KNOWLEDGE, ATTITUDE, AND PRACTICES TOWARD LASSA FEVER MANAGEMENT AMONG HEALTHCARE WORKERS IN MARYLAND COUNTY, LIBERIA

By

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APPROVAL SHEET

This thesis entitled ***Knowledge, Attitude, and Practices toward Lassa Fever Management among Healthcare Workers in Maryland County, Liberia,*** written and submitted by **Neonora Ade Payne Barclay** in partial fulfillment of the requirement for the degree of Master of Public Health (Epidemiology and Diseases Control), is hereby accepted and approved.

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Date

DECLARATION BY THE CANDIDATE

This thesis is my original work and to the best of my knowledge, this work has not been published and/or presented to any University for an award of degree.

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DECLARATION BY THE SUPERVISORS

This thesis has been submitted for examination with our approval as University supervisors.

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ABSTRACT

This research study examined the knowledge, attitude, and practices towards Lassa fever (LF) management among healthcare workers in Maryland County, Liberia West Africa. This virus is transmitted by the rodent of the genus *Mastomys natalensis* commonly known as the "multi-mammate rat." The *Mastomys* rats are the carrier of the virus which is active in their urine and feces. The virus is a single-stranded RNA virus belonging to the virus family Muridae.

This sought to study explored the relationship between knowledge, attitude and practice towards Lassa fever management among healthcare workers in Maryland County, Liberia.

Two hundred and ninety-nine healthcare workers between 22 and 52 years participated in a quantitative research using the cross-sectional study design. Participants were selected randomly after stratification. Data was collected using structured questionnaires and analyzed o STATA for windows, version 16. Analysis included descriptive statistics (frequencies and percentages). The study used the logistic regression since the response variable, health care practices was categorical. This allowed us to classify respondents as practicing poor or good health care practices. The developed logistic model was found to be statistically significant, (**6**) = **24**.**88**, = **0**.**0004** meaning that at least one of the predictor variables included in the model affected the health care practice outcome. The study found statistically significant predictors were health care worker cadre, z = -2.45, p = .014, OR = .62 95% CI (.43, .91) and experience z = 3.68, p = .000, OR = 2.32 95% CI (1.48, 3.63). The odds ratio health care cadre shows that higher cadre is associated with poor health care practices. In particular, an increase in cadre by one level lowers the odds of falling in the good practice category by a factor of 0.62. There was a statistically significant association between health care practices on Lassa fever management and the variables cadre, p = .002 and years of experience and as a health care worker, p = .000.

Consistent with other studies on the knowledge about Lassa fever and its management, there is a lack of adequate knowledge of Lassa fever management among Healthcare workers. This study found that there was not infection prevention control measures put in place across governmental and private owned clinics so compliance was lacking.

In conclusion, this study showed that knowledge on the management of Lassa fever both in governmental and private health facilities were less desirable putting Healthcare workers at risk of the virus. The study also showed that compliance to the control and prevention of Lassa fever management among healthcare workers is lacking due to the fact that none of the clinics and hospital have infection protective control practice put in place towards Lassa fever management.

The researcher recommends the Director of the Maryland county health team must put in place proper and effective control practice and prevention strategies which are crucial in the management of Lassa fever for the healthcare workers. Both the public and private health facilities must consistently put priority in place to implement standard infection prevention and control interventions when caring for febrile patients to prevent nosocomial infections including Lassa fever. Sensitization on knowledge of LF by the Williams V S Tubman University through media platforms all year round in the county with an added focus on the students of health sciences.

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To my Beloved sister, Rev Sr. Patience S. Payne and Rev. Fr. Boniface G. Tye, words cannot express how grateful to God I am for believing in me when no one else did. Your prayers, financial support and tireless encouragement have brought fruit to your labour. To my mother, father and rest of my siblings and family thanks for your support, acceptance and patience during those times when I have to neglect family duties to work on this research work and thesis preparation.

Finally, my thanks go to the healthcare workers of Maryland County and all the people who have supported me to complete the research work directly or indirectly.

DEDICATION

I dedicate this research to my beloved husband Mr. Alexander Archie Barclay and my son Aden Ethan Barclay.

ABBREVIATIONS

CDC - Center for Disease Control

EVD - Ebola Virus Disease

J.J Dosssen – Joseph Jenkins Dossen

LF - Lassa Fever

MoH - Ministry of Health

NPHL - National Public Health of Liberia

PPE - Personal Protective Equipment

RN - Registered Nurse

RNA - Ribonucleic Acid

SARS - Severe Acute Respiratory Syndrome

WHO - World Health Organization

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CHAPTER ONE: INTRODUCTION

This chapter delineates the study's background, states of the problem, articulates the objectives, states the hypothesis, outlines the significance of the proposed study, underscores te justification, illustrates the conceptual and theoretical frameworks, delimits the study's scope, highlights the limitations and provides operational definitions of the study.

1.1 Background of the Study

Lassa fever (LF) is a major Public Health importance in West Africa. All healthcare workers should have comprehensive knowledge of LF due to the endemic nature of the disease (Fisher-Hoch et al., 2000).

According to CDC (2019), 10-16% of people are admitted annually to various hospitals in some areas in Liberia and Sierra Leona demonstrating a very serious impact of the disease on the region. Lassa fever has become a endemic nature is becoming a concern of bioterrorism in West Africa (Bausch et al., 2010).

Lassa fever, viral hemorrhagic fever is a zoonotic disease that is transmitted by the rodent of the genus *Mastomy's Natalensis*, commonly known as the "multi-mammate rat." The Natal multi-mammate mouse (*Mastomy's natalensis*) is a species of rodent in the family Muridae (Dimie Ogoina, 2013). It is also known as the Natal multi-mammate rat, the common African rat, or the African soft-furred mouse. When *Mastomy's* rats get infected with the Lassa virus, the rats do not become ill but they become carriers of the virus shed with their urine and feces((Mory Keïta, 2019).

Figure 1*:Mastomy's* natalensis rodent found in Liberia (Author, 2021)

The virus is a single-stranded RNA virus belonging to the virus family Muridae. The virion is spherical particles with an average diameter of 90–110 nm (Price et al., 2011). Lassa virus is a single-stranded RNA virus that is enveloped in lipid with glycoprotein spikes protruding from the outside surface (Adebimpe, 2015) .

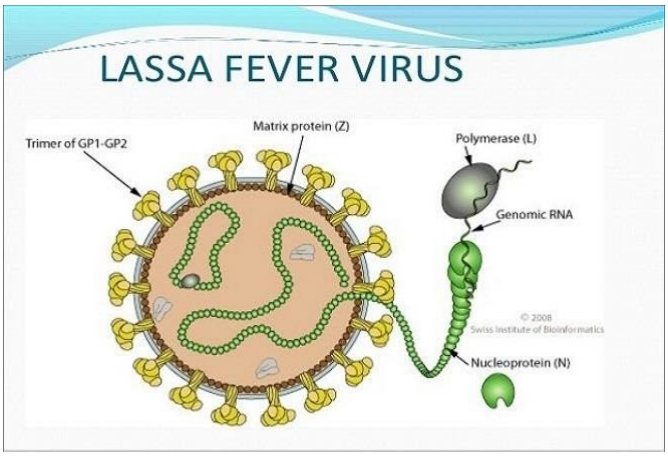

Figure 2 : Structure of Lassa Virus,(Source: Swiss Institute of Bioinformatics)

The Lassa fever was first detected and described in the 1950s but the virus was not identified (Ekuma & Akpan, 2017). After the death of two missionary nurses from a mysterious illness, it was then that Lassa fever disease was first identified in the Lassa village of Borno state Nigeria in 1969 The disease continues to spread to other African countries such as Guinea, Liberia, and

Sierra Leone (Mofolorunsho, 2016). The Lassa virus is shed in their excreta of the rodents/rat which are considered a delicacy for some rural areas of the endemic region and humans are infected by contact with the excreta of the rats or by eating them or foodstuff that has been contaminated with the urine of the rodent (Sharma et al., 2018).

The Lassa virus has become an emergence with highly virulent and contagious effects on those affected with the virus in many more districts and states of endemic countries of the West African sub-region (Huang et al., 2015). It has seriously increased sporadic cases outside the endemic regions within and outside Africa as a result of huge inter-border traffic and international traveling. Thus this should give rise to increasing the knowledge of healthcare workers on the management of Lassa fever (O. Ogbua, 2007).

According to (WHO, 2015), Lassa fever is endemicity in Liberia began with a patient that came from Guinea . From 1 January 2017 through 23 January 2018, there were 91 suspected cases reported from six counties namely Bong, Grand Bassa, Grand Kru, Lofa, Margibi, and Nimba that are also classified as the Lassa belt in Liberia. Thirty-three of these cases were laboratory confirmed, including 15 deaths. The case fatality rate for confirmed cases was 45.4%. Public health responded immediately to the outbreak by conducting a cross-board epidemiological investigation and collecting laboratory samples for testing. Involvement of the community through sanitization and in keeping the environment clean to prevent the infestation and harboring of the *Mastomy* rats that spread Lassa fever (WHO, 2015).

WHO (2018) advised that Lassa fever can be prevented by firstly promoting good hygiene and discouraging the rats from entering homes. In a hospital setting, it is very important for

healthcare workers to constantly implement and practice standard infection prevention and control when managing all nosocomial infections including the Lassa fever.

Knowledge of the Lassa fever virus among healthcare workers is very paramount since humans usually become infected with the Lassa virus from exposure to excreta of infected *Mastomys* or direct exposure by touching the excreta or spread between humans through direct contact with the blood, urine, feces, or other bodily secretions of a person infected with Lassa fever (Huang et al., 2015). Healthcare workers have to know all about Lassa fever to identify suspected cases. Person-to-person transmission occurs mostly among health care settings, where the virus may be spread by contaminated medical equipment, such as re-used needles

Healthcare workers are generally more likely to be the first point of contact for persons seeking medical care in a developing country like Liberia. In the public hospital setting, the population movements, poor sanitation, overcrowding, inadequate resources to manage victims, and poor epidemic preparedness are some of the factors contributing to disease outbreaks. The attitude towards acquiring the knowledge on how to manage Lassa fever is of most importance to prevent the nosocomial spread of the virus among patients if universal precautions are not observed.

