PERCEIVED RISK FACTORS FOR RIFT VALLEY FEVER IN IJARA DISTRICT OF NORTH EASTERN KENYA

BY

CAROLINE MWIHAKI NGÁNGÁ

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DECLARATION

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

Caroline M Ngángá

Signature…….. Date……

This thesis has been submitted with my approval as the University supervisor.

Dr. Salome Bukachi

Signature…… Date……

DEDICATION

This thesis is dedicated to my daughters Jebichi, Wambui and Kwizera. May you scale the heights of education and learn the values of hard work, perseverance and dedication.

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ABBREVIATIONS AND ACRONYMS

WHO - World Health Organization

KNBS - Kenya National Bureau of Statistics

RVF - Rift Valley Fever

RVFV- Rift Valley Fever Virus

ENSO - El Nino/Southern Oscillation Events

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ABSTRACT

Background: Zoonotic diseases are gaining importance globally and Rift Valley Fever (RVF) is no exception. Outbreaks of RVF have occurred in the North Eastern region of Kenya intermittently and with the potential for spread to other regions in Kenya, regionally and globally. Human behavioral factors have already been identified as central in perpetuating this spread as well as contributing to human infections. This study was aimed at identifying the lay beliefs and perceived risk factors for Rift Valley Fever in Ijara, North Eastern Kenya.

Methods: The study design was cross sectional and descriptive in nature and adopted qualitative methods of data collection. Specifically, focus group discussions, key informant interviews and narratives were used to collect the data. Sixteen people participated as key informants, six in the narratives and eight focus group discussions were conducted, four with men and an equal number with women. The informants were recruited from among community members who are residents of Ijara District. The discussions and interviews were taped, notes taken, transcribed and data analysis was thereafter done thematically. The theory that guided this study was the Health Belief Model.

Results: This study established that the discussants and informants perceived that there was a relationship between unusually heavy rainfall, flooding, mosquitoes and the occurrence of RVF. They also noted that the mosquitoes differed in appearance and believed that the main cause of RVF was the mosquitoes. However, livestock related activities especially consumption of meat and milk from infected animals were not perceived as risk factors for RVF because many people did not get RVF even after consuming meat and milk from ill animals.

Consequently, the study identified that the community engaged in risky activities during the last RVF outbreak. These included residing with livestock, consuming raw milk and meat from sick animals and sleeping outside without the use of mosquito nets. The informants cited various reasons for this which included lack of alternative sources of food, preference for raw milk and offering protection for their animals from the harsh weather and wild animals. The community members indicated that they had been told by government officials that consuming milk and meat products from sick animals were risk factors for RVF. However, they did not believe this to be true and continued with these practices even during the RVF

Conclusion and Recommendations: The local people have some relevant knowledge on RVF but lack sufficient information on the link between their animal husbandry practices and RVF. This study therefore, recommend proper health awareness and education regarding the risk factors for RVF taking into consideration the beliefs and socio economic dynamics of the communities in this region given that they primarily depend on livestock for livelihood.

Policy makers need to develop health messages regarding RVF that take into consideration the community's lay beliefs to counter rumors and misinformation. Concerted efforts by all stakeholders are also needed to provide alternative means of livelihood during and after RVF outbreaks to mitigate against the challenges experienced by these communities. There is need for further in depth studies on community perceptions regarding informal and formal healthcare in the treatment of RVF to provide information that would facilitate timely and effective management of RVF patients through the provision of culturally relevant treatment approaches.

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

This study was aimed at describing the beliefs and perceptions of the communities living in Ijara of Garissa County in North Eastern Kenya regarding Rift Valley Fever (RVF). The study focused on the relationship between the ecosystem, animal husbandry practices and RVF as well as the ways in which RVF affected the communities living in Ijara. This study also investigated the way in which the local communities in Ijara perceived their ecosystem and animal husbandry practices in relation to their acquiring RVF.

Rift Valley Fever is a zoonotic disease first recognized and characterized in the Rift Valley region of Kenya in 1931 (Anyamba *et al*., 2010; Anyangu *et al*., 2010; Martin *et al*., 2008). It affects animals such as cattle, sheep, camels, goats as well as humans (Anyangu *et al*., 2010; Jost *et al*., 2010; Nguku *et al*., 2010). RVF can be transmitted between humans and animals (Taylor *et al*., 2001). Humans acquire RVF infection from bites from infected mosquitoes, exposure to the blood, body fluids and tissues of infected animals as well as inhaling infectious aerosols from body tissues (Anyangu *et al*., 2010). Most infections in humans are asymptomatic and therefore result in no symptoms or in mild illness (Nguku *et al*., 2010). However, a significant number of RVF infected patients develop severe disease which includes hemorrhage, encephalitis, visual disturbances and death (Amwayi *et al*., 2010).

Since the time the disease was recognized, there have been periodic epidemics in various countries mainly in Sub Saharan Africa such as Kenya, Egypt, Somalia, Senegal, Sudan,

Mauritania, South Africa and Zimbabwe (Martin *et al*., 2008; Nguku *et al*., 2010). The most recent RVF outbreak occurred in East Africa in 2006-2007 following heavy rainfall associated with El Nino/ Southern Oscillation (ENSO) events (Anyamba *et al*., 2010; Jost *et a*l., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010). RVF outbreaks often cause devastating consequences on the livelihoods of the communities with many livestock lost as well as morbidity and mortality of humans (Munyua *et al*., 2010; Martin *et al.*, 2008). There is also the potential of spread of RVF to previously uninfected areas as occurred in 2006-2007 when RVF was reported for the first time in other thirteen districts in Kenya, and in Saudi Arabia and Yemen in 2000-2001 (Anyangu *et al*., 2010; Abdo-Salem *et al*., 2011; Munyua *et al*., 2010).

In Kenya there have been outbreaks most recently in 1997-1998 and 2006-2007. (Anyangu *et al*., 2010; Jost *et al*., 2010; Nguku *et al*., 2010). These outbreaks have mainly occurred in the North Eastern province in Garissa and Ijara Districts (Munyua *et al*., 2010). These are areas characterized by seasonal vector activity as a result of periodic heavy rainfall and the subsequent flooding (Anyamba *et al.,* 2010). Consequently, these vectors are responsible for the transmission of RVF in these regions (Munyua *et al.,* 2010). In addition the communities in Ijara depended on livestock for livelihood and did not keenly observe the recommended strategies to prevent the spread of RVF during the outbreak period (Jost *et al*., 2010). In regard to food consumption practices, consumption of raw blood mixed with milk or hot soup is common while the boiling of milk is uncommon in pastoral communities (Shirima *et al.,* 2003). It has been established that up to 90% of the population in the Ijara region are dependent on livestock for food and income (Muga *et al*., 2015).

For example in the 2006-2007 epizootic in Kenya, since animals couldn't be sold or slaughtered in North Eastern Province they were transported to Kilifi district thus introducing RVF there (Nguku *et al.*, 2010). The aim of this study was therefore to determine the beliefs and perceptions of the communities in Ijara that relate to the causes, risk factors and impacts of RVF.

Zoonotic diseases are now being prioritized in many national and international health programmes because they are not only influenced by environmental factors but by social conditions as well (Rock *et al*., 2009; WHO, 2012). For example, it has already been established that 60% of the worlds emerging infectious diseases have animal origins (Rock *et al*., 2009; Taylor *et al*., 2001). In the case of RVF as in most other zoonotic diseases the relationship between the vector, the host and the pathogen occurs in behavioural, physical and biological contexts (Rock *et al*., 2009). Some of the behavioral aspects involved in this vector-host-pathogen relationship include, individual knowledge and behavior, cultural norms and practices such as dependence on livestock for livelihood and poverty (Reidpath *et al*., 2011). For example in the case of RVF, poverty might influence close proximity to livestock and thus increase the risk to RVF (Palmer *et al*., 2010).

Rift valley fever, like most of the other infectious diseases, impacts most on the poor. The morbidity and mortality from RVF on both humans and animals leads to low productivity, the diversion of often limited household resources to address ill health and loss of income through slaughter bans and quarantines as these populations often solely depend on livestock for their sustenance (Nguku *et al*., 2010; WHO, 2012). Therefore, the losses caused by the RVF outbreaks continue to play a role in perpetuating poverty and further compromising attempts to improve the well being of the world's poorest people (Farmer, 1996; Palmer *et al*., 2010; WHO, 2012).

1.2 Problem Statement

Rift Valley Fever outbreaks are a major public health burden in Kenya and beyond over and above other tropical and infectious diseases such as malaria and HIV/AIDs (Anyangu *et al*., 2010; Jost *et al*., 2010). These outbreaks cause devastating effects on both livestock and human populations. For example, the most recent epizootic in 2006- 2007 led to a loss of $60M in East Africa alone due to the disruption in trade (Anyamba *et al*., 2010; Woods *et al*., 2002). They also cause decimation of livestock which is often the only source of livelihood for these populations (Breiman *et al*., 2008; FAO *et al*., 2010; Marcotty *et al*., 2009). Bans on transportation of livestock and closure of livestock markets also severely affects the local communities (Nguku *et al.*, 2010). RVF outbreaks are likely to occur in future and with greater intensity and there is also the threat of RVF spread to non disease prone areas increasing the need for proper mitigation and control measures (Anyamba *et al*., 2010; Jost *et al*., 2010; Munyua *et al*., 2010).

Most studies (Anyangu *et al*., 2010; Anyamba *et al*., 2010; Jost *et al*., 2010; Kahn *et al*., 2012; Nguku *et al*., 2010; Munyua *et al*., 2010; Woods *et al*., 2002) which relate to RVF have focused on the clinical and epidemiological aspects of the disease with very little assessment of the social and cultural aspects which play a considerable role in the spread and impact of RVF during epizootics. The social factors that determine differential risk to the diseases that can be transmitted from animals to humans and vice versa include human population density, agricultural practices, poverty, overcrowding, urbanization, trade networks and availability of infrastructural services, the movement of people and livestock, tourism and changes in livestock management practices (Farmer, 1996; Heymann, 2005; Jones *et al*., 2008; McMichael, 2007; Palmer *et al*., 2010).

The role of human behavior in the transmission and spread of RVF is also well documented (Amwayi *et al*., 2010; Breiman *et al*., 2008; Jost *et al*., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010). This relates to several activities associated with human- animal exposure such as contact with the blood, secretions, tissues or body fluids of infected animals during slaughter, food preparation, assisting with animal births or conducting veterinary procedures (Munyua *et al*., 2010; Woods *et al*., 2002). In Kenya, the Ijara region has been one of the epicenters of periodic RVF outbreaks in Kenya (Nguku *et al*., 2010). The predominant community in the region is the Somali who depend largely on livestock for their livelihood (Jost *et al*., 2010). Therefore, these RVF outbreaks in this region have occurred within the context whereby livestock is valued not just as a source of food but for other benefits as well, such as transport in this case camels, skin from goats, cows and sheep and other socio cultural benefits such as the payment of bride price (Jost *et al*., 2010).

Additionally, smuggling of livestock for sale during epizootics from this region to other areas in Kenya has been cited as a reason for the spread of the disease to areas where it had not been reported before (Munyua *et al*., 2010). Previous studies too have demonstrated that livestock in the region are kept near or within the family space further increasing the risk of acquiring RVF during an epidemic (Munyua *et al*., 2010; Woods *et al*., 2002). Furthermore the traditional practice of slaughtering and consuming ill or dead animals also increases the risk of infection during RVF epizootics for these communities as well (Munyua *et al*., 2010). This close interaction with livestock increases the likelihood for the transmission of RVF during epidemics.

Notably however, only a few studies (Fyumagwa et al., 2011; Jost *et al*., 2010) have accessed the lay beliefs of the local communities regarding RVF. Accessing the lay beliefs and perceptions of

the community is useful especially because the explanations in terms of perceived risk, etiology, recognition of RVF symptoms and treatment options that these communities in RVF prone areas have may not necessarily be in tandem with biomedical explanations thus the importance of understanding them to be able to develop appropriate public health initiatives (Abdo-Salem *et al*., 2011; Cohen *et al.,* 2007; Helman, 2007; Marcotty *et al*., 2009).). Indeed, in the case of RVF the main constraint for the control and prevention of RVF has been identified as inadequate knowledge by the communities of the risk factors involved in the disease's occurrence and maintenance (Owange *et al.,* 2014).

This study therefore sought to answer the following questions:

1. What are the lay beliefs of the local communities regarding RVF?
2. What are the perceived risk factors of RVF by the local communities?

1.3 Objectives

1.3.1 General objective

To establish the perceived risk factors for Rift Valley Fever in Ijara District of Northeastern Kenya.

1.3.2 Specific Objectives

1. To describe the lay beliefs of the communities regarding RVF.
2. To determine the perceived risk factors for RVF.

1.4 Rationale of the Study

This study was aimed at generating social science evidence for improving the prevention, care and mitigation of the RVF epizootics in the local communities. This was by describing how the local communities understand the disease in the context of their ecosystem. Lay perceptions regarding diseases are important because preventive practices related to any disease require the adherence of the population in question (Liao *et al*., 2009) yet many studies (Amwayi *et al*., 2010; Breiman *et al*., 2008; Jost *et al*., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010) have focused on the risk factors associated with RVF but few have sought to understand how the local communities understand the disease. This has led to interventions that have not always been accepted by the local communities.

