to the World Health Organization's recommended

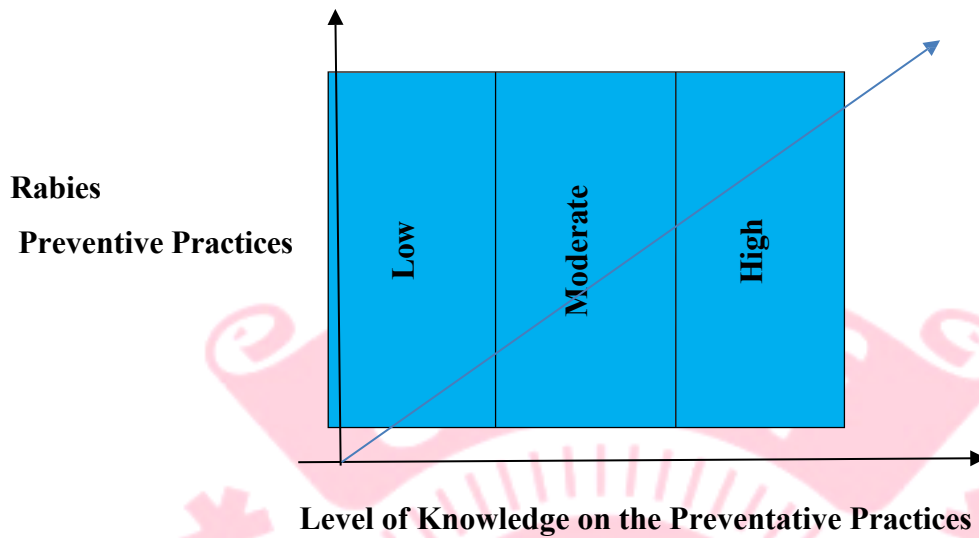
coverage of 70%. Additionally, this knowledge is essential for the ongoing deployment and enhancement of vaccination programs (Hagos et al., 2020).

Furthermore, the research conducted in Tanzania by Christian et al. (2023) revealed a discrepancy in the reported vaccination rate for dogs. The official documentation indicated a rate exceeding 70%; however, the actual rate was found to be considerably lower, specifically 50% instead of the reported 75%. The absence of foundational data will result in an insufficient understanding of coverage status, thereby leading to adverse consequences.

2.7.1 Tools for Measuring the Level of Knowledge on Rabies among Dog Owners

The study employed a matrix developed by Ma Katrina Rañesesa to evaluate the level of disaster preparedness in the Auckland region, thereby facilitating knowledge acquisition. (Raneses et al., 2018).

This matrix demonstrates a positive correlation between the extent of active acts and responsibilities undertaken and the corresponding amount of knowledge attained. According to their scores on matrix 2.2, people with sufficient knowledge of rabies exhibited admirable behavior by promptly seeking medical attention after a dog bite. Moreover, they consistently exhibited the ability to locate and obtain the necessary vaccinations and employ suitable protocols when dealing with animals suspected of being infected with rabies.



(Raneses , et al. 2018)

Figure 2: Matrix for Measuring the Level of Knowledge

According to this matrix, each respondent was allocated a position on the continuum based on the information they had provided on rabies.

High level of knowledge: Individuals who were considered to have a high level of knowledge posed self-efficacy, proper dog confinement methods, adherence to prescribed vaccination schedules by the Ministry of Agriculture and Ministry of Livestock, and prescribed methods of handling a suspected rabid animal (Chang-Richards et al., 2019).

Medium level of knowledge: Respondents who utilized all prescribed preventive measures towards rabies but didn't have a full understanding of the risks that would affect them in case of a suspected rabid dog and were uncertain about particular roles and responsibilities of themselves or others in rabies prevention practices (Chang-Richard et al., 2019).

Moderate level of knowledge: Individuals who are aware of rabies as a killer disease and the potential effects this disease may have, however, have made no plans or taken any actions regarding rabies prevention practices (Chang-Richard et al., 2019).

Low level of knowledge: Individuals who are unaware or less aware of the effects of rabies and potential effects of the types of impacts that may affect them living in the rabies potential areas and the potential effects this disease may have. They also had not made any plans or taken any rabies prevention actions. (Chang-Richard et al., 2019)

2.8 Vaccination Associated Factors

Both governmental and private veterinary professionals administer vaccination programs to meet the needs of dog and cat owners who require this particular service. Institutional, social, and environmental elements are just a few of the variables that affect immunization success (Savadogo et al., 2021).

Developing nations suffer from anticipation of demand higher than supply for vaccines, resulting in shortages caused by disruptions in vaccine production and supply chains. Nevertheless, the insufficient financial resources in underdeveloped nations poses a significant obstacle to achieving comprehensive vaccination coverage (Hagos et al., 2020).

Furthermore, this study demonstrates that deficiencies in fuel, staff, vaccinations, equipment, and operational finance are prevalent within the immunization schedule, with inadequate funding emerging as a significant contributing element. According to Muriuki (2016), insufficient funding in Kisumu, Kenya, harms vaccination coverage. He adds that the cost of dog vaccination services continues to be a significant barrier in developing nations. In the African context, the extent of coverage for "free" insurance for homeowners

surpasses that of "paid" policies to a large degree. In Tanzania, the vaccination program that requires payment for homes has attained a coverage rate of 39%. In contrast, the program that provides vaccinations free of charge has obtained a coverage rate exceeding 80% (Mwangi, 2016).

Nevertheless, Tyakaray et al. (2024) reported that the immunization program in Indonesia only had a 33% coverage rate, which is a relatively low number. The disparity might be attributed to varying degrees of societal variables.

Achieving the effectiveness of rabies vaccination relies on the level of public knowledge of the disease and the implementation of control strategies. The World Health Organization has identified a significant deficiency in the endeavors to tackle rabies: the insufficiency of public knowledge (WHO, 2018). Cleaveland et al. (2018) found that there was inadequate public awareness and community participation in the prevention of rabies, as observed in a study done in India.

According to a study by Mwangi (2016) in Kisumu City, Kenya, achieving optimal vaccine coverage was difficult due to the ineffective execution of public health initiatives. Gichohi (2019) asserts that notable advancements have been made in Kenya regarding the augmentation of public awareness and heightened involvement in executing rabies management endeavors.

2.8.1 Cost of Vaccination

In nations characterized by a high prevalence of rabies, the principal objective of giving post-exposure prophylaxis (PEP) interventions is to avert the occurrence of rabies rather than to conclusively ascertain the rabies status of the animal responsible for the bite. This particular approach is employed either based on suspicion or clinical diagnosis. The examination object was nearly prepared, as indicated by the study conducted by Chuchu et al. (2022). One way to reduce the risk of rabies is to use pre-exposure prophylaxis (PrEP), which is a treatment that is frequently recommended for those who are thought to be more susceptible to contracting the disease. Post-exposure prophylaxis (PEP) is typically used after an exposure event (Rao et al., 2022)

According to Mutunga et al. (2022), the accessibility and meticulous administration of post-exposure prophylaxis (PEP) could potentially lead to a minimum 30% decrease in mortality rates associated with rabies in regions where the disease is prevalent.

Nevertheless, it is crucial to recognize that post-exposure prophylaxis (PEP) continues to be a very cost-effective approach in terms of its capacity to preserve human lives and diminish quality-adjusted life years (QALYs) when offered for suspected instances of animal bites (Christian et al., 2023). Further, Hampson et al. 2019) state that the cost-effectiveness of post-exposure prophylaxis (PEP) relies on implementing national strategies and regulations that dictate the allocation of vaccines.

Currently, in most countries, people bear the financial responsibility for the costs connected with PEP immunization when insurance coverage is unavailable. Starting in 2021, GAVI, an alliance with a primary focus on vaccines, is poised to commit financial

resources towards the costs of post-exposure prophylaxis (PEP) through a co-financing arrangement in partnership with national governments. According to Hampson et al. (2019), the main goal of this program is to lessen the financial burden that most countries affected by endemic rabies experience. According to a study by Wambura et al. (2019), GAVI's investment can save lives by providing free delivery of the PEP vaccine to those in need at the point of care without any financial burden.

For the investment to generate substantial outcomes, individual nations must demonstrate their preparedness to receive assistance from GAVI by strengthening and enhancing their existing efforts to combat rabies (GAVI, 2018).

Existing evidence points to the viability and efficacy of vaccinating animals against rabies. Nevertheless, it is plausible that this approach will have contrasting outcomes, resulting in limited participation and media attention.

According to a study by Mwangi (2016), vaccination services for dogs, cats, and livestock were frequently available as part of cooperative programs in Kakamega County. This practice significantly facilitated the vaccination of all animals at a reduced expense. In Kenya, dogs and cats are not typically considered economically advantageous species. Consequently, when financial resources are constrained, livestock owners are more inclined to prioritize immunization for their cattle.

According to a study by Ouma et al. (2018), health facilities and their services are crucial for disease surveillance and play a crucial role in ensuring widespread accessibility for a sizable portion of the population.

The strategic positioning of healthcare facilities within a given region should prioritize equitable access for populations residing in geographically disadvantaged areas. This can be achieved through the implementation of enhanced transportation infrastructure, innovative solutions that optimize the delivery of outpatient and emergency services, or the establishment of additional medical facilities in specific geographic locations (Bitek et al., 2019).

2.8.2 Availability of Resources

For immunization programs to be successful, resources must be available. A significant factor influencing vaccine effectiveness is inadequate resources, particularly financial resources (Mwangi, 2016). Furthermore, Chuchu et al. (2022) in Tanzania stated that personnel shortages, vaccine shortages, operational funding constraints, and staff shortages were common issues with immunization programs. Additionally, underdeveloped countries encounter inadequate financing as a significant barrier to achieving 100% immunization coverage (Mwangi, 2016).

Additionally, estimates of rabies' incidence and burden are 200 times higher in people than they are in animals (Zoonotic Disease Unit of Kenya, 2014). This might have caused the county to place little emphasis on rabies control, leading to insufficient funding.

At present, the utilization of PEP is limited to individuals who seek medical care at healthcare facilities. While it is widely recommended to ensure rapid delivery of post-exposure prophylaxis (PEP), it is crucial to analyze the risks involved to minimize false positives and false negatives. This evaluation is necessary to mitigate the cost and mortality consequences associated with PEP administration (Yoder et al., 2019). The prompt

highlights the significant obstacle of ensuring timely administration of post-exposure prophylaxis (PEP) in regions with a high prevalence of rabies. This issue is mostly attributed to the considerable financial burden of obtaining costly PEP vaccines, as discussed by (Hampson et al., 2019). To effectively eradicate canine-transmitted rabies in regions where the disease is prevalent by the year 2030, it is imperative to conduct a capacity approach study. This study should aim to establish a comprehensive framework that encompasses various factors influencing an individual's accessibility to post-exposure prophylaxis (PEP).

These factors should include structural elements, such as socioeconomic factors, as identified by Wera et al. (2019). The presented paradigm elucidates several fundamental challenges that impede the accessibility of PEP vaccinations, thereby shedding light on the pervasive themes of inequality and injustice.

To attain social justice, it is imperative to modify markets to effectively address structural obstacles. This approach will facilitate enhanced health-seeking conduct and adherence to pre-exposure prophylaxis (PEP) dosage, ultimately reducing the likelihood of mortality (World Health Organization, 2018).

The research undertaken by Wambura et al. (2019) provides insight into the varied characteristics of rabies vaccines and immunoglobulins and the difficulties faced in the supply chain, which encompasses the entire process from procurement to vaccination delivery. to healthcare facilities in Kenya. Thereby, these aforementioned concerns give rise to billing complications within medical establishments, impacting the availability of

PEP. Hence, enhancing the current inventory monitoring and forecasting systems becomes imperative.

The aforementioned objective can be attained through enhancing public consciousness, providing continuous education for healthcare professionals, and implementing a nationwide distribution of complimentary post-exposure prophylaxis (PEP), similar to the successful approach adopted in Thailand. This comprehensive strategy has effectively contributed to a significant reduction in human fatalities caused by rabies, resulting in an annual occurrence of less than ten cases (Hagos et al., 2020).

2.8.3 Dog Trade Factors

Dog trading is an old practice in Kakamega County, where residents have a marketplace (Lubao Market). According to a report by Wamuswa (2019), the market, which is about 6 kilometers from Kakamega town, began in the early 1950s and has since grown to become one of the most well-known markets for dog auctions.

Dog bites have been reported to be common in markets, with dog owners being forced to compensate and pay for the victims (Wamuswa, 2019). The dog trade is a significant epidemiological factor because it brings together many susceptible dogs (Mwangi, 2016).

This report also shows a significant number of dogs, more than 10,712 per year (Mwangi, 2016).

2.9 Rabies Vaccination Coverage

Vaccination of dogs is a vital component in managing and preventing rabies, as stated by (Carlos et al., 2020). One of the reasons why rabies epidemics are more common and

frequent is because of inadequate and inconsistent coverage (Savadogo et al., 2021). It is advised that an annual vaccination campaign coverage rate of 70% should be achieved to achieve the goal of disease elimination. To effectively mitigate the rapid reoccurrence of illnesses, it is crucial to prioritize the continual sustainability of annual canine exclusion measures (Savadogo et al., 2021).

Vaccinating both human and domestic mammal populations is of the utmost importance. According to Mwangi (2016), the optimal strategy for safeguarding individuals from rabies is to eliminate the presence of the disease within the dog and cat populations through vaccination. In addition, Gichohi (2019) has argued that a canine vaccination effort that fails to achieve a coverage rate of at least 70% is deemed ineffective and results in the misallocation of resources. According to Mwangi (2016), the prevalence of canines in the county is significantly lower (2.8%) compared to the threshold required for achieving herd immunity (70%). Consequently, it may be inferred that rabies management is not feasible under these circumstances.

2.10 Conceptual Framework

The main objective of this research was to examine the tactics employed for preventing rabies, the level of compliance with these strategies, and the factors linked to these practices among dog owners in the Mumias sub-county, located in Kakamega County, Kenya. To accomplish its objectives, the study employed three independent variables, focusing specifically on the demographic attributes of humans and dog owners residing in the Mumias sub-county, located inside Kakamega County, Kenya. The study involved the assessment of participants' age, gender, and level of education. The objective of the second

variable is to assess the level of compliance among dog owners in the Mumias sub-county, located in Kakamega County, Kenya, concerning dog vaccination. This study aims to analyze the effectiveness of rabies prevention measures. A research investigation was conducted to assess the extent of knowledge on rabies prevention among dog owners residing in the Mumias sub-county, located in Kakamega County, Kenya. The major aim of this examination was to assess the participants' understanding of appropriate methods for the care and upkeep of canines.



Independent Variables

Dependent variable

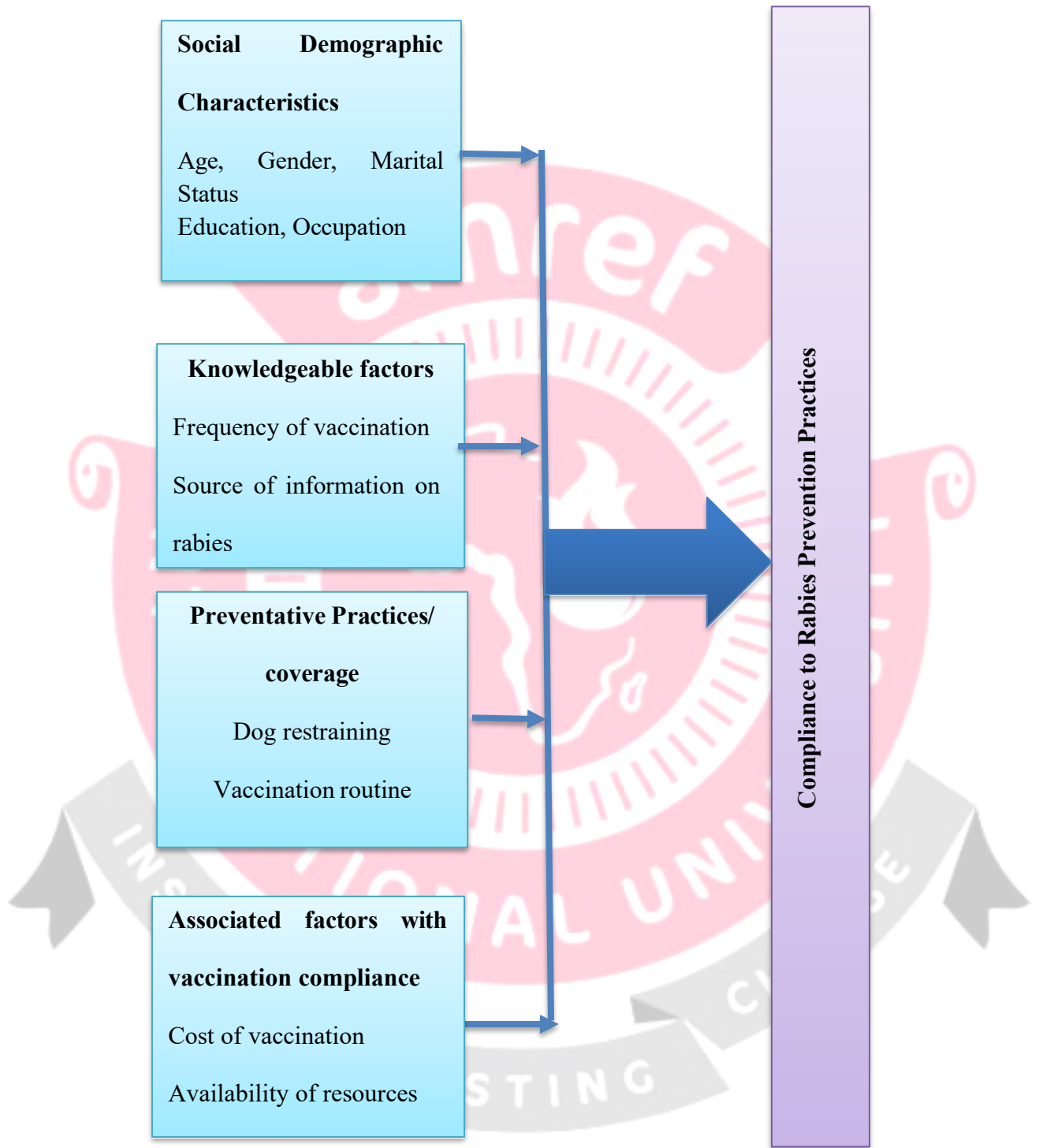


Figure 3: Conceptual Framework

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter presents a comprehensive examination of various aspects related to the research study, including the study design, study region, target population, criteria for participant selection and exclusion, determination of sample size, methodologies utilized for sampling, tools, and procedures employed for data collection, data management, data analysis, and ethical considerations.