1.2 Statement of the Problem

Lassa fever has serious increasing sporadic cases outside the endemic regions within and outside Africa as a result of huge inter-border traffic and international travelling (Ogbua, 2007). It is an endemic viral disease in Liberia in recent time creating tension nationwide, regionally and internationally (Amorosa et al., 2010). LF is also one of the notifiable diseases that is needed to be reported to the Ministry of Health. Health report indicated that Lassa fever is prevalent in Liberia, specifically Nimba County and its neighboring counties of Bong, Lofa and Margibi

(Tarpeh, 2016). The virus is frequently on the rise in the rural part of Nimba County which makes other counties in the country vulnerable to the disease.

According to the 2015- 2020 medical record of the Maryland County which is at J J. Dossen Memorial Hospital, Maryland County has no case of Lassa fever. J J. Dossen Memorial Hospital is the major referral health facility in the county. This hospital has all the medical records from all the health facilities in the county.

Furthermore, the county has the second-largest governmental university in Liberia. William V. S. Tubman University hosts students and faculty from all counties in Liberia including the Lassa fever endemic zone and from other West African countries. In view of this, it is very important to assess the knowledge, attitude and practice of healthcare workers toward Lassa fever management.

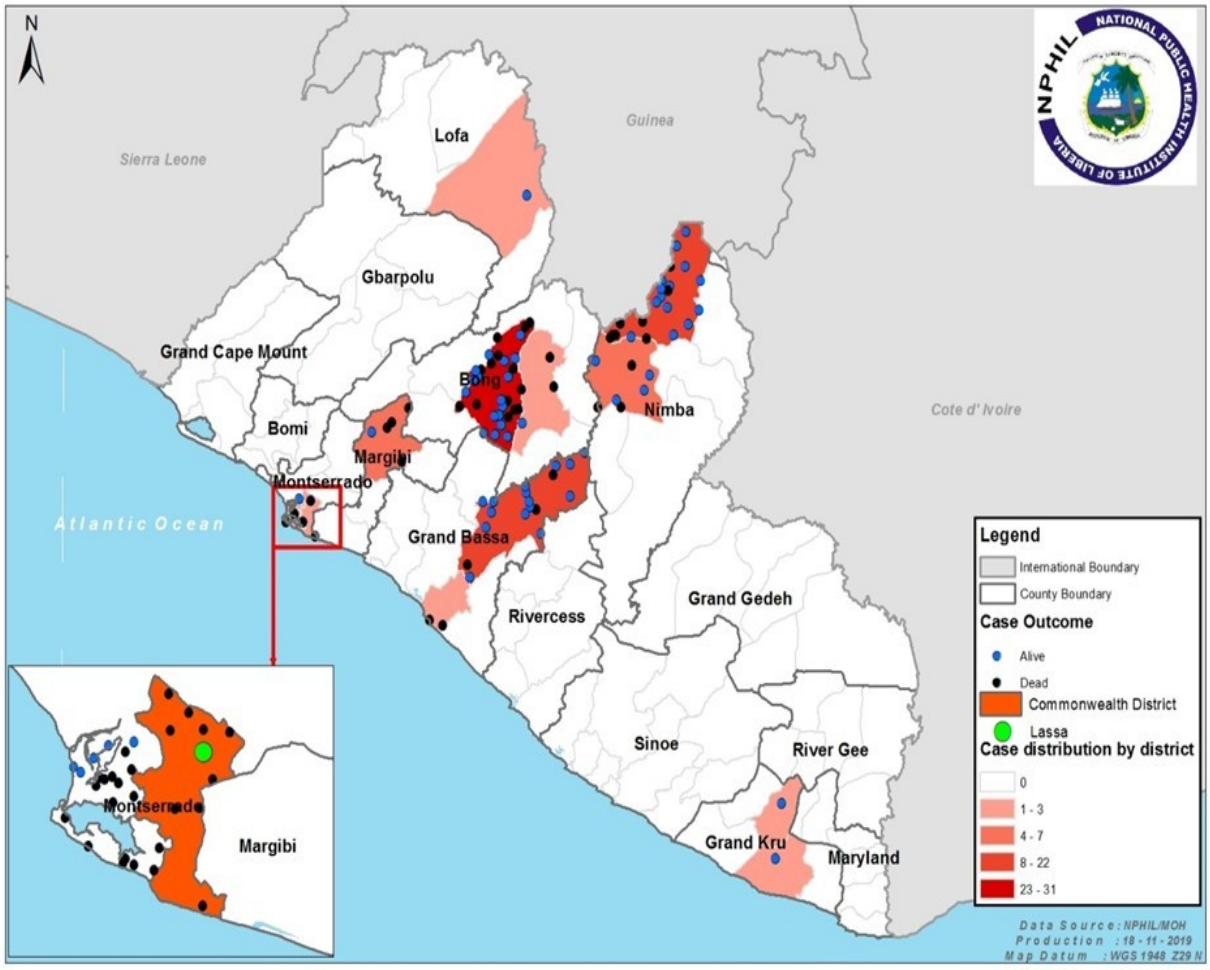

Figure 3: Map of Liberia showing Lassa fever endemic areas (NPHIL).

1.3 Research Objectives

1.3.1 Main Objective

To explore the relationship between knowledge, attitude and practice towards Lassa fever management among healthcare workers in Maryland County, Liberia.

1.3.2 Specific Objectives

- To assess the knowledge on Lassa fever management among healthcare workers in Maryland County, Liberia.
- To identify the measures of management put in place and level of compliance of control and prevention towards Lassa fever management among healthcare workers in Maryland County, Liberia.
- To assess the attitude of healthcare workers in Maryland County toward Lassa fever management in Maryland County, Liberia.

1.4 Hypothesis

Objective 1 **H**o**:** There is no significance of association of knowledge of Lassa fever on the management of Lassa fever among healthcare workers.

Objective 2 **H**o: There is no significance association of high level of compliance of control and prevention put in place in all the health facilities in Maryland County on the management of Lassa fever.

Objective 3 **H**o: There is no significance association between healthcare workers attitude and the management of Lassa fever.

1.5 Significance of the Study

On a global scale, the outcome of this study contribute to further scoping of the burden of emerging and re-emerging infectious and contagious diseases such as Lassa fever especially in Africa where communicable disease constitutes a larger proportion of the diseases.

In Liberia, this study contributes to bridging existing knowledge gaps on knowledge, attitude and practices towards Lassa fever among healthcare workers. This knowledge is instrumental in shaping the national prevention and control practices policy toward Lassa fever and other communicable diseases. For the government policy makers this study is an important agenda-setting document.

The study proved very significant to the Maryland County Health Team, William V S Tubman University, Ministry of Health, and other Public Health Agencies in Maryland County for educating healthcare workers on the management's techniques to prevent and control infectious diseases in hospital setting.

This document also serves as a resource document for other researchers who may be interested in conducting similar research .It is a motivational tool for healthcare workers as a point of reference to practice more universal precautions when taking care of patients. The significant of this research cannot be overemphasized.

1.6 Justification of the Study

There has not been any report of Lassa fever presently in J. J Dossen Memorial Referral Hospital and any other medical facility both public and private in Maryland County. But Harper city hosts the second-largest governmental University in Liberia which allows youth

and young people from all parts of Liberia to seek further education in this university. Seeking for opportunities also encouraged the migration of people in and out of the County. The constant outbreak of the Lassa fever among health care workers and communities in Nimba County and the neighboring counties of Bong, Bomi, and in the capital of Monrovia is solely due to the fact that lots of people do not have knowledge on how to manage the virus to limit the spread. Most of the spread of Lassa fever is usually in the hospital setting and this is attributed to insufficient knowledge of the management of the disease. The other counties are vulnerable to this disease and it is of great importance for healthcare workers to have adequate knowledge and a positive attitude toward the management of Lassa fever. Therefore this research study is of important to assess the knowledge of the healthcare workers in the main referred hospital in the southeastern region of Liberia.

1.7 Scope of the Study

The main focus of this research study was on the assessment of knowledge of Lassa fever among healthcare workers in Maryland County. To sensitize the healthcare workers on measures of their attitude towards the management of this virus by assessing and evaluating the knowledge on the clinical manifestation, diagnosis, treatment, and the various preventative and control measures such as proper hand hygiene, use of personal protective equipment, the practice of the universal precautions and isolation of suspect cases. Involvement of the community in the management of the Lassa fever virus is also important. This research was conducted within one semester, from January-May 2021.