According to Kenya's *Vision 2030*, good health is expected to play an important role in poverty reduction (GoK, 2012). Public education has been identified as one of the ways of achieving this by encouraging Kenyans to change their lifestyles in ways that will improve their health. Another key area in Kenya's *Vision 2030* was to address the socio cultural issues that affect access to health care (GoK, 2012). The global "One Health Initiative" too, recognizes the role of combating all zoonotic diseases by controlling them at their animal source (WHO, 2009). This initiative therefore links together animal and medical health professionals as well as other stakeholders such as social scientists (WHO, 2009). The collaboration of all these sectors has resulted to less confusing and more effective disease control strategies. Locally, Kenya hosts an enormous livestock population estimated to be 18 million cattle, 18 million sheep and 28 million goats among other livestock (Zoonotic Diseases Unit-Kenya, 2012). The country therefore recognizes that it has adequate hosts for zoonotic diseases thus necessitating an integrated and

collaborative approach across a wide variety of disciplines. (Zoonotic Diseases Unit-Kenya, 2012).

In this regard therefore, this study was aimed at helping to contextualize the disease and enable other public health policy makers to develop better interventions in future. When done, this may lead to a reduction in the vast negative effects that RVF has on the livelihoods of the local communities. It will also provide academicians and researchers with additional social science knowledge on RVF and provide impetus for further exploration on lay beliefs in the communities on RVF. The understanding of the lay beliefs of the community would facilitate more effective public health approaches. Additionally, in view of the resource constraints at the public health level this study will help interventionists to offer targeted solutions that are likely to be adopted by the communities.

1.5 Scope and Limitations of the study

This study was conducted in Ijara Division of Ijara District among adults. The study was descriptive in nature with a focus on the perceptions of the communities in regard to RVF. This study was guided by the health belief model in regard to the community's beliefs and perceptions about their susceptibility to RVF. This theory was suitable for the understanding of the lay beliefs and how these beliefs influence health behavior and the adoption of preventive practices. The study was qualitative in nature and did not involve studying these aspects by conducting laboratory tests or detailed economic analysis. The small number of informants involved in this study could bias the results and thus generalization of the results is not possible. However, the study has provided rich ethnographic data that has shed light on the aspects of lay beliefs and risk factors for Rift valley fever. In addition, since this study was conducted 5 years after the last

RVF outbreak of 2006/2007 there could have been the challenge of recall bias. Nevertheless, RVF has a significant impact on the community thus the relevance of this study.

1.6 Definition of key terms

Rift Valley Fever: A zoonotic disease which affects both animals and humans and is transmitted by mosquitoes and occurs mainly in the sub Saharan region in approximately 3-10 year cycles.

Zoonotic disease: This is any disease that can be transmitted from animals to humans and vice versa.

Risk Factors: This is anything that increases an individual's chance of being infected with a particular disease.

Risk Behavior: These are the actions which increase a person's likelihood of being infected with a particular disease.

Lay Beliefs: Lay beliefs are the common unsophisticated beliefs held by individuals and communities about health, illness and disease. These beliefs are often different from expert opinions.

Ecosystem: This is a community of living organisms including plants, animals and microbes as well as non living components such as air, water and soil interacting as a system.

Animal Husbandry Practices: This is the agricultural practice of breeding and raising livestock.

Livelihoods: This refers to a person's means of securing the necessities of life.

1.7 Assumptions

1. There is a perceived link between the lay perceptions of the community and RVF.
2. The perceived risk factors for RVF influence people's response during an RVF outbreak.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section includes the description of RVF, the knowledge and practices relating to RVF in particular and zoonotic diseases in general as well as the socio and behavioral aspects of RVF.

2.2 Rift Valley Fever

RVF is a zoonotic disease which means that it can be transmitted between humans and animals (Taylor *et al*., 2001). It is an acute, mosquito borne viral disease which mainly affects ruminants and humans as well as wildlife (Jost *et al*., 2010; Martin *et al*., 2008). The RVF virus is a member of the family *bunyaviridae* in the genus *phlebovirus*. The virus is transmitted by *aedes* and *culex* mosquitoes (Martin *et al*., 2008). These mosquitoes lay their eggs in soil grasslands depressions such as *dambos* and these infected eggs can survive in between flooding periods. The eggs hatch when these depressions are filled up with water during heavy rains and the infected mosquitoes cause major epizootics by their transmission of Rift Valley Fever Virus (RVFV) to both animals and humans (Martin *et al*., 2008).

RVF causes abortions in pregnant animals and deaths especially in the younger animals (Anyangu *et al*., 2010). Humans acquire RVF infection through bites from infected mosquitoes, exposure to the blood, body fluids and tissues of infected animals and laboratory technicians can acquire it from inhaling infectious aerosols from specimens (Anyangu *et al*., 2010). Most infections in humans are asymptomatic and therefore result in no symptoms or in mild illness

(Nguku *et al*., 2010). However, a significant number of RVF infected patients develop severe disease which includes hemorrhage, encephalitis, visual disturbances and death (Amwayi *et al*., 2010).

2.2.1 Frequency and impact of Rift Valley Fever

Rift Valley Fever outbreaks mostly occur following heavy rainfall associated with El Nino/ Southern Oscillation (ENSO) events (Anyamba *et al*., 2010; Jost *et a*l., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010). This occurs in 3- 15 year cycles. This heavy rainfall leads to flooding causing the generation of large numbers of infected mosquitoes. (Anyamba *et al*., 2009; Anyangu *et al*., 2010; Martin *et al*., 2008).

Humans acquire RVF through exposure to the blood, body fluids or tissues of infected animals or through bites from infected mosquitoes (Munyua *et al.,* 2010). Contact with animals can occur during slaughter, obstetric procedures or veterinary services provision (Anyangu *et al*., 2010). In Kenya there have been outbreaks most recently in 1997-1998 and 2006-2007. (Anyangu *et al*., 2010; Jost *et al*., 2010; Nguku *et al*., 2010). These outbreaks have mainly occurred in the North Eastern province in Garissa and Ijara Districts (Munyua *et al*., 2010).

These outbreaks often have serious consequences (Anyangu *et al*., 2010). For example the 1997-1998 epizootic, led to about 100,000 people infected with the disease in Kenya, Somalia and Tanzania and it resulted to over 450 deaths in Kenya alone (Munyua *et al*., 2010). Additionally it led to the loss of 70% of sheep and goats and 30% of cattle and camels in East Africa (Martin *et al.*, 2008). The 2006-2007 outbreaks in East Africa as well, affected thousands of animals in 29 of the 69 districts then in Kenya. There were more than 700 human cases reported in Kenya, 400

of which caused significant illness and there were 90 deaths. 85% of these cases were in Garissa, Ijara, Baringo and Kilifi districts (Munyua *et al*., 2010; Nguku *et al*., 2010).

There is also the potential for the spread of RVF to new areas as was demonstrated in the last epizootic in 2006-2007. During this period there were RVF cases in both livestock and humans reported for the first time in 13 districts in Kenya namely Kitui, Tharaka, Meru South, Meru Central, Mwingi, Embu, Mbeere, Malindi, Taita Taveta, Kirinyaga, Muranga, Baringo and Samburu causing even greater consequences than the previous outbreaks (Munyua *et al*., 2010).

2.2.2 Climatic conditions and Rift Valley Fever

It has been shown that RVF is influenced by climatic events and particularly by the El Nino/ Southern Oscillation (ENSO) events (Anyamba *et al*., 2010; Martin *et al*., 2008). This phenomenon results in heavy and widespread rainfall in the RVF epidemic prone areas in Africa (Anyamba *et al*., 2010; Munyua *et al*., 2010). As a result, there is flooding which leads to the production of *aedes* and *culex* mosquitoes (Anyamba *et al*., 2010). These mosquitoes are infected with RVFV and thus transmit RVF to livestock and humans as well (Martin *et al*., 2008).

This, therefore, means that the current global climate changes will continue to affect the distribution and frequency of the disease. This is as a result of the effects of this climate change on the geographical range and seasonal activity of the vectors responsible for the transmission of RVF as well as the frequency of ENSO events (Martin *et al*., 2008). RVF is also one of the twelve potentially lethal diseases of animal origin already identified that could spread around the world due to global warming (Singer, 2009). The other diseases include Lyme disease, yellow fever, plague, avian influenza, babesia, cholera, Ebola, red tides, sleeping sickness, tuberculosis and intestinal and external parasites (Singer, 2009).

The magnitude and frequency of extreme weather events such as hurricanes, droughts and floods is affected by climatic changes (Martin *et al*., 2008). This in turn affects vector borne diseases such as RVF which are patterned after weather changes. And consequently there might be spread of these diseases to non disease endemic areas as well as increased impact in the epidemic prone regions (Anyamba *et al*., 2010; Martin *et al*., 2008; Palmer *et al*., 2010).

This information is useful in predicting rainfall patterns likely to lead to the outbreak of the disease (Woods *et al*., 1997). This is especially so because the probability of recurring outbreaks has been identified (Martin *et al*., 2008; Woods *et al*., 1997). Notably the prediction of RVF outbreak in 2006/2007 provided a 2- 6 week period of warning during which time measures could be put in place to mitigate the effects of an outbreak (Palmer *et al*., 2010). Some authors argue that climatic changes also might affect the migration of livestock which could lead to the introduction of the virus into previously virus free areas (Martin *et al*., 2008).

2.2.3 Control of Rift Valley Fever

Most of the RVF epidemic prone countries do not have advance clear control strategies for addressing RVF outbreaks (Anyangu *et al*., 2010; Jost *et al*., 2010; Martin *et al*., 2008; Munyua *et al*., 2010). Additionally, there is not much surveillance that takes place in between RVF epidemics (Martin *et al*., 2008). Low and uncoordinated response during outbreaks is attributed to poor infrastructure, insufficient personnel, poor coordination between the veterinary and public health officials and lack of emergency funds (Jost *et al*., 2010).

Communities also may be reluctant to adopt control strategies especially if there is no compensation strategy (Palmer *et al*., 2010). For example, bans on slaughter and transport of livestock are difficult to enforce because these communities often depend only on livestock for

their livelihood, which further perpetuates the spread of the disease (Rock *et al*., 2009). For example in the 2006-2007 epizootic in Kenya, since animals couldn't be sold or slaughtered in North Eastern Province they were transported to Kilifi district thus introducing RVF there (Nguku *et al.*, 2010). This shows that compensation should be considered to ensure adherence to these bans and minimize the economic impact from the losses (Marcotty *et al*., 2009; Nguku *et al*., 2010).

2.3 Lay beliefs related to diseases

The study of lay beliefs and perceptions in understanding diseases is increasingly becoming common especially so as to improve public health interventions (Liao *et al*., 2009). Lay perceptions regarding diseases are important because preventive practices related to any disease require the adherence of the population in question (Liao *et al*., 2009). For example adherence to any preventive and control strategies for any disease by an individual are less effective when that individual's attribution for disease differs from the pathophysiological causes of that disease (Pedroso *et al*., 2008; Walter *et al.*, 2004). Similarly, if a community's causal explanations for disease differ from those by public health officials there is a greater chance of lack of adherence to any preventive practices (Naidoo *et al*., 2009). In their study of the H5N1 avian influenza in South East and East Asia, (Liao *et al*., 2009) found that majority of the rural people believed that the disease was of no consequence as it was an "old disease" that occurred from time to time. The informants in this study characterized H5N1 avian influenza as a part of their farming life that did not warrant the kind of attention it was being given and some dismissed the disease as mere propaganda (Liao *et al*., 2009). Such beliefs are likely to work against education efforts designed to encourage the use of protective equipment and improved hygiene (Liao *et al.*, 2009).

Therefore, an understanding of how communities perceive the threat of diseases and their causes is useful in advocating and planning effective health behavior change (Liao *et al*., 2009; Raude and Setbon, 2009). Indeed, it has been recognized that it is too simplistic to assume that just giving information changes behavior without understanding all the complexities involved (Liao *et al.,* 2009).

In another study conducted in France regarding the H1N1 influenza, majority of the lay people thought that the viruses did not persist for extended periods of time contrary to microbiological research that has shown that the viruses persisted for long periods on numerous materials such as door knobs (Raude and Setbon, 2009). Inadequate beliefs about disease transmission and prevention might contribute to adverse epidemiological effects thus the need for proper public health information (Raude and Setbon, 2009). In another study of the lay beliefs of sons and daughters who had a parent who died from coronary heart disease in Scotland majority of the respondents did not perceive themselves as susceptible to this disease as a result of family history (Watt *et al.,* 2000). This was in spite of the clinical observation that family histories were useful as indicators of familial susceptibility to disease via shared genes, behaviors and environment (Silberberg *et al*., 1998; Summerton and Garrood 1997; Watt *et al*., 2000). Public health professionals therefore need to be aware of the differences between clinical definitions and lay perceptions of any disease before any effective strategies can be executed (Liao *et al*., 2009; Watt *et al*., 2000).