3.2 Study Design

This study used cross-sectional analytical study design due to its effectiveness, being inexpensive, and covering a large population in minimal time. Data was collected from dog owners spread across the study area, ranging in demographics, knowledge status, and level of rabies prevention practices.

3.3 Description of the Study Population

As per the 2019 census, Kakamega County, specifically in the Mumias Sub-county, had a total population of approximately 231,205 (KNBS, 2019). Agriculture is the county's backbone, producing over 65 percent of the total earnings. There are two main categories of crops: food crops and industrial crops, and the last category is horticulture. Food crops include maize, sorghum, finger millet, rice, beans, peas, grams, cassava, potatoes, and arrowroots. The common language of communication is Luhya language which is later subdivided into Luhya clans.

Mumias Sub County contains a dog market, and due to its geographical location, traders come from nearby counties for dog auctions (KNBS, 2019).

3.4 Study Area

The research was conducted in the Mumias sub-district, which is situated in Kakamega County, a region in western Kenya. The sub-district has four distinct wards: Central Mumias, North Mumias, Etenje, and Musanda Ward. These wards collectively accommodate a population of around 111,862 individuals while occupying a land area of approximately 165.3 square kilometers within Kakamega County.

Kakamega County consists of twelve sub-counties, in addition to Uasin Gishu, Nandi, Vihiga, Siaya, Busia, Bungoma, and Trans Nzoia Counties.

Kakamega County is approximately 0.2753652 degrees latitude north and 34.75705149 degrees longitude east. The overall land area measures 3,051 square kilometers. According to the Kenya Census and Housing 2009, the population of the area under consideration is 1,660,651 individuals. The annual growth rate of this population is recorded at 2.48%. Furthermore, the population density is estimated to be 544 people per square kilometer, while the number of homes is reported to be 398,709. The primary driver of its economic activity is trade, which encompasses the cultivation of sugar cane and grain.

The county's choice was deliberate, as it belongs to the classification of high-risk locations for rabies in Kenya and is designated as a rabies control area. The epidemiology of rabies is influenced by the abundance of maple forests and extensive forest ecosystems, which play a pivotal role in providing essential habitats for feral cats and dogs. There are seven

functioning dog markets. The escalating frequency of the dog trade has resulted in an elevated risk of rabies transmission, mostly attributed to the heightened mobility of a substantial number of unvaccinated dogs. Table 3.1 displays the spatial arrangement of the dog market, sugarcane bush, and forest cover among several sub-districts. Appendix 7 displays the county map.

Mumias Sub County was selected due to its high population of roaming dogs and its geographical location, whereby it lies within large forest coverage, a large sugarcane plantation, and the presence of the largest dog market, with an approximate population of 111,862 people and an approximate area of 165.3 square kilometers.

Table 1: Spatial Distribution Patterns of Dog Markets, Sugar Bushes, and Forest Cover

| Sub-County | Dog Market | Sugarcane Bushes | Large Forest Cover |
|-------------------|-------------------|-------------------------|---------------------------|
| Lugari | × | × | × |
| Khwisero | × | × | × |
| Likuyani | × | × | × |
| Ikolomani | √ | × | × |
| Matungu | × | √ | × |
| Butere | × | √ | × |
| Lurambi | × | √ | × |
| Mumias | √ | √ | √ |
| Matete | √ | √ | × |
| Navakholo | √ | √ | × |
| Shinyalu | √ | × | √ |
| Malava | √ | √ | √ |

Source: Created by analyst

Key

× - Absent

√ - Present

3.5 Sample and Sampling Procedures

3.5.1 Sample Size Determination

Determination of the minimum required sample size to accurately represent the inhabitants of the surveyed households was performed based on the assumption of an anticipated prevalence rate of 50%. This approach aims to obtain the maximum sample size given the absence of a current prevalence rate, a desired accuracy of 5%, and a confidence interval of 95% (Kongkaew, 2004).

Table 3.2 below shows an approximation of Mumias sub-county households with the approximation number of households per ward as illustrated by (Muriuki, 2016).

Table 2: Population Approximation of Mumias Sub-County Households

| Ward | Approximate households | Approximate no. of dogs |
|----------------|------------------------|-------------------------|
| Mumias Central | 31200 | 598 |
| Mumias North | 10765 | 335 |
| Etenje | 18162 | 189 |
| Musanda | 28721 | 234 |

The sample size was determined using the above table projection of approximated populations.

$$n = Z^2 P (1-P) / d^2$$

Assumptions made in the study:

The variable "n" represents the necessary sample size.

The variable Z represents the confidence level of 95%, with a typical value of 1.96.

The prevalence, denoted as p, is equal to 50% or 0.5.

The variable "d" represents the accuracy level with a confidence interval of 5%.

The equation n =

$$\frac{1.96^2 \times 0.5(1-0.5)}{(0.05)^2}$$

The value of the variable n is 385.

3.5.2 Sampling Technique

The researcher employed a multistage sample technique in which the Mumias sub-county was first divided into wards, then further subdivided into villages, and finally into homes. These households were used as sampling units at each stage where the simple random sampling technique was applied due to its simplicity and accurate representation of the larger part of the village as well as avoidance of bias. Respondents were recruited strictly as per the inclusion and exclusion criteria described above.

3.6. Inclusion Criteria

The study comprised persons who were above the age of eighteen and resided in Mumias Sub-county, Kakamega County, and who had given their consent to participate. When all family members are present, the one occupying the role of the household head is typically consulted. If there is an absence of a family member who is 18 years of age or older, or

conversely, if said member does not provide consent, the researcher proceeds to approach the adjacent residence.

3.7 Exclusion Criteria

Dog owners, household leaders, or their spouses over the age of 18, who have communication problems and have a mental illness, and live in Mumias County, Kakamega County, Kenya, who do not meet the criteria were excluded from the study.

3.8 Data Collection Instruments

The study utilized structured questionnaires as the primary tools for data gathering. The questionnaire was partitioned into three distinct sections, organized per the research objectives. The study's initial phase consisted of gathering demographic information, then assessing the participants' level of knowledge, and finishing with a review of their adherence to rabies-prevention practices.

3.9 Validity and Reliability

A pre-test study was conducted in Malava Sub-County for questionnaire verification as well as the establishment of any deficiencies. The pre-test study helped in revealing deficiencies in the questionnaires. This helped in ensuring the improvement of content as per the uniqueness of the study area. The principal investigator checked the entirety of the questionnaire before data entry and analysis. The data was then crosschecked using a double data entry process to minimize errors.

3.10 Data Collection Procedures

A questionnaire with a methodologically planned structure was utilized to collect data regarding individuals who own dogs, their demographics, knowledge level, and adherence to preventive practices. The questionnaire collected information on dog owners' demographic features, knowledge level, and compliance with preventive practices. There were five data collectors and two supervisors, including the principal investigator, for the study. According to the study, they all received two days of training on topics such as data collection techniques. To ensure data quality, the supervisor reviewed the entirety and consistency of the questionnaires completed by the data collectors.

To mitigate potential bias, the questionnaire underwent a pre-testing phase wherein subsets of houses within Malava Sub-County were selected as a sample. The results obtained from this sample were subsequently reviewed and modified accordingly. Furthermore, the sequencing of inquiries was altered per the findings of the preceding examination. Questionnaires were gathered daily throughout the designated duration of the study.

The surveys were additionally translated into the Swahili language. (Appendix 2) by a competent and certified editor who had competency skills in Kiswahili; thereafter, the collected data was translated into English for interpretation and analysis.

3.11 Data Analysis

The data underwent a thorough examination to ensure its integrity and coherence, potentially influencing the subsequent analysis. Data analysis was conducted using a

Microsoft Excel spreadsheet and Statistical Package for Social Scientists (SPSS) version 20.

Descriptive statistics were employed to summarize the data, encompassing measures such as frequency, ratio, mean, and range. Data was presented in several visual formats, including tables, graphs, charts, and diagrams. The statistical techniques employed in this study encompassed chi-squared tests, correlation analyses, and cross-tabulation analyses. These methods were utilized to elucidate and evaluate variations among the many study variables.

A P-value below the threshold of 0.05 was considered to have statistical significance.

The research findings were facilitated in the formulation of suggestions that are tailored to the specific outcomes of the study, leading to a successful implementation. Moreover, the advice will be disseminated to pertinent parties engaged in the prevention of rabies, hence reducing its prevalence.

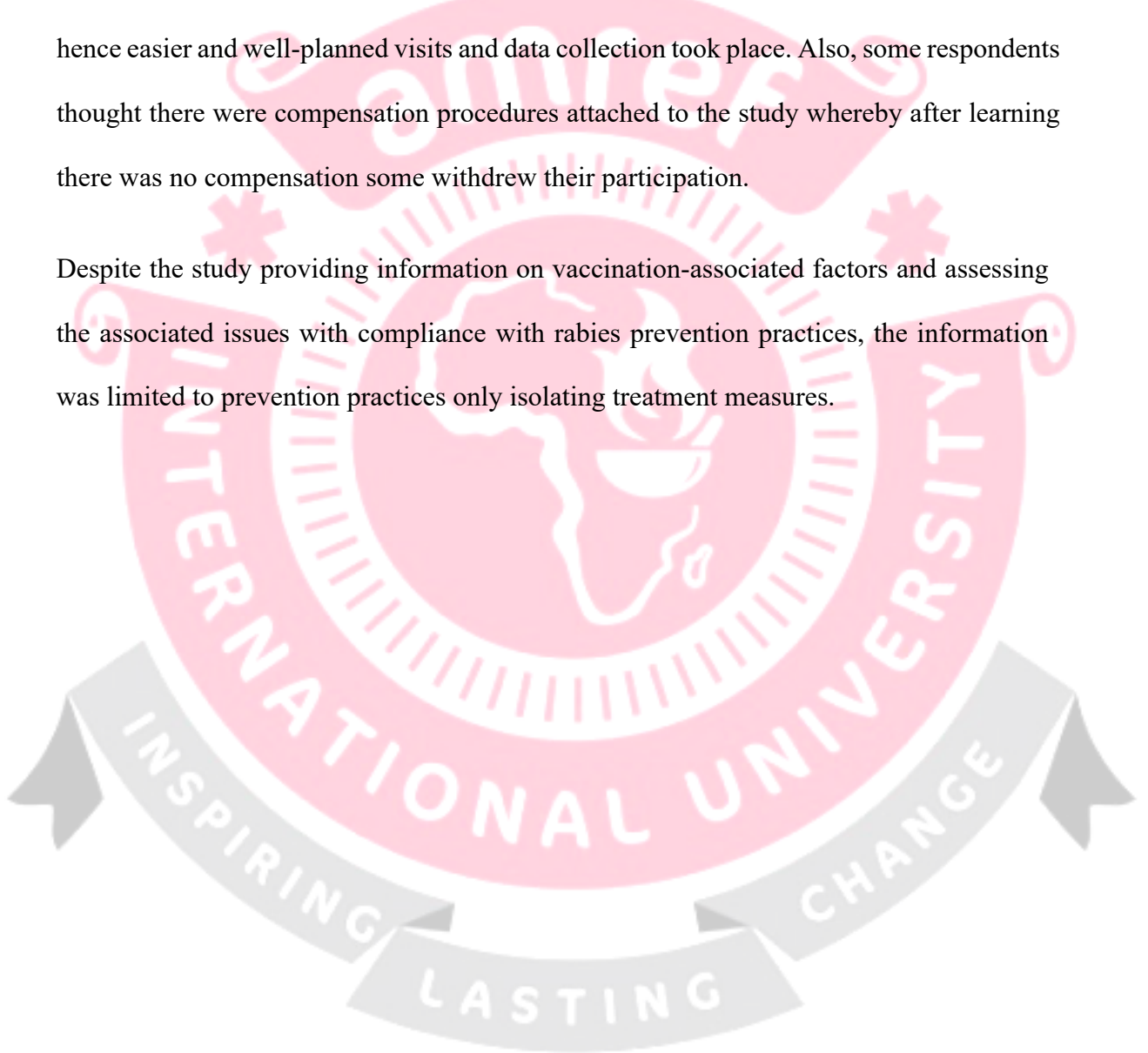
3.12 Ethical Consideration

The research was approved by the Scientific and Ethical Review Committee (ESRC) of AMREF. National Science and Technology Council (NACOSTI) also granted a license to conduct the research. Before administering the questionnaire, study respondents were asked to provide informed written consent. The confidentiality of the information provided was maintained.

3.13 Study Constraints and Limitations

The study faced some constraints which included: Some households were guarded with security-trained dogs hence not easy to access them however the village elders who had volunteered helped in informing owners that on a specific day, there would be visitors hence easier and well-planned visits and data collection took place. Also, some respondents thought there were compensation procedures attached to the study whereby after learning there was no compensation some withdrew their participation.

Despite the study providing information on vaccination-associated factors and assessing the associated issues with compliance with rabies prevention practices, the information was limited to prevention practices only isolating treatment measures.



CHAPTER 4: RESULTS

4.1 Introduction

This chapter thoroughly examines the research results, which are consistent with the stated research objectives and substantiated by the data obtained from the study participants.

4.2 Respondents' Demographic Characteristics Distribution

This study recruited a sample of 385 participants. The gender distribution of the sample revealed that a significant proportion of participants (54.8%) identified as women, whilst a slightly smaller proportion (45.2%) identified as men. The age range of the participants included individuals aged 18 to 50 years and older, with a mean age of 33.9 years. The household size varies from one to 22 individuals, with a mean of five individuals per home.

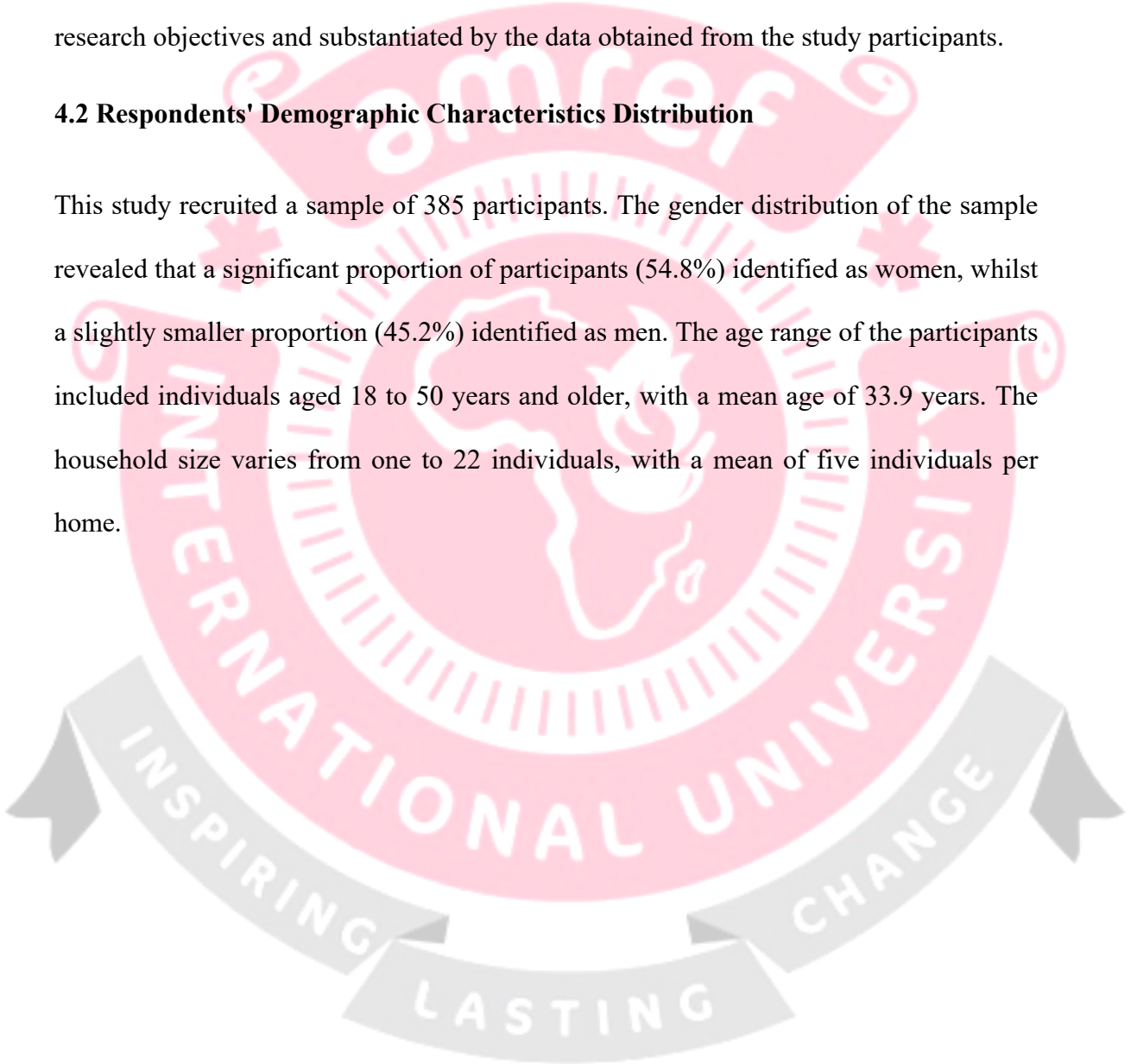


Table 3: Demographic Characteristics of the Respondents.

| Variable | Frequency | Percentage (%) |
|-----------------------------|------------------|-----------------------|
| Gender | | |
| <i>Male</i> | 174 | 45.2 |
| <i>Female</i> | 211 | 54.8 |
| Education Status | | |
| <i>No education</i> | 17 | 4.4 |
| <i>Primary</i> | 186 | 48.3 |
| <i>Secondary</i> | 113 | 29.4 |
| <i>Tertiary</i> | 17 | 17.9 |
| Occupation | | |
| <i>Formal employment</i> | 96 | 12.2 |
| <i>Informal employment</i> | 96 | 24.9 |
| <i>Unemployed</i> | 176 | 45.7 |
| <i>Student</i> | 22 | 5.7 |
| <i>Self-employed</i> | 44 | 11.4 |
| People Per Household | | |
| <i>1-4</i> | 59 | 15.3 |
| <i>5-10</i> | 252 | 65.5 |
| <i>11-20</i> | 56 | 14.5 |
| <i>21 and above</i> | 18 | 4.7 |
| Age limits | | |
| <i>15-19 years</i> | 5 | 1.3 |
| <i>20-29 years</i> | 59 | 15.3 |
| <i>30-39 years</i> | 136 | 35.3 |
| <i>40-49 years</i> | 152 | 39.5 |
| <i>50 years+</i> | 33 | 8.6 |

4.2.1 Respondent's Dog's Ownership Status

The majority of the respondents (72%) indicated that they owned dogs within their households, while (28%) indicated that they did not own dogs, as per Table 4 and Figure 4 below, respectively.

