

**CHARACTERISTICS OF ANIMAL BITE VICTIMS
PRESENTING FOR ANTIRABIES POST-EXPOSURE
PROPHYLAXIS VACCINE IN MACHAKOS LEVEL FIVE
HOSPITAL, KENYA**

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**Characteristics of Animal Bite Victims Presenting for Antirabies Post-
Exposure Prophylaxis Vaccine in Machakos Level Five Hospital,
Kenya**

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**A thesis submitted in partial fulfillment for the Degree of Master of
Science in Epidemiology in the Jomo Kenyatta University of
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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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This thesis has been submitted for examination with my approval as university supervisors:

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DEDICATION

I dedicate this work to my family members Mr. and Mrs. Gichohi and my son Jason who have been very supportive through the whole period of my studies. They have always been morally, socially and financially supportive to me. They also taught me to be patient and ambitious to achieve my goals.

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ABBREVIATIONS AND ACRONYMS

CHWs	Community Health Extension Workers
CME	Continuous Medical Education
DPHN	District Public Health Nurse
DPHO	District Public Health Officer
DVSK	Department of Veterinary Services Kabete
ERC	Ethics and Research Committee
ERIG	Equine rabies Immunoglobulin
FAT	Fluorescent Antibody Test
HRIG	Human Rabies Immunoglobulin
KEMRI	Kenya Medical Research Institute
KNH	Kenyatta National Hospital
MKS L5	Machakos Level Five Hospital
MOPHS	Ministry of Public Health and Sanitation
PEP	Post-Exposure Prophylaxis
SPSS	Statistical Package for Social Sciences
UON	University of Nairobi
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Accessibility: It is the degree to which anti-rabies post exposure prophylaxis vaccine services are available to animal bite victims.

Availability: It refers to the presence of anti-rabies post exposure prophylaxis vaccine.

Knowledge: It is the ability to be conscious of rabies and its preventive measures

Prophylaxis: It is the prevention of rabies disease or control of its possible spread by protective measures.

Rabid: Affected by rabies, raging or uncontrollable animal.

ABSTRACT

Rabies is a viral disease that affects the central nervous system. It affects both animals (animal rabies) and man (human rabies). Human rabies is present in all continents except Antarctica. It is a zoonotic disease transmitted through rabid bites, scratches, infectious saliva getting into contact with an open mucous membrane or break into the skin. Rabies control in Kenya has been hampered by the high cost and scarce supplies of potent vaccines. In Machakos County, human rabies has been endemic for over 40 years with stray dogs increasing in number day in day out and consequently leading to an increase in animal bite victims. The main objective of the study was to determine the characteristics of animal bite victims presenting for antirabies post-exposure prophylaxis vaccine in Machakos Level Five Hospital, Kenya. The study employed both qualitative and quantitative methods of data collection. A Cross sectional design was used for the quantitative study while in depth interviews were used for the qualitative aspect. Data was collected by use of questionnaires, physical examination sheet and key informant interview. The study population was victims of animal bites who revisited the health facility for the scheduled post exposure prophylaxis vaccine. Random Sampling was used to select the revisiting animal bite victims until a sample size of 243 was achieved. Purposive sampling was used to select health care workers directly involved in management of animal bite victims. A physical examination of the bite was also done to determine the nature and extent of the wound. Quantitative data was analyzed using SPSS Version 20 and excel computer programs. Qualitative data was analyzed by content analysis. Ethical clearance was granted by the Kenyatta National Hospital/ University of Nairobi Ethics Research Committee and permission to conduct the study in Machakos Level 5 Hospital was received from the Medical Superintendent. Permission to use an audio recorder during in depth interviews was sought from the respondents. Data was coded and had no names for confidentiality purposes. According to this study, knowledge of rabies significantly affects the presentation for antirabies post exposure prophylaxis vaccine. At least 48.50% of the respondents admitted that they had no knowledge of rabies and 75% had no knowledge of prevention of rabies. The results also indicate that only 4.4% of the respondents said that the health workers get in contact with them to check on completion of the antirabies post-exposure prophylaxis vaccine schedule. This shows low follow up measures are in place. In conclusion, the overall knowledge of anti-rabies post exposure prophylaxis vaccine and the follow-up of victims to check on the completion of the anti-rabies post exposure prophylaxis vaccine schedule among animal bite victims in Machakos Level Five Hospital is low, thus a major public health concern both to the community and the county government. The study recommends that Machakos county government put more resources into raising the awareness and knowledge on rabies and its prevention in the County.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Rabies is a viral disease that affects the central nervous system. It affects both animals (animal rabies) and man (human rabies) (Cohen & Powderly, 2004). Human rabies is a highly fatal viral infection characterized by encephalitis. It is a zoonotic disease transmitted through rabid bites, scratches, infectious saliva getting into contact with an open mucous membrane or break into the skin. It has an incubation period of 3-12 weeks though it varies and can take up to seven years in rare cases. Rabies virus has its reservoir in dogs, cats and bats with dogs being the major reservoir and hence source of the vast majority of human rabies deaths (Willoughby *et al.*, 2005).

Human rabies is classified as either furious (non-paralytic) rabies or paralytic rabies. Victims of furious rabies are hyperactive and with erratic behaviour. They have hallucinations, hydrophobia and hyper salivation. Paralytic rabies is characterized by restlessness, fatigue and fever, followed by convulsions, and laryngospasms. This makes the patient also develop aerophobia, hydrophobia and concurrent change of behaviour. Death often occurs due to paralysis and suffocation within ten days (Kakkar *et al.*, 2012). According to WHO (2010), thirty percent of rabies cases are paralytic. Human rabies is present in all continents except Antarctica but 95% of human deaths occur in Asia and Africa (WHO, 2010). It occurs in more than 150 countries and more than 55,000 people die of human rabies each year in Africa and Asia. Africa accounts for 24,000 deaths annually. In Kenya, the first recorded human case was from a woman in western Kenya around Lake Victoria basin in 1928. It is more prevalent in the rural areas than the urban areas since most people in the rural areas are oblivious of the complications associated with the disease. It's also attributed to the social attachment to the local dogs kept and regarded as pets by the youth. Dogs are also important as part of security in the rural areas thus present in almost every homestead. Unfortunately, few or

none of these dogs are vaccinated against rabies since most people are not aware of the seriousness of the disease (ITDG, 1996).

There exists a post-exposure prophylaxis against the disease for human beings as well as vaccination for susceptible domestic animals. For PEP, WHO recommends six shots of the vaccine within 28 days in which five are of the inactivated rabies vaccine and one is the rabies immunoglobulin. However, this is not feasible in the developing countries due to cost and availability. This makes rabies more common in low income generating countries as compared to the high income generating countries due to vaccination of domesticated animals and people in high risk occupations in these high income generating countries. They include vets, health workers and forest service men (Rupprecht *et al.*, 2006).

Poor people are at a higher risk as the average cost of rabies post-exposure prophylaxis after contact with a suspected rabid animal is US\$40 in Africa and US\$49 in Asia. This makes it a financial burden to the governments of the developing countries (Knobel *et al.*, 2005).

Animal rabies causes deterioration of the brain and they become aggressive. This makes them bite more animals and human beings thus transmitting the disease. Most affected animals are cat and dogs. The disease has three stages in animals which include a prodromal behavioural stage that lasts for one to three days. The second stage is the furious excitement stage lasting between three to four days. The third stage is the paralytic stage caused by damage to motor neurons. It is characterized by hyper salivation and respiratory arrest leading to death (Cohen & Powderly, 2004).

1.2 Statement of the Problem

It is estimated that up to 2,000 human deaths due to rabies occur annually in Kenya (WHO, 2014). In addition to human mortality, the economic burden attributable to rabies is significant. At the household level, costs of post-exposure prophylaxis (PEP)

arise directly from anti-rabies vaccines and indirectly from costs associated with travel, medical fees and income loss. In Kenya, the direct medical cost associated with a complete regime of PEP is estimated at \$85 per person. Poor households face difficulties paying for PEP, which results in considerable financial hardship and substantial delays or failure in PEP delivery (Ministry of Health and Ministry of Agriculture, Livestock and Fisheries Zoonotic Disease Unit, 2014). Evidence from the study conducted in Machakos showed that the annual incidence of rabies in humans was 2.5 per 100,000 people. Findings from a study in Tanzania determined the incidence of human rabies at 5 per 100,000 (Cleaveland, Fevre, Kaare & Coleman, 2012). Extrapolating figures from these studies, the annual incidence of human rabies is estimated to be in the range of 1,000 to 2,000 in Kenya, which are underestimated by the existing surveillance system by at least 200 times.

Despite the domestication of dogs in the then Machakos District, human rabies has been endemic for over 40 years with stray dogs increasing in number and are a health hazard to the human population. There is also a great drop out of the bitten victims from the post exposure prophylaxis and a poor follow up of such victims by the relevant departments hence increasing the risk of acquiring the disease. It is also evident that the last study on rabies and animal bites in Machakos County was carried out back in the years 1993 and 1994 despite the fact that rabies is a major public health concern. Its poor prognosis is attributed to the irrevocable damage severed by nerve cells. This is an indicator of a research gap regarding the same (Kitala, 1993).

1.3 Justification of the Study

Rabies is a neglected disease whose deaths are rarely reported. It is common in remote rural communities where measures to prevent dog to human transmission have not been implemented. There is also under reporting of the disease in these areas which prevents mobilization of resources from the various funding organizations (Nyongesa, 2013). This study is crucial since there is no available epidemiologic data that is required to convince policy makers in the country on the importance of rabies as a public health

issue. The study findings would bring out information on demographic data and presenting factors of animal bite victims which are a prerequisite for the proper planning and execution of feasible rabies control programs. This will inform the Machakos County Government, veterinary department and the Ministry of Health on the need for appropriate policy making and interventions.

The findings of the study will also be availed to the general population through sensitization health messages by the health professionals during community outreach programs. This will enhance complete adherence to the scheduled antirabies post exposure prophylaxis by animal bite victims. It will cut on cost and reduce time wastage by the Department of Public Health through reduction of follow up home visits. It will also reduce the prevalence of rabies especially for future animal bite victims due to creation of awareness on severity of the disease through health messages by health professionals.

1.4 Research Questions

- 1) What is the level of knowledge to anti-rabies post exposure prophylaxis vaccine among animal bite victims in Machakos Level Five Hospital?
- 2) Which affordability and accessibility factors are associated with presentation for anti-rabies post exposure prophylaxis vaccine among animal bite victims in Machakos Level Five Hospital?
- 3) What are the follow up measures instituted at facility level that promote presentation for anti-rabies post exposure prophylaxis vaccine among animal bite victims in Machakos Level Five Hospital?

1.5 Main objective

To determine the characteristics of animal bite victims presenting for antirabies post-exposure prophylaxis vaccine in Machakos Level Five Hospital, Kenya.