1.8 Conceptual Framework

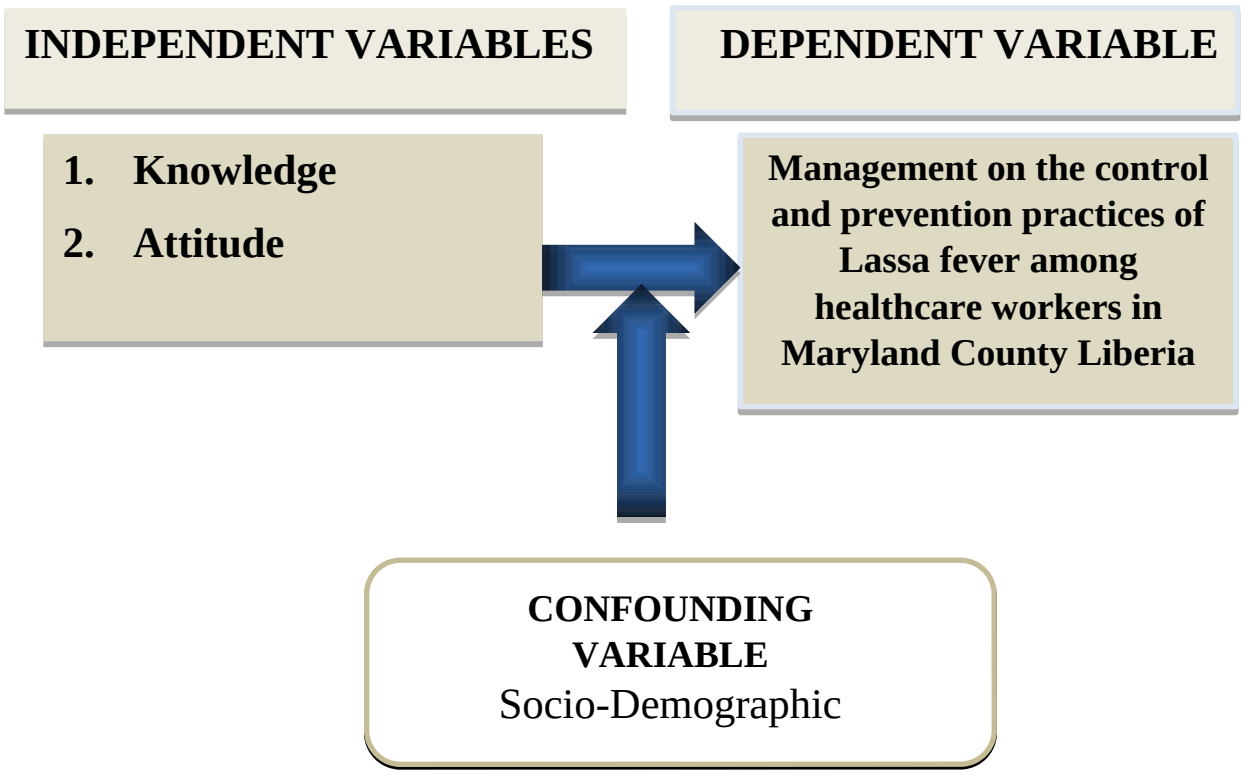

Figure 4: Conceptual framework (Source Author 2021)

The main independent variables were knowledge and attitude characteristics, whereas management on the prevention and control practices was the dependent variables. Socio-demographic characteristics were treated as potential confounders thus related to both the independent and the dependent variables.

1.9 Theoretical Framework

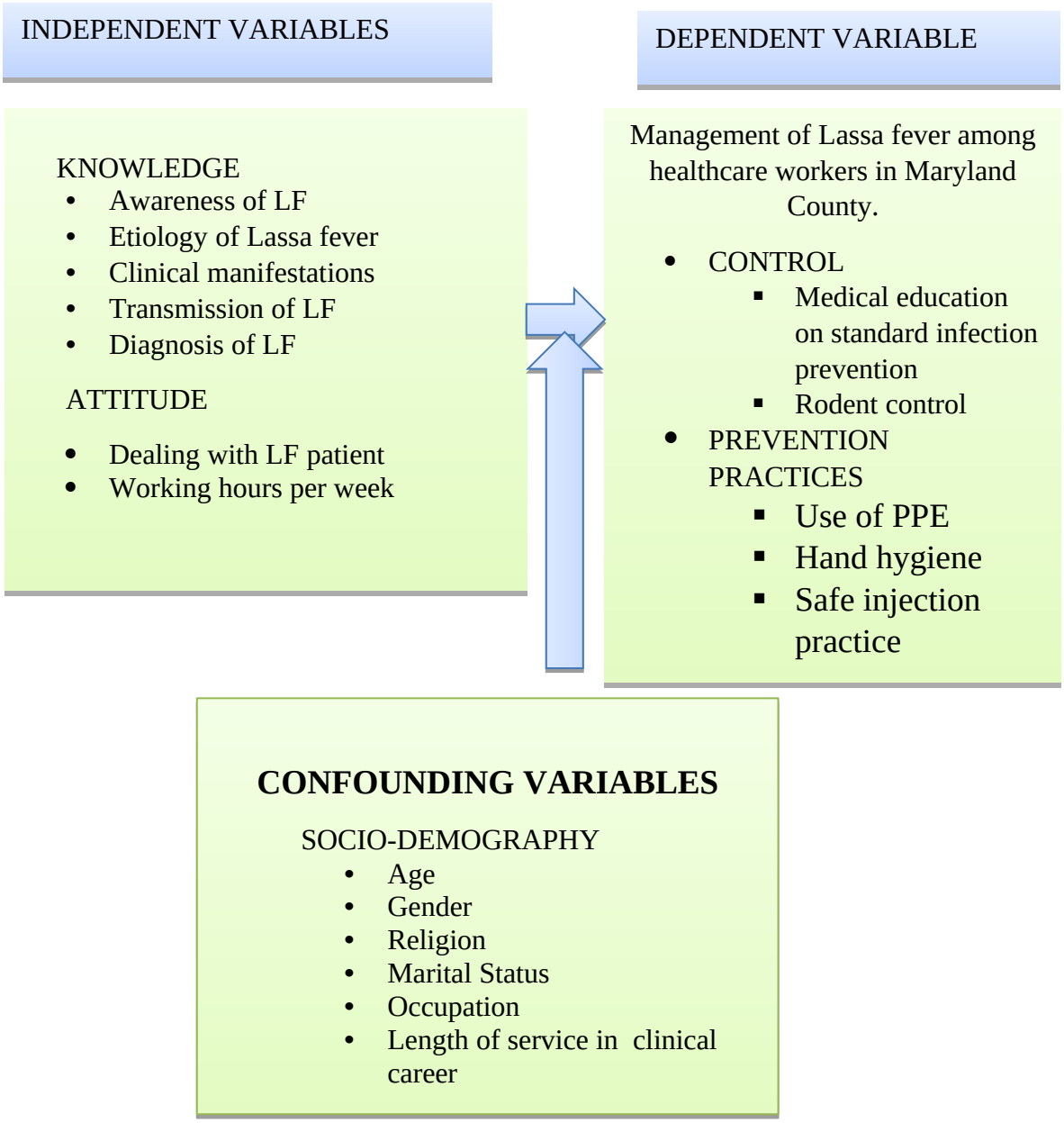

Figure 5: Theoretical framework diagram by Author (2021)

1.9. 1 Explanation of the Theoretical framework

A theoretical framework is regarded as a map for understanding the relationships between and among the variables in quantitative studies.

Knowledge of healthcare workers on Lassa fever is important in enhancing adequate management and control of the disease among healthcare workers. Healthcare workers knowing the definition, clinical manifestation mode of transmission, diagnosis and treatment will better them to develop positive attitude towards the management of LF. Several researchers have attempted to understand and identify the level of knowledge and its role in managing and controlling Lass fever among healthcare workers. (Hamblion et al., 2018) investigated the problem of knowledge, attitude and perceptions of Lassa fever among residents in the Southwest of Nigeria which is one of the common problems that faces not only resident but also healthcare workers in hospital setting. Their findings indicated that knowledge on Lassa fever and behavioral change toward hygienic practices along with universal precaution will control the persistence of Lassa fever in the community.

Also, healthcare workers knowledge through continuous training on recent and accurate information on Lassa fever diagnosis, treatment, control, and prevention will help reduce the sporadic cases in the country (Ekuma & Akpan, 2017). Isolated wards, personal protective equipment, and necessary drugs including Ribavirin in appropriate doses and route should be provided in such designated wards as a form of preparation in the management of Lassa fever (lowookere S A, 2017).

1.10 Limitations of the study

The study design employed could not establish true cause-effect associations between exposure and outcome with variables since the outcome were assessed simultaneously. Furthermore, the fact that the study population belonged to as particular geophysical location limits generalization of the outcomes of the study to wider geophysical contexts. In the interest of time, a variable such as attitude of healthcare workers with regard to Lassa fever management was not exhaustively surveyed. Again, the study assessed the knowledge, attitude and practices toward Lassa fever management among healthcare workers through self-report and admits the limitations of self-perception.

1.11 Definition of Terms

Attitude – in this study is the thinking or feeling whether negative or positive that healthcare workers have towards the management of Lassa fever.

Control - a reduction in the incidence, prevalence, morbidity, or mortality of an infectious disease to a locally acceptable level.

Healthcare workers – this include personnel who are consultants, doctors, registered nurses, midwives, laboratory technician, and pharmacists who have completed their studies fully and were awarded certified documents.

Inspection - is the examination, by the competent authority or under its supervision, of areas, baggage, containers, conveyances, facilities, goods, or postal parcels, including relevant data and documentation, to determine if public health risk exists.

Isolation - is the process of separation of ill or contaminated persons or affected baggage, containers, conveyances, goods, or postal parcels from others in such a manner as to prevent the spread of infection or contamination.

Knowledge – facts, information, and skills acquired through experience or education/ training towards management of Lassa fever

Lassa Fever (LF) – an acute viral hemorrhagic illness caused by the urine and feces of infected Mastomy's rat that occurred in West Africa.

Management – a process of treating and controlling Lassa fever in a hospital setting

Medical examination - the preliminary assessment of a person by an authorized health worker to determine the person's health status and potential public health risk to others, and may include the scrutiny of health documents, and a physical examination when justified by the circumstances of the individual case.

Practice – actual application or use of an idea, belief, or method towards management of Lassa fever.

Prevention - measures aimed at stopping an event from occurring and/or stopping such occurrence having harmful effects on communities (or groups of individuals) such as vaccination programs by the health sector.

CHAPTER TWO: REVIEW OF RELATED LITERATURE AND STUDIES

Here is presented a review of key literature on Lassa fever and its management relevant to the scope of this study. It discusses the origin, epidemiological assessment, the clinical manifestation, transmission, and factors associated with healthcare workers attitude toward the management of Lassa fever. To delineate their impact on prevent and control of infectious diseases among healthcare workers are also discussed. Finally summary of existing knowledge gap is presented.

2.1 Lassa fever

Lassa fever is an acute viral hemorrhagic illness caused by the Lassa virus, a single-stranded RNA virus that belongs to the family old world Arenaviridisae spp (Aigbiremolen AO, 2012). Lassa fever has become an endemic disease in the West African sub-region in countries like Nigeria, Sierra Leone, Guinea, and Liberia where about 3-5 million individuals are infected yearly (Magassouba et al., 2020).

The Lassa virus has become an emergence with highly virulent and contagious effects on those affected with the virus in many more districts and states of endemic countries of the West African sub-region. It has seriously increasing sporadic cases outside the endemic regions within and outside Africa as a result of huge inter-border traffic and international traveling. Thus this should give rise to increasing the knowledge of healthcare workers on the management of Lassa fever (O. Ogbua, 2007).