The study focused on dog owners only, who had a frequency of 279 respondents, as illustrated in Table 4 below.

Table 4: Status of Dog Ownership

| Do you own a dog? | Frequency | % Frequency |
|-------------------|-----------|-------------|
| Yes | 279 | 72.5 |
| No | 106 | 27.5 |
| Total | 385 | 100.0 |

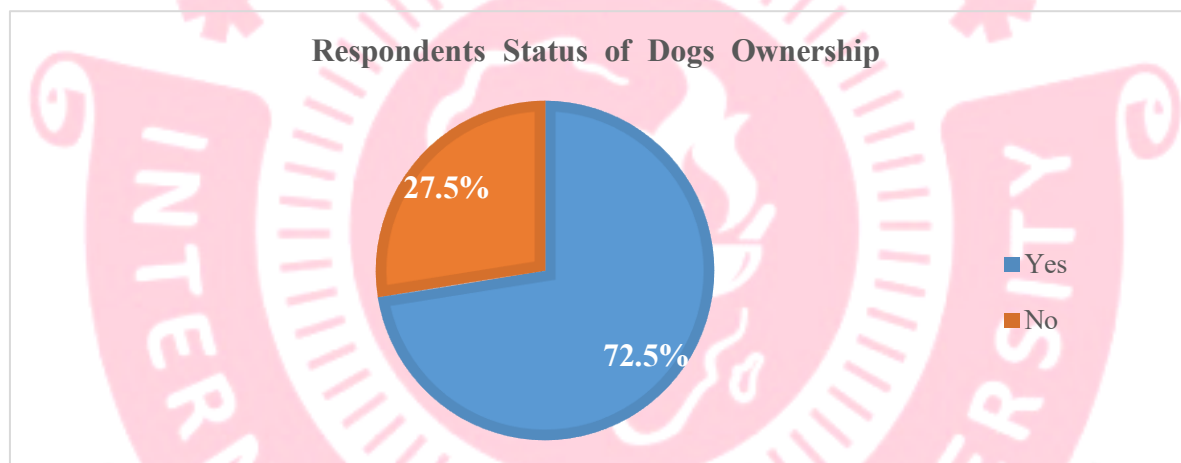


Figure 4: Status of Dog Ownership

The study focused on dog owners in the Mumias sub-county, as illustrated in the analysis below, whereby dog owners were 279.

4.2.2 Chi-square Test for Demographic Characteristics and Dog's Vaccination Coverage

This section shows cross-tabulations and chi-square tests for various demographic characteristics to test their relationship and association with rabies vaccination coverage.

4.2.2.1 Level of Education and Vaccine Coverage.

Table 5 below shows cross-tabulation data for vaccination coverage and level of education for the study respondents.

Table 5: The Relationship Between Vaccination Coverage and Level of Education

| | | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|---------------------|------------|---|------|-----------|------|--------------|------|--------------------------------------|
| | | Yes | | No | | I don't know | | |
| Level of education: | | Frequency | % | Frequency | % | Frequency | % | .001 |
| | Primary | 73 | 59.3 | 58 | 52.7 | 21 | 45.7 | |
| | Secondary | 22 | 18.0 | 28 | 25.5 | 17 | 37.0 | |
| | Tertiary | 16 | 13.0 | 13 | 11.8 | 5 | 11.0 | |
| | Illiterate | 12 | 10.0 | 11 | 10.0 | 3 | 6.5 | |
| Total | | 123 | | 110 | | 46 | | |

Level of education and vaccine coverage: The study's findings demonstrated a statistically significant association between the level of education achieved and vaccination coverage. Respondents who indicated primary level also indicated that their dogs were not vaccinated, and they were ($X^2 = 17.512^a$) (56.8%) ($P = 0.001$) significantly higher compared to those who had tertiary education and their dogs were vaccinated (23.8%).

4.2.2.2 Vaccination Coverage and Occupation.

Table 6 below shows cross-tabulation data for vaccination coverage and occupation status as per the study respondents.

Table 6: The Relationship Between Occupation Status and Vaccination Coverage

| | | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|---------------------|-----|---|-----|-----------|----|-----------|---|--------------------------------------|
| | | Yes | | No | | Not sure | | |
| Occupation | n | Frequency | % | Frequency | % | Frequency | % | 0.005 |
| | | Formal Employment | 13 | 11.5 | 22 | 17.0 | 2 | |
| Informal Employment | 30 | 26.5 | 34 | 26.0 | 9 | 25.7 | | |
| Unemployed | 45 | 40.0 | 50 | 38.2 | 17 | 48.6 | | |
| Student | 17 | 15.0 | 10 | 7.6 | 3 | 8.6 | | |
| Self Employed | 8 | 7.1 | 15 | 11.5 | 4 | 11.4 | | |
| Total | 113 | | 131 | | 35 | | | |

Occupation status and vaccine coverage: The research revealed a significant relationship between one's occupational status and the level of vaccine coverage. Respondents who indicated unemployment status also indicated that their dogs were not vaccinated ($X^2 = 10.998^a$) ($P = 0.005$).

4.3 Respondents' Level of Knowledge of Rabies Prevention Practices

The primary aim of this study was to assess the participant's knowledge of practices for preventing rabies among participants who owned dogs. To enable this measurement, several variables were analyzed to measure knowledge level, as shown in Table 7 below.

Table 7: Knowledge of Rabies Prevention Practices

| Knowledge assessment questions | | |
|--|-------------------------|------------------------------|
| <i>Have you ever heard of the disease Rabies?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Yes</i> | 134 | 48.0 |
| <i>No</i> | 145 | 52.0 |
| <i>Can rabies be transmitted from animals to humans?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Yes</i> | 137 | 49.1 |
| <i>No</i> | 142 | 51.0 |
| <i>Is rabies an infectious disease?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Yes</i> | 69 | 24.7 |
| <i>No</i> | 100 | 35.8 |
| <i>Don't know</i> | 110 | 39.4 |
| <i>After how long should a dog be vaccinated against rabies</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Annually</i> | 120 | 43.0 |
| <i>After 2 years and above</i> | 85 | 30.5 |
| <i>Don't Know</i> | 74 | 26.5 |
| <i>Is rabies preventable?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Yes</i> | 151 | 54.1 |
| <i>No</i> | 58 | 21.0 |
| <i>Don't know</i> | 70 | 25.1 |
| <i>Should rabies vaccine be vaccinated on a schedule?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Yes</i> | 143 | 51.2 |
| <i>No</i> | 48 | 17.2 |
| <i>Don't Know</i> | 88 | 31.5 |
| <i>How long is the incubation period of rabies usually?</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i><14 days</i> | 68 | 24.4 |
| <i>1-3 months</i> | 50 | 18.0 |
| <i>>1 year</i> | 72 | 26.0 |
| <i>Don't know</i> | 89 | 32.0 |
| <i>Where do you think dogs' get rabies from</i> | <i>Frequency</i> | <i>Percentage (%)</i> |
| <i>Drinking contaminated water</i> | 59 | 21.1 |
| <i>Scavenging</i> | 58 | 21.0 |
| <i>Bites from Rabid animals</i> | 77 | 28.0 |
| <i>Not aware</i> | 85 | 30.1 |

The knowledge level was determined using eight questions on awareness about rabies and its transmission. The results are shown in Table 7 above

4.3.1 Rabies Awareness

The majority of the respondents (52.0%) never knew about rabies, while (48.0%) knew about rabies; of those who never knew about rabies, the majority (51.0%) never knew rabies could be transmitted from animal to human. The majority (39.4%) did not know rabies is an infectious disease, while the minority (24.7%) knew rabies as an infectious disease, as per Table 7 above.

4.3.2 Respondent's knowledge of the duration of rabies vaccination

The majority (43.0%) of those questioned knew the recommended duration of a dog's vaccination, while 26.4% did not know the recommended duration for rabies vaccination.

4.3.3 Respondent's knowledge of rabies prevention

The majority (54.1%) knew that rabies was preventable, while (46.1%) did not know rabies was a preventable disease, as shown in Table 7 above.

4.3.4 Source of the dog's infection with rabies

The majority of respondents (30.1%) said that they were not aware where their dogs contracted rabies from; (28.0%) bites from the rabid animals; (21.0%) scavenging; and (21.1%) indicated drinking contaminated water, as per Table 7 above.

4.3.5 Respondents' outcome on level of knowledge among dog owners

In this study, people categorized as having good knowledge of rabies using matrix Figure 5 below had a comprehensive guide on the necessary procedures for obtaining medical assistance following a dog bite occurrence, a recommended schedule for receiving vaccinations, and suitable protocols for handling animals that are suspected of being infected with the rabies virus.

Furthermore, from matrix 2.2, respondents had moderate knowledge of rabies prevention practices, 42.6% of the sample population. However, there was a relatively good percentage (27.15 % and 30.14% of those with low and high levels of knowledge, respectively).

Table 8: The Percentage Score of Knowledge Assessment Questions

| Knowledge assessment questions | % score of every question | | |
|--|---------------------------|----------------|--------------|
| | Low level | Moderate level | High-level |
| Have you ever heard of the disease Rabies? | 26.25 | 46.25 | 27.50 |
| Is rabies transmissible from animals to humans? | 31.28 | 40.00 | 28.72 |
| Is rabies an infectious disease? | 23.78 | 45.50 | 30.72 |
| What is the duration for dog has to be vaccination against rabies? | 30.72 | 38.70 | 30.58 |
| Is rabies preventable? | 23.98 | 45.00 | 31.02 |
| Does rabies vaccine have a schedule? | 24.44 | 45.00 | 29.56 |
| What is the incubation period of rabies? | 30.43 | 41.25 | 28.32 |
| Where do you think dogs' get rabies from | 26.32 | 39.00 | 34.68 |
| AVERAGE SCORE | 27.15 | 42.6 | 30.14 |

Knowledge was assessed using a matrix of eight questions. If a respondent got questions correct as per the classification below, he/she was classified on that level of knowledge respectively.

6>8 high level

3<5 moderate level

0<2 low level

Table 9: Summary Average for the Level of Knowledge

| Level of knowledge as per the matrix | The mean average for respondents (%) |
|--------------------------------------|--------------------------------------|
| Low level of knowledge | 27.15 |
| Moderate level of knowledge | 42.6 |
| High level of knowledge | 30.14 |

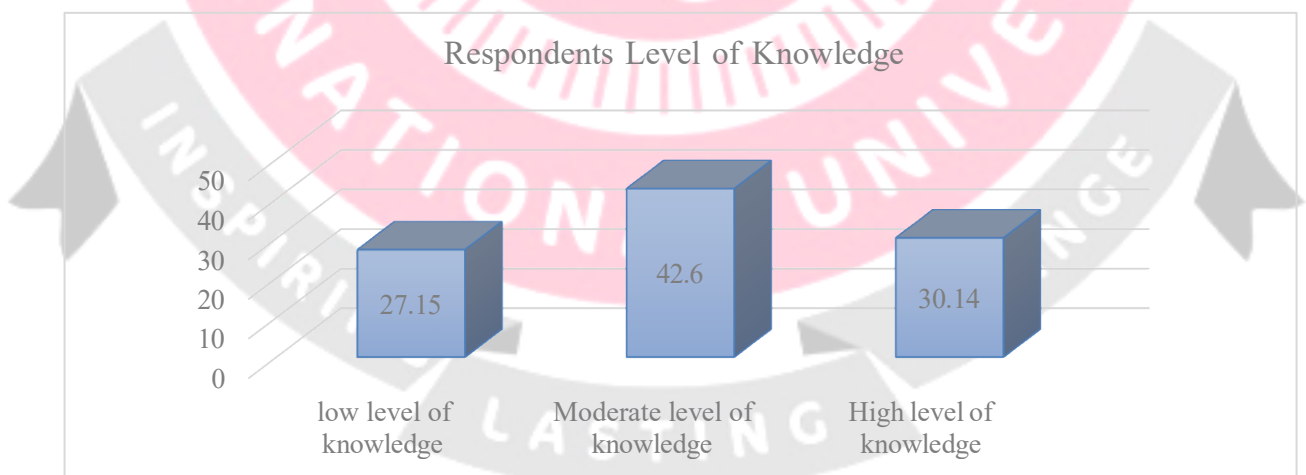
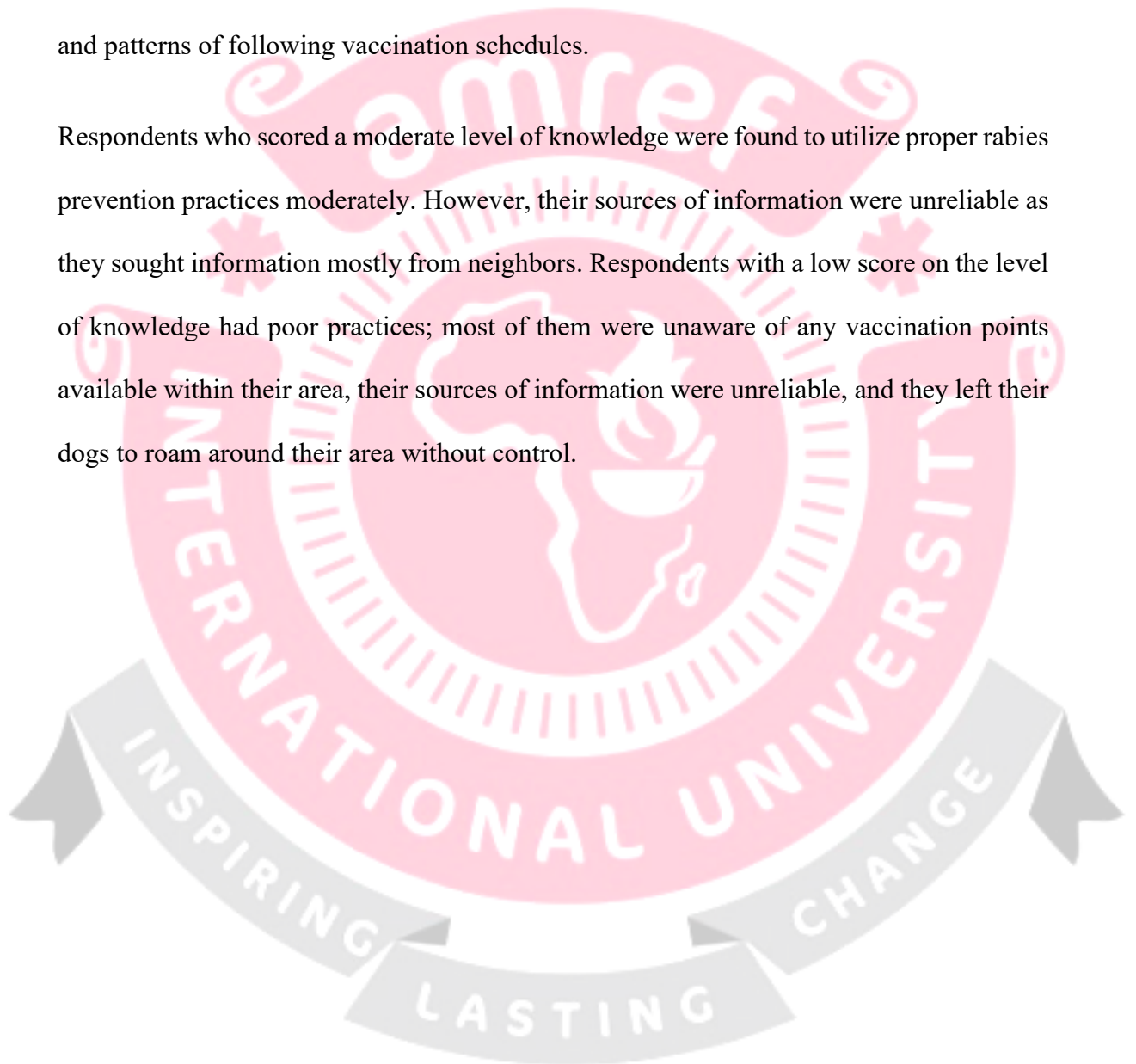


Figure 5: Matrix Outcome for Measuring the Level of Knowledge

Respondents with a high level of knowledge were classified according to their practices regarding rabies prevention. This included, but was not limited to, those who knew about rabies' existence, reliable sources of information, proper handling of suspected rabid animals, reliable sources of rabies in dogs, frequency of seeking dog vaccination services, and patterns of following vaccination schedules.

Respondents who scored a moderate level of knowledge were found to utilize proper rabies prevention practices moderately. However, their sources of information were unreliable as they sought information mostly from neighbors. Respondents with a low score on the level of knowledge had poor practices; most of them were unaware of any vaccination points available within their area, their sources of information were unreliable, and they left their dogs to roam around their area without control.