1.5.1 Specific objectives

- 1) To determine the level of knowledge on anti-rabies post exposure prophylaxis vaccine among animal bite victims in Machakos Level Five Hospital.
- 2) To determine the affordability and accessibility factors associated with presentation for anti-rabies post exposure prophylaxis vaccine among animal bite victims in Machakos Level Five Hospital.
- 3) To establish follow up measures instituted at facility level that promote presentation for anti-rabies post exposure prophylaxis vaccine in Machakos Level Five Hospital

CHAPTER TWO

LITERATURE REVIEW

2.1 Rabies Morbidity and Mortality

The full scale of the global burden of human rabies is unknown, owing to inadequate surveillance of this fatal disease. However, the terror of hydrophobia, a cardinal symptom of rabies encephalitis, is suffered by tens of thousands of people each year. The recent discovery of enzootic European bat *lyssavirus* infection in the UK is indicative of our expanding awareness of the *Lyssavirus* genus. The main mammalian vector species vary geographically, so the health problems created by the *lyssaviruses* and their management differ throughout the world. The methods by which these neurotropic viruses hijack neurophysiological mechanisms while evading immune surveillance is beginning to be unraveled by, for example, studies of molecular motor transport systems. Meanwhile, enormous challenges remain in the control of animal rabies and the provision of accessible, appropriate human prophylaxis worldwide (Warrell & Warrell, 2015).

One of the approaches to understanding the scale of human deaths due to rabies is the use of decision tree models. This methodology was developed by Cleaveland and Hampson (2017) using active rabies surveillance data in Tanzania. The model is designed based on a series of probability steps using the distribution of bite injury on different body parts and the probability of developing rabies. This decision tree model has been used by the WHO to estimate human deaths from rabies in Africa and Asia overall. It has also been used in Uganda to estimate human rabies deaths using passive surveillance dog bite data.

2.2 Rabies in Kenya

According to Deressa, Getahun, Bogale, Sefir, Haile, Akililu and Kassa (2015), the total number of human rabies deaths in Kenya confirmed by laboratory tests was 2 in 2010, 1

in 2011 and 1 in 2012. The total number of human rabies deaths diagnosed on clinical grounds only in 2010, 2011 and 2012 were not recorded. The total number of people bitten by dogs recorded as animal bites was 38,944 in 2010: 133,150 in 2011 and 146,362 in 2012. The confirmed rabies cases were referrals from health facilities yet records from the health facilities have no recorded cases of rabies diagnosis. Thus this shows the under-reporting of the human rabies cases in Kenya.

In case of animal rabies, official recorded figures of laboratory confirmed cases provide an indication and not a true extent of animal rabies occurrence in Kenya. This is attributed mainly to: non-presentation/or reporting of suspected cases, non-availability of local district diagnostic facilities, arrival of specimens at the diagnostic laboratories in a state of decomposition that no diagnosis can be made, as well as, general lack of awareness amongst the public (Gitta, Mwesiga & Kamadjeu, 2015). From reviews on rabies early history, Kenya experienced varying degrees of animal rabies epidemics between 1900 and 1969. No cases were recorded in years 1917-27, 1930, 1956, 1959, 1961, 1964 and 1966 - 67. There were one to five cases between 1912-16, 1928, 1929, 1931 and 1937-39. Outbreaks went up to sixteen to twenty in 1933-35, 1947-48, and 1951. In 1932, 1945, and 1950 and during the emergency period 1952-54, twenty one to twenty five cases were recorded. The figures went up, twenty six to thirty in 1946 and thirty one to thirty five in 1941 and 1949. Between 1970 and 1975, there was relative quiet marked with low and stable incidence. This picture changed between 1975 and 1978 when there was an epidemic with an average of 103 cases per year and then a brief decline period from 1978 to 1979 (Chong, 2013).

However, from 1980's onwards, the country experienced a dramatic rise, peaking at 290 cases in 1987. From 1983 to 1992, the case incidence has remained high, averaging 216.3 cases per year confirmed at Kabete, representing a ten year (1983-1992) average of 58.19 percent positive cases per year (Kitala, McDermott, Kyule & Gathuma, 2013).

Animal rabies has been widespread in the country over the last ten years. To date, all the eight provinces have at least had rabies. Generally, the number of districts with positive

cases has ranged from seventeen to twenty nine. Eastern, Rift Valley, Central and Nairobi Provinces contributed slightly over ninety five percent of total rabies cases over 1983 - 1992 periods. The highest Incidence was in Machakos in Eastern, followed by Nairobi, then Nakuru in Rift Valley, Nyeri and Kiambu in Central, and, Kericho in Rift Valley in that order, contributing nearly seventy two percent of the outbreaks. There has been no laboratory confirmed rabies recorded in Garissa and Mandera in North Eastern, and, Lamu and Tana River in Coast Provinces (Muriuki, 2016).

The fact that rabies appears to be widespread in the country seems to be confirmed by the wide distribution in many species in which it has been confirmed. The disease incidence is very high in the dog (62.83%) followed by livestock (cattle, sheep and goats) (28.39%), cat (3.19%), wildlife (2.82%), and other domestic stock (pig, horse and donkey) (2.04%). The human cases (0.74% confirmed may not portray a complete picture, given that many cases are diagnosed in human hospitals and still a number go unreported or unconfirmed at our laboratories (Chong', 2013).

2.3 Rabies in Machakos County

Surveillance studies on the disease by Kitale, McDermott, Kyule, and Matere (2013) during the period 1981-1990 in Machakos County, indicates that the study had 8027 people bitten by dogs and 4947 of them received PEP and 22 died of rabies. 505 confirmed cases of animal rabies were also reported by the Machakos district veterinary department during the same period.

This is an indication of the situation in the district and not a precision since most of the cases are unreported. It also demonstrated the central role played by dogs in maintenance and transmission of the disease in the county.92% of rabid suspect animals and 81% confirmed animals were dogs. Also, 97% of the human animal bite cases were due to dogs. Therefore the high incidence of rabies in the county is due to a high dog density and minimal dog control which have a low vaccination rate (Kitale *et al.*, 2013).

2.4 Classification of Suspected Rabid Animal Bites

Animal bite wounds from rabies suspects are classified into three categories and this determines their management. (a) The first category refers to victims of touch or licks on intact skin who are hence not eligible for PEP. (b) The second category refers to victims of minor scratches, abrasions without bleeding who are hence eligible for PEP. (c) Category three refers to victims of single or multiple transdermal bites, licks on broken skin and contamination of mucous membranes with saliva from licks. These victims require immediate vaccination of rabies immunoglobulin (Liu, Wang, Liu, Gong, Mkandawire & Shi, 2017).

Assessment of risk is done depending on whether the biting animal is wild or domesticated, has abnormal behavior or not, the bite was unprovoked and also whether the animal had been vaccinated. The consequences of dog bites to humans are many. The most common is the direct physical injury. Sometimes the injury may cause permanent disfigurement of the victims requiring reconstructive surgery, psychological trauma and posttraumatic stress where as others can be fatal (Rothe, Tsokos & Handrick, (2015).

2.5 Rabies Control Measures

World Health Organization (WHO) estimates the threshold vaccination coverage for rabies eradication in dog populations at about 70% based on empirical evidence? Rabies vaccination campaigns in rural Africa have resulted in reductions in cases of rabies in dog populations by 70%. There is need for increased vaccination coverage of dogs to reduce rabies transmission among the susceptible animals and humans. Human rabies is close to elimination due to vaccination of domestic dogs and other control measures implemented in industrialized countries. Mass vaccination of dogs and widespread immunization of humans has significantly reduced the number of human deaths from rabies globally (WHO, 2010).

Currently four control methods are in use. These are vaccination targeted mainly at dogs, destruction of stray dogs, restriction of dog movement and pre-exposure and post-exposure immunization of humans. The main target of control measures is the dog population. Unfortunately, dog population dynamics and exact figures are little known and/or understood, hence the percentage vaccination coverage is difficult to gauge. This is indeed a big setback in the successful control of the disease (Leung & Davis, 2017).

There is a pre-exposure prophylaxis for those who professionally handle potentially infected animals, those who work with rabies virus in laboratories and those who live at special risk in rabies endemic areas. Children visiting rabies-affected areas are most at risk.

Protection is afforded by intramuscular doses of 1ml Or 0.5ml to given on days 0,7,21 or 28 on the deltoid region for adults and anterolateral region of the thigh for children below two years. Alternatively, an intra-dermal injection of 0.1 ml human diploid cell strain vaccine can also be given on days 0,7,21 or 28.Booster doses are also available for individuals whose occupation puts them at continual risk of exposure. If available, antibody monitoring is preferred to booster doses. Antibody testing should be a routine check after every six months for people working in high exposure laboratories. Veterinarians and animal health officers should have a serological monitoring every two years (WHO, 2010).

In post exposure prophylaxis, the wounds should be thoroughly cleaned, with soap where by damaged tissues should be excised and the wound left unsutured. Rabies can usually be prevented if started within a day or two of biting. One dose of the vaccine should be administered on days 0, 3,7,14 and 28 as an intramuscular injection of 0.5mls on the deltoid muscle. In case of children the injection should be into the anterolateral area of the thigh muscle. Vaccine should never be administered in the gluteal region as this can induce an acute immune reaction. Intradermal multisite regimens have also been developed in order to reduce the cost of post exposure treatment and are in use in Thailand and Sri Lanka (WHO, 2010). Unfortunately, the latter is not available in

Kenya, but intramuscular injections are administered instead. The purified Vero cell rabies is used in Kenya since it is affordable to procure. Immunoglobulins are acceptable in Kenya though in the recent years they have not been procured due to cost implications (MOPHS, 2012).

2.6 Access Factors Influencing Presentation for Antirabies PEP

The difference between human rabies and other infections is that the development of clinical disease can be prevented through timely immunization even after exposure to the infecting agent. WHO estimates that 272,000 people would die annually from rabies in Africa and Asia in the absence of post-exposure prophylaxis (WHO, 2010).

A study carried out in the United States on rabies post exposure prophylaxis revealed that there are relatively significant rate of errors in its use. It also identified that it is only through effective dealing with domestic animals that are linked to animal bites appeared to be the most appropriate way of reducing the PEP cost (Mpolya, Lembo, Lushasi, Mancy, Mbunda, Makungu & Meslin, 2017). There are disparities in the accessibility and affordability of PEP treatment resulting in a skewed distribution of the disease burden across society, with the major impact falling on those living in poor rural communities, in particular children (Gsell, Knobel, Cleaveland, Kazwala, Vounatsou & Zinsstag, 2017).