Lass fever diseases was first detected and described in the 1950s but the virus was not identified (Wood et al., 2010). However, Lassa fever was first identified in a village of Lassa, Borno in 1969 after two missionary nurses died of it and it was then that the viral disease was named after the village (Morgan, Amos, Divine, Emaediong, & Mfon, 2018).

When infected with the virus, about 80% of patients become asymptomatic for a while before the clinical manifestations after the virus has affected major organs such as the kidneys, liver, and spleen (Okoro et al., 2020).

Outbreaks of Lassa Fever in Liberia are common in rural communities, and hospital settings, fueled by socio-cultural practices, poor environmental and personal hygiene, and poor practices of infection prevention and control (Hamblion et al., 2018) . The clinical presentation of LF is protean and diagnosis is often delayed. The only effective life-saving treatment is Ribavirin but only when given six days of onset of symptoms (Brosh-Nissimov, 2016).

Nosocomial infection with a high case fatality rate has been described in the hospital settings in many West African countries including Liberia (Kernéis et al., 2009). Hospitalized patients with Lassa fever may pose a substantial risk to health care workers and other patients.

According to the study of (Happi et al., 2015), Almost all of the 98.% health workers surveyed were aware of LF as an infectious disease. The study continued to elaborate that many respondents (89.8%) knew the correct definition of LF. However the study has highlighted the risk perception, knowledge and attitude of health workers from two tertiary health institutions in Nigeria within the endemic zone for Lassa fever. Based on the findings of that study, the importance of the survival of healthcare workers including public health workers working in the hospital setting attention should be put on the continuous training of healthcare workers on emerging and reemerging infectious diseases including LF for health workers should be paired

with appropriate and corresponding training on personal protective equipment (Happi et al., 2015).

2.2 Lassa Fever Epidemiology

The epidemiological study of Lassa fever is complicated in that the length of the incubation period varies up to three weeks and the spatial clustering of this disease is developing due to the lack of easily available diagnosis, limited public health surveillance system infrastructure, and the high clustering of incidence in regions that are affected (Medicine, 2020). There is limited understanding of the incidence and distribution of the disease(Winn & Walker, 1975) . Yearly, in West African countries of Nigeria, Sierra Leone, Guinea, and Liberia, Lassa fever has become an endemic disease accounting for about 200,000 to 500,000 cases and 5000 deaths (Omotayo, 2020). Evidence shows that the serological positive cases of Lassa fever have also been found in Ghana, Mali, Senegal, and the Central African Republic (Dzotsi et al., 2012). The United States of America, Europe, and Asia have reported sporadic cases that were imported from Africa (Adebimpe, 2015). Most importantly, laboratory infection has occurred among health workers in some parts of the world during handling of infected specimens.

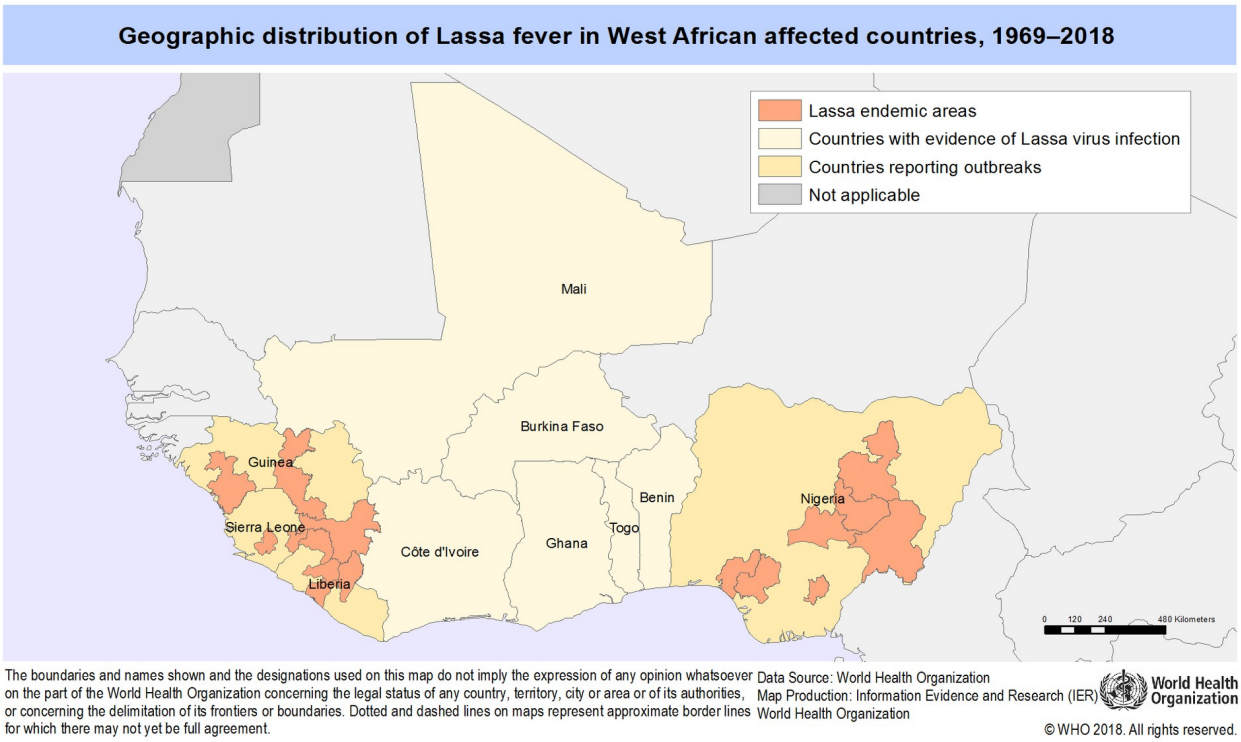

Figure 6: Geographic distribution of Lassa fever in West Africa affected countries (WHO, 2018)

Lassa fever has no age, gender, or racial predilection, it affects anyone as long as you are exposed to the virus (Adebimpe, 2015). Endemic outbreaks in West African countries and their regions are promoted by factors that lead to increased rodent-man contact such as civil unrest leading to a mass movement of people and rapid development of human settlements causing over-crowdedness, poor sanitation, deforestation, rodent hunting, bush burning, and agricultural developments such as rice cultivation that provide food supplies for rodents (Wilkason et al., 2020).

Due to the proximity of animal reservoirs, open construction of African villages, the practice of drying grains by roadsides or outside homes, and unprotected grain storage within homes make rural dwellers in West Africa to be at risk of Lassa fever. All these factors and more are known

to facilitate increased rodent-man contact or contamination of food sources by infected rodent secretions (Daboer et al., 2020).

Lassa fever pathogenesis is not clearly understood, however it is related to immune suppression, uninhibited viral proliferation, and host responses (Mulbah, 2020). Microvascular instability and impaired hemostasis are the pathophysiologic hallmarks of Lassa fever (Shaffer et al., 2014). Lassa fever does not present with a marked increase in cytokine production/response also called a cytokine storm (Townsend Peterson et al., 2014). Host immune responses to infection have a profound and direct influence on the disease course and outcomes and it is not yet clear how the Lassa fever virus inhibits host immune responses by directly suppressing interferon production (Grahn et al., 2018). Cellular immunity is considered to be an important feature of pathogenesis, with strong T-cell responses in survivors.

The rodents of *Mastomys natelensis* are the complex species that host the Lassa virus. It is often imported into countries outside of some West African countries where the Lassa fever is endemic. These countries such as Liberia, Serra Leone, Guinea, Nigeria, and other parts of West African countries are affected due to the migration of infected rodents. The infected rodents remain lifetime carriers of the virus when they are infected (Sharma et al., 2018). They are healthy carriers because they do not show signs and symptoms of the virus. The virus remains in the urine, saliva, blood, and other respiratory secretion (Magassouba et al., 2020).

2.3 Clinical manifestation of Lassa fever virus

In the early stage of being infected with the Lassa fever virus, the signs and symptoms are indistinguishable from those of other viral, bacterial, or parasitic diseases such as malaria, typhoid, yellow fever virus, Ebola virus, and other hemorrhagic fevers that are very common in the tropical regions.

Lassa fever is symptomatic after the incubation period from 6 – 21 days but sometimes varies. The most common clinical manifestations that usually appear are fever, myalgia, nausea, vomiting, sore throat, abdominal and chest pains(Ekuma & Akpan, 2017). When the illness progresses into a more serious form, symptoms like hemorrhaging, neurological problems, hearing loss, tremors and encephalitis will start to manifest in the affected patient coma, and eventually death (Ireye et al., 2019). People who are highly at risk for Lassa fever are the elderly, young children, female and pregnant women (Flatz et al., 2010). Maternal death or fetal loss is more than 80% in most cases in the third trimester. The reason for this vulnerable group is not known but it is most like associated with the decline in their immunity.

In the later stage of Lassa fever, shock, seizure, tremor, disorientation, and coma may also be seen. About 25% of patients that survive the later stage, usually become deaf, however, the partial hearing returns after 1-3 months after recovery (Wood et al., 2010). Recovering patients also have gait disturbance and transient hair loss. In fatal cases, death usually occurs with 14 days.

Due to the endemic nature of other hemorrhagic diseases in West Africa, it is complicated to differentiate the signs and symptoms from each other thus making the diagnosis of suspected cases difficult. The virus remains in the body fluid including semen for a certain period. And because of this, Lassa fever has the potential to cause thousands of deaths in the population (Wood et al., 2010). The prevalence of antibodies to the Lassa virus ranges from 7% in Guinea and 15–20% in Sierra Leone and Liberia; and to over 20% in Nigeria.