4.3.5.1 Source of Rabies infection on Dogs and Knowledge variables:

Table 10: The Relationship Between the Source of Rabies Infection in Dogs and Knowledge Variables.

| | Level of knowledge | | | | | | The Pearson chi-square statistic (P) |
|--------------------------------|--------------------|------|-----------|------|-----------|------|--------------------------------------|
| | High | | Moderate | | Low | | |
| Where do dogs get rabies from? | Frequency | % | Frequency | % | Frequency | % | 0.001 |
| Drinking contaminated water | 12 | 26.7 | 19 | 11.5 | 6 | 8.7 | |
| Scavenging | 9 | 20.0 | 24 | 14.5 | 13 | 18.8 | |
| Bites from Rabid animals | 14 | 31.1 | 118 | 71.5 | 30 | 43.5 | |
| Not aware | 10 | 22.2 | 4 | 2.4 | 20 | 29.0 | |
| Total | 45 | | 165 | | 69 | | |

Table 10 above shows cross-tabulations of data between the source of rabies infection in dogs and knowledge variables.

This study found significant associations between the origin of rabies infection in canines and knowledge regarding rabies.

The respondents who correctly identified the causes of rabies in dogs demonstrated a statistically significant association with a moderate level of knowledge, where they were ($X^2 = 32.721$ ($P = 0.001$)) significantly higher compared to those who indicated the wrong sources of dogs rabies, as shown in Table 10 above.

4.4 Preventive Practices among Dog Owners

Different rabies prevention practices were assessed using self-reported questions, and the findings are shown in Table 11 and the figures below.

Table 11: Preventive Practices among Dog Owners

| Variables | frequencies | % |
|--|-------------|------|
| Frequency for dog vaccination | | |
| Six months | 85 | 30.5 |
| After every one year | 37 | 13.2 |
| After every two years | 34 | 12.2 |
| Not aware | 123 | 44.1 |
| Status of vaccination | | |
| Yes | 119 | 42.7 |
| No | 140 | 50.2 |
| I don't know | 20 | 7.2 |
| Number of stray Dogs | | |
| One | 33 | 11.8 |
| More than one | 70 | 25.1 |
| Uncountable | 153 | 54.8 |
| None | 23 | 8.2 |
| Dogs Restrain method | | |
| Open during the day, but locked at Night | 27 | 9.7 |
| locked in enclosure , released at night | 42 | 15.1 |
| Free to roam but within the compound | 85 | 30.5 |
| Free Roam | 125 | 44.8 |
| Age for dogs vaccination | | |
| After six months | 66 | 23.7 |
| After one year | 52 | 18.6 |
| After one year and half | 18 | 6.5 |
| None at all | 143 | 48.1 |
| Attendance of vaccination campaigns and clinics | | |
| Annually | 88 | 31.5 |
| Semi Annually | 39 | 14.0 |
| The veterinary personnel are always available to vaccinate | 13 | 4.7 |
| Never | 139 | 49.8 |

4.4.1 Dog Confinement

Dog Confinement methods assessed dog restriction and containment practices to determine appropriate rabies prevention practices. The majority of respondents (44.8%) let their dogs roam freely; (30.6%) let their dogs roam freely on the premises; and (15.1%) kept their dogs confined, while (9.7%) released the dog during the day and confined them at night. As shown in Figure 6.

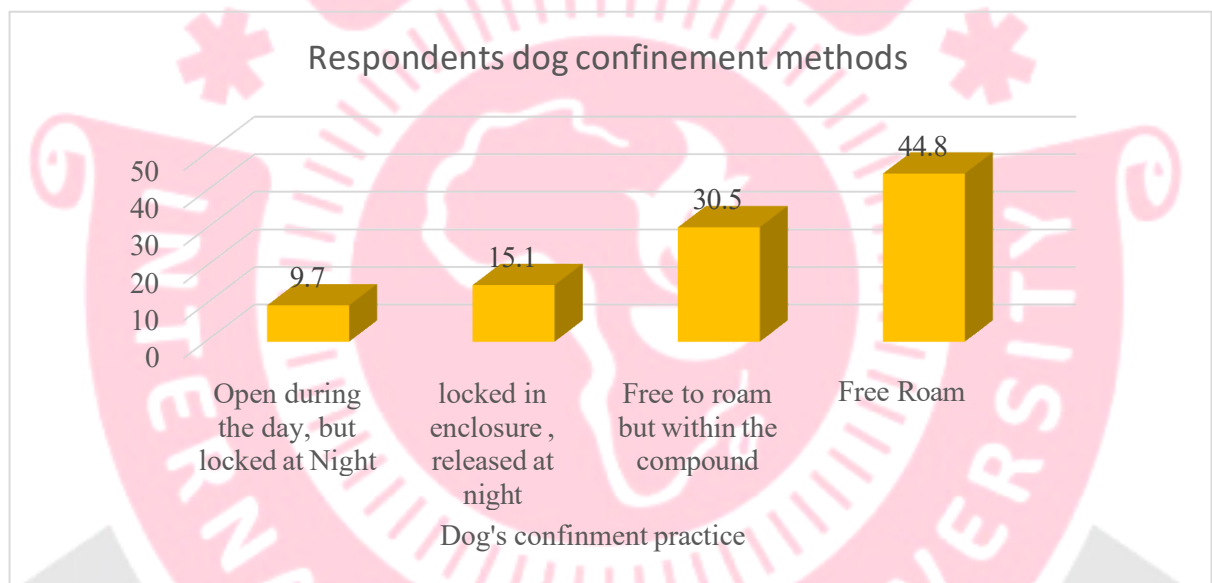


Figure 6: Dogs Confinement Practice

4.4.2 Vaccination Coverage

Most of the respondents (50.2%) had not vaccinated their dogs in the last year; (42.7%) had vaccinated their dogs; and (7.2%) did not know whether their dogs were vaccinated.

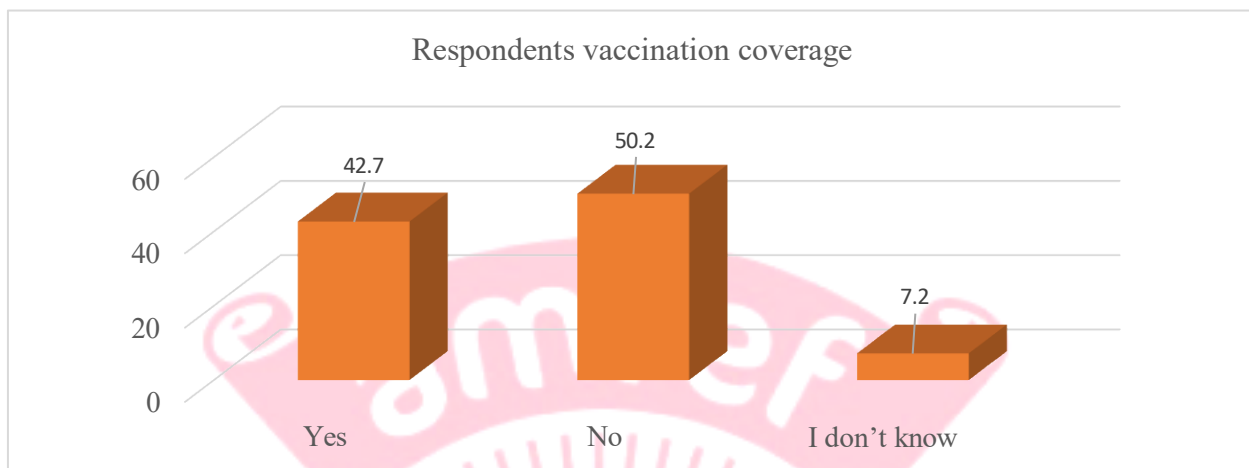


Figure 7: Dogs Vaccination Coverage

4.4.3 Patient Health-Seeking Behavior Following a Dog Bite

The recommended time for one to be in the hospital, the majority (85.7%) indicated that they would immediately visit a hospital after a dog bite; 3.1% indicated that they would present themselves to the hospital the next day after being bitten; and 11.2% were not sure when to present themselves to a hospital after a bite, as shown in Figure 8 below.

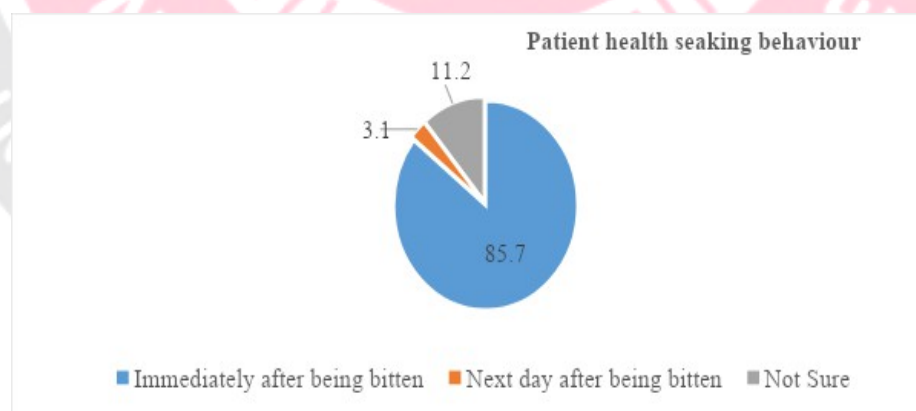


Figure 8: Patient Health-Seeking Behavior

4.4.4 Free-Roaming Dogs

The majority (54.8%) indicated that the number of roaming dogs was uncountable; (25.1%) indicated that they were more than one; (11.8%) indicated that only one dog was roaming; and (8.2%) indicated that no dogs were roaming.

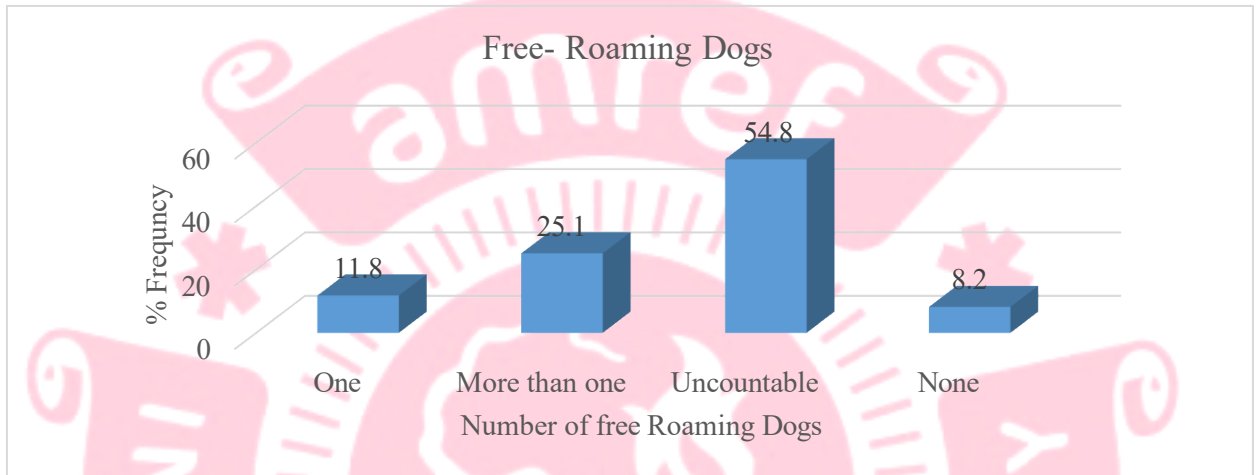


Figure 9: Number of Free-Roaming Dogs

4.4.5 Respondents' Practices Towards a Suspected Rabid Dog

In a case involving a dog suspected of being infected with rabies, 62.3% of individuals would opt to consistently administer vaccinations to the dog. Additionally, 22.1% of respondents would promptly seek medical treatment following a dog bite, while 9.1% would choose to avoid any contact with the rabid dog. These proportions are visually represented in Figure 10.

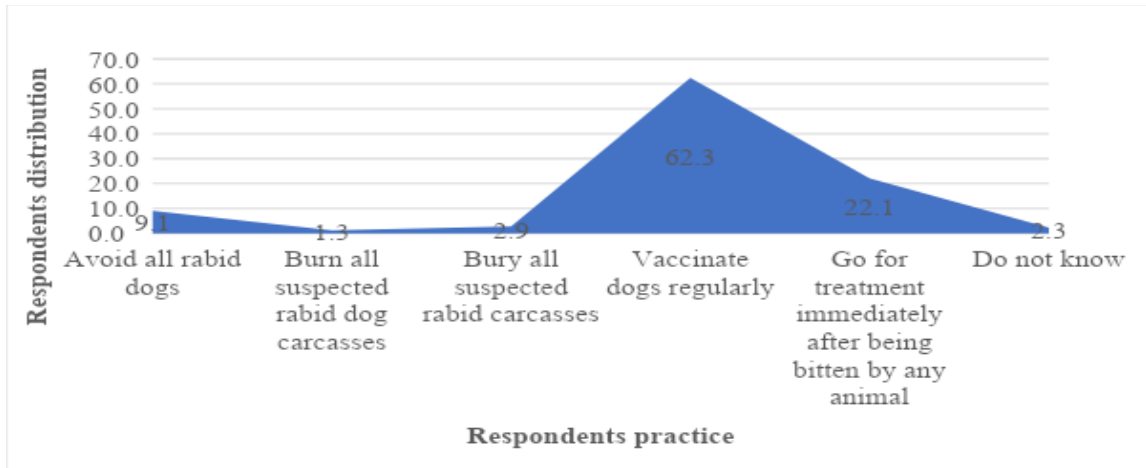


Figure 10: Respondents' Practices towards a Suspected Rabid Dog

4.4.6 Chi-Square Tests for Level of Knowledge and Preventive Practices

Tables 12 and 13 below consecutively show cross-tabulation data and the chi-square test for the dog restraint method as a rabies prevention practice and level of knowledge.

4.4.6.1 Cross-Tabulation and Chi-Square Tests for Dog Restraint Practice and Level of Knowledge.

Table 12: The relationship between dog restraint practice and level of knowledge

| | Level of knowledge | | | | | | The Pearson chi-square statistic (P) |
|---|--------------------|------|-----------|------|-----------|------|--------------------------------------|
| | High | | Moderate | | Low | | |
| How do you restrain your dog? | Frequency | % | Frequency | % | Frequency | % | |
| Open during the day, but locked at Night | 6 | 14.6 | 33 | 18.1 | 12 | 21.4 | 0.001 |
| locked in an enclosure, released at night | 6 | 14.6 | 50 | 27.5 | 10 | 17.9 | |
| Free to roam but within the compound | 8 | 19.5 | 71 | 39.0 | 10 | 17.9 | |
| Free Roam | 18 | 43.9 | 28 | 15.4 | 33 | 58.9 | |
| Total | 41 | | 182 | | 56 | | |

The Tables above 12 show cross-tabulations of data between dogs' restraint methods to prevent rabies transmission and the level of knowledge.

Dog confinement and knowledge level about rabies:

The available research indicates a significant correlation between how dogs are kept and the information on rabies. Participants who said that their canines were allowed to roam freely had a diminished understanding of rabies, and this association was statistically significant ($\chi^2 = 5.915, p = 0.001$).

4.4.6.2 Cross Tabulation and Chi-Square Test for Vaccination Coverage and Level of Knowledge About Rabies.

Table 13 below shows cross-tabulation data and a chi-square test for vaccination coverage as a rabies prevention practice and level of knowledge.

Table 13: The Relationship Between Vaccination Coverage and Level of Knowledge About Rabies

| | | Level of knowledge | | | | | | The Pearson chi-square statistic (P) |
|---|-----|--------------------|------|-----------|------|-----------|------|--------------------------------------|
| | | High | | Moderate | | Low | | |
| Have you ever vaccinated your dog against rabies for the last one year? | Yes | Frequency | % | Frequency | % | Frequency | % | 0.005 |
| | No | 14 | 47.0 | 89 | 47.3 | 20 | 25.3 | |
| I don't know | 12 | 40.0 | 49 | 26.1 | 26 | 33.0 | | |
| Total | 4 | 13.3 | 50 | 26.6 | 33 | 41.8 | | |
| | | 30 | | 188 | | 79 | | |

The study's findings demonstrated a statistically significant relationship between the vaccination rate of dogs residing in households and a moderate level of knowledge.

There was a significant association between respondents who said their dogs had been vaccinated and a moderate degree of knowledge ($\chi^2 = 14.968, p = 0.005$).

4.4.6.3 Cross-Tabulation and Chi-Square Test for Number of Dogs Kept and Level of Knowledge.

Table 14 below shows cross-tabulation and chi-square tests consecutively between the number of dogs kept and the level of knowledge.

Table 14: The Relationship Between the Number of Dogs Kept and the Level of Knowledge

| | | Level of Knowledge | | | | | | The Pearson chi-square statistic (P) |
|--|------------------|--------------------|------|---------------|------|---------------|-----|--|
| | | High | | Moderate | | Low | | |
| On average how many stray dogs do you see in a day? | One | Frequen cy | % | Frequenc y | % | Frequen cy | % | 0.005 |
| | More than one | 9 | 18.0 | 15 | 10.0 | 7 | 9.0 | |
| Uncountabl e | 26 | 52.0 | 78 | 52.0 | 22 | 0 | 28. | |
| None | 4 | 8.0 | 20 | 13.3 | 9 | 0 | 11. | |
| Total | 50 | | 150 | | 79 | 4 | | |

Table 14 above shows cross-tabulations of data between the number of dogs kept to prevent rabies transmission and the level of knowledge.

The relationship between the number of roaming dogs and the level of knowledge about rabies: The investigation results revealed a statistically significant association between the number of stray canines and the knowledge about rabies sickness.

Respondents who indicated a high number of roaming dogs also reported a low level of knowledge, which was significantly ($\chi^2 = 18.313$; $P = 0.005$) higher than that of those who indicated a low number of dogs kept and a high level of knowledge (10.0%).

4.4.6.4 Cross-Tabulation and Chi-Square Test Between Patient Health-Seeking Behavior and their Level of Knowledge on Rabies.