The human population boom in Africa appears to correlate well with the increase in the number of domestic dogs. Nevertheless, by conservative estimates, the prevalence of human rabies is considered to be under-reported. The underreporting is largely attributed to poor surveillance systems and people's tendency not to report human and animal cases of rabies. Therefore, there has been poor planning resulting in poor availability and inappropriate administration of post-exposure prophylaxis as well as delays in administration. Although not as frequent as the inability to afford treatment, such scenarios have built a false picture of health facilities, as well as poor compliance with PEP regimen (Kurosawa, Tojinbara, Kadowaki, Hampson, Yamada & Makita, 2017).

Other reasons given for not reporting, completing or adhering to PEP include poor awareness about the danger of the disease, small size of the injury, reluctance of the dog owner to pay for treatment costs, and not being advised to take PEP (Khazaei, Rezaeian, Soheylizad & Gholamaliece, 2014).

According to Dimple, Doibale, Sonkar, Aswar, Khadilkar and Jain (2015), rabies is a neglected disease in many developing countries though the preventive tools are known. There is need for more funding, for study of dog population-control measures, and for sustainable canine immunization. Safe and effective tissue-culture rabies vaccines and human and equine rabies immunoglobulin (HRIG and ERIG) are not readily available in many regions where rabies is endemic. This and the continuing presence and spread of rabies have increased the risk for travelers, who cannot rely on being able to receive optimal post exposure treatment in many parts of the world. Alternatives to HRIG or ERIG are not available.

A study done by virologists from Africa, USA and France reported that the rabies virus circulating in western and central Africa is from a common ancestor introduced into the continent about 200 years ago probably by European colonialists. Within this common species there are subspecies at each country level which only circulate between localities. Their study analyses showed that there were two types of the rabies virus in Africa namely Africa 1 and Africa 2 with different geographical distribution. Therefore, by identifying the species of the virus that is most prevalent and how it spreads through Africa, it will be possible for African countries to control the disease by use of the appropriate vaccine. This implies that collaboration amongst neighboring countries is a progressive strategy to eliminate rabies from sub-Saharan Africa (Talbi *et al.*, 2009).

2.7 Follow up Measures and KAP of Healthcare Workers

According to World Health Organization (2018), any animal bite or direct contact with suspicious rabid animal reported requires that the animal be confined for ten days and the victim involved commenced on treatment and follow up. The owner should also

provide proof that the animal is adequately vaccinated against rabies. If not vaccinated it should be done immediately after the confinement period is over. The victim involved should also be commenced on antirabies PEP immediately. Follow up care is also crucial in the case of animal bite wounds, to ensure that the infection is diminishing or has not developed. It is also important to follow up animal bite victims who are on PEP vaccine to ensure adherence to the regimen and avoid resistance to the active drug ingredient.

Knowledge and actual practice in rabies prophylaxis differ in practice and are not adequate even among animal bite clinic physicians. It has been shown that knowledge is not always applied to actual practice, thus risking lives. Efforts to correct this dangerous situation must focus on better understanding of animals transmitting rabies, WHO categorization of bite wounds, principles of animal bite management, intradermal use of vaccination to save costs, dosage and correct use of RIG, management of re-exposed patients and pre-exposure prophylaxis where indicated. This can be done through continued medical education (CME) programs, seminars, conferences, workshops, technical films, hands on training, etc. Physicians should understand and follow WHO guidelines and we must work towards bringing about uniformity in pre- and post-exposure rabies management (Ravish *et al.*, 2013).

2.8 Rabies Diagnosis

Human and animal Rabies diagnoses are done by the basis of clinical signs, history and laboratory confirmation. Investigation of animal bites requires that each situation be handled on an individual basis with the investigating authority exercising discretion on the extent to which each investigation should be carried out. It is only necessary to determine whether or not the biting animal was rabid (or its mouth or claws were contaminated with rabies virus) at the time the bite was inflicted. If rabies can be ruled out there is no need to carry out further investigation. Animal bite investigation requires trained personnel and knowledgeable supervisory personnel who can exercise a high

degree of discretion in review and direction of field investigations (Duong, Tarantola, Ong, Mey, Choeung, Ly & Buchy, 2016).

Human cases of rabies in Kenya are suspected through clinical grounds only due to lack of capacity at the health facilities. Confirmatory tests are done at central veterinary laboratories and CDC through a postmortem whereby the standard diagnostic technique is searching for the rabies virus antigen in brain tissue by fluorescent antibody test (FAT). A rapid tissue culture isolation test may also be used as well. More recently, a direct immune-histochemical test to detect rabies virus antigen in frozen or glycerol-preserved brain samples has been shown to be 100% sensitive and specific compared to FAT (MOPHS, 2012).

In case of suspicion of animal rabies, the initial investigation should be made as soon as possible after receipt of a bite report, preferably at once and no later than the next day, for the purpose of checking on present health status of the biting animal, placement of, the animal in isolation (quarantine) if appropriate and obtaining history on the bite incident and biting animal. In some instances it will not be possible to obtain all the information desired during the first investigation; however, the investigator should determine as much information as possible (Brown, Conti, Ettestad, Leslie, Sorhag & Sun, 2014).

Laboratory confirmation for animal rabies is carried out at the Central Veterinary Research Laboratories, Kabete and Mariakani Regional Veterinary Investigation Laboratory. However, for disease security and documentation purposes, other laboratory based animal rabies work is done at Kabete. It is also done in other Regional Laboratories at Eldoret, Kericho, Karatina and Nakuru. This is in order to cut down the long distances samples have to travel as well as easing other transport associated problems (Mucheru, 2015).

Diagnostic tests for animal rabies in use are Fluorescent Antibody Test (FAT), mouse inoculation test (MIT), polymerase chain reaction (PCR) and histopathology. MIT is done on all cases that test negative on both FAT and histopathology. Tissue culture is at the moment being adopted using neuroblastoma cells. Attempts have also been made at using BHK21 cells. Diagnostic capability has been greatly hampered by inadequate operational funds to run the services though the Central Veterinary Research Laboratories and the Regional Laboratory have been able to provide rabies diagnostic services, whenever called upon (MOPHS, 2012).

2.9 Conceptual Framework

INDEPENDENT VARIABLE

DEPENDENT VARIABLE

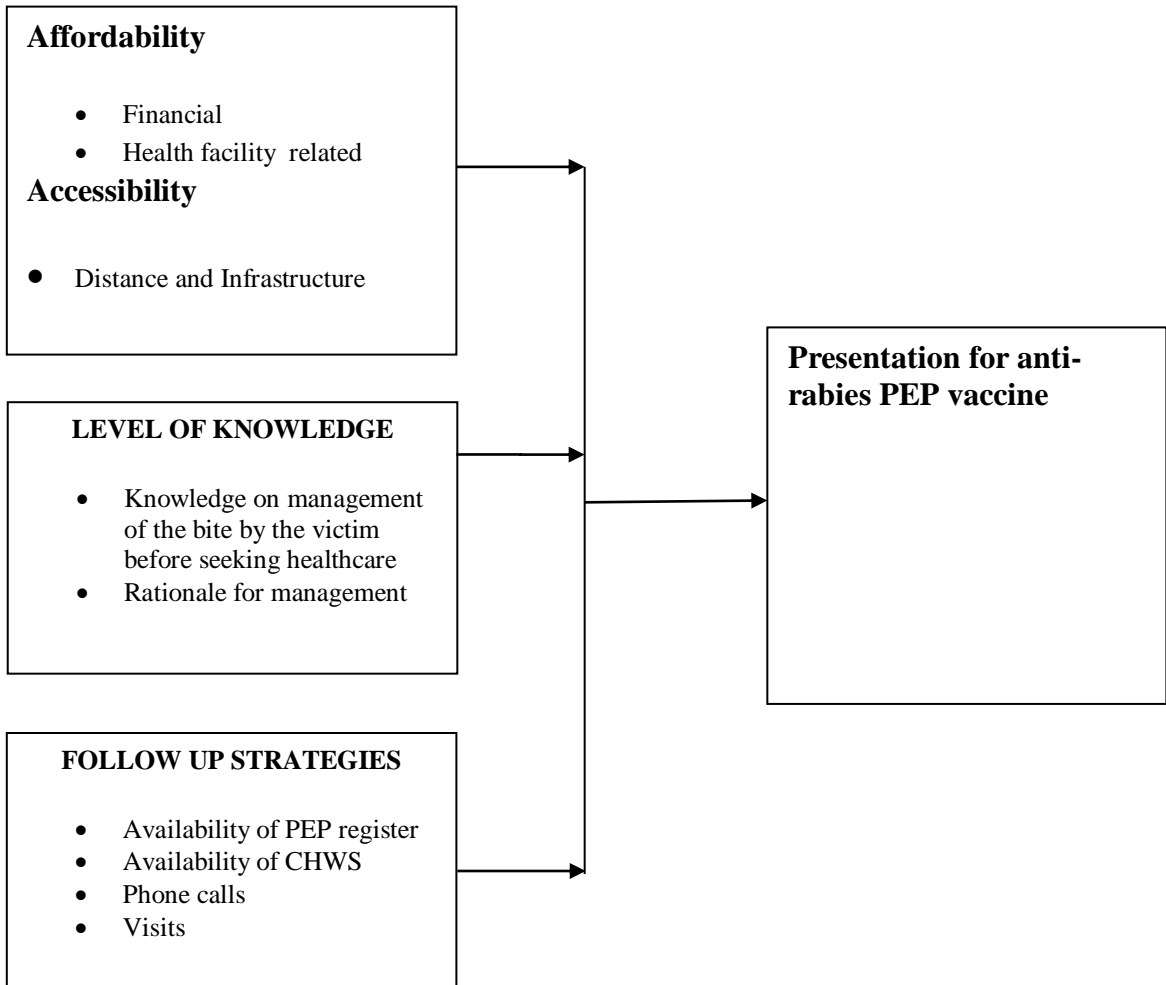


Figure 2.1: Conceptual Framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study site

The study was carried out in Machakos County at Machakos Level Five Hospital (MKS L5) at the division of vaccine and immunization where anti-rabies PEP is administered. The county has human population of approximately 1,098,584 people (2009 census). It has a hilly terrain with a land mass covering 669.70 Km². Most of the County is semi-arid. It, however, has high potential areas where a mixed crop livestock production system is practiced. The hierarchical administrative structure of the county, from the smallest, includes sub-districts, divisions, locations and sub locations. Machakos County has eight constituencies: Machakos Town, Masinga, Matungulu, Mavoko, Mwala, Kangundo, Kathiani and Yatta. It has 320 health facilities with 1678 health workers (Kenya Directory of Health Facilities, 2017)

MKS L5 is a referral hospital to all those health facilities below this tier in the Kenyan health care system. It serves approximately 200,000 patients annually (MOPHS, 2012). It is a referral facility to Kitui, Makueni and Mwingi counties. The health facility serves an average of 6 animal bite victims daily both new and revisiting victims. It receives antirabies vaccines from the Division of Vaccines and Immunization located in Nairobi depending on the availability of the vaccine (Machakos Level Five Hospital Health Records, 2013).