2.4 Lay beliefs regarding Rift Valley Fever

Only a few studies have documented the local communities' beliefs on RVF in epidemic prone areas (Fyumagwa *et al*., 2011; Jost *et al*., 2010). Most of the other studies have accessed the risk

factors associated with RVF but with no mention of the knowledge the local communities have on the same (Amwayi *et al*., 2010; Breiman *et al*., 2011; Munyua *et al*., 2010; Nguku *et al*., 2010). However, in a study of the Maasai and the Somali of Tanzania and Kenya respectively, it was found that these two ethnic groups had a significant amount of knowledge corresponding to biomedical knowledge on the symptoms of RVF in both humans and livestock, the risk factors associated with the disease and they also knew the outbreak history (Jost *et al*., 2010). This was especially so for the Somali of Northern Kenya who primarily depended on their livestock for their livelihood. They also noticed the changes in their environment such as heavy rains, flooding and large numbers of mosquito swarms which they associated with the RVF outbreak. (Jost *et al*., 2010). Another study though, conducted in Tanzania showed that the local communities were not able to differentiate the RVF symptoms from tick borne diseases which were more prevalent (Fyumagwa *et al*., 2011). However, Breiman et al., (2011) observe that there is need for ethnographic and epidemiological studies to understand human behavioral factors in regard to RVF.

2.5 Practices relating to risk of infection with Rift Valley Fever

Risk factors for infection with RVF include consuming raw milk or handling products from sick animals especially sheep. For example through milking, skinning, slaughtering, touching blood, providing care during birthing, conducting veterinary procedures and sleeping with animal herds (Anyangu *et al*., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010). This is associated with acute RVF infection and death. The likelihood of acquiring severe RVF diseases was associated with touching an aborted animal fetus (Anyangu *et al*., 2010; Munyua *et al*., 2010; Woods *et al*., 2002). Socio- demographic factors increasing vulnerability to RVF infection include being male

and being a herdsman, housewife, abattoir worker, veterinary personnel or a farmer (Anyangu *et al.,* 2010).

However severe disease and death from rift valley fever was associated with males, suggesting potential susceptibility of males to the infection and disease (Anyangu *et al*., 2010). This is likely due to their occupation of herding and animal related exposures such as slaughter, milking as well as handling sick animal products. Also because of their greater proximity to animal herds they may be at a greater risk of being bitten by mosquitoes that have bitten infected animals (Nguku *et al*., 2010).

2.6 Social and behavioral aspects of zoonotic diseases including Rift Valley Fever

Zoonoses in as much as they are not prioritized in many national and international health programmes are not only influenced by environmental factors but by social conditions as well (Rock *et al*., 2009; WHO, 2012). It has been established that 60% of the worlds emerging infectious diseases have animal origins (Rock *et al*., 2009; Taylor *et al*., 2001). Outbreaks for example are influenced not only by environmental and ecological factors but by socio economic factors as well such as the RVF outbreak which occurred for the first time in 2000-2001 in Yemen and Saudi Arabia (Abdo Salem *et al*., 2011). The importation and smuggling of livestock from Somalia for the Eid-Al Kabeer celebrations during periods of high vector densities led to the outbreak in these two Middle East countries (Abdo Salem *et al*., 2011). The social conditions too, determine differential morbidity and mortality from these diseases across the gender or socio economic status (Palmer *et al*., 2010; Rock *et al*., 2009).

The relationship between vector, host and the pathogen occurs in social, physical and biological contexts (Rock *et al*., 2009). However, there is increasingly little evidence that any attention is being paid to this complex interrelationship in addressing RVF and other vector borne diseases (Reidpath *et al*., 2011). Some of the behavioral aspects involved in this vector-host-pathogen relationship include, individual knowledge and behavior, levels of poverty, physical location, sanitation, cultural norms and practices, the interrelationships between various arms of Government such as agriculture, health and finance (Reidpath *et al*., 2011). For example in the case of RVF, poverty might influence close proximity to livestock and thus increase the risk to RVF (Palmer *et al*., 2010). Lack of proper coordination of communication messages between the health and veterinary officials might also propagate the spread of RVF during an outbreak as happened in Kenya in 2006-2007 (Jost *et al*., 2010).

Emphasis on the need for effective and targeted health education has been made in several studies as well as other control strategies such as slaughter bans and animal quarantines (Anyangu *et al*., 2010; Munyua *et al*., 2010). However, the enforcement of these especially the slaughter bans and ban on movement of livestock has been found to be difficult to implement due to the crucial role that livestock play in the lives of the communities in most of the epizootic prone areas (Anyangu *et al*., 2010; Munyua *et al*., 2010; Nguku *et al*., 2010). Nevertheless some successful initiatives have been noted, for example due to effective health education campaigns during the 2006-2007 epizootic in Garissa the ban on slaughter of animals was accepted during the Muslim Eid-Al-Adha holiday where more than 20,000 animals would have been slaughtered (Munyua *et al*., 2010).

Behavioral factors are increasingly being recognized as crucial in the provision of health care and in improving health seeking behavior (Haussmann- Muela *et al*., 2003). It is therefore essential to incorporate the social, cultural and economic variables in understanding disease distribution patterns and health seeking behavior (De Plaen *et al*., 2003). In this case, therefore, a proper understanding is needed of the various determinants of differential prevalence rates of disease within relatively homogenous community. These include factors such as who becomes sick and why and what factors other than biology and adequacy of health services contribute to different prevalence rates across the gender or ages (De Plaen *et al*., 2003).

Previous studies on the risk factors have centered on clinical and epidemiological evidence and not on the local communities attitudes (Anyangu *et al*., 2010; Jost *et al.,* 2010; Kahn *et al*., 2011; Munyua *et al*., 2010). Other studies have called for more collaboration among the medical, veterinary and entomology experts in accessing RVF risk (Anyamba *et al*., 2010). There has been little involvement of the social and behavioral studies (Reidpath *et al*., 2011; Rock *et al*., 2009; Singer, 2009).

And this is despite the argument that social conditions such as changes in transportation options, agricultural advance, climate and urbanization are all connecting animals and humans in new ways (Rock *et al*., 2009). These will continue to impact on the spread, control and impact of zoonotic disease. For example HIV/AIDs emerged from non human primates but its spread and control is influenced by social, economic and political factors. Other diseases in this regard include bovine tuberculosis (Rock *et al*., 2009).

Some authors have suggested the loss of memory in the communities regarding RVF due to the long durations between epidemics and that this might impact control activities for RVF (Martin

et al., 2008). The examination of the psycho social effects occasioned by control initiatives for zoonotic diseases are also not always analyzed (Rock *et al*., 2009). The interrelationships between various arms of Government such as agriculture, veterinary and health also do impact on the spread and control of RVF on a broader scale as well (Reidpath *et al*., 2011). These are areas that social science research can provide a critical appraisal leading to better control and compensation policies.

2.7 Theoretical Framework

2.7.1 Health Belief Model

This model is one of the most commonly used theories of health related behaviour (Champion and Skinner, 2008). This theory states that people take certain health related actions only if they believe that those actions will prevent a particular disease (Smith, 2012). This theory has been found useful in studying attitudes, practices and risk perceptions because it concentrates on beliefs of individuals and barriers and facilitators of their actions (Bosch *et al.*, 2010; Jantz and Becker, 1984). This theory therefore is useful where lay beliefs are important in inducing prevention related behaviour in a community (Becker and Maiman, 1975). Often this model is adapted to a researchers study area (Hausmann- Muela *et al.*, 2003). As a result, this theory has been used in studying health perceptions, attitudes and behaviour related to smoking, breast cancer and HIV/AIDs (Champion and Skinner, 2008) as well as zoonotic diseases (Bosch *et al.*, 2010; Smith, 2012; Wheeler, 2011).

The critical components of this theory are beliefs, attitudes and behavior (Jantz and Becker, 1984). Other researchers have listed six operational elements for this model (Glanz *et al.*, 1997;

Hausmann- Muela *et al.,* 2003; Smith, 2012). These elements determine the readiness to take a particular health action and help in developing strategies that protect the health of a community (Jantz *et al.,* 2002):

1. Perceived susceptibility or vulnerability by the individual to the condition.
2. Perceived severity of the condition as having a serious medical and social consequence.
3. Perceived benefits of taking the health action in reducing the disease threat as well as other additional benefits.
4. Perceived barriers or obstacles to taking the health action.
5. Cues to action which is the factors or events that might activate a person's readiness to take a recommended action. These include the physical signs of a condition or media attention that motivates people to take action.
6. Self efficacy which is the belief by an individual that they can successfully carry out particular health behaviour.

Demographic variables are also relevant in conceptualizing this theory. This is because these variables can affect health behaviour. These include age, sex, education levels, socio economic status, gender and religion of an individual (Sheeran and Abraham, 1995).

However this theory has been criticized for not offering any strategies for altering peoples beliefs (Becker, 1974). Other researchers too have observed that it is difficult to operationalise the various components of this theory (Harrison *et al.,* 1992). This model can be conceptualized as follows as adapted from Smith, 2012:

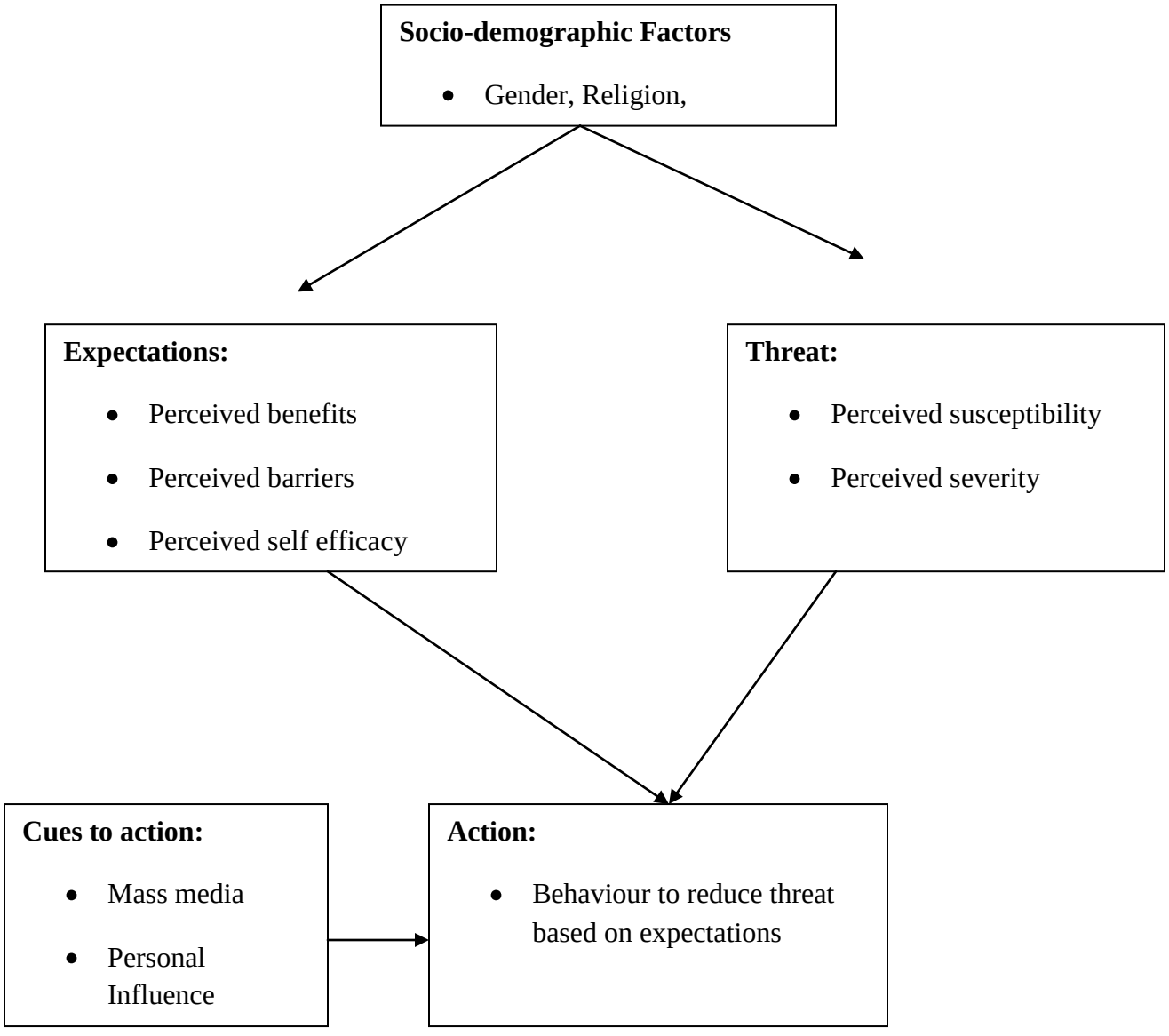

Figure 2.7 Conceptual Framework

Based on this conceptual framework it is expected that the perceived threat from RVF and the perceived benefits of taking certain actions will influence the community's willingness to adopt preventive actions during an RVF outbreak.