Table 15 below shows cross-tabulation and chi-squares tests consecutively between patient health-seeking behavior and level of knowledge about rabies.

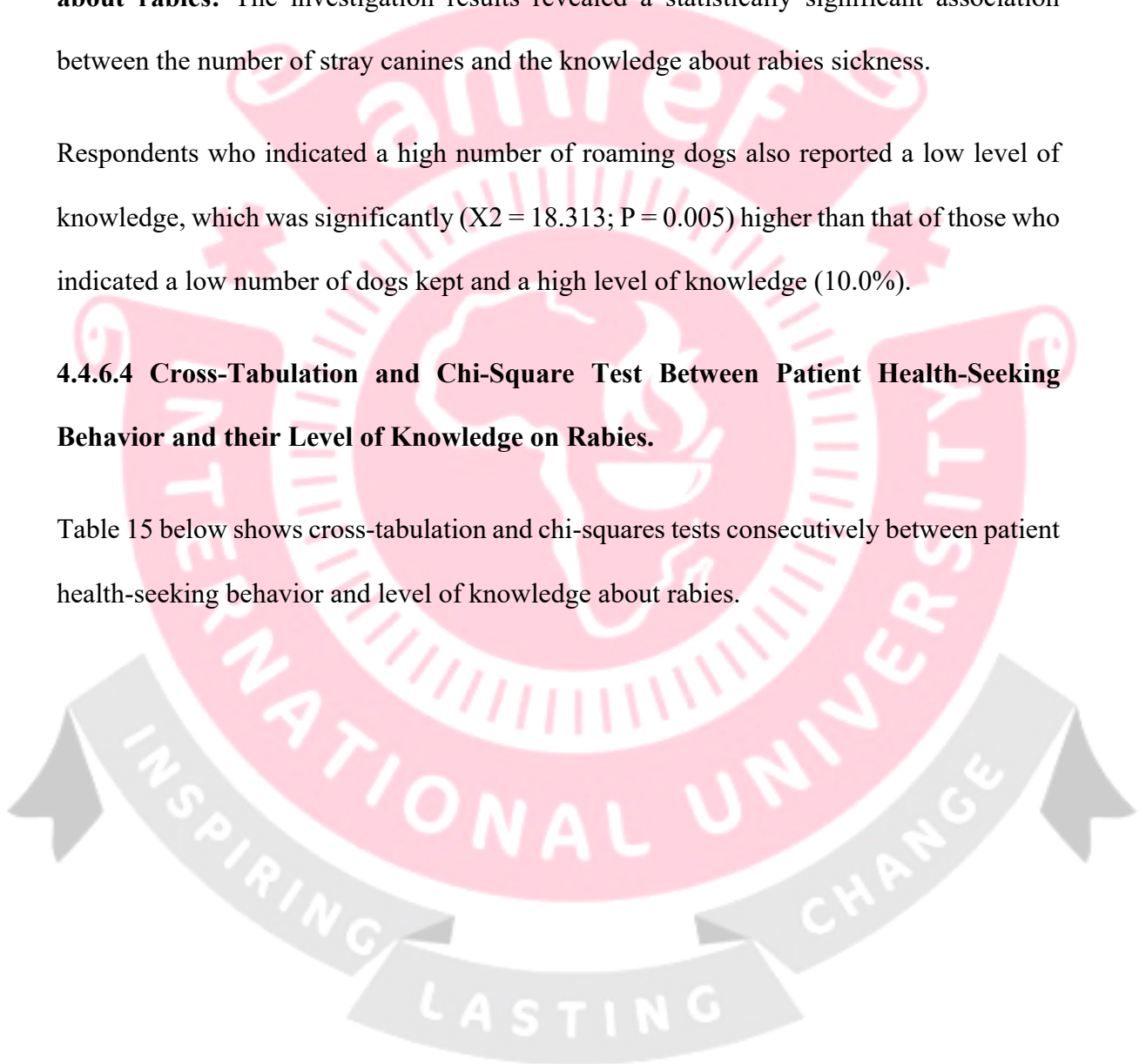


Table 15: The relationship between Patient health-seeking behavior and level of knowledge about rabies

| | Level of Knowledge | | | | | | The Pearson chi-square statistic (P) |
|--|--------------------|------|-----------|------|-----------|------|--------------------------------------|
| | High | | Moderate | | Low | | |
| | Frequency | % | Frequency | % | Frequency | % | |
| When would you present to the hospital after a dog bite? | | | | | | | |
| Immediately after being bitten | 103 | 67.3 | 51 | 74.0 | 38 | 67.0 | 0.003 |
| The next day after being bitten | 30 | 19.6 | 10 | 14.5 | 15 | 26.3 | |
| Not Sure | 20 | 13.1 | 8 | 12.0 | 4 | 7.0 | |
| Total | 153 | | 69 | | 57 | | |

Table 15 above shows a cross-tabulation between patient health-seeking behavior and level of knowledge about rabies as a method of rabies prevention.

The relationship between the patient's care-seeking behavior and knowledge about rabies: The research found a significant association between the patient's care-seeking behavior after being bitten by a dog and their knowledge of rabies. Respondents who noted that they should visit a hospital immediately if bitten by a dog also indicated a high level of knowledge, which was significantly ($X^2 = 2.014$, $P = 0.003$) higher compared to those who indicated that they would present themselves to the hospital the next day after being bitten and those who were not sure (15.7%) and (10.1%) respectively.

4.4.6.5 Cross-Tabulation and Chi-Square Test Between the Appropriate Duration for a Dog's Vaccination and Level of Knowledge About Rabies.

Table 16: The Relationship Between the Appropriate Duration for a Dog's Vaccination and the Level of Knowledge About Rabies

| | Level of Knowledge | | | | | | The Pearson chi-square statistic (P) |
|---|--------------------|------|-----------|------|-----------|------|--------------------------------------|
| | High | | Moderate | | Low | | |
| After how long a dog should be vaccinated against rabies? | Frequency | % | Frequency | % | Frequency | % | 0.003 |
| After six months | 27 | 52.0 | 67 | 49.6 | 56 | 64.4 | |
| After one year | 11 | 21.2 | 40 | 29.6 | 12 | 14.0 | |
| After two years | 9 | 17.3 | 16 | 11.9 | 9 | 10.3 | |
| Not Aware | 5 | 9.6 | 12 | 9.0 | 10 | 11.5 | |
| Total | 52 | | 135 | | 87 | | |

The relationship between the appropriate duration for a dog’s vaccination and knowledge level about rabies: There was a significant relationship between the duration of dog vaccination and the level of knowledge on rabies. Respondents who indicated a high number of roaming dogs also reported a low level of knowledge and were significantly lower ($\chi^2 = 16.543, P = 0.003$)

4.5 Factors Associated with Adherence to Rabies Prevention Measures in Dog Owners

4.5.1 Vaccination-seeking and Adherence Behavior

The majority of the respondents (62.9%) indicated that they have never vaccinated their dogs; (23.6%) said they vaccinated their dogs every six months; and (13.2%) indicated after one year and a half.

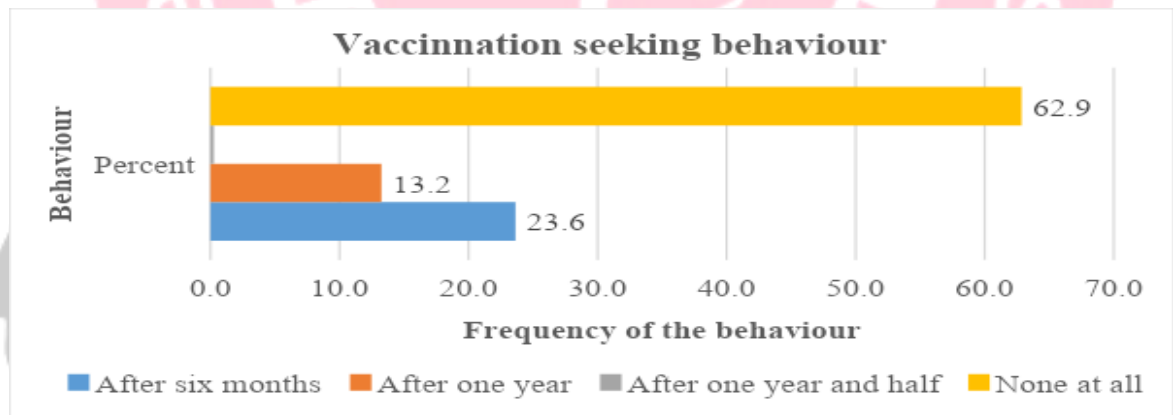


Figure 11: Vaccination-seeking Behavior

4.5.2 Patterns of Seeking Vaccination Information

The majority (67%) indicated that they have never attended any vaccination campaigns; 22% said that they attended those campaigns annually, and only 2% indicated that the veterinary personnel always vaccinate the animals. As shown in Figure 12 below.

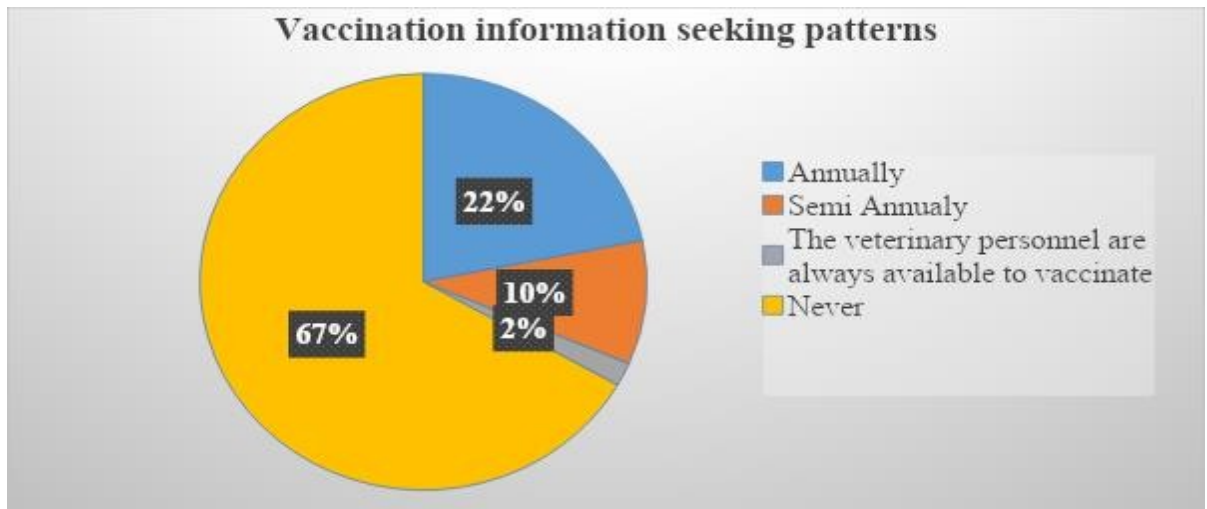


Figure 12: Vaccination Information Seeking Patterns

4.5.3 Availability of Veterinary Personnel

The majority (42.3%) of the respondents indicated that they were unsure whether a veterinary officer was in their area. In comparison, 38.7% said there was a veterinary officer, and 11.2% never knew about the veterinary officer, as shown in Figure 13 below.

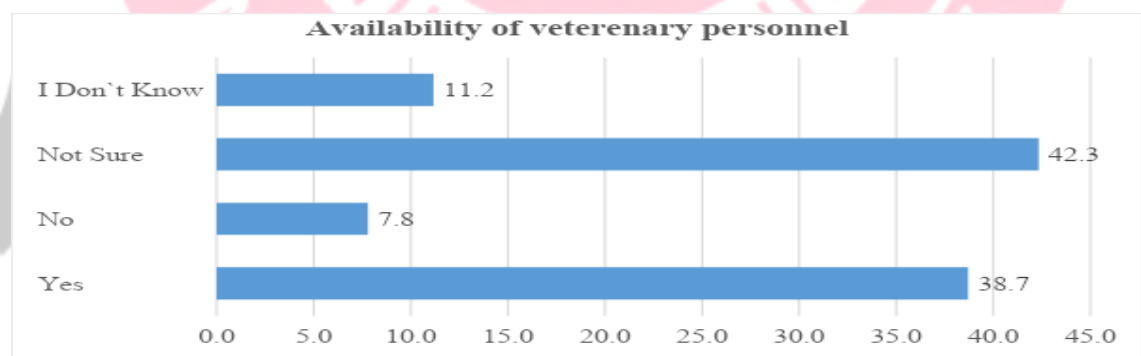


Figure 13: Availability of Veterinary Personnel

4.5.4 Presence of Dog Market in the Area

The majority (65%) of respondents pointed out a dog market in the area; 30% indicated

they were not sure, and 5% indicated there was no market for dogs, as shown in Figure 14 below.

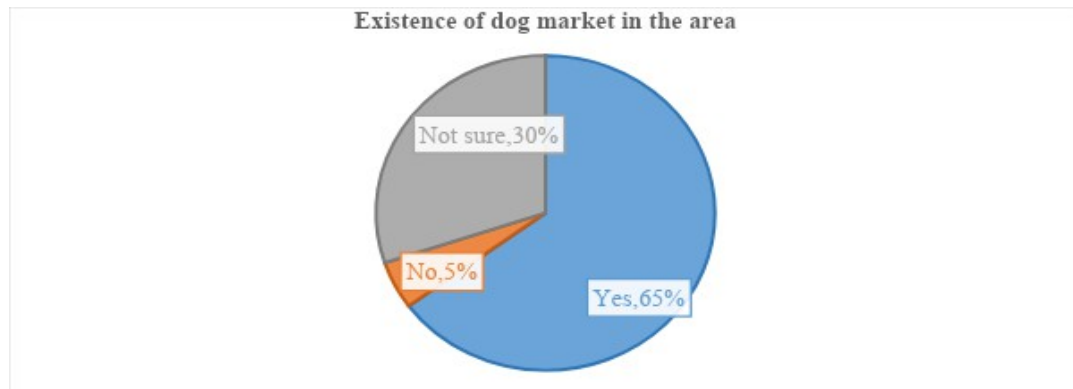


Figure 14: Presence of Dog Market in the Area

4.5.5 Availability of Vaccination Points in the Dog Market

The majority of respondents (69.1%) were unsure whether the market had a vaccination point. In comparison, 26.5% said there was a vaccination point, and 4.4% said there was no vaccination point, as shown in Figure 15 below.

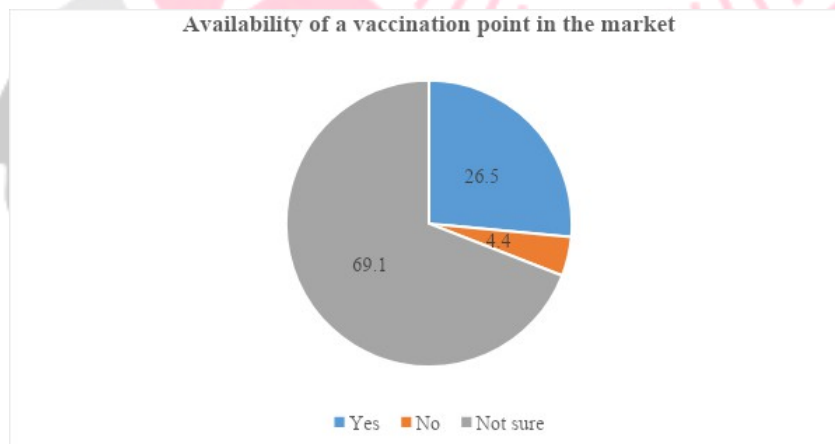


Figure 15: Availability of Vaccination Points in the Market

4.5.6 Chi-Square Tests and Cross Tabulations for Factors Associated with Compliance of Rabies Prevention Measures

This section shows cross-tabulations and a chi-square test for the relationship between factors associated with compliance and rabies prevention measures.

4.5.6.1 Cross Tabulations and Chi-Square Tests for Patterns of Seeking Vaccination Information and Compliance with Rabies Prevention Measures

Table 17 shows cross-tabulations and chi-square for patterns of seeking vaccination information and compliance with rabies prevention measures.

Table 17: The Relationship Between Patterns of Seeking Vaccination Information and Compliance with Rabies Prevention Measures.

| | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|---|---|------|-----------|------|--------------|------|--------------------------------------|
| | Yes | | No | | I don't know | | |
| How many times in a year do you attend the vaccination clinics/campaigns? | Frequency | % | Frequency | % | Frequency | % | 0.001 |
| Annually | 22 | 26.0 | 21 | 16.4 | 9 | 13.8 | |
| Semi-Annually | 14 | 16.3 | 11 | 8.6 | 1 | 1.5 | |
| The veterinary personnel are always available to vaccinate | 10 | 11.6 | 8 | 6.3 | 5 | 7.7 | |
| Never | 40 | 46.5 | 88 | 69.0 | 50 | 77.0 | |
| Total | 86 | | 128 | | 65 | | |

Table 17 above shows cross-tabulation data for patterns of seeking vaccination information and compliance with rabies prevention measures.

Patterns of seeking vaccination information and compliance with rabies prevention

measures: The research found a significant association between the frequency patterns within which respondents were seeking vaccination information and compliance with rabies prevention measures. Respondents who indicated that they never attended any vaccination campaign also indicated low levels of compliance and were significantly lower ($\chi^2 = 40.027, P = 0.001$).

4.5.6.2 Cross-Tabulations and Chi-Square Tests for Availability of Veterinary Personnel and Compliance with Rabies Prevention Measures.