3.2 Study design

This was a cross sectional study which utilized both qualitative and quantitative methods. Data was collected from the animal bite victims when revisiting the facility for the scheduled PEP vaccine by use of questionnaires. A physical examination of the victims' animal bite site was done and documented as shown in the attached physical examination

sheet. Data from health care workers was collected at their station of work by use of key informant interviews.

3.3 Study population

The study was carried out amongst victims of animal bites who revisited the health facility for the scheduled PEP vaccine. It also included health care workers who were directly involved in the management of animal bite victims in MKS L5.

3.3.1 Inclusion criteria:

1. All victims of suspected rabid bites who revisited the facility for PEP vaccine in at MKS L5 Hospital.
2. Animal bite victims who consented or assented to take part in the study

3.3.2 Exclusion criteria:

1. Minors below 18 years who were not accompanied by their parents or guardians for consent to the study
2. Animal bite victims who did not consent or assent to take part in the study

3.4 Sample size determination

The sample size was determined using the formula by Fisher *et al.* (1998) and an assumed prevalence rate of animal bite victims in Machakos at 50% (WHO, 2018). The sample size was calculated as follows:

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

Where:

n = Sample size for large population

Z = Normal distribution Z value score, (1.96)

p = prevalence rate for animal bite victims

d = Precision level desired or the significance level which is 0.06 for the study

Hence, the sample size for the study is 267. However, since the population was less than 10,000, another formula was used to adjust the sample size further.

$$n_0 = n / (1 + ((n - 1) / N))$$

$$n_0 = 267 / (1 + ((267 - 1) / 2695))$$

$n_0 =$ 243 Desired sample size (66.39% of the target population)

$n =$ 267 Sample size when population is more than ten thousand

$N =$ 2695 Total population size

Hence, the sample size for this study was 243 victims.

3.5 Sampling procedure

The sampling frame entailed all animal bite victims who were expected to revisit the health facility for antirabies vaccine from category two to category five during the period of study, May, June, July, August and September 2015. The sampling frame consisted of 2695 victims. A list of the expected revisiting animal bite victims was made from the existing rabies registry and a random selection done from the list until a sample size of 243 respondents was achieved. In order to cater for non-attendance or

non-response, a replacement allowance of less than 5% was set for this study where convenient sampling was used to select/replace the victims

Purposive sampling was used to select health care workers directly involved in administering PEP services to the bite victims for key informant interviews. The process continued until a sample size of three was achieved and saturation of information attained.

3.6 Data Collection

It entailed the use of questionnaires administered to the animal bite victims. The main issues captured in the questionnaire included socio-demographic characteristics, type of animal that bit them, knowledge on rabies and follow up of the animal bite victims by health care workers.

Key informant interviews using an interview guide, were also used to gather information from health care workers who were directly involved in managing animal bite victims. The information gathered included follow up strategies instituted by the health facility, supply of antirabies vaccines to the health facility and challenges encountered during follow up of patients. The researcher moderated the interviews and tape recorded them whereas one research assistant took notes of the proceedings as a backup.

A physical examination was also done on the animal bite victim so as to determine the extent and nature of the wound. This was scored and reported as demonstrated in the attached physical examination sheet (Appendix V).

3.7 Data management

Information gathered during key informant interviews was audio recorded using a digital voice recorder. This information was then stored into the computer and secured by use of a password. Quantitative data was then stored under lock and key for confidentiality

purposes and later entered into the computer using MS Access software. This data was backed up using a hard disk.

Data from the questionnaires and physical examination sheet was analyzed using SPSS version 20.0 statistical software. Exploratory data techniques were employed at the initial stage of analysis to uncover the structure of data and identify outliers or unusual entered values.

Univariate analysis: Descriptive statistics such as proportions was used to summarize categorical variables while measures of central tendency such as mean, standard deviation, and range for continuous variables were used to summarize quantitative data.

Data from the key informant interviews was transcribed, translated into English (where applicable), analysed manually using themes developed from the study objectives and guide (thematic analysis). Results were then presented in verbatim.

3.8 Variables

Level of Knowledge

1. The animal bite victim was assessed on the management of the wound and the rationale for doing so as to determine their level of knowledge.

Factors associated with presentation for anti-rabies PEP vaccine

1. Distance and infrastructure. These will influence accessibility to the health facility depending on how close or far the facility is as well as availability of the means of transport. It includes geographical features that influence accessibility to the vaccine.
2. Financial status. It refers to the affordability of the vaccine to the animal bite victim and this will also affect presentation of the victim for the regimen.
3. Demographic characteristics such as age of the respondents

Follow up strategies

1. Availability of PEP registers. This was used to determine the existence of follow up measures of the animal bite victims by the healthcare workers.
2. Existence of community health workers who follow up animal bite victims was also determined.
3. Making of phone calls or any home visits to the animal bite victims was also sought.

3.9 Ethical considerations

The proposal was submitted to KNH/UON Ethical Research Committee for approval. Permission was sought from Machakos Level Five Medical superintendent to obtain data from the animal bite victims and health care workers. Respondents were also informed about the use of an audio recorder for data collection before consenting to the study. Data was coded and had no names for confidentiality purposes. Respondents above 18 years were requested to sign an informed consent form. Written consent for minors below 18 years accompanied by their parents or guardians was sought from their parents or guardians while as those ones unaccompanied were excluded from the study.

3.10 Limitations and assumptions

A number of limitations such as the inability to collect data from unaccompanied minors below eighteen years were experienced. The study had several assumptions mainly: the sample size was adequate enough since the prevalence rate used to determine the latter is an assumption and also that the respondents gave correct information.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic Characteristics of the Respondents

This section consists of information that describes the background characteristics namely the sex distribution of animal-bite victims and age of respondents.

4.1.1 Distribution of Animal-Bite Victims by sex in Machakos Level five Hospital

A total of 243 respondents were enrolled into this study and males were 139(57%) while females were 104(43%) as shown in Table 4.1.

Table 4.1: Distribution of Animal-Bite Victims by sex in Machakos Level 5 Hospital

Gender	Frequency	Percentage
Male	139	57%
Female	104	43%
Total	243	100%

4.1.2 Age of Respondents

The age of the participants ranged between less than 18 years to 60 years with a mean age of 38.5 years. Respondents who were under 18 and accompanied by their parents and consented to the study and who were the most were 29.4%. The category that had the least was age 49-60 who were represented by 9.6%. Inspections and tabulations from the physical examination sheet for the bite also found a similar number of respondents for each of the age category.

Table 4.2: Distribution of Animal Bite Victims by age in Machakos Level 5 Hospital

Age	Frequency	Percentage
Under 18	72	29.40%
18-28	55	22.70%
29-38	56	23%
39-48	37	15.30%
49-60	23	9.60%

4.2 Level of knowledge on Rabies

The level of knowledge on rabies among animal bite victims in MKS L5 Hospital was found to be 78% for inadequate knowledge while those with adequate knowledge were 22% as shown in Table 4.3.

Table 4.3: Distribution of the Level of Knowledge of Animal Bite Victims

Level of Knowledge	Frequency	Percentage
Adequate knowledge	53	22%
Inadequate knowledge	190	78%
Total	243	100%

4.3 Factors Associated With Presentation for Anti-Rabies PEP Vaccine

4.3.1 Knowledge on the Anti-Rabies PEP Vaccine

Results in Table 4.4 indicate that at least 48.5% of the respondents admitted to have no knowledge of rabies and 75% had no knowledge of prevention of rabies. On management of the wound before visiting a health centre, at least 47.1% of the respondents agreed that they cleaned the wound. The respondents who knew whether the animal that bit them was vaccinated were 19.1%.

Table 4.4: Knowledge on Rabies and its Prevention

Variable	Frequency			Percentage (%)		
	Yes	No	Don't Know	Yes	No	Don't Know
Knowledge of rabies	125	118	-	51.50	48.50	-
Knowledge of prevention of rabies	61	182	-	25.00	75.00	-
Cleaning the wound immediately before visiting a health center.	114	129		47.1	52.9	
Knowledge of whether the animal was vaccinated	46	122	75	19.1	50.0	30.9

Nineteen point one percent (19.1) of the respondents said that vaccination of animal bite victim and early treatment of animal bites are the preventive measures of rabies while majority (30.9%) said that vaccination of the animal bite victim is the only preventive measure.

Table 4.5: Knowledge on Preventive Measures of Rabies

Knowledge on Preventive measures of rabies	Frequency	Percentage (%)
Vaccination of animal	71	29.40
Vaccination of animal bite victim	75	30.90
Early treatment of animal bites	50	20.60
All of the above	47	19.10
Total	243	100

Majority of the respondents (36.8%) sought medical care within a day of being bitten while at least 27.9% seek medical attention immediately they are bitten. Majority of the respondents (60.3%) said that they were bitten by a dog, 32.35% said they were bitten by a cat, and only 7.4% by a monkey.

Table 4.6: Knowledge on Rabies and its Prevention

Time taken before seeking medical care after the bite	Frequency	Percentage (%)
Immediately	68	27.90
Within a day	89	36.80
After a day	86	35.30
Total	243	100

Tabulations of the findings from the physical examination sheet represented in Table 4.7 showed that most (60%) of the respondents were bitten on the leg and only 9% were bitten on the hand. The physical examination sheet for bite examination also showed that Category I (Low risk) bite were 13% being the least while Category II (Moderate risk) 62% were the majority Most (29%) of the respondents who had been bitten were aged below 18 years while those aged 49-60 years were the least 11%. Of those bitten and vaccinated, majority (87%) were not healed while 13% were healed.

Table 4.7: Physical Examination Sheet Summary Tabulations

Physical Examination	Gender		Total	Percentage
	Male	Female		
Anatomical site of bite				
Leg	99	47	146	60
Buttocks	32	43	75	31
Hand	9	13	22	9
Total	140	103	243	100
Category of Bite(WHO classification)				
Category I(Low risk)	7	25	32	13
Category II(Moderate risk)	89	61	150	62
Category III(High risk)	43	18	61	25
Total	139	104	243	100
Age				
Under 18	50	21	71	29
18-28	32	22	54	22
29-38	25	32	57	23
39-48	25	11	36	15
49-60	7	18	25	11
Total	139	104	243	100

4.3.2 Factors associated with presentation for anti-rabies PEP vaccine

Results in Table 4.8 shows that 50% of the respondents said that the distance to health facility was far (approximately between one and three kilometers) and only 16.2% said it is close (approximately less than one kilometer). The main means of transport to the health facilities is vehicle (36.7%) and motorcycle (32.4%) while 30.9% walk to the health facility. Majority of the respondents (57.4%) buy the anti-rabies PEP vaccine and 42.6% obtain it for free. Sixty nine point one (69.1%) of them stated that the cost is not affordable while 30.9% believe that the cost of anti-rabies PEP vaccine is affordable.