2.4 Transmission of the Lassa virus

Lassa fever can be transmitted from person to person when the infected persons come in contact with the Lassa virus from exposure to the excreta of infected *Mastomys*. The exposure can be both directly and indirectly (Dimie Ogoina, 2013). Direct exposure includes touching the excreta and eating infected rodents and may also be spread between humans through direct contact with the blood, urine, feces, or other bodily secretions of a person with Lassa fever. Indirect person-to-person transmission occurs in healthcare settings also by healthcare workers coming in contact with contaminated medical equipment, such as the re-use of infected needles (Coyle, 2010). Sexual transmission of the Lassa virus has also been reported(Wilkinson, 2017). The virus particles have been isolated from the semen of infected individuals up to six weeks following acute symptoms, and transmission via sexual contact has been implicated in several cases of New and Old World arenaviruses (Ekuma & Akpan, 2017) . It is important to capture the mode of transmission to create the necessary awareness among healthcare workers and the public so that appropriate measures for the prevention of Lassa fever can be put in place.

Lassa fever is most often diagnosed by using enzyme-linked immunosorbent serologic assays (ELISA), which detect IgM and IgG antibodies as well as Lassa antigen (Yun & Walker, 2012). Reverse transcription-polymerase chain reaction (RT-PCR) can be used during the early stage of the disease (Sattler et al., 2020). The virus itself may be cultured in 7 to 10 days, but this procedure should only be done in a high containment laboratory with good laboratory practice (Price et al., 2011). Immunohistochemistry, performed on formalin-fixed tissue specimens, can be used to make a post-mortem diagnosis(Lee et al., 2013). Antigen detection tests can also be used to diagnose Lassa fever.

2.5 Management of Lassa fever

The management and treatment of Lassa fever follow the guidelines for septic shock and as well as the administration of the antiviral drug ribavirin (Asogun et al., 2019) . Patients should be isolated under specialized viral hemorrhagic fever precautions and contacts monitored daily for 3 weeks (Monath, 2010). The patient must be put on other supportive treatments such as oxygen, fluid, and electrolytes to help treat the signs and symptoms. Prevention in the community is oriented toward limiting contact with rodents.

Lassa fever outbreaks illustrate the issues associated with the response and management of emerging infectious diseases and it is of great importance that healthcare workers have adequate knowledge on the management of Lassa fever in so doing they will have a positive attitude managing the disease.

Research is still ongoing to develop the Lassa fever vaccine so it is very important to have accurate knowledge and a positive attitude toward managing Lassa fever.

2.6 Attitude toward Lassa fever management

The contributing factors to hospital-acquired Lassa infection include poor knowledge of the disease and infection control techniques on the part of the healthcare workers, structural challenges like lack of isolation wards in hospitals, inadequate provision of personal protective equipment (PPE), and lack of screening and confirmatory tests among others. Efforts to curtail the nosocomial spread of Lassa fever include wearing protective clothing such as gloves, gowns, and face masks; using infection control measures such as complete sterilization of equipment; and isolating infected patients from contact with unprotected persons until the disease has run its course (Mulbah, 2020).

Health workers are more prone to Lassa fever than the general population so it is most important that they have knowledge that Lassa fever does not only affect people who directly come in contact with the urine of infected rodents. Nosocomial transmission is the most common means of transmission in a healthcare setting. Person-to-person transmission may occur after exposure to the virus in the blood, tissue, secretions, or excretions of a Lassa virus-infected individual (Ilori et al., 2019).

Healthcare workers must be knowledgeable about the techniques used hand washing. It is one of the most immediate measures to prevent nosocomial transmission of Lassa fever to facilitate proper management of the disease. Another measure is isolating suspected or confirmed cases and it is critical to the management of Lassa fever. It is standard practice to isolate viral patients whether they are suspected or confirmed and to take extra care in ensuring universal precautions of using PPE and regular hand washing.

According to (Ekuma & Akpan, 2017), in health care settings, staff should consistently implement standard infection prevention and control measures when caring for patients to prevent nosocomial infections. Travelers from areas where Lassa fever is endemic can export the disease to other countries, although this rarely occurs (Ochei et al., 2014). The diagnosis of Lassa fever should be considered in febrile patients returning from West Africa, especially if they have been in rural areas or hospitals in countries where Lassa fever is endemic (Chime et al., 2020). Health care workers seeing a patient suspected to have Lassa fever should immediately contact local and national experts for guidance and to arrange for laboratory testing.

According to WHO, (2006), the standard infection prevention and control that healthcare workers must practice include:

- Basic hands hygiene is one of the most effective methods to prevent the transmission of viruses and pathogens associated with health care. Hand washing among healthcare workers promotes a safe workplace. Healthcare workers must wash their hands for 40-60 seconds or rub with an alcohol-based solution for 20-30 seconds before and after direct contact with patients and from one patient to the next to prevent cross-contamination. Even when wearing gloves, hands must be washed thoroughly.
- Respiratory hygiene was developed during the outbreak of severe acute respiratory syndrome (SARS) and it is now part of the standard.
- Use of personal protective equipment such as gown, gloves, face masks, goggle will protect the healthcare workers from splashes of infected bodily fluid or direct contact with the infected person.
- Safe injection practice entails that each patient should have exclusively dedicated injection and parenteral medication equipment which should be disposed at the point of care. Syringes, needles, or similar equipment should never be reused. Healthcare workers must limit the use of needles and other sharp objects as much as possible. Limit the use of phlebotomy and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care. If the use of sharp objects cannot be avoided, ensure the following precautions are observed. Never replace the cap on a used needle. Never direct the point of a used needle towards any part of the body. Finally, do not remove used needles from disposable syringes by hand, and do not bend, break, or otherwise manipulate used needles by hand
- The hospital must promote an institutional safety climate to helps improve the conformity with the recommended measures and subsequently lead to risk reduction and proper management of infectious diseases including Lassa fever. Adequate provision of staff and

supplies and educating healthcare workers, patients and also visitors in a hospital setting is critical in enhancing a safe workplace.

2. 8 Socio-Demographic Factors

Several factors have been associated with management of care among healthcare workers in health facilities. Here are discussed selected factors relevant to the proposed study.

2.8.1 Age

The association between age of healthcare and management towards Lassa fever has been explored by some researchers. A study by Usuwa et al. (2020) among healthcare workers in Northern part of Nigeria reported that advancement in the healthcare field give more knowledge and experience in the management on the control and prevents of communicable diseases such as Lassa fever. Healthcare workers age is associated with maturity (Raab et al., 2020).

2.8.2 Gender

A survey by Boniol et al.(2019) reported that there are inequality among gender in healthcare management. There are more females then males yet male healthcare workers are more to management patient than female.

2.8.3 Religion and Marital status

Religion was define by a researcher Akpenpuun Joyce Rumun, (2014) as an “organized system of beliefs, practices, and symbols designed to facilitate closeness to god.” Religion is any set of beliefs and practices concerning our relationship with the sacred. In light of this a healthcare workers religion play an intrigue role on how he/she look as a disease or infection. However Han

et al.(2020) reported in a survey that religion or marital status have nothing to do with healthcare workers demonstrating proper care to patient, it have to do with moral and values.

2.8.4 Occupation and Length of clinical career

A study by Chikwe et al.(2020) among healthcare workers concluded that all healthcare workers are at risk for contracting infectious. Nosocomial transmissions are usually due to poor pathogen containment via lack of barrier nursing, ineffective sterilization, needle pricks and direct contact with infected blood and blood products during clinical procedures (Chikwe et al., 2020). The length of clinical career cannot prevent the spread of diseases if standard of control and preventions are not practice in the management of Lassa fever (Chime et al., 2020)

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter outlines the methods employed in the survey. It delineates the area where the study was conducted, the research design, sample size and technique used in sampling, study population survey, the data collection tool, and analysis. It also addressed all methodologies from inception until the end.

3.1 Study Area

The study was conducted among healthcare workers in Harper District, Maryland County. The researcher selected health facilities.

3.3.1 J. J Dossen Memorial Hospital, Harper City

This hospital is the only referral hospital in the Southeast of Liberia and it is situated in Harper City. All the major health offices are located at this hospital including the medical records. Emphasis was placed on the J. J Dossen Memorial Referral Hospital because this hospital is the major hospital and only referral hospital in the Southeast part of Liberia. The J. J Dossen Memorial Referral Hospital is situated in Harper City, Maryland County. This hospital caters to the health needs of the residents in Maryland County and adjacent areas in the Southeastern regions of River Gee, Grand Kru, and Grand Gedeh Counties, and neighboring Ivory Coast.

The hospital has these facilities, medical and surgical wards, pediatric ward, mental health facility, gynecology and obstetrics ward, triage and emergency department, and outpatient clinic.

Figure 7: J. J Dossen Hospital, Harper City, Maryland County (Author 2021)

3.1.2 Merci Medical Center, Pleebo City

Merci Medical Center also known as Pleebo Health Center is the major governmental health facility serving the people of Pleebo City. It is situated northwest of Gebio Mission, northwest of Firestone Rubber Plantation. The facility is under the umbrella of Partners In Health, a non-governmental organization. The facility has maternity ward, emergency department, daily outpatient consultation and TB unit.

Figure 8: Merci Medical Center, Pleebo City, Maryland County (2021)

3.1.3 Sacred Heart Catholic Clinic, Harper City

The Sacred Heart Catholic clinic in Rehab, Harper City is a private clinic run by the Sisters of the Holy Family, Diocese of Cape Palmas. It is a day facility that takes deals with daily outpatients.

Figure 9: Sacred Heart Catholic Clinic, Hends Street Rehab, Harper City

3.1.4 Quality Care Medical Clinic, Pleebo City

Quality Care Medical clinic is a private facility that in located in Pleebo Zone5 and cater for the immediate help need for the community.

Figure 10: Quality Care Medical Clinic, Zone 5 Pleebo City

3.1.5 St. Francis Catholic Clinic, Pleebo City

The St. Francis Catholic Clinic is situated in Zone 2, Pleebo City, a private facility run by the Sisters of the Holy Family, Diocese of Cape Palmas. It is a day outpatient facility with and extension of a maternity facility.

Figure 11: St. Francis Catholic Clinic, Zone 2 Pleebo City

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3.1.6 Barraken Clinic, Barraken Town

Barraken Clinic is a governmental facility in the town of Barraken that focus on outpatient care and Primary health care.

Figure 12: Barraken Clinic, Barraken Town, Maryland County.