2.7.2 Relevance of the theory to the study

The health belief model is relevant in understanding the perceived threat from RVF, understanding lay beliefs and how these beliefs influence health behaviour and the adoption of preventive practices (Hausmann-Muela *et al.*, 2003). This model theorizes that people's beliefs about whether or not they are at risk for RVF and their perceptions of the benefits of taking action to avoid it influence their readiness to take action. Interventions for Rift Valley Fever that include health promotion and the vaccination of livestock centre on the beliefs about disease threat. This theory is therefore suitable to this study as it pays attention to the socio cultural context in preventive health programmes. This theory also helps to understand the underlying socio cultural changes that account for changes in behavior (Smith, 2012). Given that the control efforts related to RVF disease in both people and livestock depend highly on effective health education and behaviour change it is important to understand the communities risk perceptions about RVF. This model enables for the exploration of the different perceptions about RVF causation and perceived risk factors.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section describes the research site, study design, study population and the unit of analysis. Additionally, the sampling method, sample population, methods of data collection and analysis are also discussed.

3.2 Research Site

3.2.1 Location

This study was carried out in Ijara Division of Ijara District in North Eastern Province. Ijara is one of the eleven districts that form North Eastern Province and was curved out of Garissa District in 2000. The district borders Fafi District to the North, Lamu District to the South, Tana Delta District to the South West, Tana River to the West and the Republic of Somalia to the East. The district lies approximately between latitude 1° 7`S and 2° 3`S and longitude 40° 4`E and 41° 32`E.

The district covers an area of 10,000 km² and is subdivided into seven administrative divisions namely Masalani, Ijara, Sangailu, Hulugho, Kotile, Ruqa and Bodhai; nineteen locations and twenty seven sub-locations as shown in Fig 3.2. This study was conducted in Ijara Division because it has been one of the regions where the RVF outbreak has occurred and at a great magnitude.

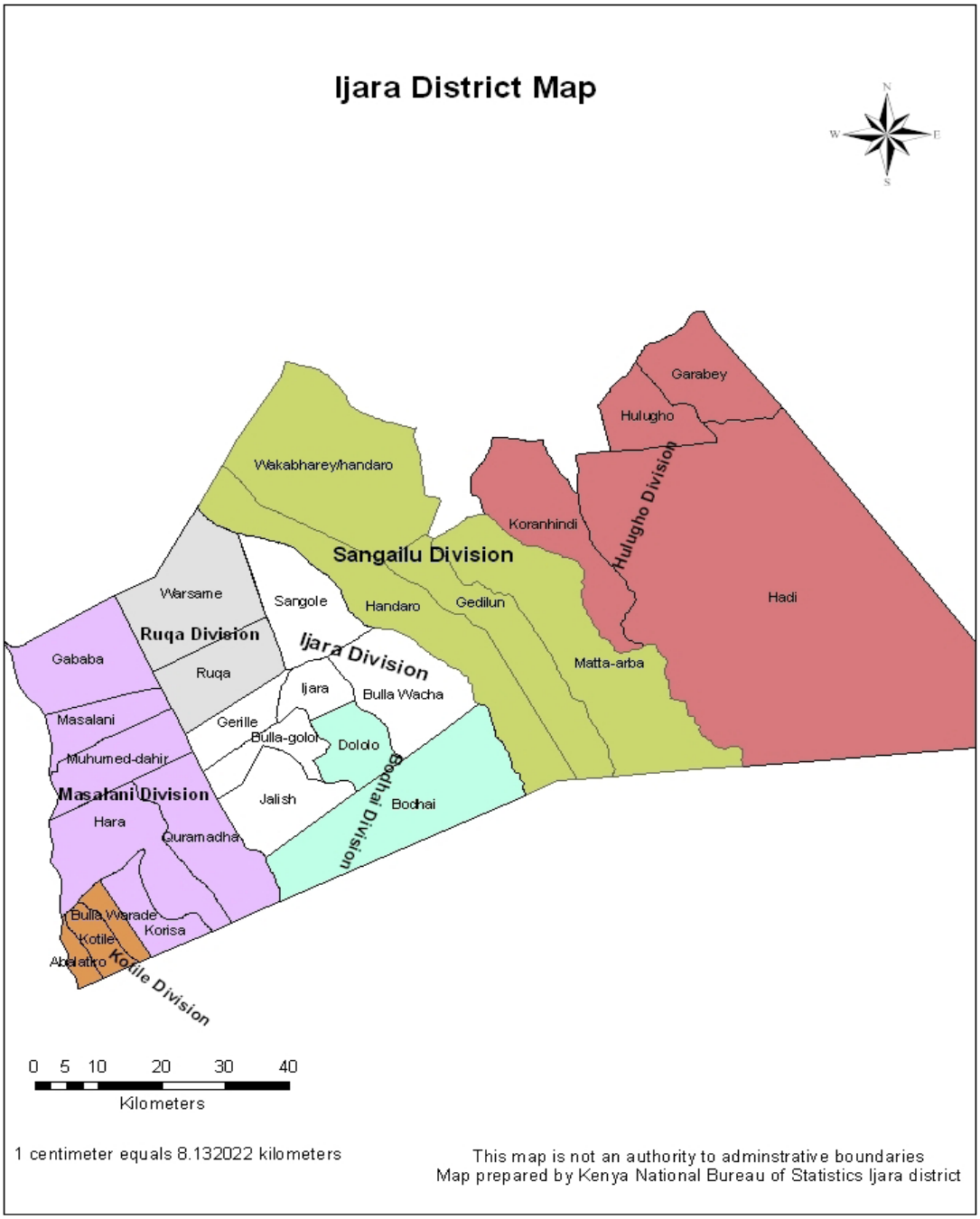

Figure 3.2 Ijara District Map

Source: **Kenya County Fact Sheets, 2011.**

3.2.2 Topography

The district is a plain with Tana River to its west and the Indian Ocean to the south east tip of the district. The district's land may be described as semiarid rangeland with soils ranging from the sandy stones, dark clays in some patches, to alluvial soils along the River Tana basin. Basically five types of soils exist in the district i.e. fertile alluvial soils, fertile grey cotton soils, black salty cotton soil, red soils and white and red sandy soils (NCAPD, 2005).

3.2.3 Climate

Rain falls in two seasons, the long rains in March to April and the short rains in October to December. The rainfall is unreliable with some short periodic torrential down pours. The irregular nature of the rains means that the district is prone to frequent droughts. And because of the low altitudes, temperatures are often high ranging from 20 to 38 degrees centigrade. The hottest months are September, January and March, while the period between April and August is relatively cool. The district experiences strong winds between April and August (NCAPD, 2005).

3.2.4 Population

Ijara District has a total population of 92, 663 persons. The total number of households is 13,180. Majority of the population in this area are ethnically Somali pastoralists. Generally, the county is sparsely populated with majority of the population being concentrated in facility and service areas. The population depends on pastoralism for livelihood and has great value for animals. The district is characterized by high incidences of poverty with 46,197 or 59% persons being in overall poverty bracket for both urban and rural. The hard core poor include 4,006 female headed households and 572 children headed household constituting 35% and 4% of

the total households respectively. The causes of poverty in the district include low levels of incomes as a result of over reliance on livestock with no livestock markets established in the district, harsh climatic conditions and a population structure that is youthful in nature comprising 51% of the total population and a high percentage of the households either female or children headed who actually constitute the hard core poor estimated at 39% in the district. Poverty in the district is manifested by material deprivation measured by inadequate nutrition, poor health and educational status, geographical remoteness, unemployment etc. HIV/AIDs is emerging factor that is exacerbating the levels of poverty in the district (NCAPD, 2005).

3.2.5 Economic activities

The District is arid with most areas being used for livestock production. Only a limited area can be used for crop production. Livestock keeping is the major economic activity in the district. However, their livelihood is constrained by the high prevalence of diseases and pests, poor marketing of livestock and frequent droughts as well as periodic diseases such as RVF. Pastoralism therefore remains the most suitable economic activity in the district. The main livestock types kept are indigenous cattle, sheep, goats and camels. Apart from provision of food to the community, livestock is also sold to generate income (NCAPD, 2005).

3.2.6 Health facilities

Health services in the district are provided through 8 institutions comprising of one hospital, 2 health centers and 5 dispensaries. Despite its vastness, the district is poorly covered by existing health facilities. In addition, inadequate equipment, drugs and personnel have led to underutilization of all facilities. There is also a problem of accessibility of health

facilities since the average distance to the nearest health facility is 40 km.. The most prevalent diseases in the district are Malaria, diseases of respiratory systems and tuberculosis (NCAPD, 2005).

3.3 Research Design

This study was cross sectional and descriptive in nature. It utilized qualitative methods of data collection which guided the exploration of the perceptions and beliefs of the community on RVF. The study involved collecting detailed information on the community's perceptions regarding RVF through focus group discussions. Key informant interviews were used to provide additional information on the beliefs and practices of the community. Lastly, the study entailed collecting in depth accounts of personal lived experiences using narratives.

3.3.1 Study Population

The study population consisted of the adults in Ijara district in Garissa County. The respondents were aged 18 years and above both males and females.

3.3.2 Sample Population

The study targeted adult members both male and female within the community aged 18 years and above. Only those who consented to participate in the study were interviewed.

3.3.3 Sampling Procedure

Purposive sampling was used to select the informants for the Key Informant Interviews, Narratives and Focus Group Discussions. This was to increase the likelihood of generating appropriate and useful data by interviewing those who were knowledgeable on the study subject.

Key informants sampled were public health/ animal health officers, community elders and administrative leaders. They needed to have been residing and working in the Ijara region during the period of the last RVF outbreak in 2006/2007. The community elders needed to be aged 50 years old and above. Focus group discussants recruited needed to have been adults (18 years and above) at the time of the last RVF outbreak and residing in the area under study. Additionally, the sampling for the focus group discussions was done in a manner that enabled representation from young, middle aged and older adults in each group. The informants sampled for narratives had to have either suffered from RVF in the last outbreak or had an immediate family member (father, mother, brother or sister) who suffered from RVF in the last outbreak. The total number of people interviewed using each method is shown in Table 3.

Table 3: Number and particulars of the informants and discussants

Method	Category	No.
Focus Group Discussions	Women (Group 1)	11
	Women (Group 2)	10
	Women (Group 3)	10
	Women (Group 4)	11
	Men (Group 1)	9
	Men (Group 2)	10
	Men (Group 3)	11
	Men (Group 4)	11
	Total	**83**
Key Informant Interviews	Public and Private health professionals	6
	Animal health practitioners	2
	Administrative leaders	2
	Elders; Male	3
	Elders; Female	3
	Total	**16**
Narratives	Male	4
	Female	2
	Total	**6**
CUMMULATIVE		**105**

3.4 Data collection methods

Focus group discussions, key informant interviews and narratives were used to collect primary and qualitative data. Secondary data sources were also utilized.

3.4.1 Focus Group Discussions

A total of eight Focus Group Discussions were conducted. Adult males and females were interviewed separately to obtain data from both genders without undue interference or dominance from either gender. The information gathered included information such as types of livestock kept, uses of livestock, benefits of livestock, beliefs about the causes of RVF, signs and symptoms of RVF, perceived risk factors for RVF, as well as how RVF impacts on their livelihood. FGDs were used because they provided a natural setting and therefore these issues were discussed openly. A moderator guided the discussion with the help of a translator. Notes were taken and tape recording used to record the discussion. A focus group discussion guide (Appendix 4) was also used to guide and keep the discussion focused.

3.4.2 Key informant interviews

Key informants are people knowledgeable on the topic under investigation (Bernard, 1994). These were held with local public health and animal health professionals, administrative leaders as well as both male and female local elders. A key informant guide was used and the interviews were recorded where consent was given and notes taken where the use of the recorder was not consented to. They were face to face interviews with a purpose of getting detailed information on the key concepts, provide background to local perceptions and attitudes, expand on critical issues, provide the historical perspective of RVF, knowledge and practices on RVF as well as the

consequences and coping mechanisms during RVF epizootics. Key informant interviews were considered favorable because they provided for flexibility and collection of in depth information from knowledgeable people. An interview guide (Appendix 2) to facilitate the interview was used and the interviews were conducted in quiet and secluded locations.

3.4.3 Narratives

A total of six narratives were conducted with four men and two women who had an immediate family member infected (5) with RVF or had been infected (1) in the last outbreak with RVF. They were used to obtain a detailed profile of the personal lived experience with RVF regarding the symptoms, beliefs on RVF causation, perceived risk factors for RVF, health seeking behavior and the impact of the disease on one's livelihood. A narrative guide (Appendix 3) was used to prompt for the lived experience with the RVF disease.