Table 4.8: Assessment of Presentation Factors among Animal Bite Victims

Distance of the health facility	Frequency	Percentage (%)
Very far(approximately more than three kilometers)	82	33.80%
Far (approximately between one and three kilometers)	122	50.00%
Close (approximately less than one kilometer)	39	16.20%
Means of transport to the health facility		
Motorcycle	79	32.40%
Walking	75	30.90%
Vehicle	89	36.70%
How vaccine was acquired		
Free	104	42.60%
Bought	139	57.40%
Affordability of the cost of PEP Vaccine		
Not Affordable	168	69.10%
Affordable	75	30.90%
Plans to complete scheduled vaccination		
No	96	39.70%
Yes	147	60.30%

4.3.3 Follow up Measures Instituted to Promote Presentation for Anti-Rabies PEP Vaccine

The results in Table 4.9 indicate that once attended to, only 4.4% of the respondents said that the health workers got in contact with them to check on completion of the schedule. Majority (95.6%) of the respondents reported that no healthcare worker got in contact with them as a reminder of the next vaccine.

Table 4.9: Follow up of Animal Bite Victims by the Health Care Workers

Did healthcare worker get in contact as a reminder of next vaccines	Frequency	Percentage (%)
No	11	4.40%
Yes	232	95.60%
Total	243	100

4.4 Summary of Qualitative Results

These were the results obtained by content analysis of the responses given by the healthcare workers who were interviewed. The results were consistent with the results reported by quantitative analysis of the data obtained from the questionnaires. The key theme was highlighted from the interview and the main responses by the health care workers interviewed were presented in direct speech as they were responding.

Themes	Main Responses
Preferential treatment given to animal bite victims who cannot afford to purchase the required anti rabies drug at your facility.	“Those victims who are not able to purchase the drugs are assisted in a way. Sometimes the hospital management tries to offer the vaccine to them free of charge. Though that comes after long consultations because it’s not easy to access the drugs”.
Follow up strategies put in place by the hospital to ensure that animal bite victims complete the scheduled antirabies vaccine.	“At the moment I haven’t heard of them. You see we have a lot of work. And since the victims are so many, it becomes hard to do a follow up. In the last meeting we had, the management wants to set up some strategies”. “Currently it has been a challenge. The number of community health workers we have are few. That poses a challenge in the follow up strategies. What I normally see happen for now is a situation where a nurse can just decide to follow up by phone out of their own will,” Senior Nurse, 16 years of experience.
Challenges encountered in following up animal bite victims.	“Many of the victims keep moving from place to place and majority of them go to towns. So it becomes hard to follow up with such people and know whether they are in tune to complete the vaccination. We are also under staffed. The few of us are already over worked, I mean, how can we also add

	<p>more duties of doing follow-ups?”</p> <p>“As much as we would like to go out there (if accorded the resources) and do a follow up on the victims, it becomes hard because of poor terrain. The roads are bad. This is one of the biggest challenges that make the process very hard to be accomplished.”</p>
<p>Availability of an updated rabies register in Machakos level five hospital</p>	<p>“Yes. There is one where we write the names of all the victims who come to seek medical attention after being bitten. That helps us to know the next schedules we have with them”.</p>
<p>Annual supply of antirabies vaccine by the government in quantity and frequency.</p>	<p>“I can’t give accurate details on that because most of the allocations are discussed at board meetings which am not a member”</p> <p>“It is inconsistent and I therefore can’t give the actual amount”</p>
<p>Demand and supply of antirabies vaccine at the facility</p>	<p>“For the last five years I have served here, I can confidently say that antirabies PEP vaccine is not adequate and this makes it hard to follow up animal bite victims empty handed. We need enough vaccines so that we can follow them up. The demand of antirabies PEP vaccine is higher than its supply”</p>

CHAPTER FIVE

DISCUSSION

5.1 Demographic Characteristics

A total of 243 respondents were enrolled into this study and males were 139 (57%) while females were 104(43%).The age of the participants ranged up to 59 years with a mean age of 38.5 years. Under 18 years old respondents who were accompanied by their parents who consented to the study were 29.4%. Further, the least (9.6%) were in the 49-60 category. The fact that more males are affected can be attributed to the fact that they spend time in the field herding cattle and cultivating hence a higher likely encounter with animals as compared to ladies. Under 18 years old respondents were also most affected due to the fact that children are more playful with pets especially dogs than adults. The results agree with those of Dhand, Gyeltshen, Firestone, Zangmo, Dema, Gyeltshen and Ward, (2011) who found that there were significant gender and age differences in bite incidents; males and the children are affected the most. Further, Ghosh, Chowdhury, Haider, Bhowmik, Rana, Marma and Ahmed's (2016) study revealed that male children of less than 15 years of age were the most common victims of dog bite.

5.2 Level of Knowledge on Antirabies PEP Vaccine among Animal Bite Victims in MKS L5 Hospital

The study sought to determine the level of knowledge on antirabies PEP vaccine among animal bite victims in MKS L5 Hospital. The level of knowledge to anti-rabies PEP vaccine among animal bite victims in MKS L5 Hospital was found to be inadequate. Those respondents with inadequate level were 78% (190) while those with adequate level were 22% (53). Inadequate knowledge as presented by the findings may be attributed to low level of education and high level of illiteracy. Alexis and Chritie (2007) conducted a study on social and cultural factors related to health in South America and

found that, social factors such as education and literacy influence awareness and health outcomes.

The Ministry of Health (2014) states that some of the Kenya Health Policy 2014-2015 objectives require the County Governments to promote democracy and accountability in the delivery of health care (MOH, 2014). It is meant to further foster a flawless service delivery during and after the transition period, facilitate powers of independence to the citizens, and improve their participation in decision-making matters dealing with their health. The county government is also required to recognize the right of its county communities to manage their health affairs, protect, and promote the health interests of the special groups. This cannot be achieved if the health awareness is low. The indication of low level of awareness might indicate that the county government of Machakos has not done enough to raise the level of awareness.

Machakos County recently introduced community health workers in Kivaa Sub location of Masinga Sub County. The county government introduced 62 CHWs, community health extension workers employed by the Ministry of Health and a community health committee in the sub location to help out with health matters of the community. The level of rabies awareness is still low despite the county government assigning a CHW for every 20 households. This might imply that the programmes being run by the county government have not gained ground in the whole county or even rabies awareness is not a task assigned to the CHWS.

Another implication is that other health hazards are prioritized in the expenditure allocation and rabies awareness remains neglected.

Ghosh, Chowdhury, Haider, Bhowmik, Rana, Marma and Ahmed (2016) in their study found that although there was a high level of awareness regarding rabies and its prevention, more than half of the dog bites victims first sought treatment from traditional healers. Kumar and Sinha (2016) established that poor knowledge and practice regarding

management of dog-bite cases was one of the causes for higher incidences of rabies in India.

5.3 Factors associated with Presentation for Anti-Rabies PEP vaccine among animal bite victims in MKS L5 Hospital

The study also sought to determine factors associated with presentation for anti-rabies PEP vaccine among animal bite victims in MKS L5 Hospital. Results indicate that among the factors associated with presentation for anti-rabies PEP vaccine is knowledge. At least 51.5% (125) had adequate knowledge of rabies. 75% (182) of all the respondents had no knowledge of prevention of rabies. Majority (30.9%, 75) said that vaccination of the animal bite victim is the only preventive measure.

These results are in line with the results reported by WHO (1999) which stated that among the reasons given for not reporting, completing or presenting to PEP include inadequate knowledge about the danger of the disease and not being advised to take PEP. Majority 52.9% (129) of the respondents agreed that they did not clean the wound before visiting a health facility. Majority of the respondents (36.8%) seek medical care within a day of being bitten. The respondents who are aware of the vaccination status of the biting animals are 50% (122).

The results indicated that 50% (122) of all the respondents said that the distance to health facility was far (1- 3Kms). The main means of transport to the health facilities is vehicle (36.8%). Majority of the respondents (57.4%, 139) buy the anti-rabies PEP vaccine. Sixty nine point one 69.10% (168) of all the respondents believe that the cost is not affordable to everyone. Affordability is a factor that affects presentation for antirabies vaccine by animal bite victims. The results found from this study are consistent with the results from a study by Knobel *et al.* (2005) which established that there are disparities in the accessibility and affordability of PEP treatment resulting in a skewed distribution of the disease burden across society, with the major impact falling on those living in poor rural communities. Similar reports were reported by MOPHS (2012) who stated

that rabies control in Kenya has been hampered by the high cost and scarce supplies of high quality vaccines. The quantity of antirabies PEP vaccine supplied to the health facilities is insufficient to meet the increasing demand of animal bite victims. Clients are therefore forced to purchase the vaccine at an exorbitant price or miss out the PEP due to financial constraints.

Abubakar, Van Baar, Fischer, Bomu, Gona and Newton (2013) conducted a study on socio-cultural determinants of health-seeking behaviour on the Kenyan coast. They observed that many Kenyans in the rural setting would prefer to go to the hospital for care if the treatment was free. They prefer to spend money at a traditional healer than going to hospital because they were not sure whether the hospital has the correct medicine/treatment. The cultural background of the people of Ukambani entails belief in the traditional medicine. The claim is further supported by WHO (2002) report on traditional medicine which states that, at least 80% of people in Africa use traditional medicine at some point in their lives. Parents opt for one of the forms of treatment between traditional and bio medical and if this does not appear to be working, they opt for the other.

Affordability is another factor that affects presentation of animal bite victims for the prescribed anti rabies vaccine. Affordability of vaccine might be attributed to high levels of poverty as Ukambani is a hardship area as Mbogoh (1991) as cited in (McNicoll, 1996) put it, rural residents of Machakos County report frequent crop failures and water shortages, and food relief has become a permanent feature of rural life.

5.4 The Proportion of Animal Bite Victims Followed Up for Anti-Rabies PEP Vaccine in MKS L5 Hospital

The study also sought to determine the proportion of animal bite victims that was followed up for anti-rabies PEP vaccine in MKS L5 Hospital. According to the study, only 4.4% of the respondents said that the health workers get in contact with them to check on completion of the schedule. Majority (95.6%) of the respondents reported that

no healthcare worker gets in contact with them as a reminder of the next vaccine. Responses from the key informant interviews, as cited below, also backed up the qualitative results that no follow up measures are in place. One respondent observed;

“At the moment I haven’t heard of them. You see we have a lot of work. And since the victims are so many, it becomes hard to do a follow up. In the last meeting we had, the management wants to set up some strategies,” KI, Senior Nurse, 16 years of experience.