Maryland County is in the southeastern portion of Liberia, one of the 15 counties that comprise the first-level of administrative division in the nation, it has four districts. Harper serves as the capital with the area of the county measuring 2,297 square kilometers (887 sq. mi). As of the 2008 Census, it had a population of 136,404, making it the seventh most populous county in Liberia. The county is bordered by Grand Kru County to the west and River Gee County to the north. The eastern part of Maryland borders the nation of Ivory Coast, separated by the Cavalla River.

Figure 13: Maryland County on the Liberia map .

3.2 Research Design

This research was a descriptive study using the Cross-sectional study design. This design is appropriate for Cross-sectional studies that explore statistical association without the variables been manipulated; it was relatively easy and inexpensive to conduct. It was useful in this study because it provided a snapshot of the healthcare workers' population in Maryland County.

3.3 Population

The study was conducted among the general healthcare workers which include consultants, doctors, nurses, midwives, pharmacists, and laboratory technicians working in Maryland County, Liberia. The total population of 1000.

3.2 Sampling Technique

A stratified random sampling technique was used in determining the selection of participants. A list of the healthcare workers who are permanently employed at the hospital was obtained from the Human Resource office and a research randomized tool was used to select the respondents that participated in the study from the population of 1000 inclusive of both healthcare workers in private health facilities who are permanently employed.

3.3.1 Inclusion criteria

All healthcare workers between the age of eighteen (22) years and above, willing to participate and permanently working in any healthcare facility in Maryland County Liberia.

3.3.2 Exclusion criteria

This research study excluded those healthcare workers who were not willing to participate. Any healthcare worker below eighteen (22) years of age was also excluded from the study.

3.4 Sample Size Determination

The sample size was calculated using Epi Info™ and the targetted healthcare workers were 278. An adjustment was made and only 299 healthcare workers participated in the research. The margin of error of 5%, confidence level at 95% , response distribution at 50% of a population of 1000 of healthcare workers and the required sample size was 278.

Epi Info™ is a series of freely-distributable tools and utilities for Microsoft Windows for use by public health professionals to conduct outbreak investigations, manage databases for public health surveillance and other tasks, and general database and statistics applications. It enables physicians, epidemiologists, and other public health and medical officials to rapidly develop a questionnaire or form, customize the data entry process, and enter and analyze data (CDC, 2020).

Epi Info™ 7 is free of charge and can be downloaded from the CDC website at http://www.cdc.gov/epiinfo

3.4 Research Instruments

Data collection for this study was done in stages: the first step involved data collection through the use of a structured questionnaire. The questionnaire was administered to respondents between the ages of I8 years and 62 years randomly selected irrespective of sex and status as

long as the respondent was a healthcare worker. The result from the responses was used to answer the research questions and to achieve study objectives.

3.5 Data gathering procedures

Data collection for this study was done in stages: the first step involved getting permission from governmental and Chief Medical Officer from Maryland County to conduct the research study. After obtaining permission, the researcher went to various working shifts in the hospitals, clinics, pharmacies, and laboratories and administered the structured questionnaire to those healthcare workers that met the inclusive criteria, consented and were present at the job site. The data included in the structured questionnaire were demography, knowledge of Lassa fever management, attitude towards Lassa fever management, and preventive practices and control of Lassa fever transmission.

3.5.1 Pilot Study

A pilot study was conducted among healthcare workers in Sacred Heart Catholic Hospital in Harper city on the length, content, wording, and language used in the questionnaire. The questionnaires were administered to 25 healthcare workers to allow for modification through correcting mistakes and inclusion of other key questions that might be of use to the study. Ambiguous questions were also restructured for the purpose of clarity thereby enhancing reliability of the tool. The pilot study was done June 2021.

3.5.2 Validity of the tool

The questionnaire was subdivided in accordance with the variables and objectives to ensure that the content was comprehensive and representative of the domains that were measured. In addition, referring to other research studies was essential in locating similar challenges in

similar contexts. Other suggestions were sought out from the supervisors and the changes were incorporated in the final document.

3.5.3 Reliability of the tool

The Lee Cronbach alpha test was used to test for reliability in the questionnaires using the pilot study. A Cronbach Alpha coefficient of 0.75 and above was considered as an appropriate threshold. Poor reliability scores, therefore, demean the precision of the questionnaire.

3.6 Statistical treatment of data

The data collected was under the protection of the researcher who always ensured the privacy and confidentiality of the participants. The data was then entered in MS excel and transferred into STATA version 16 software for statistical analysis. The data was presented in tables, charts, and graphs. Data was saved as password protected documents accessible only to the investigator. Statistical significance between categorical variables was evaluated using the Chi-Square test of independence while the relationship between variables was modeled using the binary logistic regression model.

3.7 Data Analysis

Collected data in questionnaires were screened for appropriate completion and then entered into Microsoft Excel, sorted, checked for accuracy, and thereafter imported, validated, cleaned, and analyzed using Stata version 16 software.

This distribution of knowledge across socio-demographic characteristics was analyzed using descriptive analysis results are presented using frequencies, proportions, and percentages for categorical data and median and interquartile quantitative for numeric data using either tables or graphs and charts.

3.7 Ethical Considerations

Before conducting the research, approval was granted by the Institutional Research and Ethics Committee chairperson from the University of Eastern Africa Baraton through an introduction letter. Permission from the county superintendent through an official letter of approval was given to the researcher by the Superintendent of Maryland County as a legal permission to conduct a research in the county. Letter of approval was also given to the research by the director of the Maryland County health team to conduct the research in any health facilities in Maryland County, Harper District. Permission was given from the nursing director of the J. J Dossen Memorial Referral Hospital and permission was also granted by each of the nurses in charge of the various private and public clinics that data was collected. Written informed consent was obtained from each respondent to participate in this research study. A declaration was also adhered to by the researcher during data collection to ensure the respondents of non-disclosure which breaches their confidence. In addition, the researcher also included a voluntary clause in the questionnaires and declared that the identity of the respondents will not be revealed. The purpose and nature of the study were expounded to the respondents to provide more information before they decided to participate. Finally, the gathered information was treated with the utmost confidentiality.

CHAPTER FOUR: PRESENTATION OF FINDINGS, ANALYSIS, AND INTERPRETATION

This chapter presents the results of the results of the investigations with the corresponding interpretations. It gives the implications of the findings and compares the findings with related studies. The findings are presented under the following major headings: demographic and socio-economic characteristics; knowledge on the management of Lassa fever; attitude towards Lassa fever management; and control practices and prevention towards Lassa fever transmission.

4.1 Demographic characteristics of participants

The sociodemographic characteristics surveyed in this study include age, gender, religion, marital status, occupation and length of clinical career. The total of 299 consenting health care workers participated in the study.

As shown in Table 4.1, the median age was found to be 35 years and an interquartile range of 10, with females being one year older than the males. These results are presented in Table 4.1.

Table .1: Descriptive statistics of the age of health care workers in Maryland County, Liberia

Gender	Minimum age (yrs)	Maximum age (yrs)	Median	Interquartile range
Female	23	61	35	9.0
Male	22	61	34	9.5
Total	22	61	35	10.0

In terms of gender, the study found that the majority of health care workers were female 191 (63.9%). This was strikingly comparable to the national estimated which reported female Out of the 299 health care workers interviewed, 177 (59.2%) were single, 117 (39.1%) were married and very few 5 (1.7%) were divorced. Moreover, the majority of the respondents had attained university education 286 (95.7%) with only 12 (4.0%) and 1 (0.3%) having college/polytechnic and secondary level of education respectively. Further investigation revealed that the 1 respondent with a secondary level of education was a midwife while the 12 with college or polytechnic qualification were distributed as follows: registered nurses (3), midwives (6) laboratory technicians (2), and pharmacists (1).

Table .2: Socio-demographic characteristics of the respondents (n = 299)

Variable	Frequency	Percent (%)
Gender		
Female	191	63.9
Male	108	36.1
Marital status		
Married	117	39.1
Divorced	5	1.7
Single	177	59.2
Education level		
Secondary	1	0.3
College/Polytechnic	12	4.0
University	286	95.7
Religion		
Christian	285	95.3
Muslim	14	4.7

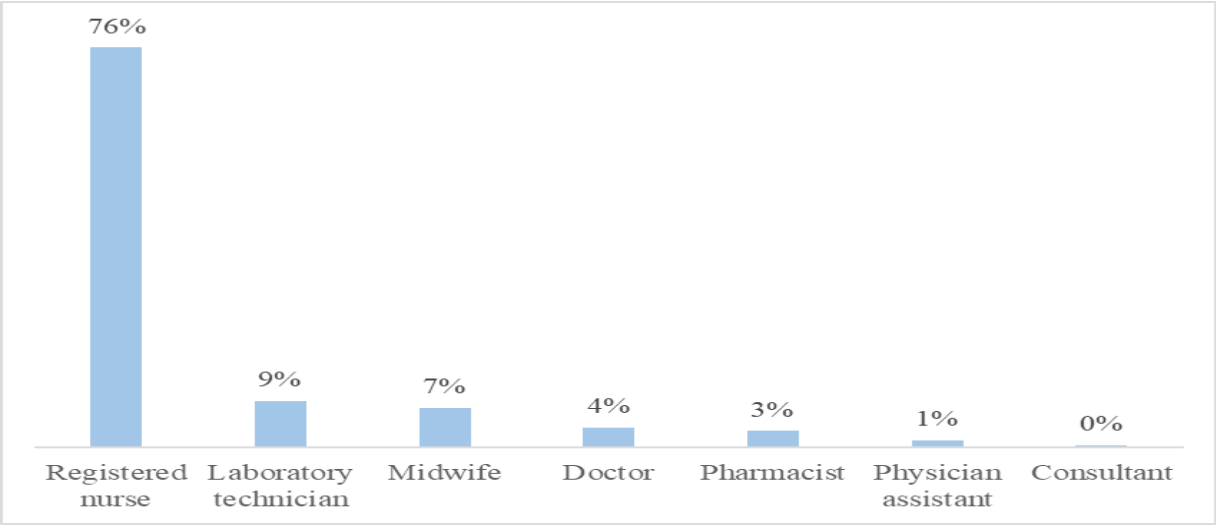

Figure 14: Distribution of job cadre for health care workers in Maryland County, Liberia

The job cadre of interviewed health care workers shows that three-quarters of them were nurses. All the other job types had a percentage representation below 10%, with consultant and physician assistant having very low percentages of 0.3% and 1.3% respectively. These results are presented in Table 03..