3.4.4 Secondary sources

Background information to the study was gathered from documents such as journal articles, books, thesis and the internet. This included relevant literature on the knowledge and practices of communities in regard to RVF and the impact that RVF outbreaks had on this community.

3.5 Data management and analysis

All the tape recorded qualitative data obtained from the focus group discussions, key informant interviews and narratives was transcribed. The data was then coded along the general themes from the study. Data analysis was then conducted in line with the emerging themes. The results were then organized according to the study objectives. Quantitative data on the demographic

characteristics of the informants and discussants collected were coded and analyzed using descriptive statistics.

3.6 Problems and challenges encountered in the field

Generally, the research was completed successfully. However, a few problems were encountered which in various ways affected the study. First, there have been numerous studies conducted in the region since the last outbreak in 2006/2007 and as a result the community has certain perceptions which made them hesitant to participate in the study. They complained that a lot of studies were being conducted on RVF with no feedback or added benefit to them. Nevertheless, with the help of the local leaders I was able to explain to them the necessity of this study in informing future policy regarding RVF.

Secondly, due to the harsh terrain and long distances to the villages it took me a lot of time just to get to where the informants were which inadvertently slowed down the data collection process. Additionally, both male and female informants were hesitant to be interviewed for more than 45 minutes as they needed to attend to other chores and duties including going to the mosque at noon and 4pm. This being an in-depth qualitative study, that undoubtedly curtailed detailed data collection. To deal with this challenge I resulted to conducting interviews only if there was an assurance of the informant's availability for at least an hour and 15 minutes and if not we would postpone the interview to the following day. Local leaders also helped in explaining to the informants the nature of this study and the need to provide comprehensive information.

3.7 Ethical considerations

This study was part of a larger study titled Dynamic drivers of diseases in Africa carried out by the International Livestock Research Institute (ILRI). The ethical clearance was issued by the Ethical Review Committee of AMREF. The research permit was obtained from the National Council of Science and Technology in the Ministry of Higher Education, Science and Technology. Consent for participation in the study was sought from all the adults recruited. Research assistants who spoke the local language further explained the study objectives to those who did not understand English to ensure informed consent was given. Only those who consented to participate in the study were interviewed. Those who consented signed on the consent form to show their willingness to participate in this study. Additionally to ensure anonymity and confidentiality of the participants, pseudonyms were used in the data collection tools and in the final report.

CHAPTER FOUR

LAY BELIEFS REGARDING RIFT VALLEY FEVER

4.1 Introduction

This chapter presents the study findings and discussion related to the lay beliefs on RVF. It is divided into four main sections which are the profile of the informants, lay beliefs on RVF, discussion and summary.

4.1.1 Profile of the Informants

This study comprised a total of 105 informants interviewed using different methods over a period of two months. Slightly more than half (55%) of the informants were male while (45%) were female and all were adults aged between 18-60 years old. Most of the participants were of Somali ethnicity (98.1%). In addition, majority of the participants reported to practice the Islam religion (98.1%), only a small number (1.9%) identified themselves as Christians. The small number (1.9%) who reported to be Christians were two male government employed nursing officers in the region, one each from the *Luo* and *Agikuyu* ethnic groups. The most commonly reported main source of livelihood was livestock keeping accounting for 88.6%. This is exemplified in the Table 4.

Table 4: Profile of the informants (n=105)

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	58	55
Female	47	45
Religious affiliation		
Muslim	103	98.1
Christian	2	1.9
Main Source of livelihood		
Livestock keeping	93	88.6
Government employee; hospital	4	3.8
Government employee; provincial administration	2	1.9
Government employee; livestock sector	2	1.9
Private business	2	1.9
Private clinical practice	1	0.95
Employment in private sector	1	0.95
Ethnic affiliation		
Somali	103	98.1
Agikuyu	1	0.95
Luo	1	0.95

4.2 Lay beliefs on Rift Valley Fever

The discussants and informants were asked questions to explore their perceptions about their lay beliefs related to RVF.

4.2.1 Lay perceptions about the causes of RVF

In this study the perceived causes of Rift valley fever were mosquitoes, poor sanitation, supernatural reasons and wind. Notably, only women mentioned wind as a causal factor for RVF.

Mosquitoes: The discussants in all (8/8) the focus group discussions observed that RVF is caused by mosquitoes during periods of exceptionally heavy rainfall and flooding. This in turn leads to the breeding of numerous mosquitoes. The discussants further added that the last time they experienced RVF was in 1997/1998 and again in 2006/2007.According to the study findings, the discussants were of the opinion that the mosquitoes were infecting livestock and humans with RVF through their bites. This is exemplified in the quotes below:

> *"A lot of rain causes a lot of mosquitoes which bite livestock and people leading to RVF,"* ***Women FGD, Ijara.***

> *"We think RVF is caused by mosquitoes during periods of heavy rainfall,"* ***Men FGD, Ijara.***

The participants were further asked to describe the mosquitoes prevalent during the RVF outbreaks. They said that the mosquitoes were different from the ones they see during normal seasons. These mosquitoes were described variously. Some described them as being bigger than

usual and darker in color while others noted that they were small and whitish in color. These quotes show the varied responses:

> *"The mosquitoes were very big and carried poison. Those mosquitoes are only seen when it rains,"* ***Women FGD, Ijara.***

> *"RVF was caused by mosquitoes. Those mosquitoes were very small and whitish in colour,"* ***Men FGD, Ijara.***

This was further collaborated by the key informants who noted that RVF occurs during periods of exceptionally high rainfall which results to flooding. This in turn increases the number of mosquitoes which cause RVF. And these mosquitoes were characterized differently from other mosquitoes. A 55 year old male key informant observed that, *"there were a lot of mosquitoes and the mosquitoes were also different, some had varying colors. Right now you cannot see them."* On the other hand, a 45 year old female key informant explained, *the mosquitoes were very many, what we have seen is that those had white dots and were biting people even during the day. The ordinary mosquito bites you in the house, the others were in large numbers and you could not sit outside.* Another key informant, a medical practitioner opined that RVF occurred because *there was a lot of rain and a very large number of mosquitoes.*

Supernatural Reasons: Supernatural reasons were also cited as leading to RVF occurrence. It is notable that this was cited by individuals who were infected or had a close family member infected with RVF in the last outbreak. In two of these cases both the informants refused to have their RVF infected relatives to be treated in a health facility. Notably, both recovered and the informants attributed this to God. This is exemplified in the following excerpts:

"I believe God brought RVF because I do not understand where it came from," ***Male, 65 years old, Ijara.***

"It is God who brings this thing…RVF," ***Male, 35 years old, Ijara.***

"God brought RVF…I don't know what you people think," ***Male, 51 years old, Ijara.***

Poor Sanitation: The study findings also showed that the community perceived poor sanitation to be a cause of RVF. The discussants noted that during periods of heavy rainfall all the human waste in the surrounding environment was washed into the water pans. This was because most people in the community did not have access to latrines. The water in these sources was being used for domestic purposes and this led to RVF. For example, women in one FGD indicated that, *RVF is caused by dirty water because when it rains all the human waste gets into the water dams and people use the same water for drinking.*

Wind: Wind was also seen as a causal factor in RVF transmission by the female discussants while it was not mentioned in the FGDs with the men. In some of the FGDs it was a lot of wind, while for others it was lack of it altogether. One focus group discussion was of the opinion that, *a lot of wind also comes with RVF*. On the contrary, another group suggested that lack of wind causes RVF by noting that, *when it rains heavily there are a lot of mosquitoes and a lot of long grass. In addition, there is no wind and wind blows away the mosquitoes.*

4.2.2 Perceived RVF symptoms in Livestock

The most commonly cited symptom of RVF in livestock by the discussants was bleeding from the nose and other body orifices (8/8FGDs). Other symptoms cited by FGD discussants included fever (6/8FGDs), emaciation (5/8FGDs), coughing (3/8FGDs), inability to feed (3/8FGDs), the

skin/hide being reddish on the inside (4/8 FGDs), bloody diarrhea (4/8 FGDs), low milk production (3/8 FGDs), general body weakness (5/8FGDs) and meat not having a "sweet" taste (4/8 FGDs). These are exemplified in the following quotes:

> *"In livestock there is bleeding from the body orifices, the skin is red on slaughter and the meat is not sweet,"* ***Women FGD, Ijara****.*

> *"In livestock the RVF symptoms are emaciation, bleeding from the nose, bloody diarrhea, high fever, coughing, inability to feed and general body weakness,"* ***Men FGD, Ijara.***

The key informants agreed with these sentiments. For example a man whose son had RVF and survived observed that, *in livestock they had fever, bleeding from the nose, bloody diarrhea and then they would die very fast.* Another female informant whose mother died of RVF in 2006 observed that *in livestock, symptoms of RVF included high fever, vomiting blood and redness of the skin of goats and sheep on the inside.* Notably only women mentioned low milk production, meat not having a "sweet" taste and the skin/hide being reddish on the inside after slaughter while emaciation, inability to feed and coughing were mentioned mostly in the FGDs with men.

4.2.3 Most affected livestock species

The study findings showed that the most affected livestock species were sheep and that they died in large numbers during the RVF outbreak. An FGD comprising of males were in consensus that the s*heep were affected the most and people lost a lot of sheep.* In addition, women in one of the FGDs observed that, their sheep died in large numbers after they bled from the nose. These observations were collaborated by key informants. For example, a 60 year old male reported that,

sheep died in large numbers and led to the impoverishment for those who had mainly sheep in their herds. Similarly, a 45 year old male medical practitioner also observed that, people in the region lost about 75% of their livestock especially the sheep.

4.2.4 Perceived RVF symptoms in humans

The perceived symptoms of RVF in humans according to the discussants were bleeding from the ears, nose and mouth (8/8FGDs), fever (8/8FGDs) and headache (8/8FGDs. Other symptoms were coughing (5/8FGDs), bloody diarrhea (4/8FGDs), vomiting (4/8FGDs), neck pain (2/8FGDs), stomach pain (2/8FGDs), general body weakness (2/8FGDs), joint pains (1/8FGD). These quotes by the discussants illustrate this:

> *"The symptoms we saw in people with RVF included bleeding from the gums, headache, chest pains and bleeding from the ears,"* ***Men FGD, Ijara.***

> *"People who were infected with RVF had symptoms such as headache, stomachache, flu like symptoms and bleeding from the mouth and nose,"* ***Women FGD, Ijara.***

Additionally, narratives with informants whose close relatives had been infected with RVF noted that the symptoms were similar to those experienced in malaria cases. The following quotes collaborate this:

> *"My husband had a headache, stomachache, fever and then he started vomiting blood. When it started we thought it was malaria,"* ***Woman, 45 years old, Ijara.***

> *"My father had fever at first. A while later he started bleeding from the nose and mouth.. At home we were treating my father for malaria but the fever didn't reduce. He also had*

joint pains all over his body, then bleeding from the mouth then bloody diarrhea and after that he died," ***Man, 35 years old, Ijara.***

Other symptoms cited by key informants who suffered from RVF in the last outbreak were, rashes on the body, chest congestion and pain, reddish eyes as well as poor eyesight. A narrative with a 43 year old man who suffered from RVF in the last outbreak and survived demonstrates this:

"It all started with a severe headache until I got disoriented. Thereafter I vomited and had bloody diarrhea that lasted for several days. I was so weak that I could hardly walk. My eyes were also reddish and I could not see properly and they pained a lot. Actually, even after going to the hospital and being treated and recovering my eyes still continued to pain".

Key informants who are practicing medical practitioners in the region agreed with these observations. They observed that the RVF symptoms in humans included: headaches, joint pains, fever and bleeding from the body orifices. However, they also noted that zoonotic diseases were not well understood even by the clinicians themselves because they had similar symptoms to malaria. For example, one medical practitioner said that *zoonotic diseases were not very well understood even by the clinicians themselves. Fevers were treated as Malaria but they were not going away so it is likely that it was RVF or other hemorrhagic diseases*. Another one admitted that, "*I did not know how RVF presents; I just knew it was a viral infection".* These findings reveal that the community perceptions regarding RVF symptoms in humans correspond to the biomedical characterization of the disease.

4.2.5 Onset and progression of RVF in humans

This study showed that the participants perceived that RVF started and progressed in a certain manner. The discussants observed that bleeding from the nose and mouth occurred after most of the other symptoms had been experienced and that this was the sign that signified risk of imminent death. The focus group discussions participants gave an account of the symptoms of RVF and progression of the disease in humans. Male participants in one FGD observed that, *before the bleeding one would feel the sensation of blood about to flow then bleeding would start and this showed grave danger to your life.* Women collaborated this by noting that, *people infected with RVF were bleeding from the nose and mouth and this often resulted to death* and *for some it started with stomach pains, others it was like a common cold and others had a headache.* These findings are similar to those expressed by an administrator in the Government who opined that *people had a headache, fever then bleeding from the body orifices and this often resulted to death.* Similarly, narratives by individuals who had suffered from RVF or had a close relative suffering from RVF supported these observations as demonstrated below:

Narrative 1: Male, 35 years old in Ijara, Kenya whose father died of RVF in 2007

My father was a 63 years old cobbler. He got sick for only six days, 3 of these at home and 3 in hospital. He died at Ijara Health Centre. At first he had very high fever which we tried to treat using malaria tablets and pain killers. However, the fever remained high. Then he had blood oozing from the upper jaw… from the teeth and nose as well as bloody diarrhea. He also had joint pains. We took him to the hospital when he started bleeding and that is where he died.