The results are consistent with the results reported by a study conducted by Kitale *et al.* (1993) in Machakos District, Kenya which reported that there is a great drop out of the bitten victims from the post exposure prophylaxis and a poor follow up of such victims by the relevant departments hence increasing the risk of acquiring the disease. The results from qualitative analysis also revealed the same findings. The qualitative study responses indicated that the challenges facing the processing of follow up are; Rural-urban migration , inadequate drugs , poor infrastructures, Lack of patient’s background and availability of less number of community health workers (CHWS).

“Currently it has been a challenge. The number of community health workers we have are few. That poses a challenge in the follow up strategies. What I normally see happen for now is a situation where a nurse can just decide to follow up by phone out of their own will,” KI, Senior Nurse, 16 years of experience.

Dillip, Alba, Mshana , Hetzel and Lengeler (2012) stated that inadequate financial resources and an under-resourced health care system contribute to delay in accessing medical facilities. These two cardinal factors only partially explain the observed trends in low uptake of optimal treatment patterns. As is the case in Machakos, low adherence and uptake of anti-rabies vaccine can be attributed to lack of follow up patterns as a result of inadequate resources in the hospital. This sentiment was aptly captured by one respondent;

“For the last five years I have been serving here, drugs have been inadequate and this makes it very difficult to follow up patients empty handed. We need enough drugs in order to do proper patient follow up,” Senior Public Health Officer, 5years of experience. .

Only 6.9 % of roads in Machakos County are paved and only 26.9 % of the roads are considered to be good roads. That explains why accessibility is a problem. The terrain is rough and roads are not up to standards required (World Bank, 2014). The bad roads hinder follow up activities .One of the responses captures this problem as cited by one of the respondents:

“As much as we would like to go out there (if accorded the resources) and do a follow up on the victims, it becomes hard because of poor terrain. The roads are bad. This is one of the biggest challenges that make the process very hard to be accomplished,” KII, Junior Nurse, 4 years of experience.

Machakos County government has an efficient ambulance service and mobile clinics that serves all the members of the county. This is in a bid to improve the follow up strategies in the county. The county government has initiated a program that aims at constructing dispensaries across the county in order to take the health care services closer to the people. That is a bid to reduce the distance when seeking medical attention. The County Governor has also initiated an upgrade of Machakos Level Five Hospital by introducing new services such as renal dialysis services and a modern Intensive Care Unit. Machakos County government has invested over Kshs. 400 million in the health sector to upgrade and build new dispensaries and increase the awareness on health matters in the County (Kibui *et al.*, 2015).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The study concluded that the overall knowledge of anti-rabies PEP vaccine among animal bite victims in MKS L5 Hospital was low. The follow-up of victims to check on the completion of the anti-rabies PEP vaccine schedule and also the management of wounds before visiting health facilities among animal bite victims in MKS L5 Hospital was low.

The study also concluded that there are few health centers in the County which can help in managing animal bite victims against rabies. This is because majority of the respondents admitted to covering a large distance before reaching Machakos L5 hospital. Since the findings reveal that majority of the respondents wait for longer periods of time before being attended to, the study concludes that service provision at Machakos level5 hospital is poor. An emergency case of rabies needs a faster medication attention. The study also concluded that the cost of anti-rabies PEP is not affordable among the community members of Machakos County. Another conclusion from the study is that there is a low rate of rabies victim's follow-up to check on completion of the anti-rabies PEP vaccine schedule. These results also imply that the efforts to improve healthcare access in Africa cannot ignore traditional health systems. It seems as if the biomedical and traditional systems compete at a decision-making level within families, rather than publically competing against each other. Parents opt for one of the forms of treatment and if this does not appear to be working, they opt for the other.

6.2 Recommendations

6.2.1 Action Recommendations

The study recommends that the National Government put more resources into raising the awareness and knowledge on rabies and its prevention in Machakos County. Among the awareness campaigns, awareness on management of wound by the victims should be included. The county government should also ensure that its community members are well informed on health matters to be able to promote their health interests and affairs well. In a decision to increase awareness, the County and National government should also incorporate traditional healers in the process. For example, they should provide an incentive for a traditional healer who refers serious cases to hospital.

The study also recommends that the County Government of Machakos work together with the hospital management to come up with strategies which would lead to increased vaccination coverage of dogs to reduce rabies transmission among the susceptible animals and humans. Mass vaccination of dogs and widespread immunization of humans has significantly reduced the number of human deaths from rabies globally. This is because the study found out that most rabies is caused by dog bites.

The study also recommends that the County government of Machakos and administration of Machakos level five Hospital come up with strategies of giving preferential treatment to animal bite victims who cannot afford to purchase the required anti-rabies drug. This is because majority of the victims cannot afford the vaccine. The County government of Machakos should increase the amount devoted to free prescription of the Vaccine and also subsidize the cost further more than the current subsidy.

The study also recommends that Machakos County government and Machakos level five hospital reach an agreement to hire more community health workers who would help carry out with the follow up process on rabies victims' to make sure that the completion of the anti-rabies PEP vaccine schedule is done.

6.2.2 Recommendations for Further Research

The study recommended that similar studies can be conducted in various other hospitals in other counties facing the same challenge. A study should also be conducted to investigate the effectiveness of the follow up measures instituted at facility level to promote adherence to anti-rabies PEP vaccine in MKS L5 Hospital in accomplishing this objective.

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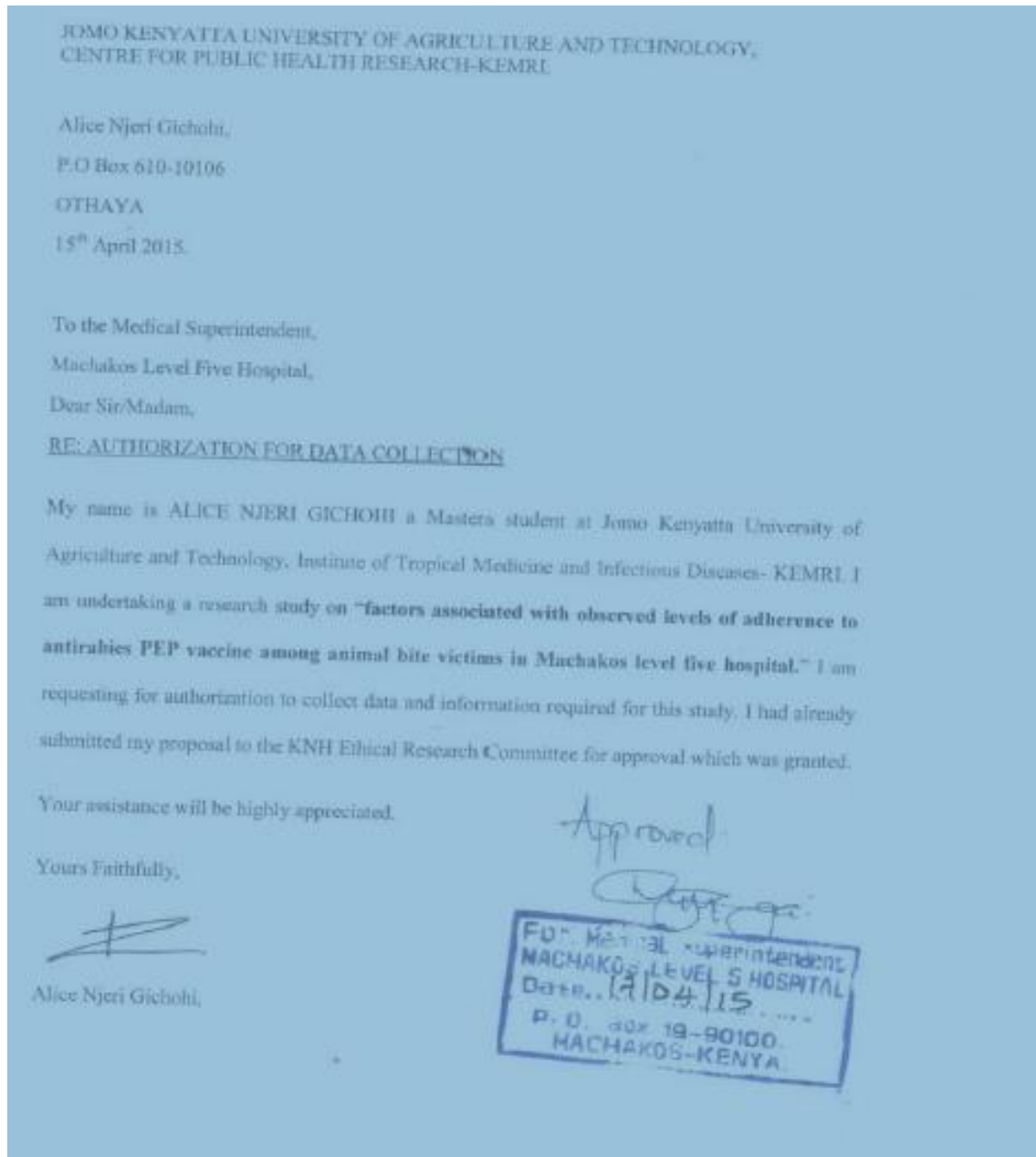
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APPENDICES

Appendix I: Authorization Letter for Collecting Data



Appendix II: Animal Bite Victim Informed Consent Form

TITLE: CHARACTERISTICS OF ANIMAL BITE VICTIMS PRESENTING FOR ANTIRABIES POST-EXPOSURE PROPHYLAXIS VACCINE IN MACHAKOS LEVEL FIVE HOSPITAL, KENYA

PRINCIPAL INVESTIGATOR

Name: ALICE NJERI GICHOHI (ITROMID, KEMRI)

RESEARCH SUPERVISORS

1. **Name:** PROF. PETER MWANIKI

Jomo Kenyatta University of Agriculture and Technology

2. **Name:** Dr. YERI KOMBE

Institute of tropical medicine and infectious Diseases (KEMRI)

INTRODUCTION

My name is ALICE NJERI GICHOHI a Masters student at Jomo Kenyatta University of Agriculture and Technology, Institute of Tropical Medicine and Infectious Diseases-KEMRI. I am undertaking a research study on characteristics of animal bite victims presenting for antirabies post-exposure prophylaxis vaccine in Machakos level five hospital, Kenya. I would be very grateful if you would assist me by allowing me to collect data from you.

WHY IS THE STUDY BEING DONE?

This research aims at investigating factors associated with presentation for antirabies PEP vaccine among animal bite victims in Machakos level five hospital. The results of this study will be given to Machakos level five hospital and the District Health Management Team who will take the necessary action depending on the outcomes. The

study will therefore be of benefit to the hospital and will further aid in policy formulation within the health sector of the government of Kenya.

WHAT IS INVOLVED IN THE STUDY?