The distribution of health care workers by their duration in this career indicated that majority (70.6%) of them has been in this career for more than 5 years, followed by 1-5 years (18.7%), then by those health workers who had been in this career for below one year (10.7%).

While all the 299 health care workers who participated in this study indicated that they had heard about Lassa fever, very few 10 (3.3%) indicated that they had treated or taken care of a patient suffering from Lassa fever in other counties in Liberia before coming to Harper District, Maryland County to work. The other 289 (96.7%) had not treated neither had they taken care of such patients.

The minimum and the maximum number of working hours per day were 8 and 12 hours respectively with a median of 12 hours per day. When this analysis was disaggregated by the occupation type, the study showed that consultants, registered nurses, and midwives had the highest number of working hours in a day (12 hours) while the rest had a median daily working time of 10 hours.

Table.3: Minimum, maximum, and median working hours by occupational cadre of health workers in Maryland County, Liberia

Occupation	Frequency	Minimum	Maximum	Median
Consultant	1	12	12	12
Doctor	11	8	12	8
Physician assistant	4	8	10	8
Registered nurse	226	8	12	12
Midwife	22	8	12	12
Laboratory technician	26	8	12	8
Pharmacist	9	8	12	8
Total	229	8	12	12

4.3 Knowledge on the causative agent for Lassa fever

The knowledge on the causative agent for Lassa fever by the interviewed health care workers was assessed through a series of questions. Slightly over half of the health workers correctly identified Lassa fever as a viral illness 151 (52%), another 80 (27%) thought it was a bacterial

illness while 32 (11%) and 30 (10%) thought that it was both a viral and zoonotic illness. These results are presented in Figure 4.3.

On the symptoms of Lassa fever, 290 (97%) of health workers indicated fever as a symptom, sore throat 198 (66.2%), general weakness 146 (48.8%), bleeding 145 (48.5%), facial swelling 124 (41.5%). None of them identified stomach pain, hair loss, and fluid in the lungs as symptoms of Lassa fever. The distribution of other symptoms is presented in Table 4.4.

Table .4: Knowledge on symptoms of Lassa fever by health workers in Maryland County, Liberia

Symptoms	Frequency	Percent	Percent cases
Fever	290	24.1	97.0
General weakness	146	12.1	48.8
Malaise	88	7.3	29.4
Stomach pain	0	0.0	0.0
Sore throat	198	16.5	66.2
Muscle pain	76	6.3	25.4
Chest pain	97	8.1	32.4
Hair loss	0	0.0	0.0
Facial swelling	124	10.3	41.5
Bleeding	145	12.1	48.5
Fluid in the lung	0	0.0	0.0
Shock	38	3.2	12.7
Total	1202	100.0	402.0

The incubation period for Lassa fever is between 6-21 days, and about two-thirds of the health workers interviewed got this correct 187 (64.5%). On transmission, 148 (51.2%) got it correctly that Lassa fever is transmitted by *Mastomy's* natalensis rodents.

Table 0.4: Knowledge on Lassa fever incubation period and transmission

Variable	Frequency	Percent
Incubation period		
1-3 days	19	6.6
6-21 days	187	64.5
1-5 days	17	5.9
2-10 days	67	23.1
Lassa fever transmission mode		
Flies	43	14.9
Mosquitoes	10	3.5
Bats	82	28.4
Mastomy's natalensis rodents	148	51.2
Flies/Bats	6	2.1

Poor hygiene, eating rat meat, and direct contact with blood/secretions of infected persons were identified as transmission methods by health care workers.

Table 5.5: Knowledge of Lassa fever transmission route

Variable	Frequency	Percent	Percent cases
Direct contact with blood/secretions of an infected person	110	19.6	36.8
Contact with urine/feces of infected rodent	67	11.9	22.4
Eating bushmeat	18	3.2	6.0
Eating rat meat	148	26.4	49.5
Contaminated medical equipment	22	3.9	7.4
Hugging and shaking of hands	0	0.0	0.0
Sexual contact with an infected person	29	5.2	9.7
Poor hygiene	167	29.8	55.9
Total	561	100.0	187.6

Among participants' responses, laboratory testing was identified as the most common method used for the diagnosis of Lassa fever at 59%. Very few hospitals use urine testing (10%) and physical examination (7%) as diagnosis methods. A further 25% of hospitals use both physical examination/laboratory testing for the diagnosis of Lassa fever.

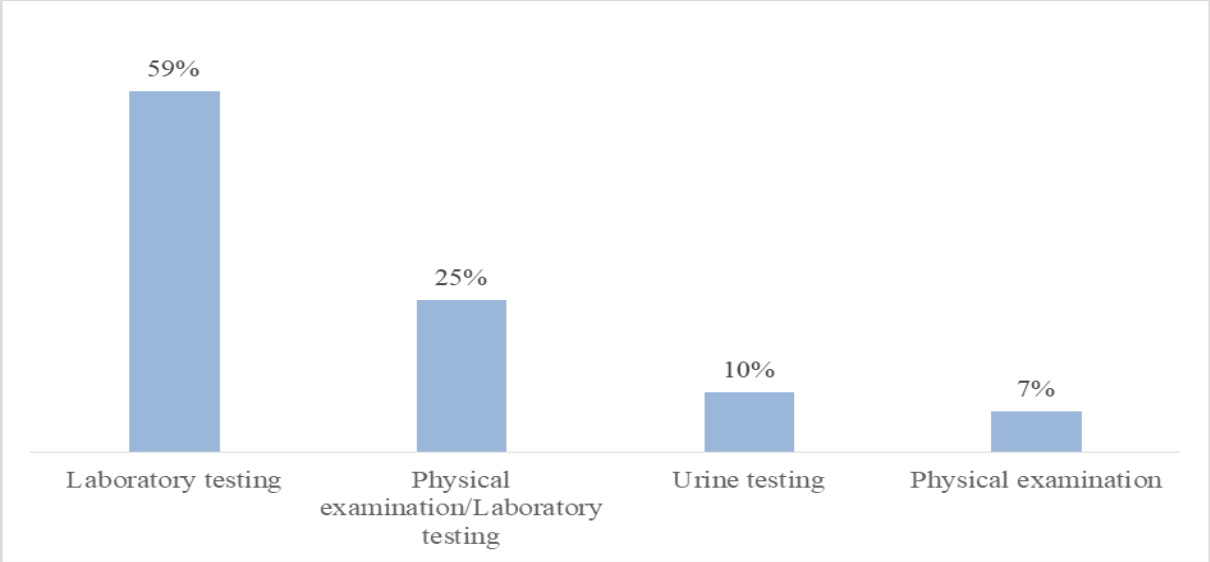

Figure 15: Lassa fever diagnosis methods used.

The study found that participants responded that ribavirin intravenously and antibiotic tablets as the most common ways of treating Lassa fever at 46% and 43%. Only 3% of the healthcare workers indicated the used antiemetic for treatment of Lassa fever. Figure 16 presents these results.

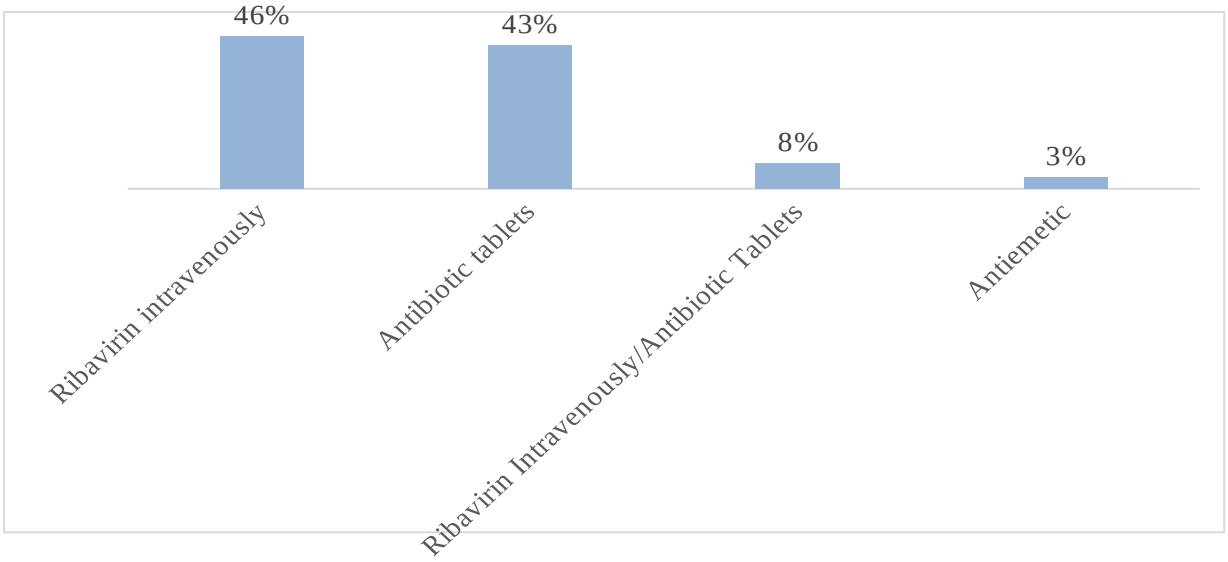

Figure 16: Lassa fever treatment

On supportive treatment and management, the study found that fluid electrolytes 46% and vaccination 30% were the most commonly used methods. These findings are presented in Figure 17.