Narrative 2: Female, 20 years old in Ijara, Kenya whose mother died of RVF in 2006

My mother got sick at night. We took her to the hospital in the morning and by 10 am she was oozing blood from her nose. She started with a headache, neck pain and high fever. She started bleeding after we took her to the hospital. She was admitted in hospital for a month and later died.

4.3 Discussion

4.3.1 Lay beliefs regarding RVF

Perceived causes of RVF: The findings showed that all the informants said that RVF in both humans and livestock occurred during periods of unusually heavy rainfall and flooding. They also observed that RVF occurred in 1997/1998 and 2006/2007. This is in congruence with other studies (Anyangu *et al*., 2010; Nguku *et al*., 2010; Woods *et al*., 2002) which observed that RVF did occur in that region in those particular periods. In their study on RVF in Northeastern Kenya, Woods *et al*., (2002) noted that more than 150 people died of RVF in the then larger Garissa District of which Ijara was part of. They (Woods *et al.*, 2002) also concluded that about 27,500 human infections occurred during this period. On their part, Nguku *et al.*, (2010), in their study after the major outbreak of RVF in 2006-2007 found that several hundred people were confirmed to have RVF in Northeastern Province. This was during a period of unusually heavy rainfall and flooding (Nguku *et al*, 2010).

The informants further attributed RVF infections in both livestock and humans to mosquito bites due to the proliferation of mosquitoes after the flooding. Consistent with these findings, participants in a study by Jost *et al*., 2010 observed changes in their environment such as heavy

rainfall, flooding and a large number of mosquito swarms which they associated with the RVF outbreak. The participants in the study by Jost *et al*., (2010) proved to be very adept at recognizing that RVF outbreaks were associated with heavy rainfall and mosquito swarms. In this current study, the informants described these mosquitoes in various ways noting that they were different from those seen during normal seasons. They were described variously as bigger, darker in color, very noisy or small and whitish in color. These findings correlate with the findings of a previous study by Jost *et al*., (2010) among the Somali of North Eastern Kenya which established that the pastoralists were aware of the unusual nature of mosquitoes in the region, both in intensity and appearance, following heavy rainfall and flooding. Furthermore, participants in the study by Jost *et al*., (2010) reported that the mosquitoes were large and possessed white legs.

The participants in this study therefore, were confident that RVF was transmitted by mosquitoes as a result of flooding following unusually heavy rainfall. The Biocultural theory places importance on understanding ecological phenomena and how that relates to diseases in a particular region (Armelagos *et al*., 1992). In the case of RVF in the study area, ecological conditions have been known to lead to periodic outbreaks of this disease. These ecological conditions, according to Martin *et al.*, (2008), include the presence of mosquitoes which are sensitive to changes in climatic conditions as well as this region being prone to heavy rainfall as a result of El Nino/Southern Oscillation (ENSO) events. On the other hand, Bird *et al*., 2009 established a crucial link between rainfall patterns and mosquitoes in RVF prone areas. This link was found to be related to the presence of mosquito breeding habitats also known as *dambos* in the Northeastern region which when flooded provided an ideal environment for mosquito

breeding from dormant eggs. This consequently led to the breeding of a heavy population of mosquitoes which acted as a vector for RVF (Bird *et al*., 2009).

Additionally, some of the informants also gave folk causal explanations of RVF by reporting factors such as the windy conditions in the region, poor sanitation including lack of access to clean water and supernatural reasons observing that God causes the disease. These folk causal explanations were reported by both men and women with the exception of windy conditions. Although previous studies on RVF have not reported similar findings, studies on other diseases have reported supernatural explanations for disease (Dropkin, 2010). Individual and population based causal explanations for disease play a big role in the acceptance or rejection of public health interventions (Naidoo *et al*., 2009). In the case of RVF, these public health interventions include ban on transport and slaughter of livestock and the ban on the consumption of meat and milk (Munyua *et al*., 2009). Previous research on other epidemic diseases has shown that there is less acceptance of control strategies during disease epidemics by communities whose explanations for the causes of the disease differ from biomedical explanations (Liao *et al*., 2009; Raude and Setbon, 2009). Understanding how the community perceives the causes of RVF in Ijara is therefore important if any public health messages and interventions are to be accepted.

Perceived symptoms of RVF in livestock: Recognition of the symptoms of a disease is often the starting point in developing a suitable course of action. The findings show that most of the respondents reported symptoms of RVF both in livestock that were consistent with the biomedical symptoms. The most commonly cited symptoms of RVF in livestock were bleeding from the nose and other body orifices, high fever, the skin/hide being reddish on the inside, bloody diarrhea, low milk production, general body weakness and meat not having a pleasant

taste. These findings correspond to the biomedical symptoms of RVF in livestock which include fever, abortions, nasal discharge, bloody diarrhea, decrease in milk production and lethargy (Bird *et al*., 2009; Breiman *et al*., 2011; Munyua *et al* 2010).

Participants in a study on RVF in Kenya reported the following symptoms in their livestock; bloody discharge from the nostrils and mouth, abortions, coughing, anorexia, weakness, fever and oral discharge (Munyua *et al*., 2010). These findings are also similar to those noted in a study on the Somali pastoralists in Kenya by Jost *et al*., (2010) who found that the pastoralists had an accurate and detailed clinical description of RVF. The pastoralists listed abortion and froth emanating from the nose as symptoms of RVF (Jost *et al.,* 2010).

Notably too, informants in this current study consistently observed that meat from RVF infected livestock had an unpleasant taste and the hide/skin was reddish on the inside. This shows that consumption of meat from RVF infected livestock was indeed taking place at the time of the outbreak. This corresponds to a previous study by Munyua *et al.*, (2010) which was conducted in 12 Districts in Kenya among them Ijara which established that indeed consumption of meat from RVF infected livestock was taking place in spite of the warnings from public health officials against the practice.

Moreover, prior to probing informants in this current study did not mention abortions in livestock as a symptom of RVF. However, LaBeaud *et al*., (2008) in their study in Ijara before the 2006/2007 outbreak showed that disposal of an animal fetus was associated with greater RVFV seropositivity in humans in that region. Also, Jost *et al*., (2010) in their study among the Somali in Kenya found that abortion rates were reported to be very high in cattle, sheep and goats. Chengula *et al*., (2013) in their study in Tanzania reported that abortions in goats and

sheep were identified by their respondents as being caused by RVF infection. The communities in this current study were not well aware of animal birthing as being a big risk factor for RVF.

The findings of this current study further showed that sheep were the most susceptible of all livestock to RVF. Previous studies (Bird *et al*., 2009; Munyua *et al*., 2010; Nguku *et al*., 2010) too noted that sheep were the most affected species by RVF of all livestock. In a study by Jost *et al*. (2010), the Somali pastoralists in that study reported that sheep had the highest outbreak incidence, fatality and mortality rates. They estimated that more than 85% of their sheep died in the 2006/2007 outbreak compared with 56% and 36.5% of goats and cattle respectively (Jost *et al.*, 2010). On the other hand, Bird *et al*., (2009) note that young lambs especially those under a month old were highly susceptible to RVF virus infection with mortality rates of 90% to 100%. However, they argue that adult sheep are less susceptible to RVF infection with mortality rates of only 10% to 30% (Bird *et al*., 2009).

Perceived symptoms of RVF in humans: This current study findings showed that the RVF symptoms experienced in humans were coughing, fever, headache, bloody diarrhea, vomiting, joint pains, neck pain, rashes on the body, chest congestion and pain, reddish eyes, stomach pain, general body weakness, poor eyesight and bleeding from the nose and the upper jaw. Other previous studies have observed that RVF causes an abrupt onset of malaise, fever, ocular disturbances, encephalitis and hemorrhagic syndromes (Bird *et al*., 2009; Anyangu *et al*., 2010; Nguku *et al*., 2010). RVF patients experience flu like illness after an incubation period of 2-5 days with other symptoms like fever, headache, fatigue and joint pains (Balkhy and Memish, 2003). Most RVF cases in humans are asymptomatic with less than 5% of the patients developing complications (Balky and Memish, 2003).

The informants also observed that, bleeding from the nose and mouth occurred after most of the other symptoms had been experienced and that this was the sign that signified risk of imminent death. Corresponding to these findings, previous studies (Bird *et al*., 2009; Anyangu *et al*., 2010; Nguku *et al*., 2010) noted that the hemorrhagic syndromes developed in the most severely affected individuals and were associated with death. In their study conducted after the 2006/2007 RVF outbreak in the Northeastern region of Kenya, Anyangu *et al*., (2010) reported that 7-8% of patients with RVF developed severe disease characterized by hemorrhagic syndromes, encephalitis and death and 1-20% of patients developed ocular complications. On the other hand, Bird *et al*., (2009) based on findings from a study conducted in Saudi Arabia established that 1-2% of RVF infected individuals developed hepatitis, encephalitis and hemorrhagic syndromes. This shows that the informants' perceptions of RVF symptoms corresponded with the biomedical characterization of the disease. However, no previous studies have reported bleeding from the upper jaw in humans as a symptom of RVF.

4.4 Summary

This study therefore established that the community was aware that RVF occurred in both humans and livestock during periods of unusually heavy rainfall and flooding. They also observed that RVF occurred largely as a result of mosquito bites to both humans and livestock. They also believed that RVF was also caused by folk causal reasons such as God, poor sanitation and the presence or absence of wind. They noted too, that sheep were the most affected livestock species in terms of morbidity and mortality. In regard to the symptoms of RVF in both humans and livestock, most of the signs they noted corresponded to known biomedical signs. This study therefore shows that the community has some relevant knowledge on RVF. Nevertheless, more

relevant health education is needed to enable the people in this region to understand better the causes and symptoms of Rift Valley Fever.

CHAPTER FIVE

PERCEIVED RISK FACTORS FOR RIFT VALLEY FEVER

5.1 Introduction

This chapter presents the study findings and discussion related to the perceived risk factors for RVF. It is divided into three main sections which are perceived risk factors for RVF, discussion and summary.

5.2 Perceived risk factors for Rift Valley Fever

The discussants and informants were asked questions to explore their beliefs about the risk factors for RVF. The discussants on being asked whether any of their animal husbandry practices could lead to RVF were of the opinion that RVF was caused only by mosquitoes. This is illustrated in the quotes below:

> *"RVF is a dangerous disease and it is caused by mosquitoes. This occurs during periods of heavy rainfall and flooding like it did in 1997 and 2007. Some people said it is caused by meat consumption but that is not true. It is because of the heavy rains and the resultant mosquitoes,"* ***Men FGD, Ijara.***

> *"RVF occurs when it rains heavily. This is because mosquitoes increase in number as a result of the long grass that grows. In addition, there is no wind to drive away the mosquitoes,"* ***Women FGD, Ijara.***

> *"Nothing else causes RVF other than flooding and mosquitoes,"* ***Men FGD, Ijara***.

However, after probing they used words such as "the government said", "we heard", "people said" to describe RVF causes related to their livestock practices. They mentioned that some of the risk factors that they had heard, mainly from Government agencies were consumption of meat and milk from diseased animals, herding, residing with animals and herding. This is exemplified in the quotes below:

> *"We were consuming meat and milk from our livestock during the last outbreak. We did not know that the livestock might have been infected with RVF. Later on we heard that consumption of meat and milk from ill animals could cause RVF in humans,"* ***Women FGD, Ijara.***

> *"Nothing else causes RVF other than flooding and mosquitoes. However, some people said that RVF is caused by consumption of meat but we know the disease only occurs during periods of heavy rainfall and is transmitted by mosquitoes,"* ***Men FGD, Ijara****.*

On further probing the discussants associated the risk of acquiring RVF as a result of their practices as arising from the breath from the animals. They also noted that if a person had a wound and it came into contact with the blood and body fluids from the diseased animal the person would also acquire the infection. For example a female informant said that, *you can get RVF when slaughtering, that is if the animal is infected and you have a wound on your arm and also from the substances emitted when the animal coughs.* Nevertheless the discussants and the informants still did not believe that RVF could occur as a result of their livestock practices. This is exemplified in the quotes below:

"Many people died and much later we heard that RVF is caused by meat and milk but people did not believe," ***Administrator, 33 years old, Ijara.***

"I know RVF is caused by mosquitoes but the Government said that consuming meat and milk also causes the disease. However, I personally believe it is mosquitoes that cause RVF and not meat. There were warnings through the radio against meat and milk consumption but we went ahead and consumed them and nobody got sick. We were eating the meat because the goats and sheep were dying very fast and they were very healthy so we slaughtered and ate. We just believed God would protect us". And we also drank the milk," ***Male 35 years old, Ijara.***

The discussants in this study therefore noted that the risk factors they had heard were associated with RVF were herding and consumption of meat and milk from infected animals. Other risk factors cited were residing with sick animals, milking, and slaughtering, skinning and assisting livestock when giving birth.