Table 4.16 shows cross-tabulations and chi-square tests for the availability of veterinary personnel and compliance with rabies prevention measures:

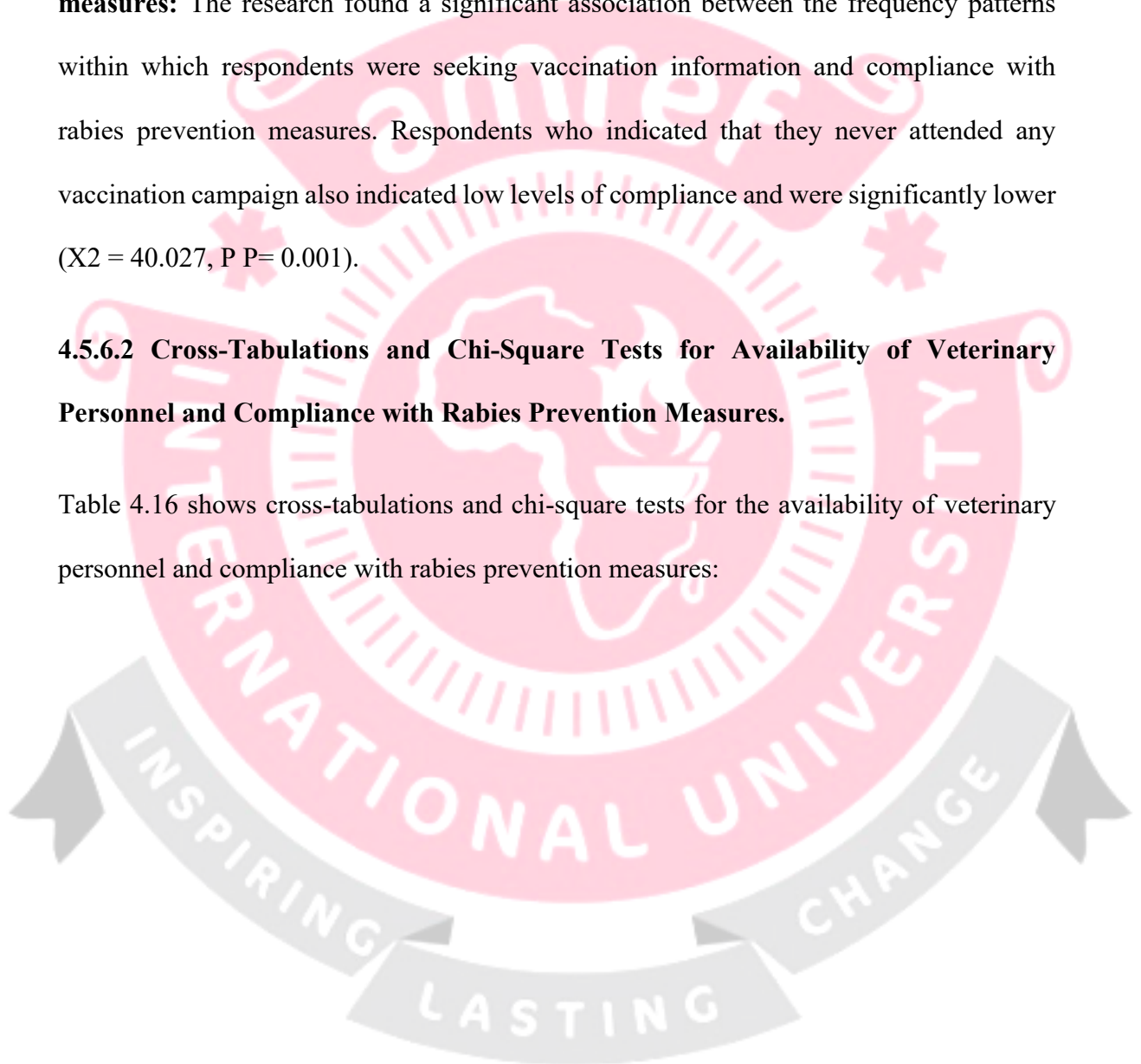


Table 18: The Relationship Between the Availability of Veterinary Personnel and Compliance with Rabies Prevention Measures

| | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|---|---|------|-----------|------|--------------|------|--------------------------------------|
| | Yes | | No | | I don't know | | |
| Does your area have a veterinary vaccination officer? | Frequency | % | Frequency | % | Frequency | % | 0.001 |
| Yes | 44 | 44.0 | 43 | 35.0 | 10 | 18.2 | |
| No | 11 | 11.0 | 11 | 8.9 | 3 | 5.5 | |
| Not Sure | 32 | 32.0 | 60 | 48.4 | 23 | 41.8 | |
| I Don't Know | 13 | 13.0 | 10 | 8.1 | 19 | 34.5 | |
| Total | 100 | | 124 | | 55 | | |

Table 18 above shows cross-tabulation data for the availability of veterinary personnel and compliance with rabies prevention measures.

Availability of veterinary personnel and compliance with rabies prevention

measures: The research findings indicated a significant relationship between the presence of veterinary workers and adherence to rabies prevention methods. Respondents who indicated that they were not sure whether there was a veterinarian also reported a low level of compliance with rabies prevention measures ($\chi^2 = 45.24, P = 0.001$).

4.5.6.3 Cross-Tabulations and Chi-Square Tests for the Presence of a Dog Market In the Area and Compliance with Rabies Prevention Measures.

Table 19 shows cross-tabulations and chi-square tests for the presence of a dog market in the area and compliance with rabies prevention measures.

Table 19: The Relationship Between the Presence of a Dog Market in the Area and Compliance with Rabies Prevention Measures

| | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|---|---|------|-----------|------|--------------|------|--------------------------------------|
| | Yes | | No | | I don't know | | |
| Do you have a dog market or markets in your area of work? | Frequency | % | Frequency | % | Frequency | % | 0.005 |
| Yes | 63 | 58.3 | 70 | 56.0 | 22 | 47.8 | |
| No | 14 | 13.0 | 16 | 12.8 | 9 | 19.6 | |
| Not sure | 31 | 28.7 | 39 | 31.1 | 15 | 32.6 | |
| Total | 108 | | 125 | | 46 | | |

Table 19 above shows cross-tabulation data for a dog market in the area and compliance with rabies prevention measures.

Presence of a dog market in the area and compliance with rabies prevention measures: The study revealed a significant correlation between the existence of a canine marketplace and adherence to rabies protection protocols. Respondents who indicated a

dog market in the area also indicated high levels of compliance with rabies prevention measures, where they were significantly higher ($X^2 = 2.723$; $P = 0.005$).

4.5.6.4 Cross-Tabulations and Chi-Square Tests for the Availability of Vaccination Points in the Dog Market and Compliance with Rabies Prevention Measures.

Table 20 below shows cross-tabulations and chi-square tests for the availability of vaccination points in the dog market and compliance with rabies prevention measures.

Table 20: The Relationship Between the Availability of Vaccination Points in the Dog Market and Compliance with Rabies Prevention Measures

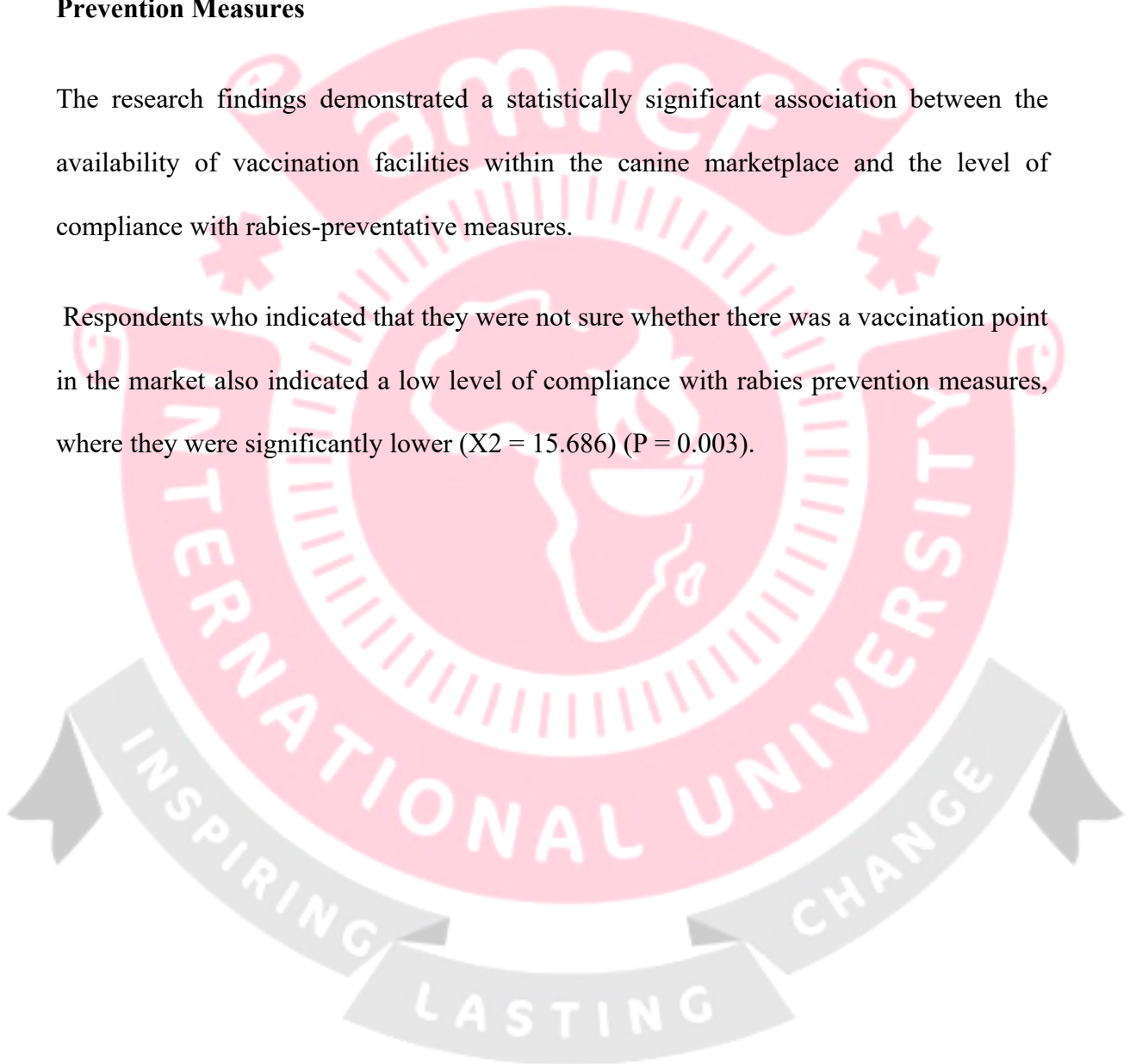
| | Have you ever vaccinated your dog against rabies for the last one year? | | | | | | The Pearson chi-square statistic (P) |
|--|---|------|-----------|------|--------------|------|--------------------------------------|
| | Yes | | No | | I don't know | | |
| Are dogs vaccinated against rabies in your market? | Frequency | % | Frequency | % | Frequency | % | 0.003 |
| Yes | 44 | 32.8 | 30 | 30.3 | 8 | 17.4 | |
| No | 14 | 10.4 | 13 | 13.1 | 4 | 8.7 | |
| Not sure | 76 | 56.7 | 56 | 56.6 | 34 | 74.0 | |
| Total | 134 | | 99 | | 46 | | |

Table 20 above shows cross-tabulation data for the availability of vaccination points in the dog market and compliance with rabies prevention measures.

Availability of Vaccination Points in the Dog Market and Compliance with Rabies Prevention Measures

The research findings demonstrated a statistically significant association between the availability of vaccination facilities within the canine marketplace and the level of compliance with rabies-preventative measures.

Respondents who indicated that they were not sure whether there was a vaccination point in the market also indicated a low level of compliance with rabies prevention measures, where they were significantly lower ($X^2 = 15.686$) ($P = 0.003$).



CHAPTER 5: DISCUSSIONS

5.1 Introduction

This chapter provides a comprehensive examination of research outcomes, emphasizing consistencies, similarities, and inconsistencies between them and previous scholarly investigations. It also thoroughly analyzes and expands on the findings.

5.2 Demographic Characteristics

The research revealed that of the 385 interviewed participants, a significant majority (72.5%) reported ownership of one or more dogs. The findings presented in this study exhibit disparities when compared to previous research conducted in Ethiopia, which reported a dog ownership rate of 40.5% among households Chuchu et al. (2022), and Tanzania, where the rate was reported to be 22% (Cleaveland et al., 2018). This can be attributed to a dog market in the area where dogs are treated as part of the business; further, dogs are treated as pets, hence larger ownership.

A significant proportion of participants (54.8%) identified as female. This finding aligns with research conducted in Tanzania regarding the knowledge, attitudes, and practices of those who own dogs. The study observed a higher representation of female participants (55%) compared to male participants. Additionally, most respondents (68%) were from rural areas (Christian et al., 2023). This fortuitous occurrence could be attributed to cultural norms and behaviors that contribute to the increasing number of women staying within domestic spheres in both nations and the availability of space for dog's upkeep.

According to the research, 48.3% of the participants had completed their primary and secondary school education. The findings presented in this study align with the outcomes of comparable research undertaken in Tanzania and Kenya, as reported by Chuchu et al. (2022), respectively. This could be attributed to the government policy on free education and advocacy for basic education for children.

This study revealed that a significant proportion of participants, specifically 74%, had completed elementary and secondary education, with a focus on primary school level.

A significant proportion of participants in the study had received formal education, a factor that plays an active role in efforts to combat rabies. Previous research has established a positive correlation between possessing information about the disease and having attended school.

Furthermore, the research revealed a significant relationship between formal education and dog vaccination among the participants ($P < 0.001$). Previous research conducted in Kenya Gichohi (2019) and Tanzania Ferguson et al. (2020) has demonstrated a positive correlation between individuals who have completed high school education and their level of knowledge regarding rabies.

The observed phenomenon can be attributed to the increased dissemination and availability of knowledge on rabies, along with the recognition of the significance of administering vaccinations to dogs ($P 0.05$). Further education has helped individuals classify rabies as a disease of public health importance.

The investigation results revealed that a significant number of the participants were without jobs, as evidenced by an unemployment rate of 53.3%. The study revealed a statistically significant relationship ($p < 0.05$) between the lack of formal employment and the ownership of an unvaccinated canine inside the household. The observed phenomena may be attributed to the existence of income fluctuations, which therefore reduce peoples' ability to afford immunization services and the expense of rabies vaccination services.

5.3 Level of Knowledge among Dog Owners

This study revealed that Mumias sub-county residents had a moderate level of knowledge, which was 42.6%.

Further, the study examined the relationship between respondents' knowledge of rabies, as assessed by the matrix used in this investigation, and their likelihood of receiving adequate medical assistance after being bitten by a dog. The findings revealed that individuals who were grouped as having sufficient knowledge of rabies had positive results in accessing appropriate medical advice. Moreover, the researchers observed a correlation between the participant's comprehension of the disease and their competence in managing animals potentially afflicted with rabies.

The present investigation revealed a significant relationship ($p < 0.001$) between individuals' level of understanding regarding the nature of rabies as an affliction and their propensity to administer vaccinations to their dog companions. The observed relationship can be affiliated with the fact that a significant majority (61.8%) of these individuals know the etiology of rabies and basic education.

This specific condition possesses the capacity to lead to fatality. The results revealed in this study align with the findings reported by Cleaveland and Thumbi (2018), which demonstrated a significant correlation between households impacted by rabies and the presence of dogs that had been vaccinated ($p < 0.05$).

The observed association between these links can be attributed to the relatively large number of households involved (88.7%) possessed knowledge regarding the lethal nature of the condition in the absence of medical intervention due to its fatality nature.

The present study reveals that a significant proportion of respondents, specifically 28.3%, obtained knowledge about rabies from medical centers, while 20.3% relied on information from friends or neighbors. Additionally, 28.3% of respondents acquired knowledge about rabies through exposure to media sources.

The findings presented in this study demonstrate a discrepancy compared to the research conducted by Chuchu et al. (2022), which found that a significant proportion (85.6%) of participants' understanding of rabies was derived from families, neighborly, friendly, and professional sources.

Furthermore, a separate study conducted in Tanzania revealed that a significant percentage of participants, specifically 70%, relied on information sources such as neighbors, family, and acquaintances (Christian et al., 2023).

The observed disparity can be ascribed to the heightened availability of information in current technology. Here, a large population poses a gadget where he/she can access information with ease.

The study found that 44.2% of the assessed population of dog owners administered immunizations to their dogs. The results described in this research are inconsistent with prior research conducted in Ethiopia, which documented a vaccination rate of 33.3% among dogs living in households (Hagos et al., 2020). Similarly, a separate investigation in the Machakos region of Kenya documented a vaccination prevalence of 29% among the canine population under examination (Kitala et al., 2016). In all the studies, consumption of dog vaccination services is very low; this may be due to the high cost of vaccinating a dog and inadequate sensitization to the importance of dog vaccination.

The study's results demonstrate a significant relationship between participants (58%) who indicated that the primary means of rabies transmission are the transfer of the disease through animal bites and the possession of vaccinated dogs. (P- 0.05).

This tendency might be ascribed to the notion that, in the event of a dog bite, those who own dogs that have not had vaccinations may have financial liability for the healthcare costs accrued by the injured party.

A survey conducted in Kakamega revealed that a considerable percentage of participants, particularly 73.4%, recognized animal bites as the principal transmission mode for rabies (Chuchu et al., 2022). Furthermore, the investigation results revealed that a significant proportion of participants (62.2%) demonstrated their commitment to regularly administering vaccinations to their canines to control the incidence of rabies effectively. The inclination of individuals who own pets to assist their ailing animals presents a potential hazard of human exposure. To optimize the efficacy of a rabies control program, it is crucial to disseminate information to the general population regarding the prevailing

characteristics of rabies in animals. This measure will benefit persons by reducing their interactions with the mentioned wildlife, decreasing the probability of human encounters. The aforementioned conclusion resembles the study conducted by Gichohi (2019).

5.4 Preventive Practices among Dog Owners

Various strategies are employed in the prevention of rabies, including implementing measures to confine dogs, strict adherence to vaccination schedules, and the rapid seeking of medical attention following a dog bite incident. The appropriate care of dog bites and vaccination of the involved dog is critical to successfully managing dog bite injuries. The decision to learn about rabies prevention can result from an experience with a dog bite that happened in one's home or in the neighborhood where one lives. This finding is consistent with that of Chuchu et al. (2022), who found a strong correlation between prior dog bite experiences and the behavior of seeking treatment... The present study found a strong association between the technique of dog confinement and patterns of obtaining vaccination services, as well as the consistency of vaccination protocols ($P < 0.05$). This resembles the research conducted by Gichohi (2019).