The study will involve identifying animal bite victims in Machakos level five hospital for data collection and also collecting the relevant information from health care workers in Machakos Level Five Hospital. It will entail the use of an audio recorder to collect information from the respondent.

HOW LONG WILL I BE IN THE STUDY?

Five months

WHAT ARE THE RISKS OF THE STUDY?

No risks involved.

WHAT ARE THE BENEFITS OF TAKING PART IN THE STUDY?

There are no direct benefits to the individual but to the health sector at large since the study will elicit relevant recommendations regarding animal bites and take appropriate measures. It will also raise awareness of rabies disease within relevant stakeholders for control and prevention strategies.

WHAT ABOUT CONFIDENTIALITY?

All the information obtained will be strictly confidential and data password protected only accessed by the Principal investigator, records belonging to the victims will be kept nameless, being identified only by specific numbers assigned by the principal investigator.

WHAT ARE THE COSTS?

There will be no costs involved.

SUMMARY OF YOUR RIGHTS AS A PARTICIPANT IN A RESEARCH STUDY

This study is absolutely voluntary, subjects will be free to withdraw from the study and will not be penalized in any way, and subjects will not also be waiving any of their legal rights by signing this informed consent document.

CONTACT INFORMATION

The following persons will be available for contact in the event of any research related questions, comments or complaints.

Principal Investigator:

ALICE NJERI GICHOHI (ITROMID, KEMRI)-0727022047

Research Supervisors:

1. **Name:** PROF. PETER MWANIKI

Jomo Kenyatta University of Agriculture and Technology
(0722 429 596)

2. **Name:** Dr. YERI KOMBE

Institute of tropical medicine and infectious Diseases (KEMRI)
(0734 257 864)

SUBJECT'S PERMISSION

I have read the Consent Form and conditions of this thesis. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent.

CONSENT FOR DATA COLLECTION GIVEN **YES** **NO**

PLEASE TICK ONE BOX ONLY

Signature

Date

SIGNATURE OF PERSON OBTAINING CONSENT.....

DATE.....

PRINTED NAME OF PERSON OBTAINING CONSENT

.....

(Must be the principal investigator or individual who has been designated in the checklist to obtain consent)

SIGNATURE OF PRINCIPAL INVESTIGATOR DATE.....

(Affirming subject's eligibility for the study and that informed consent has been obtained)

KARATASI YA KUFHAMISHA IDHINI KUTOKA KWA MSHIRIKI.

KICHWA: Sababu zinazofanya wagonjwa wanaopewa chanjo dhidi ya ugonjwa wa kichaa cha mbwa kupata huduma hii inavyopendekezwa baada ya kuumwa na wanyama wenye kueneza ugonjwa huu katika Hospitali kuu ya kaunti ya Machakos.

WACHUNGUZI:

MCHUNGUZI MKUU

Jina: ALICE NJERI GICHOHI

(Chuo Kikuu cha Jomo Kenyatta)

WASAIKIZI

1. Jina: Prof. PETER MWANIKI

(Chuo Kikuu cha Jomo Kenyatta)

(0722 429 596)

2. Jina: Dkt. YERI KOMBE

(KEMRI)

(0734 257 864)

UTANGULIZI

Jina langu ni ALICE NJERI GICHOHI mwanafunzi wa chuo kikuu cha Jomo Kenyatta ninasomea shahada ya pili. Kwa wakati huu ninafanya utafiti wa shahada la pili kwa kuchunguzasababu zinazofanya wagonjwa wanaopewa chanjo dhidi ya ugonjwa wa kichaa cha mbwa kupata huduma hii inavyopendekezwa baada ya kuumwa na wanyama wenye kueneza ugonjwa huu katika Hospitali kuuya kaunti ya Machakos. Uchunguzi huu utaniwezesha kufuzu kwa shahada hili. Ningeshukuru sana kama ungalifurahia kuwa mmoja wa washiriki wangu katika uchunguzi huu.

MADHUMUNI

Uchunguzi huu unachunguza sababu zinazofanya wagonjwa wanaopewa chanjo dhidi ya ugonjwa wa mbwa na kupata huduma hii inavyopendekezwa katika Hospitali kuuya kaunti ya Machakos. Matokeo ya uchunguzi huu yatawasilishwa kwa hospitalikuuya kaunti ya Machakos ambayo itachukua jukumu kufuatiana na matokeo ya utafiti huu kuelimisha na kusaidia wagonjwa na uma kwa njia mbalimbali.

IDADI YA WASHIRIKI

Utafiti huu utahusisha washiriki mia mbili arobaini na tatu. Washiriki watakuwa ni wagonjwa waliosajiriwa kupata chanjo dhidi ya ugonjwa baada ya kuumwa na wanyama wanaoeneza ugonjwa huu. Wahudumu wa afya wanaohusika na wagonjwa wenye kuumwa na wanyama wenye kueneza ugonjwa wa kichaa cha mbwa pia watahusishwa.

NI MUDA GANI NITADUMU KWA UCHUNGUZI?

Uchunguzi huu utachukua muda wa miezi mitano

MADHARA

Hakuna madhara yoyote ya kuhusika katika huu uchunguzi.

FAIDA

Hakuna faida yoyote ya binafsi mshiriki atakayopata ila tu majibu ya utafiti huu yatatumiwa, baada ya idhini ya mshiriki, kuelimisha na kusaidia uma.

SIRI YA HALI YAKO

Majibu ya utafiti huu yatawekwa kwa siri kuu. Mchunguzi mkuu ndiye pekee atakua na idhini. Hakuna jina litakalochapishwa popote wakati hata baada ya uchunguzi kukamilika. Washiriki watajulikana kwa nambari za siri zitakazopeanwa na mchunguzi mkuu.

GHARAMA

Hakuna ada au gharama yoyote mshiriki atatozwa katika uchunguzi huu.

MUHKTASARI JUU YA HAKI ZAKO KAMA MSHIRIKI WA UCHUNGUZI?

Huu uchunguzi ni wa hiari na mshiriki anaweza kujiondoa wakati wowote na hatahujumwa haki zake kwa kutia kidole kwenye stakabathi hii.

HABARI/ MAWASILIANO

Maswali yoyote kuhusu uchunguzi huu yanastahili kuelekezwa kwa wafuatao:

Mchunguzi Mkuu

ALICE NJERI GICHOHI (Chuo Kikuu cha Jomo Kenyatta) **(0727022047)**

Wasaidizi wa Uchunguzi:

1. Prof. PETER MWANIKI **(0722 429 596)**

(Chuo Kikuu cha Jomo Kenyatta)

2. Dkt. YERI KOMBE **(0734 257 864)**

(KEMRI)

IDHINI YA MSHIRIKI

Nimeisoma fomu hii na masharti ya uchunguzi huu. Maswali yangu yote yamejibiwa na kwa hivyo natoa idhini kwa hiari yangu.

IDHINI

NDIO **LA**

(CHAGUA MOJA)

SAHIHI YA MSHIRIKI.....TAREHE.....

JINALA MSHIRIKI LILILOCHAPISHWA.....TAREHE.....

**SAHIHI YA MTU ANAYECHUKUA IDHINI
TAREHE.....**

JINA LILILOCHAPISHWA LA MTU ANAYECHUKUA IDHINI.....

(Lazima awe mtafiti/mchunguzi ama mtu aliyepewa jukumu la kupewa idhini)

SAHIHI YA MCHUNGUZI MKUU.....TAREHE.....

(Anayethibitisha kuwa mshiriki anafaa kushiriki na kwamba karatasi ya idhini imepatikana)

Appendix III: Health Care Worker Consent Form

TITLE: CHARACTERISTICS OF ANIMAL BITE VICTIMS PRESENTING FOR ANTIRABIES POST-EXPOSURE PROPHYLAXIS VACCINE IN MACHAKOS LEVEL FIVE HOSPITAL, KENYA

PRINCIPAL INVESTIGATOR

1. Name: ALICE NJERI GICHOHI (ITROMID, KEMRI)

RESEARCH SUPERVISORS

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Jomo Kenyatta University of Agriculture and Technology

2. Dr. YERI KOMBE

Institute of tropical medicine and infectious Diseases (KEMRI)

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There are no direct benefits to the individual but to the health sector at large since the study will elicit relevant recommendations regarding animal bites and take appropriate measures. It will also raise awareness of rabies disease within relevant stakeholders for control and prevention strategies.

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There will be no costs involved.

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This study is absolutely voluntary, subjects will be free to withdraw from the study and will not be penalized in any way, and subjects will not also be waiving any of their legal rights by signing this informed consent document.

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ALICE NJERI GICHOHI (ITROMID, KEMRI) (0727 022 047)

Research Supervisors:

1. Prof. PETER MWANIKI (0722 429 596)

Jomo Kenyatta University of Agriculture and Technology

2. Dr. YERI KOMBE (0734 257 864)

Institute of tropical medicine and infectious Diseases (KEMRI)

SUBJECT'S PERMISSION

I have read the Consent Form and conditions of this thesis. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent.

CONSENT FOR DATA COLLECTION GIVEN **YES** **NO**

PLEASE TICK ONE BOX ONLY

Signature

Date

SIGNATURE OF PERSON OBTAINING CONSENT.....DATE.....

PRINTED NAME OF PERSON OBTAINING CONSENT

.....

(Must be the principal investigator or individual who has been designated in the checklist to obtain consent)

SIGNATURE OF PRINCIPAL INVESTIGATOR DATE.....

(Affirming subject's eligibility for the study and that informed consent has been obtained)

Appendix IV: Patient Questionnaire

All questions answered in this questionnaire are strictly confidential and information will be managed strictly in accordance with the research ethics approval for this thesis. After informed consent is obtained, the patient is to complete the 6 page questionnaire with the principal investigator.

A) Socio-demographic data

1. Name
(optional).....

Sex 1) Male

2) Female

2. Age (in years):

3. Exact place of residence.....

B) Assessing Knowledge

5. Do you know of a disease called rabies?

1. Yes

2. No

6. What causes rabies?.....

7. Is the disease preventable? (Please tick appropriately)

1. Yes

2. No

a) If yes, which of the below statements is a preventive measure?

1. Vaccination of rabid animals

2. Vaccination of animal bite victims

3. Early treatment of animal bites

4. All of the above

8. What animal bit you?

1. Dog

2. Cat

3. Monkey

a) If other, please specify.....

9. Did you clean the wound immediately after the animal bite before visiting the health facility? (Please tick appropriately)

1. Yes

2. No

a) If yes, what did you use to clean the wound?

.....

10. How long did you take before seeking medical care in a health facility due to the animal bite? (Please tick appropriately)

1. Immediately

2. Within one day

3. After one day

If other please specify.....