Herding: The discussants (8/8FGDs) noted that the category of people most infected with RVF during the last outbreak were herdsmen. The reasons cited for this included close proximity to the livestock, consumption of the milk and meat from the infected animals, lack of mosquito nets and lack of access to information as they were away from the villages and towns. For example, women in the focus group discussion said that, *RVF affected the herdsmen mainly because they drank the milk and ate the meat of the sick animal*s. And also that, *the men who were herding at that time were the most affected. They were sleeping together with the livestock in the open, slaughtering and eating the sick animals and drinking their milk.* Men collaborated this findings,

for example they said that, *men were the most affected as they are the ones that herd…they move with the animals.*

An interview with a man who was infected with RVF in the last outbreak also supported these findings. At the time he got infected he was herding and residing with the livestock in close proximity. He was also consuming the meat and milk from the animals. He gave his story as narrated below:

> *"When I got RVF, I was a herdsman. I was taking cattle to a place called Ege in Sangailu. I was drinking milk and eating meat. As soon as the livestock started bleeding from the nose we would slaughter before they died and eat them. I was also keeping livestock in the house where I lived because it was raining heavily. We did not know that RVF can be transmitted from animals to humans,"* ***Male, 51 years old, Ijara.***

Another informant whose brother had RVF in 2007 gave the following narrative:

> *"My brother had RVF. He was 28 years old and a herdsman. At the time he had moved the livestock to Garissa. RVF affected mainly herdsmen and people in the villages because they were drinking unboiled milk and eating infected meat. They were also keeping livestock in their houses and were getting bitten by mosquitoes,"* ***Male, 35 years old, Ijara.***

Meat and milk consumption: The discussants (4/8FGDs) noted that they did not know that consumption of meat and milk from ailing livestock would cause RVF. For example, women in one focus group discussion observed that, *we were consuming both milk and meat at the time of the outbreak. We did not know that our livestock had acquired RVF*. In addition, men in one

focus group discussion added that, *some people said that RVF is caused by consumption of meat but we know the disease only occurs during periods of heavy rainfall and is transmitted by mosquitoes.* A 50 year old female key informant also supported these sentiments as she observed that, *we did not think that what we were experiencing was RVF…sheep meat is very sweet. When we realized our sheep were dying and they had a bloody nose we slaughtered, ate the meat and consumed the milk as well*. They added that it was only much later in the outbreak that they were informed of the risks involved. Furthermore, a 20 year old female key informant whose mother died of RVF in 2006 observed that, *My mother was slaughtering the goats and sheep when they got sick and we ate….we did not know it could affect us.*

Additionally, key informants clarified that there was no other food available due to impassable roads and so they had to consume the meat and milk as the only food available. For example, one key informant, a 53 year old male observed that, *even with the livestock sick, we were still eating their meat and drinking the milk. There was no tea, no food, people really suffered. People were slaughtering each day, because the livestock were dying. They reasoned that it was better for the children to eat as they were hungry. We would slaughter the fattest animals as we did not have other options available.* When asked how the community responded to the imposed ban on slaughter most of the informants noted that people did not comply with the ban. These medical practitioners observed that:

> *"All the roads had been destroyed by the floods and were impassable, there was a lot of hunger and there was no food. People did not obey the ban on slaughter as they had to eat and the only food available was the meat and milk from their livestock,"* ***Male, 48 years old, Ijara.***

"There was nothing else to eat since all the shops were closed and this area was completely cut off by the floods. The food that used to be brought to us by airplanes was too little. There was therefore nothing to eat other than meat and milk. It was either you died of hunger or you died of RVF," ***Male, 44 years old, Ijara.***

The informants noted too, that culturally they would slaughter ailing animals before they died and believed that once boiled, the meat was free of any disease. This is exemplified in the following quotes:

"Doctors said we should not eat meat. We the Somalis believe that when our livestock get sick we should slaughter them and eat before they died," ***Male, 55 years old, Ijara.***

"In our culture we believe that once meat has been boiled it has no disease and so it is fit for our consumption," ***Male, 60 years old, Ijara.***

The findings also showed that the respondents reported that they preferred unboiled milk to boiled milk. They reported that unboiled milk had a much better taste. Women in one focus group discussion reported that, *"we do not wait for milk to boil (laughter). When we are milking we taste some. We believe boiled milk doesn't taste as good".*

***Residing with livestock*:** The findings, (6/8FGDs), showed that the community resides with livestock in their houses for two main reasons. One was to protect them from wild animals and to shelter the sick and young animals from weather elements such as cold and rain. They observed that this was the best thing to do as they did not want their livestock to die. In 2006/2007 they added, it was imperative to sleep inside their houses together with the young and sick animals as it was raining heavily and these would die if left outside. The following quotes shed further light:

"It was raining all the time and cold too so people started keeping livestock in their houses. Then people got RVF as a result of the "breath" from the livestock," ***Men FGD, Ijara.***

"We kept them inside our houses because it was raining….where else would you keep the? We were taking in the ones that were very sick and we slept together," ***Men FGD, Ijara.***

"We kept livestock inside our houses if they were sick and if it was raining a lot. This was so as to protect them from the cold. If we failed to do that they would die very quickly," ***Women FGD, Ijara.***

Key informants further supported these findings. For example, a 48 year old male medical practitioner opined that, *small goats and sheep sleep inside as well as calves. Bigger animals also sleep near the homestead. That is why if a mosquito bites the animal it will bite the people as well*. The members of the community also slept outside and near their animals when they were out herding away from home. This increased their chances of suffering mosquito bites as they did not sleep under mosquito nets. A 44 year old male medical practitioner noted that, i*n the bush they sleep with the animals.*

The narrative interviews with individuals who had RVF or had close family members who suffered from RVF also supported these observations. For example, this individual's father died of RVF in 2007 and he had this to say when asked about the causes of RVF:

"I think it was mosquitoes that caused RVF because it was raining heavily in 2007. And then the goats and sheep were near our house and my father used to light fires near the livestock shed to

ward off the mosquitoes as they were so many then. At the same time, some goats were sick and I think that those mosquitoes bit my father after biting the infected animals. That is how he got RVF. He would spend the night there, goats don't like mosquitoes, they just circle all night so he used to go and stay near the goats at night. So it is not milk or meat, it is the mosquitoes, he didn't eat meat and consumed boiled milk," ***Male, 35 year old, Ijara.***

On being probed further on the value of residing with the animals in the house this informant added that, *residing with livestock is common here. They live near you, your neighbors are the goats and there is no problem with that.* The discussants were of the opinion also that they were willing to protect their livestock at any cost because they could not live without them. For example, women in a focus group discussion opined that, *we do not want our livestock to die. If all our livestock died and we remained there was no use since we cannot live without livestock".*

Slaughtering and skinning**:** This study (6/8FGDs) found that, the risk factors associated with slaughtering and skinning were inhaling the breath from the animal under slaughter and coming into contact with the fluids of the animal. The discussants noted that an animal's breath can cause RVF to the person slaughtering if it is infected. Secondly, if one had a wound in the arm and it came into contact with the animal's body fluids then they could become infected with RVF as this quote exemplifies:

> *"You could get RVF during slaughter and skinning if you had a wound on your arm and the blood and body fluids from the infected animal came into contact with that wound,"* ***Women FGD, Ijara.***

Milking: The discussants (5/8 FGDs) said that they do not boil their milk and one could get infected with RVF as a result of consuming unboiled milk. The act of milking too could result to an infection as well as from the breath from the animals when milking. For example, women in one focus group discussion observed that, *you can get RVF from the breath that comes to you from the animal as you milk as well as from drinking unboiled milk…we don't wait for the milk to boil..(laughing) we taste as we milk. Once the milk has been boiled the flavor is not as good.*

However, according to a 55 year old male from the community, the practice of consuming boiled milk is catching on. He attributed this to the presence of a lot of diseases found in unboiled milk. He observed that, *previously they were not boiling milk, but it is now becoming a common practice because there are many diseases found in milk nowadays.*

***Assisting in births*:** The risk factors associated with assisting animals while giving birth were related to having an open wound and from the animal's breath. The findings (4/8FGDs), show that the discussants thought that these were the two ways through which one could acquire RVF. For example, in a focus group discussion it was suggested that, *you could get RVF from the infected animal if you had an open wound and you came into contact with the animals bodily fluids*.

Key informants further observed that some people actually consumed the aborted foetuses in the last outbreak as a result of hunger. A 48 year old male medical professional who was present in the region during the last outbreak said, *some of them were eating even the aborted foetuses if they suspected that the foetus would not survive. This is because they were hungry.*

5.3 Discussion

5.3.1 Perceived risk factors for RVF

Participants in this current study were asked questions to explore their perceptions about the risk factors for RVF that related to their animal husbandry practices. The informants said that they had heard that certain practices were risk factors for RVF in humans. These factors were consumption of meat and milk from sick animals, herding, residing with livestock, slaughtering and skinning, milking and assisting livestock in giving birth. However, they did not believe this to be true since they reported to have consumed meat and milk products in the last RVF outbreak and they did not get RVF. Indeed numerous studies have demonstrated that practices such as herding, residing with livestock, touching an aborted animal fetus, slaughtering, skinning and consumption of meat and milk from ill or dead livestock do play a key role in the transmission of RVF to humans (Bird *et al*., 2009; Breiman *et al*., 2011; Nguku *et al*., 2010).

Consumption of meat, raw blood and raw milk: The findings of this current study showed that while the informants had heard that consumption of animal products from ill animals might cause RVF, they perceived this to be false. They especially observed that many of them consumed meat and milk from ill animals during the last RVF outbreak and they did not get sick. They associated RVF infection in humans with manifested symptoms and did not seem to know that majority of RVF human infections are asymptomatic (Anyangu *et al.*,2010; Breiman *et al*., 2010). This reveals a gap in knowledge within the community regarding RVF. They also added that they lacked alternative sources of food during the RVF outbreak and had no choice but to consume the meat and milk. Additionally, the informants believed that cooking killed all the disease causing organisms. Furthermore, the participants in this current study opined that

culturally, they did not slaughter dead animals but they did slaughter very ill animals to salvage the meat which is valued highly. Previous studies have suggested that inadequate beliefs about disease transmission and prevention might contribute to adverse epidemiological effects including the spread of disease during an epidemic thus the need for proper public health information (Raude and Setbon, 2009).

In this regard therefore, lay perceptions regarding diseases are important because preventive practices related to any disease require the adherence of the population in question (Liao *et al*., 2009). In the case of RVF, the beliefs about consumption of animal products during an RVF outbreak need to be understood before the community can refrain from that practice. In their study, Munyua *et al*., (2010) also showed that the communities in Ijara District did consume meat from ill animals to salvage the value of the protein of that animal. This is because animal products including meat, fat and milk form the bulk of the diet of the pastoralist communities (Jost et al., 2010; Munyua et al., 2009).

The findings of this current study also showed that the community believed in taking unboiled milk adding that it tasted a lot better than boiled milk. The participants in this current study also noted that they valued meat highly and that it why they slaughtered and consumed ill animals in spite of the risks involved. A previous study by Munyua *et al*., (2010) suggested that consumption of meat and milk from sick animals was the most significant risk factor for human infection with RVF. This shows that the perception that consuming animal products during an RVF outbreak was safe needs to be addressed so as to reduce the magnitude and impact of the disease.

In their study conducted in Sudan, Hassan *et al.*, (2011) observed that while mosquitoes played a role in the transmission of RVF to humans one of the most significant risk factors for severe RVF disease was consuming or handling products from sick animals. Studies conducted in Kenya too, demonstrated that the most significant risk factors for RVF were slaughter as well as consumption of meat and raw milk from ill animals (Anyangu *et al*., 2010, Munyua *et al.*, 2010; Nguku *et al*., 2010). This is because of the greater inoculums from viremic animals such as sheep and cattle than that transmitted by mosquitoes thus providing an effective route for disease transmission (Balkhy and Memish, 2003; Munyua *et al.*, 2010). In fact in a study conducted by Anyangu *et al*., (2010), mosquito related exposures were not associated with severe RVF disease.

The findings of this current study also showed that the community largely continued with consuming animal products from ill animals during the last RVF outbreak. In another study conducted in Saudi Arabia after an RVF outbreak Al-Hazmi *et al.,* (2003) found that there was a connection between RVF infection in humans and the consumption of raw milk in which concentrations of the RVF virus were found. This is in tandem also with previous studies conducted in the Ijara region which concluded that, the government's ban on raw milk and home slaughter was difficult to enforce because livestock are critical to the livelihood of people in this region (Anyangu *et al*., 2010; Breiman *et al.,* 2008; Munyua *et al*., 2010).