According to this study's findings, approximately 32.5% of the participants expressed their willingness to allow their dogs to roam without restraint. These findings exhibit variation when compared to prior research done by Mucheru et al. (2015) in Kakamega. The earlier study revealed that 28.7% of participants intended to employ a similar approach to relinquishing their canine companion. The dogs have unrestricted freedom to move about.

These two studies, done at separate periods, provide evidence of a rising pattern whereby a growing proportion of individuals release their domesticated canines into natural habitats.

According to Christian et al. (2023), there was a substantial correlation between individuals who indicated their intention to report a case of dog rabies to a veterinarian and the presence of a similarly vaccinated dog in their family.

In contrast to analogous investigations carried out in Kakamega, Kenya, by Mucheru et al. (2015) and Muriuki (2016), the present study reveals that a significant proportion of individuals exhibiting signs of rabies tend to resort to the killing of animals, while only a minority seek veterinary assistance for its management. The results of this survey suggest that a substantial percentage, specifically 62.3%, of participants expressed their intention to administer vaccinations to their canine companions consistently. This observation suggests a shift in behavior, accompanied by a growing level of comprehension and consciousness (Muriuki, 2016).

Animals should exhibit potential human interaction but not display evident symptoms of illness and not be promptly sent to euthanasia. Instead, they should be placed in isolation and subjected to ongoing observation to facilitate the identification of any subsequent clinical manifestations of rabies, thereby aiding in the diagnostic process.

Further, terminating animals suspected of being infected with rabies contributes to a notable underestimation of reported cases, compromising the accuracy of official records in properly reflecting the true prevalence of rabies (Zoonotic Disease Unit of Kenya, 2014). The study's findings indicate that a significant proportion of 55% of participants indicated their immediate inclination to transport an individual who has suffered an animal bite to a medical facility. It is noteworthy that the aforementioned proportion exhibits a notable

decrease compared to the 96% rate documented by Chuchu et al. (2022) in their research done in Kenya.

According to the results of this study, it can be inferred that individuals who have experienced dog bites exhibit a decreased inclination to pursue conventional medical treatment, which includes a hesitancy to engage in discussions with healthcare practitioners adhering to standard healthcare practices compared to prior years. Unfortunately, the existing strategy for managing rabies is insufficient and demands urgent consideration (Carlos et al., 2020).

This study found a strong association between individuals who believed that the initial rabies vaccination should be administered to dogs less than one-year-old (45.5%) and those who believed that dogs should be vaccinated before reaching one year of age (35.5%). This phenomenon may be attributed to the prolonged period of dog rearing, which enables the determination of the optimal age for the initial vaccination.

5.5 Factors Associated with Compliance of Rabies Prevention Measures among Dog Owners

The study identified multiple factors that influenced the level of compliance with rabies prevention activities and the vaccination status of dogs among the participants.

There existed a significant relationship ($p < 0.05$) between several dogs owned and the presence of a dog that has been vaccinated concerning the procurement and possession of dogs. This relationship between these two can be attributed to various factors, including

budgetary limitations, temporal constraints, and the degree of compliance with dog vaccination initiatives.

Participants who possessed knowledge of the significance of vaccinating dogs demonstrated active involvement in vaccination initiatives. Additionally, those who reported the availability of veterinary professionals to administer vaccinations at any given moment were shown to have a statistically significant association with having their dogs vaccinated locally ($P < 0.05$). This knowledge may arise from the owners' strong inclination to vaccinate their dogs. This study's findings resemble a prior investigation carried out in Kakamega (Chuchu et al., 2022).

The findings derived from the participants' responses revealed a statistically significant relationship ($p < 0.05$) between the availability of veterinary personnel in the area and the prevalence of vaccinated dogs. The observed relationship can be attributed to the veterinary staff's knowledge and advocacy for rabies vaccination.

The study's participants reported a significant relationship between the treatment victims received following a dog bite incident and the dog's vaccination status. This association may be attributed to the utilization of services related to dog vaccinations.

The potential rationale behind this could be attributed to the high cost associated with post-exposure prophylaxis, which may incentivize the implementation of a strategy wherein the financial burden of treating bitten individuals is offset by investing in the regular vaccination of dogs, ensuring future protection. In line with the research conducted in Kakamega by Mucheru et al. (2015), the current study unveiled a significant association (P

< 0.001) between the prevalence of markets in the region and the elevated population of unvaccinated wild canines.

Approximately 65% of the markets in the area were found to be connected with this phenomenon. This phenomenon could be attributed to the canines having departed from the market while others have failed to secure a prospective buyer.

According to research conducted by Chuchu et al. (2022) regarding the influence of socio-cultural factors on healthcare-seeking behavior in coastal Kenya, individuals residing in rural regions of Kenya tend to seek healthcare services at hospitals, mainly when the provision of treatment is offered without charge. The assertion made in the statement is further substantiated by the (World Health Organization, 2023) report on traditional medicine, specifically the Rabies Vaccine 2010 edition of the Weekly Epidemiological Records.

The report provides additional evidence indicating that a significant proportion, at least 80%, of individuals residing in Africa actively utilize traditional medicine at different points in their lives. Parents make intentional choices between traditional and biomedical treatment methods, and in cases where conventional therapies prove ineffective, they subsequently pursue alternative approaches.

CHAPTER 6: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 Introduction

This part summarizes the study's conclusions derived from the specific research objectives. Additionally, it offers recommendations to pertinent stakeholders based on the obtained results. Moreover, the chapter provides suggestions for further investigation.

6.2 Conclusion

The study revealed that majority of the study participants (42.6%) had a moderate level of knowledge concerning rabies prevention practices.

Residents of Mumias Sub-county use dog confinement methods, vaccination services, and treatment methods to protect themselves from rabies disease. However, vaccination coverage was below the recommended 80%, with only 42.7% of the participants having vaccinated their dogs in the previous year.

Demographic characteristics, such as employment status and education level, were associated with having a vaccinated dog. Those who had secondary education and above were associated with having a vaccinated dog in the last year, as were those who were employed at any level.

Mumias sub-county has several factors associated with compliance with rabies prevention practices, such as the availability of dog markets in the area, the level of education, employment status, availability of veterinary personnel, and availability of vaccination points in the dog market area.

6.3 Recommendations

At the household level, the study recommends that individuals keep pets to afford their veterinary services, including the recommended vaccination schedule by the Ministry of Livestock in Kenya.

To encourage dog owners to vaccinate their dogs, it is necessary to improve awareness and education about good animal care practices, such as providing appropriate diets for dogs to prevent scavenging and ensuring immunization.

Kakamega County will improvise mass dog vaccination to cater to the high number of stray unvaccinated dogs within the region due to the presence of the dog market and enforce mandatory dog vaccination points within the dog market.

This study recommends that county and sub-district health administrators enhance knowledge and awareness of rabies prevention measures through targeted campaigns in educational institutions, religious establishments, and various media platforms such as radio and television.

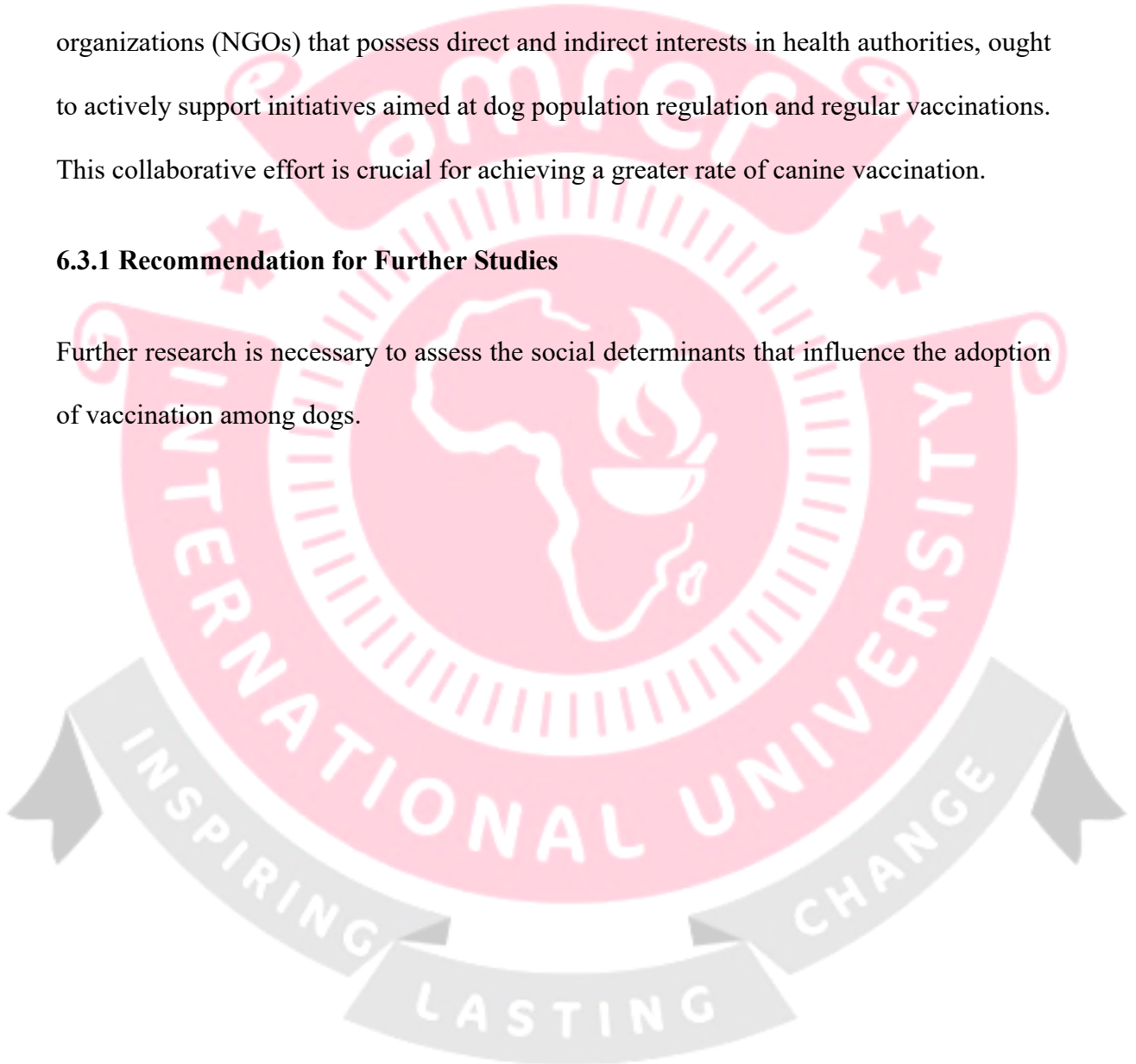
The provision of necessary logistics and money necessitates sufficient assistance from the county government and collaborations with the commercial sector, non-government organizations, and other pertinent donor agencies.

Effective elimination of rabies necessitates implementing stringent and sufficient measures to enforce control over dog movement, mandatory vaccination, and other relevant legislation on rabies control.

The collaboration between the Ministry of Agriculture and Livestock and the Ministry of Health aims to enhance awareness and promote health information regarding the significance of dog vaccination against rabies sickness. The government (Ministry of Health and Ministry of Livestock) and other stakeholders, such as non-governmental organizations (NGOs) that possess direct and indirect interests in health authorities, ought to actively support initiatives aimed at dog population regulation and regular vaccinations. This collaborative effort is crucial for achieving a greater rate of canine vaccination.

6.3.1 Recommendation for Further Studies

Further research is necessary to assess the social determinants that influence the adoption of vaccination among dogs.



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APPENDICES

Appendix 1: Questionnaire

(This section contains four sections: section A, on Socio-Demographic Information, Section B Knowledgeable factors on rabies prevention practices, section C on Preventive Practices among Dog Owners and Section D Factors Associated with Compliance of Rabies Prevention Practices among Dog Owners).

Section A: Socio-Demographic Information of the sample population:

(Kindly answer all the questions appropriately by either a tick (✓) or (x))

1. Please indicate your Gender:

a) Male b) Female

2. Age:

a) 15-19 b) 20-29 c) 30-39 d) 40-49 e) 50 >

3. Level of education:

a) Primary b) secondary c) tertiary d) illiterate

4. Marital status:

a) Single b) Married c) divorced d) separated

5. Occupation:

a) Formal employment b) Informal employment c) Farmer d) Student

6. Number of people in the Household:

a) 1 to 5 b) 5 to ten c) 10- 20 d) 20 and above

Section B: Knowledgeable factors on rabies prevention practices

(Kindly answer all the questions appropriately by either a tick (✓) or (x))

1. How many Dogs do you have?

a) One b) Two c) Three d) More than Three

2. For what purpose do you keep your dog(s)?

a) Guard the Home b) Hunting c) Home Pet d) For fun

3. Have you ever heard of the disease Rabies?

a) Yes b) No

4. If Yes. What is your source of information?

a) Media/ Friends /Neighbors] b) Vet Services] c) Health Centers [] d) Media]

5. Where do u think these dogs get rabies from?

a) Drinking contaminated water [] b) Scavenging [] c) Bites from Rabid animals

d) Not aware []

6. How do you prevent this disease from affecting your dog?

a) Vaccination [] b) Restricting movement [] c) Feeding well [] d) Not aware

7. Do you think this disease can be transmitted from animals to people?

a) Yes [] b) No []

8. If yes, How?

a) Bites from rabid animals [b) Meat from rabid animals] c) Contaminated fomites d)

Not aware []

9. In your opinion, after how long should a dog be vaccinated against rabies?

a) Six months [] b) After every one year [] c) After every two years [] d)

After more than two years []

Section B1: questions for assessing level of knowledge

1. Have you ever heard of the disease Rabies?

a) Yes [] b) No []

2. Where do you think dogs get rabies?

a) Drinking contaminated water [] b) Scavenging [] c) Bites from Rabid animals

d) Not aware []

3. Do you think rabies can be transmitted from animals to humans?

a) Yes [] b) No []

4. After how long should a dog be vaccinated against rabies?

a) Six months [] b) After every one year [] c) After every two years [] d)

After more than two years []

5. Is rabies an infectious disease?
a) Yes b) No
6. Is rabies preventable?
a) Yes [] b) No []
7. Should the rabies vaccine be vaccinated on schedule?
a) Yes [] b) No []
8. How long is the incubation period of rabies usually?

Section C: Preventive Practices among Dog Owners

(Kindly answer all the questions appropriately by either a tick (✓) or (x))

1. Do you own a dog?
a) Yes [] b) No []
2. How do you restrain your dog?
a) Leashed the whole day [] b) Leashed half the day []
c) Not leashed but stays in compound [] d) Roams freely []
3. Have you ever vaccinated your dog against rabies? (If no, skip to 5)
a) Yes [] b) No [] c) I don't know []
4. If yes, when last was it vaccinated in the last one year?
a) 6 months ago [] b) 12 months ago [] c) 12 months ago []
5. If No, why have you never vaccinated your dog?
a) Dont know where to seek vaccination services []
b) No one available at home during vaccination clinics/campaigns []
c) The charges for vaccination are high []
d) The vaccination center is far []
6. On average how many stray dogs do you see in a day?
a) One [] b) More than one [] c) Uncountable d) None []
7. When would you present to the hospital after a dog bite?
a) Immediately after being bitten []
b) Next day after being bitten []
c) Between 2 to 14 days after being bitten []
d) After 14 days []

8. How can a person prevent himself from getting rabies? (Select all that apply)

- a) Avoid all rabid dogs []
- b) Burn all suspected rabid dog carcasses []
- c) Bury all suspected rabid carcasses []
- d) Vaccinate dogs annually []
- e) Go for treatment immediately after being bitten by any animal []
- f) Do not know []

9. What do you do with an animal suspected to have rabies?

- a) Kill [] b) Call Veterinarian [] c) Chase away from home [] d) Confine them []
- e) I do not know []

Section D; Factors Associated with Compliance of Rabies Prevention Measures among Dog Owners.