11. Was the animal involved vaccinated against rabies?

1. Yes

2. No

3. Don't know

C) Affordability and Accessibility Factors

12. How far is the health facility from your residence? (Please tick appropriately)

1. Very far (approximately more than three kilometers)

2. Far (approximately between one and three kilometers)

3. Close (approximately less than one kilometer)

13. What is the means of transport from your home to the health facility?

1. Vehicle

2. Motorbike

3. Walking

If other, please specify.....

14. How did you acquire your vaccine? (Please tick appropriately)

1. Free of charge

2. Bought

a) If bought, how much did it cost in total?.....(ksh)

b) Do you consider this affordable to you? (Please tick appropriately)

1. Yes

2. No

D) Follow- up

15. Did any health care provider get into contact with you as a reminder of the remaining vaccines and progress? (Please tick appropriately)

1. Yes

2. No

If yes, what did the health care provider actually do regarding the same?

.....
.....

FOMU YA MASWALI KWA MSHIRIKI ALIYEUMWA NA MNYAMA

KICHWA: Sababu zinazofanya wagonjwa wanaopewa chanjo dhidi ya ugonjwa wa kichaa cha mbwa kupata huduma hii inavyopendekezwa baada ya kuumwa na wanyama wenye kueneza ugonjwa huu katika Hospitali kuu ya kaunti ya Machakos.

Maswali yote yatakayojibiwa kwa fomu hii yatakuwa ni siri na habari zote zitakazo chukuliwa zitahifadhiwa kulingana na taratibu na kanuni zilizowekwa na shirika la utafiti. Baada ya kuitikia ufahamisho wa idhini, mgonjwa atajaza kurasa sita za fomu hii ya maswali na mchunguzi mkuu.

A) Historia ya kijamii ya mgonjwa

1. Jina la mgonjwa (ni hiari).....

2. Jinsia : 1. Mume 2. Mke

3. Miaka/Tarehe ya kuzaliwa:.....

4. Nyumbani:.....

B) Ujuzi wa mgonjwa

5. Je, unajua kuhusu ugonjwa wa kichaa cha mbwa?

1. Ndio

2. La

6. Ugonjwa huu wa kichaa cha mbwa husababishwa na nini?.....

7. Ugonjwa wa kichaa cha mbwa unalo kinga lolote?

1. Ndio

2. La

Kama kunayo kinga yoyote, ni gani baina ya hizi zilizotajwa?

1. Kuchanja wanyama wasababishao ugonjwa wa kichaa cha mbwa dhidi ya ugonjwa

2. Kuchanja wagonjwa wote walioumwa na wanyama wanaoweza kusababisha kichaa cha mbwa dhidi ya ugonjwa huu

3. Kuhudumia wagonjwa walioumwa na wanyama wanaosababisha kichaa cha mbwa haraka iwezekanavyo

4. Yote yaliyotajwa hapa juu

8. Ni mnyama yupi aliyekuuma?

1. Mbwa

2. Paka

3. Nyani

9. Uliosha kidonda kabla ya kwenda kuhudumiwa katika hospitali?

1. Ndio

2. La

Kama uliosha kidonda, ulitumia nini kukiosha?.....

10. Ulienda kutafuta huduma ya afya baada ya muda gani ulipoumwa na mnyama?

1. Punde tu

2. Kabla ya siku moja kupita

3. Baada ya siku moja

11. Mnyama aliyekuuma alikuwa amepata chanjo dhidi ya ugonjwa huu wa mbwa?

1. Ndio

2. La

C) Masuala ya kuzingatia

12. Kituo cha afya ulichoenda kuhudumiwa kiko umbali gani kutoka unakoishi?

1. Mbali sana (takriban zaidi ya kilomita tatu)

2. Mbali (takriban kilomita moja hadi kilomita tatu)

3. Karibu (takriban isiyozidi kilomita moja)

13. Ni njia gani ya usafiri inayotumika kutoka unakoishi hadi kwa kituo cha afya?

1. Gari

2. Pikipiki

3. Kutembea

Ingingine(taja).....

14. Uliweza kupata chanjo dhidi ya ugonjwa wa kichaa cha mbwa kwa njia gani?

1. Kupewa bure

2. Kununua

a) Kama ulinunua, ilikugharimu pesa ngapi kununua chanjo zote?.....

b) Bei uliouziwa ilikuwa ghali kwako ama la?

1. Ndio

2. La

D) Kufuatilia wagonjwa

17. Kuna mhadumu yeyote wa afya aliyewasiliana nawe akitaka kujua unvyoendelea na chanjo zilizopendekezwa?

1. Ndio

2. La

Kama kunaye, ni hatua gani alichukua kutaka kukufuatilia?.....

.....

Appendix V: Physical Examination for the Bite

Name(optional)				
Age				
Sex				
Anatomical site of bite				
Nature of bite Healed <input type="checkbox"/> Not healed <input type="checkbox"/>				
Type of bite	Dog <input type="checkbox"/>	Cat <input type="checkbox"/>	Human <input type="checkbox"/>	Other(specify)
Extent of bite (can tick twice if applicable)	localized <input type="checkbox"/>	Generalized <input type="checkbox"/>	superficial <input type="checkbox"/>	deep <input type="checkbox"/>
Category of bite (WHO classification)	1 <input type="checkbox"/>	11 <input type="checkbox"/>	111 <input type="checkbox"/>	other

Appendix VI: Health Care Worker (Key- Informant) Interview Guide

All details in this guide are strictly confidential and information will be managed strictly in accordance with the research ethics approval for this thesis.

Respondent no.....

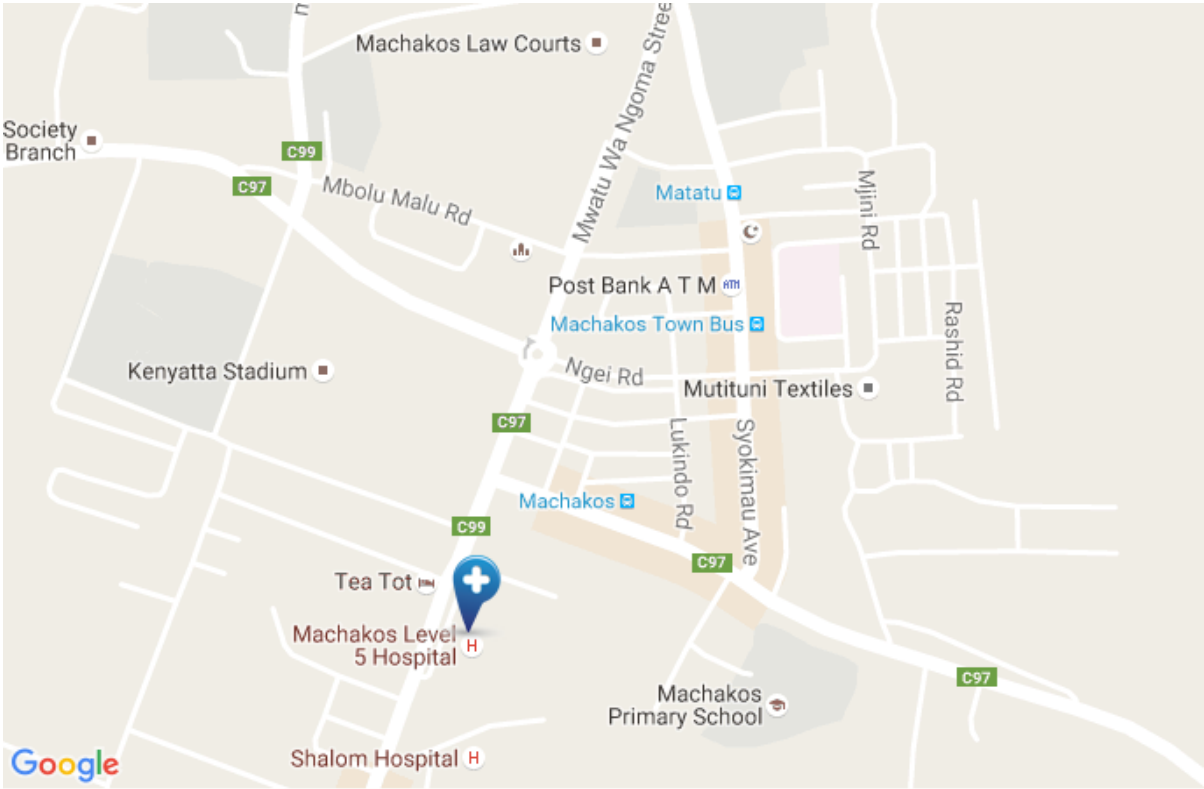
Designation.....

Department.....



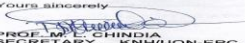
Working experience.....

1. Preferential treatment given to animal bite victims who cannot afford to purchase the required antirabies drug at your facility.
2. Follow up strategies put in place by the hospital to ensure that animal bite victims complete the scheduled antirabies vaccine. Availability of CHWs.
3. Challenges encountered in following up animal bite victims.
4. Availability of an updated rabies register in Machakos level five hospital
5. Annual supply of antirabies vaccine by the government in quantity and frequency.
6. Demand and supply of antirabies vaccine at the facility

Appendix VII: Map of Study Area



Appendix VIII: Ethical Clearance

		
UNIVERSITY OF NAIROBI COLLEGE OF HEALTH SCIENCES P O BOX 19676 Code 00202 Telegrams: varsity (254-020) 2726300 Ext 44355	KNH/UON-ERC Email: uonkah_erc@uonbi.ac.ke Website: www.uonbi.ac.ke	KENYATTA NATIONAL HOSPITAL P O BOX 20723 Code 00202 Tel: 726300-9 Fax: 725272 Telegrams: MEDSUP, Nairobi
Ref: KNH-ERC/A/49		9 th February, 2015
Gichohi Alice Njeri Reg. No. TM-306-0953-2012 JKUAT		
Dear Alice		
Research Proposal: Factors associated with observed levels of adherence to Antirabies PEP Vaccine among animal bite victims in Machakos Level Five Hospital (P648/11/2014)		
This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and approved your above proposal. The approval periods are 9 th February 2015 to 8 th February 2016.		
This approval is subject to compliance with the following requirements:		
<ul style="list-style-type: none">a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC 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 KNH/UoN ERC within 72 hours.e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (<i>Attach a comprehensive progress report to support the renewal</i>).f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.g) Submission of an <i>executive summary</i> report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.		
For more details consult the KNH/UoN ERC website www.erc.uonbi.ac.ke		
Protect to discover		
Yours sincerely  PROF. M. C. CHINDIA SECRETARY, KNH/UON-ERC		
<small>c.c. The Principal, College of Health Sciences, UoN The Deputy Director CS, KNH The Assistant Director, Health Information, KNH The Chairperson, KNH/UoN-ERC Supervisors: Dr. Yen Kombe, Dr. Peter Mwaniki</small>		
Protect to discover		