Herding: The practice of herding was also cited as a key risk factor for RVF. The informants elaborated that the herders lacked proper information on RVF so as to engage in preventive behavior. This was mainly because the herders were away from their homes where the health messages were being communicated. The herders also engaged in risky practices such as

consuming raw milk and meat from sick animals as well as sleeping outside with no protection from mosquitoes. These findings concur with other previous studies (Munyua *et al*., 2010; Nguku *et al*., 2010) which demonstrate that the herders typically move their livestock to areas of new grass growth and *dambos* (temporary water bodies) at the onset of the rains. These are the areas where the mosquitoes breed, further increasing the pastoralists' chances of being bitten and infected with RVF. Participants in this current study show that the herdsmen were the most affected by RVF. Similarly, researchers in a study conducted in Ijara concluded that herding was associated with severe RVF disease in humans (Anyangu *et al.*, 2010).

Residing with livestock in close proximity: In this current study, residing with livestock in close proximity was cited as a risk factor for RVF. The discussants opined that during periods of heavy rainfall they kept the kids, calves and sickly animals inside their houses at night to protect them from the cold and rain. Additionally, the practice of residing in close proximity with the livestock emanates from the need to protect them from wild animals such as leopards, lions and hyenas. LaBeaud *et al*., 2008 also found that sheltering livestock was a risk factor for RVF in their study within the Ijara region. They found that this was more common among the rural populations and this was associated with greater seropositivity. In another study, 98% of the human RVF cases reported in the Saudi Arabia epidemic were from the regions of Gazar and Asir and people in these two regions had repeated mosquito exposure from sleeping outside due to the heat and also lived in close proximity to their livestock (Balhky and Memish, 2003).

In spite of the fact that the greatest risk for severe RVF disease is from animal contact, the informants in this current study adopted a no choice attitude towards that and instead were more convinced that RVF was from mosquitoes. Anyangu *et al*., (2010) noted that mosquito bites were

not associated with severe RVF disease as were animal husbandry practices. This demonstrates the need for proper health education to the communities and provision of alternative means of sustenance during an outbreak. Nevertheless, the informants in this current study also noted that livestock being a central part of their lives and livelihood it was nearly impossible to not engage in certain practices however harmful. That was the reason why in order to protect their livestock from the floods, rain and cold they opted to reside with their livestock within their houses at night. This also served to protect the livestock from the wild animals.

Exposures related to close proximity to livestock: These included slaughtering, milking and assisting in births: The findings of this current study also show that the informants believed that the main method of transmission of RVF from livestock to humans was aerosol. They related this to close proximity to the diseased livestock when slaughtering, milking, and assisting in births. Additionally, the presence of a wound especially on the hand was said to increase the likelihood of transmission of RVF during animal contact. Previous studies have shown that the aerosolization of blood and other body fluids during animal contact resulted to RVF infection for those exposed (Anyangu *et al.*, 2010; LaBeaud *et al*., 2008; Woods *et al.*, 2002). In their study, Anyangu *et al.*, (2010) noted that direct secretions after touching an animal infected with RVF contributed greatly to human RVF infections. In their study conducted in three Districts in Kenya between January and March 2007, Anyangu *et al*., (2010) concluded that certain exposures related to animal contact resulted to acute RVF infection. They also noted that there was a possibility of aerosol transmission of RVF from birthing animals to humans.

5.4 Summary

Table 5 below shows the various themes identified in the study that relate to the health belief model. It further suggests potential applications of the themes in developing interventions for RVF in the future. The themes include the beliefs by the community that their livestock practices do not cause RVF disease in humans, the fatalistic attitude that nothing can be done to prevent RVF as well as the belief that RVF affects only a few people. This study proposes that health education to the community should address such misinformation and attitudes in the context of high regard for livestock as the main means of livelihood by the communities in the study region.

Table 5: Application of the health belief model to the study

Concept	Definition (Janz *et al.*, 2002)	Themes identified in this study	Application
Perceived Susceptibility	Belief regarding ones chance of getting a condition.	"Our animal husbandry practices do not cause RVF disease in humans". Mosquitoes cause RVF during periods of unusually heavy rainfall.	Health education curricula that addresses susceptibility for RVF from animal husbandry practices also considering that livestock is the main means of livelihood in the region.
Perceived Severity	Belief of how serious a condition is.	Limited overall. RVF disease in humans affected only a few people. Its Gods will for one to be infected with the disease and nothing can be done about that.	Proper health education on the risk of severe RVF disease in humans in subsequent outbreaks leading to high fatality rates.
Perceived Benefits	Belief in the efficacy of the advised action to reduce risk	Fatalistic attitude, nothing you do or fail to do will protect one from RVF if they were meant to get sick and vice versa.	Training the community on the importance of adopting preventive measures against RVF.
Perceived Barriers	Belief on the tangible and psychological costs of advised action	Lack of alternative sources of food. Great value for livestock as the main source of livelihood so cannot stand to see meat and milk go to waste.	Provide alternative and adequate sources of food during an RVF outbreak.

Cues to action	Strategies to activate ones readiness to take action	Limited timely and relevant health education.	Target key opinion leaders in the community to spearhead the health education efforts.
Self efficacy	An individual's confidence in their ability to take action	Individual behavior determined by culture and religion.	Provide health information that addresses cultural and religious beliefs.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the study conclusions and recommendations.

7.2 Conclusions

In the preceding chapters the lay beliefs and perceived risk factors as well as the peoples experiences with RVF have been examined. The findings of this study show that the community perceives RVF to occur in their region as a result of heavy rainfall, flooding and the resultant mosquitoes that transmit RVF. The community observed that RVF occurred in the region in 1997 and again in 2006. In both instances they reported that there was heavy rainfall followed by flooding in the area. They added that the mosquitoes that resulted were different from those that they observed during the normal seasons. These mosquitoes were described variously as being of a different color and size. Other factors that were also said to cause RVF in regard to their ecosystem were poor sanitation, supernatural reasons and the presence and absence of wind.

In regard to their animal husbandry practices as being a risk factor for RVF, the people's perceptions were that those practices did not play a major role in the transmission of RVF as did mosquitoes. However, on further probing they observed that they believed RVF would be transmitted from livestock to humans through the breath from the infected animals. This would occur during herding, assisting livestock in births and milking. They also observed that they had heard from Government sources that RVF could occur as a result of consumption of meat and

milk from infected livestock. Notably though, they perceived this not to be true. They cited incidences where even after consumption of meat and milk from infected livestock many people did not get infected. They also cited a preference for raw milk and animal blood which they also gave to RVF infected patients to aid in recovery. They also added that they consumed meat and milk because there were no alternative sources of food during outbreaks. This made it difficult for them to follow the advice of not eating meat and consuming raw milk which was an important part of their diet.

Lastly, this study also found that RVF impacted the community adversely especially because of the loss of large numbers of livestock. RVF also impacted negatively on the community through loss of human life, loss of the main means of livelihood, disruption of economic and daily activities and psychological turmoil. They observed that this loss led to impoverishment and poverty. This was mainly because they had to seek other means of livelihood such as casual labor which they were not used to.

In conclusion therefore the findings of this study imply that the lay beliefs and perceptions of the community regarding the causes of RVF have implications on the community's perceptions of risk and their willingness to engage in protective practices. Participants in this study perceived RVF to occur largely as a result of mosquito bites. They reported that they had heard from Government sources that some of their livestock practices did predispose them to RVF. These included consumption of meat and milk from infected livestock. However, the findings imply that the perceived threat from engaging in such practices during an outbreak was low. Consequently, the willingness to practice safer practices was minimal.

7.3 Recommendations

Based on the findings of this study, the following recommendations are made:

1. Policy makers need to develop health messages regarding RVF causes, symptoms and treatment taking into consideration the community's lay beliefs to counter rumors and misinformation. This would lead to a better understanding of the risks involved to ensure adherence to control strategies by public health and animal health officials during an outbreak.

2. There should be concerted efforts by all stakeholders to provide alternative means of livelihood during and after RVF outbreaks to mitigate against the challenges experienced by the community. This would help the community to refrain from potentially risky activities as a result of hunger and impoverishment. This would also help to reduce poverty since the community in Ijara depends a lot on livestock for their livelihood.

3. Further in depth studies on community perceptions regarding informal and formal healthcare in the treatment of RVF would be useful. This would provide information that would facilitate timely and effective management of RVF patients through the provision of culturally relevant treatment approaches.

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APPENDICES

Appendix 1: Statement of Consent

"Hello. My name is …….I am from the University of Nairobi. I am carrying out a study on the lay beliefs and risk factors for Rift Valley Fever in this locality. I am interested to know your opinions on the causes, symptoms and treatment of the disease as well as the livestock practices in this locality in regard to RVF. You have been purposively selected as one of my respondents in this study. Please feel free to discuss the above issues with me. Your name will not appear in any of the documents and all the information you provide will be treated with confidence. You are not under any obligation to respond to all the questions and you can withdraw from the study at any time. Thank you".

Consent Sheet

"I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to participate in this study and understand that I have the right to withdraw from the discussion at any time with no consequences."

_____	_____	_____
Informant's Name	Signature and Date	
_____	_____	_____
Researcher	Signature and Date	

Appendix 2: Key Informant Guide

ID NO:

Demographics**:**

Age:

Sex:

Village: Location: Division: District:

Level of Education:

Marital Status:

Occupation:

Theme 1: Knowledge and Practices regarding RVF

- Describe the livestock practices in this region: types of livestock kept, uses of livestock, where kept, grazing patterns, movement patterns, gender and age dynamics in caring for livestock, livestock preparation and consumption practices, seasonal variations in roles and responsibilities.
- Name the common livestock diseases in this region and their symptoms?
- Describe RVF: Local names, causes, symptoms, risk factors, control and treatment.
- Factors associated with the occurrence, transmission and spread of RVF.

Theme 2: Historical Perspective and Control Mechanisms regarding RVF

- Describe the last outbreak: areas or regions most affected categories of animals and people most affected by RVF.
- Control and management of the disease in livestock and humans in the community.
- Risk reduction strategies for animals and humans.

Theme 3: Perceptions regarding RVF

- Describe the specific behaviors that lead to RVF infection in humans.
- Describe the ways in which the local people's interaction with their environment predisposes them to acquiring RVF.
- Describe the linkage between the animal husbandry practices in this community and RVF.
- Describe the people's health seeking behaviour when suspecting or infected with RVF.

Theme 4: Impact of RVF on individuals, families, community

- How would you describe the impact of RVF in this locality? (Short and long term impacts on individuals, families and communities)
- How would you describe the response of the Government agencies to RVF outbreaks?
- What would you like to see done in regard to mitigating the impacts of RVF in this community?

Appendix 3: Focus Group Discussion checklist

ID NO:

Demographics

Type of Group:

No in a Group:

Level of education:

Village: Location: Division: District:

Theme 1: Livestock practices in the community

- List the different livestock practices the community engages in.
- List the uses of livestock.
- Describe the livestock practices: (herding, watering, milking, treating, slaughtering, preparation and consumption of animal and animal products, assisting in births, caring for diseased animals, where animals are kept) in terms of age and gender dynamics.
- Describe the livestock movement and grazing patterns: where and in which environments such as forested, swampy or grassland areas, seasonal variations, which categories of people are involved in this.

Theme 2: Knowledge and Perceptions regarding RVF:

- Describe some of the common livestock diseases in this region and their symptoms.

- Describe RVF: local names and meanings, causes, when does the disease occur, risk factors, symptoms in animals and humans, breeds of animals most affected, categories of people most affected, frequency of occurrence.

- Describe how RVF is controlled and treated in the community for both animals and humans: methods known, methods used and preferred methods.

- Describe the reporting to relevant authorities of RVF risk: to whom is it done, why, what changes or issues signify RVF risk in the community, how is the authorities response perceived.

Theme 3: Factors associated with transmission and spread of RVF

- Risk factors for the occurrence, transmission and spread of RVF: any specific behavior that predispose humans to acquiring RVF.
- Describe the perceived linkage of livestock practices (herding, milking, and consumption of animal products, residing with animals) with RVF.
- Describe the perceived linkage of the ecosystem with RVF (show photographs of the different ecosystems such as forests, flooded areas, and grasslands).

Theme 4: Impact of RVF on individuals, families and community

- In what ways does RVF affect individuals, families and communities? {Probe; ability to meet basic needs, impact of illness or death on families, community's response to such calamities, Government's response in regard to human and animal health, long term impacts to families and community}

- What measures would you like to see in place regarding the control of RVF?

Appendix 4: Narratives

ID NO:

Demographic issues

Age:

Sex:

Level of education:

Residence:

Marital status:

Family size:

- Livelihood issues: occupation, types of livestock caring for, livestock practices engaging in then: herding, milking, and caring for diseased livestock, cooking animal products, handling diseased animals, residing with animals.

- Describe RVF: local names, causes, symptoms in animals and humans, risk factors, last outbreak.

- Describe your experience with RVF: when you got ill, where were you when you got ill, what was happening then, symptoms, what do you feel caused your illness, how long were you ill, extent of illness, course of action taken, treatment sought and where, experience with the treatment, experience with formal health care if any.

- Describe the impact of your illness on you as an individual and your family: both short term and long term.