(Kindly answer all the questions appropriately by either a tick (✓) or (x))

1. At what age do you start vaccinating dogs against rabies?

- a) After six months] b) after one year] c) after one year and a half] d) None at all

2. How many times in a year are the vaccination clinics/campaigns?

- a) Once] b) Twice] c) The veterinary personnel are always available to vaccinate d) Never available []

3. Does your area have a vaccination veterinary officer?

- a) Yes [] b) No [] c) Not sure [] d) I don't know []

4. Are there charges at vaccination centers?

- a) Yes [] b) No []

5. Are the charges within affordable ranges?

- a) Yes [] b) No [] c) Not aware []

6. Do you have a dog market or markets in your area of work?

- a) Yes] b) No []

7. Are dogs vaccinated against rabies in your market?

- a) Yes [] b) No []

Appendix 2: Questionnaires in Kiswahili

KIAMBATISHO CHA PILI:

ISrA*nszr Aii i• r•cÄ•n•a rt/üfgiisezo nne. ___fi+••••H ya @ 1yuar6e AuAfzso demogzaŞefKizøøeneoJ,
**Sehemu ya B; Ufahamu kuhusu mambo makuu yanayoathiri kujikinga kutokana na kichaa cha
mbwa, Sehemu ya C; Jinsi ya kujikinga kwao wamiliki wa mbwa, Sehemu ya D; Mambo makuu**

•şöhmü ye A. L juinbe kuhuou utöngsnisn wø kimønen wø ixøtu

1. Tnf: <dhili thibitisha jiris

2. Umri (Miaka)

a) 1S-19 [] b) 20-29 [] c) 30-39 [] d) 40-49 [] e) 50+ []

a) Shule ya msingi [] b) Shule ya upili [] c) Chuo [] d) Hujasoma []

a) L!oaisbi pcJtem }'oko(j b) Liaxokka{ } c) Utnç•urükJwa[] d) djktmcicagxogazut []

a) Uroeqj iria'ø aa .wikag [] b) L!røsjixiwo kaz oyo [] c) M k»limn [] d) Mw.n.rnfinzi []

ail -S [] bi ß-III [] cil I-20 [] di Zaidi yu TO []

Sehemu ya B: Ufahamu kuhusu mambo makuu yanayoathiri kujikinga kutokana na kichaa cha mbwa,

(Tafadhali jibu maswali yote kikamilifu kwa kutia alama {x} au (√))

1. Una mbwa wangapi?

- a) Mmoja [] b) wawili [] c) Watatu [] d) Zaidi ya watatu []

2. Unawafuga mbwa hawa kwa madhumuni gani?

- a) kulinda boma [] b) kuwinda [] c) Mfugo wa kufurahia [] d) kufurahia []

3. Je umewahi kusikia kuhusu ugonjwa wa kichaa cha mbwa?

- a) ndio [] b) La []

4. Ikiwa ndivyo. Ujumbe huu uliutoa wapi?

- a) kupitia vyombo vya habari //majirani [] b) Madaktari wa mifugo [] c) Vituo vya afya []

5. Je unafikiri kichaa cha mbwa hutoka wapi?

- a) Kunywa maji machafu [] b) kula mizoga [] c) kuumwa na wanyama wanaoambukiza ugonjwa huo [] d) sijui []

6. Utafanyaje ili kuzuia kichaa cha mbwa?

- a) chanjo [] b) kuwathibiti wanyama kutotembea [] c) kuwalisha wanyama vyema [] d) sina ufahamu []

7. Je unafikiri kuwa ugonjwa huu unaweza kusambazwa kutoka kwa mnyama hadi kwa binadamu?

- a) ndio [] b) la []

8. Ikiwa ndivyo, kiviipi?

- a) kuumwa na wanyama [] b) kula nyama [] c) mchanganyiko wa kemikali []

9. kwa maoni yako mbwa anapaswa kupewa chanjo baada ya muda gani

- a) miezi sita [] b) baada ya kila mwaka [] c) baada ya miaka miwili []

Sebatika ya C; Jiz'ia ya huf'it'oga kwao weafllri wa ozba,

2. wewe huihibiti s4pi I bu'a?

- a) kuzuñvra siku azñoo [] b) kuzuiiwa oitsu yo sJku []
c) kutozuñlwa iJx svxnaññ kxtLkzt boaza [] d) aoaziuura **apeatavyo** []

3 Uinewahi kumpa iobwa wako cbanjo dhidi yn ugnjwa wo kichoa chui mbxvn?

- a) Njio [] b) sijui/ []

4 Iwnpo taiivyii,iiiwachanja aiwiilxi lini?

- a) J miezi o iliyopim [] h) mic'i 12 iliyopits [] e) J Zaidi ya toiczi 12 iliyopita []

5 Ikiwa sivyo ni kwa oini bujampñ nibwn wukn cbanjo?

- a) j xijui pabali pa kuzipata hujon! hizo [] b) j Hapakuwepo ani yeyom witkr wa shugbiili uu

6. Kto ñiku u'w'c buwaooa abws koLo wuogipi?

- u) . *dzaoja [] b) Zcñi y'a auooja [] e) Wasio *t'şks [] d) Hukuox []

7. Ni hni uiuwmii kumpeleka tnbwa wako Kupulñ ckuşjo banda kiimwa?

- a) Ffndi fu utetpournws [] b) iku izayofwiitx b8eJa yit kuiuowa [] e) J Kxñ ys siku raltili ouo ze
baada ya kuumwa [] d) Baada ya siku kumi na nne []

8. h4tu aoaweza kujiLingo vipi *n9nkann ttA lucban clvi tobwn!; ebagun oiajibu yaoayowem
şuhus isbwn

- a) J Jiepusbe na mbwn koko [] b) j Chn ia mizoga yoie ya aibwa walioatñrika [] e) J Zika mizoga
yote yo mbwa woJioaiñrika [] d) J Cbanja mbwa wote kda aiwaktñ [] e) J Nenda upofee mnrñh.vni
podi iu iinapoutnwa na mnyomu yyoin [] f) J Sijui []

'?. Ucd ojc iwupo utagundua kuu'a axnyczuo «usa kicbua cba zabaw'!

al iuouuc [] b) Muite Jak mi wa azizugo [] tf MAMtzc pxlc xy'umb«oi { | d) L!wxfuogje
wanyama ndani wasiondoke []

Sehrmu ya D; Mamlvi makul yanaynbusiaon da nthari z» tnjikingn dhidi ya kichen chi

ITsfnrthelf Jikn maswali ynte ipamvyn two hu"ta (x') su tx]]

1. Ni umri upi aaskm unapaswo kuanza kuoiolvujn tnber dhidi ya kichaa cici tnbws*
zl Baadn ya niczi sita { } b) £taada ye mwuka mmuja]]
c) BaMu yu mwaka aunoju unusu | | d) Hekuaz [j

2. Ni mann itgupi kza mwai«i kuittpeni za cbmjo buwtpu?

et M•lukii:m mifugn wapo kwa uinq•i kuwachanju suyumu [] dl Muilakituri w'a chanju

3. le cnco lako liv kisa wu kuwoiibu wanyitrnc?

ay Nuin { | bl Lea (| ey Sina e£»kiLa { at sijui {

4. Kiuta zoajipo ucyotuzwo kaLikz vituu v'a kucfunji'«

ay Njio [| bi La [j

5. JeiA&Üpo umzyotoz moo o kuy udu2

s+NJö{ }b>L1{ }

fi.Je kum suko la tisbwo kaiikz cnou uualofanyn krizi'!

a) hfdio [| bjLs }

7. le usbwu wa£opo sokoni wamochanjwn dbidi ş'a kâ:tura cha tbbwa?

ay Ndio { } by La[]

Appendix 3: Informed Consent Form

Ethics & Scientific Review Committee

APPENDIX I: Informed Consent Form

[This ICF should only be used for those who have attained the age of majority, LB

| | |
|------------------------|--|
| Study Title | Rabies's Prevention Practices among Dog Owners in hennas Sub-County, Kakamega County. |
| Investigator(s) | <p>Principle investigator</p> <p>Nwima Christophe Ocfie+i'g Email: christopfier mwima@gmail.com Phone No: +25472266176</p> <p>SUPERVISORS'</p> <p>William Okedi Phb, wokedi@uau.ac.ke; okedi@uau.ac.ke</p> <p>Grace f4bubiiia PhD grace.mbulhia@uau.ac.ke</p> |
| Study Sponsor(s) | Self-sponsored |
| Collaborators | N/A |

This Informed Consent Form has the following parts:

- **Information** Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form

This is a study designed to identify rabies prevention practices, the correct lead, and the associated factors among dog owners in Nandi sub-county,

- **Brief description of the purpose of the study.**

level, and the association among dog owners in Nandi sub-county, Kakamega region Kenya. This will be achieved through measuring the level of information on rabies prevention practices in the Nandi sub-county, assessment of dog owners' adherence to rabies prevention practices in Nandi sub-county, and finally classify the factors associated with rabies prevention practices in Nandi sub-county, (Kakamega 'o'P'ty, K'ny).

It is a high rabies area (Italy's control area) in Kenya due to the unrestricted movement of dogs, (Kakamega County, and its neighboring counties of Bungoma, Vihiga, Kisumu, Siaya, and Kisumu, a high rabies area (Italy's control area) in Kenya due to the unrestricted movement of dogs,

Inclusion Criteria

Any family past present and beyond age 18 years old who lives in Nandi region, Kakamega County, and whose part in the study will be included. If all individuals from the family are available, the head of the family will be consulted. If there is no family member beyond 18 years old, or if the head of the family is unavailable, the house nearby will be visited.

Dog owners, household heads, their spouse over the age of 18, who have no mental illness, and who live in Nandi sub-county, Kakamega County, Kenya, will be excluded from the study.

Voluntary participation

Your participation in the study is completely voluntary and you can withdraw from the study at any stage. You are at liberty to refuse to answer any questions you deem inappropriate. The questionnaire will not be identifiable and therefore your identity will not be revealed. The questionnaire will take 30 to 45 minutes.

The study will be carried out with questionnaires and interviews. The questionnaires will include sections on: socio-demographic information, Knowledge factors and rabies prevention practices, and the Dog Owners' Attitudes towards Rabies Control.

How long will the project last?

One year

What are the risks?

There are no risks in participating in the study:

What are the benefits?

There are no direct benefits if you choose to participate. However, the study findings will help in drawing precise recommendations hence detection proposals will be tailored to the study area's needs, furthermore, recommendations will be made to specific stakeholders involved in rabies deterrence such as the county office of health and the regional department of livestock and agriculture.

How will we protect your information and maintain confidentiality?

The information you provide is for research purpose only, will totally be confidential and will not be disclosed whatsoever. Your name will not appear anywhere in the questionnaire.

What will happen with the results?

study results will be displayed in tables, frequencies, ratios and chi square tests.

Can I refuse to participate or withdraw from the study?

In case a participants want to withdraw his/has consent in the study at in point in data collection, there will be no objection to their will: however, in any case if they provided their personal data, the data will be discarded with utmost confidentiality without exposure.

Compensation

There are no compensation benefits attached with the study as it doesn't involve any invasive procedures.

Who can I contact?

Mwima Christopher Ochien'g
Email: christopher.mwima@gmail.com
Phone No: +254702266176

The Research Officer
Amref Health Africa in Kenya
Wilson Airport, Lang'ata Road
Office Tel: +254 20 6994000
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Fax: +254 20 606340
P.O Box 30125-00100
Nairobi, Kenya

Do you have any questions at this time?

Part II: Certificate of Consent

I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to participate in this study.

| | |
|------------------------------|---------------------------------|
| Print name of Subject | [at least forename and surname] |
| Signature of Subject | |
| DD/MM/YYYY | |

If visually impaired, physically impaired, mentally impaired or illiterate

I have witnessed the accurate reading of the Consent Form to the potential study subject, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

| | |
|------------------------------------|--|
| Print Name of Subject | [at least forename and surname] |
| Thumb/Foot print of Subject | |
| Signature of Witness | [A literate witness must sign and should be selected by the study subject and MUST have no connection to the research team.] |
| DD/MM/YYYY | |

Statement by the researcher/person taking consent

I confirm that the study subject was given an opportunity to ask questions about the study, and all the questions asked by the study subject have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the study subject.

| | |
|---|---------------------------------|
| Print Name of researcher/person taking the consent | [at least forename and surname] |
| Signature of researcher/person taking the consent | |
| DD/MM/YYYY | |

Appendix 4: AMREF ESRC Approval Letter



Amref Health Africa in Kenya

REF: AMREF – ESRC P1304/2022

February 2, 2023

Christopher Ochieng
Amref International University
P.O Box 27691-00506
Nairobi, Kenya
Tel: +254702266176/ +254737656039
Email: Christopher.mwima@gmail.com

Dear Christopher Ochieng,

RESEARCH PROTOCOL: RABIES PREVENTION PRACTICES AMONG DOG OWNERS IN MUMIAS SUB-COUNTY, KAKAMEGA COUNTY KENYA

Thank you for submitting your protocol to the Amref Ethics and Scientific Review Committee (ESRC).

This is to inform you that the ESRC has reviewed and approved your protocol. Your application approval number is ESRC P1304/2022. The approval period is from February 2, 2023, to February 1, 2024, and is subject to compliance with the following requirements:

- a) Only approved documents (including informed consents, study instruments, advertising materials, material transfer agreements, etc.) will be used.
- b) All changes including (amendments, deviations, violations, etc.) are submitted for review and approval by Amref ESRC before implementation.
- c) Death and life-threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the Amref ESRC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to Amref ESRC within 72 hours.
- e) Clearance for export of biological specimen must be obtained from the relevant government authorities for each batch of shipment/export.
- f) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- g) In case of late renewal, the Amref ESRC shall not be held responsible for any serious adverse events (SAEs) that may occur as a result of research activities that were carried out after the expiry of approval.
- h) Submission of an executive summary report within 90 days upon completion of the study to the Amref ESRC.
- i) All government regulations for prevention and control of the spread of COVID-19 including social distancing, provision of personal protective equipment for participants and research assistants should be adhered to during data collection. All research assistants should be monitored for COVID 19 symptoms and referred for testing in case they present with symptoms.

Board Members: Mr P Kasimu | Mrs E Mathu | Prof P Kiama | Mrs M Kuyoh | Prof Z Qureshi | Prof J Wang'ombe | Dr D Soti | Dr G Gitahi

P O Box 30125-00100 Nairobi, Tel: +254 (0)20 699 4000, Fax: +254 (0)20 699 2531. www.amref.org

Winner of the
Gates Award
for Global Health



Prirrr to cummezsciny your study, you will be exposed co obtain a researc4\ licerise from National Wnmms•uon ttYr •icincoc, Technology and 1nooyan an ACOSTE) <https://research-portal.nacosti.ug.ke>

Please du not hcaitato ro cun I khe ñ5ItC Go:retariat fesrc.kenya@amref.org for cny clarificscion or



Prof. Samuel Muhula
Chair, Amref Health Africa
CC: Samuel Muhula, Senior Manager, Learning and Impact Amref Health Africa




Board Members: Mr P.Kasimū | Mrs E. Mathu | Prof. P.Kama | Mrs M. Kuyoh | Prof. Z. Qureshi | Prof. J. Wang'ombe | Dr. D. Soti | Dr. G. Gitahi

Winner of the
Gates Award
FOR THE BEST

Appendix 5: NACOSTI Approval Letter

Republic of Kenya
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION
Date of Issue: 07/March/2023

RESEARCH LICENSE




This is to Certify that Mr. **CHRISTOPHER OCHIENG MWIMA** of Amref International University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kakamega on the topic: **RABIES PREVENTION PRACTICES AMONG DOG OWNERS IN MUMIAS SUB-COUNTY, KAKAMEGA COUNTY KENYA for the period ending : 07/March/2024.**

License No: **NACOSTI/P/23/23679**

Applicant Identification Number: **336215**

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code



NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

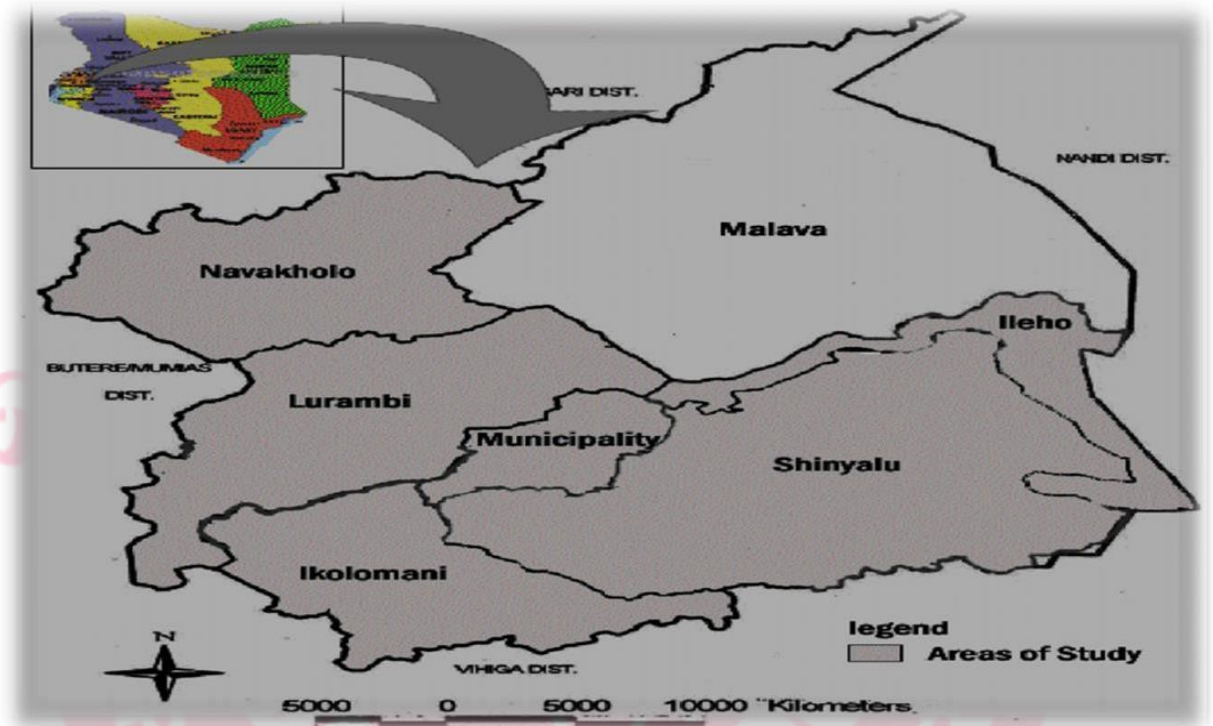
CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
 - i. Endanger national security
 - ii. Adversely affect the lives of Kenyans
 - iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
 - iv. Result in exploitation of intellectual property rights of communities in Kenya
 - v. Adversely affect the environment
 - vi. Adversely affect the rights of communities
 - vii. Endanger public safety and national cohesion
 - viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

LASTING

Appendix 6: Map of the Study Area



Appendix 7: Similarity Report

Thesis Report Document 2024 april 77.doc

ORIG MTY REPORT

2. SIMILARITY INDEX 11« INTERNET SOURCES 3« PUBLICATIONS 3« STUDENT PAPERS

PRIMARY SOURCES

| | | |
|---|---|-----|
| 1 | ir.jkuat.ac.ke Internet Source | 2« |
| 2 | ir.mu.ac.ke:8080 Internet Source | 1« |
| 3 | erepository.uonbi.ac.ke:8080 Internet Source | 1« |
| 4 | erepository.uonbi.ac.ke Internet Source | <1« |
| 5 | eprints.usm.my Internet Source | <1« |
| 6 | animaldiseases.biomedcentral.com Internet Source | <1% |
| 7 | library.kisiiuniversity.ac.ke:8080 Internet Source | <1« |
| 8 | elibrary.buse.ac.zw:8080 Internet Source | <1« |
| 9 | Submitted to Mount Kenya University Student Paper | <1« |

Appendix 8: Progress of Publication