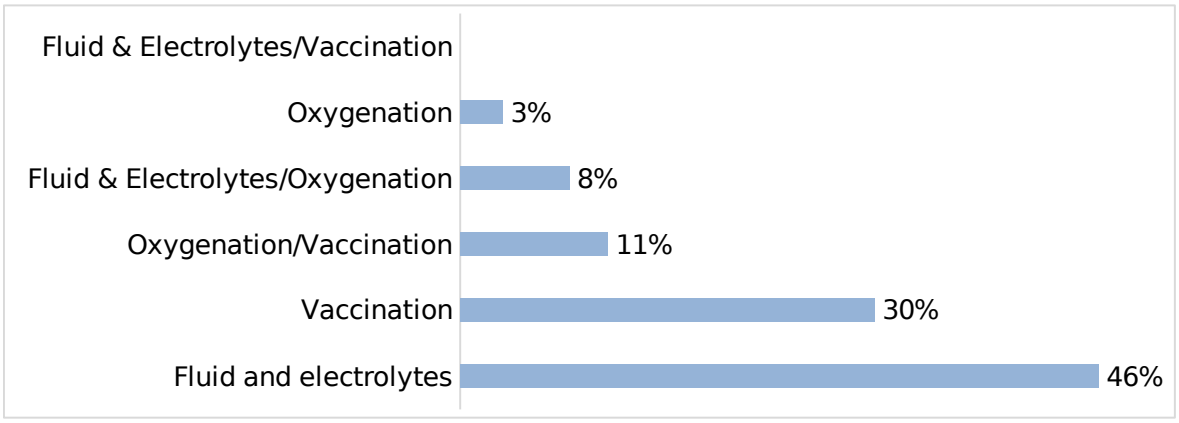

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Figure 17: Supportive treatment for Lassa fever

4.4 Testing the association between knowledge and specified categorical variables

The study used Fisher's exact test to assess the association between knowledge and the demographic variables gender, marital status, education level, religion, cadre, and experience (duration as a health care worker). There was no statistically significant association between knowledge about Lassa fever and any of these variables. Results are presented in Table 02.

Table 0.6: Fisher's exact test of independence

Variable	p-value
Gender	0.289
Marital status	0.923
Education level	0.826
Religion	1.000
Cadre	0.475
Experience	0.662

4.4.1 Logistic regression analysis for the relationship between knowledge and specified categorical variables

The binary logistic regression with knowledge (0 = Poor knowledge, 1 = Good knowledge) was performed with gender, marital status, education level, religion, cadre, and experience as the

predictor variables. None of the independent variables statistically significantly predicted the knowledge score of the health care workers, $\chi^2(6)=3.41$, $p=0.756$.

Table 0.7: Logistic regression between knowledge practice score and specified predictors

Knowledge score (outcome variable)	OR	SE	z	p	95% LCI	95% UCI
Gender	1.36	0.35	1.21	0.228	0.82	2.26
Marital status	1.00	0.13	0.00	0.999	0.78	1.28
Education level	0.91	0.49	-0.17	0.866	0.32	2.62
Religion	0.93	0.53	-0.13	0.898	0.30	2.86
Cadre	0.82	0.11	-1.41	0.159	0.63	1.08
Working hours	1.10	0.20	0.51	0.612	0.77	1.56
Intercept	2.59	6.22	0.40	0.692	0.02	286.70

4.5 Attitude towards Lassa fever management

Results for the respondents' attitudes towards Lassa fever are presented in Table 4.9. The study found that 298 (99.7%) agreed that they were at risk of contracting Lassa fever. 13 (4.3%) of the respondents indicated that their specialty has nothing to do with the management of Lassa fever. A few of them 12 (4%) indicated that they will refuse to treat patients suspected of Lassa fever patient to protect themselves. For all the other questions measuring attitude, all the interviewed health workers answered "Yes".

Table 4.8: Health care workers attitudes towards Lassa fever

Variable	Frequency	Percent %	Cases
Healthcare workers are a risk of contracting Lassa fever	298	12.3	99.7
My specialty has nothing to do with the management of Lassa fever	13	0.5	4.3
Lassa fever is a preventable disease with a positive health-seeking behavior	299	12.4	100.0
As HCW, I have a role to play in the prevention and spread of Lassa fever	299	12.4	100.0
I Will refuse to treat suspected Lassa fever patients to protect myself	12	0.5	4.0
Good infection prevention and control practice at all times is ideal	299	12.4	100.0
Good patient education regarding Lassa fever can mitigate its spread	299	12.4	100.0
Training of HCW will improve the infection prevention and control practices	299	12.4	100.0
Facilities in this hospital are sufficient to protect staff from Lassa fever	299	12.4	100.0
Early identification treatment can improve outcomes in the case management of Lassa fever	299	12.4	100.0
Total	2416	100.0	808.0

4.6 Control practice and prevention towards Lassa fever management

Proper and effective control practice and prevention strategies are crucial in the management of Lassa fever. On all the questions measuring the control practices and prevention except one, the health care workers recorded “Yes”. None of the hospitals had a special wardrobe put in store for the management of Lassa fever. These results are presented in Table 4.10.

Table 4.10: Control practice and prevention towards Lassa fever management

Variable	Frequency	Percent	% case
Hospital is perfectly equipped to manage Lassa fever	283	9.6%	94.6%
Personal protective equipment (PPE) available	295	10.0%	98.7%
Wear PPE when caring for patients	284	9.6%	95.0%
The practice of universal precaution on all patients	292	9.9%	97.7%
Proper disposal of infectious medical wastes	299	10.2%	100.0%
I practice single-use syringes and needle	299	10.2%	100.0%
Wash/sanitized my hands before and after contact with the patient	299	10.2%	100.0%
We completely sterilized our equipment	296	10.1%	99.0%
The hospital has an isolation center or room	299	10.2%	100.0%
Suspected/confirmed cases of Lassa fever are put in isolation	299	10.2%	100.0%
The hospital has a special wardrobe put in store for the management of Lassa fever	0	0.0%	0.0%
Total	2945	100.0 %	984.9%

4.7 Testing the association between practices and specified categorical variables

The study used Fisher's exact test to assess the association between practices and the demographic variables gender, marital status, education level, religion, cadre, and experience (duration as a health care worker). There was a statistically significant association between health care practices on Lassa fever management and the variables cadre, $p = .002$ and years of experience and as a health care worker, $p = .000$. Results are presented in Table 4.11.

Table 4.11: Fisher's exact test for health care practices and demographic characteristics

Variable	p
Gender	0.599
Marital status	0.235
Education level	0.712
Religion	0.702
Cadre	0.002
Experience	0.000

4.7.1 Logistic regression analysis for the relationship between health care practices and specified categorical variables

The binary logistic regression with attitude (0 = Poor attitude, 1 = Good attitude) was performed with gender, marital status, education level, religion, cadre and experience as the predictor variables. The developed logistic model was found to be statistically significant,

$\chi^2(6) = 24.88, p = 0.0004$. The health care worker cadre, z = -2.45, p = .014, *OR* = .62 95% CI (.43, .91) and experience z = 3.68, p = .000, *OR* = 2.32 95% CI (1.48, 3.63) were found to be statistically significant predictors of health care worker attitudes towards the management of Lassa fever.

Table 4.1: Logistic regression analysis for the relationship between health care practices

Attitude	Odd Ratio	Standard Error	z-score	p-Value	95% LCI	95% UCI
Gender	1.03	0.40	0.07	0.940	0.48	2.19
Marital status	0.82	0.17	-0.97	0.334	0.55	1.23
Education level	1.17	0.89	0.21	0.837	0.26	5.20
Religion	2.57	2.82	0.86	0.392	0.30	22.19
Cadre	0.62	0.12	-2.45	0.014	0.43	0.91
Experience	2.32	0.53	3.68	0.000	1.48	3.63
Intercept	2.03	6.92	0.21	0.836	0.00	1614.78

4.8 Discussion

This study investigated the knowledge, attitude and practices toward Lassa fever management among healthcare workers in Maryland County, Liberia. The study used the logistic regression with the response variable, health care practices was categorical. This allowed researcher to classify respondents as practicing poor or good health care practices. The developed logistic model was found to be statistically significant, (**6**) = **24**.**88**, = **0**.**0004** meaning that at least one of the predictor variables included in the model affected the health care practice outcome. From the results of Table 4.12, we found these statistically significant predictors to be health care worker cadre, z = -2.45, p = .014, OR = .62 95% CI (.43, .91) and experience z = 3.68, p = .000, OR = 2.32 95% CI (1.48, 3.63). The odds ratio health care cadre shows that higher cadre are associated with poor health care practices. In particular, an increase in cadre by one level lowers the odds of falling in the good practice category by a factor of 0.62

Consistent with other studies on the knowledge about Lassa fever and its management, there is a lack of adequate knowledge of Lassa fever management among Healthcare workers. This study found that there was not infection prevention control measures put in place across governmental and private owned clinics so compliance was lacking (Usuwa et al., 2020). The attitude among participants toward the management of Lassa fever was good (positive) as per the findings. Most studies have concluded that healthcare workers are infected with Lassa fever because of the way in which they managed patients who are admitted with the Lassa fever virus (Adeomi et al., 2017). This also concurred with this study

From a public health perspective, the study finds that cadre and experience are the predictors of healthcare practice outcome and this can be used to improve the management of Lassa fever. Given these results, more resources can be availed so that the lower health care cadres are trained on good health care practices in order to improve the management of health Lassa fever, and indeed limit its spread to them.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, RECOMMENDATIONS

This chapter summarized the entire study on the knowledge, attitude, and practices of management of Lassa fever among health care workers. Conclusions are made on the finding with regards to the objectives statements as well as recommendations were made to the relevant authorizes.

5.1 Summary

This study was about the knowledge, attitude, and practices towards the management of Lassa fever among healthcare workers in Maryland County, Liberia. Maryland County has no report of Lassa fever despite the illness being endemic in the northern part of the country. The county

furthermore hosts the second-largest university in the country and students, faculties and staff of the university is from all over the country including the Lassa fever belt. In this light, the researcher was curious and sorts to explore the relationship between knowledge, attitude, and practices towards Lassa fever management among healthcare workers in Maryland County. Two hundred and ninety-nine healthcare workers (Doctors, Registered Nurses, midwives, Laboratory technicians) participated in quantitative research using the cross-sectional study design. Participants were selected randomly after putting them in a stratum. This study was conducted in Maryland County, Southeastern Liberia, and a region which is very vulnerable and partially insecure for many infectious diseases. However, there is no report of suspected or confirmed LF in this part of Liberia. The study found that the majority of health care workers were female 191 (63.9%). Out of the 299 health care workers interviewed, 177 (59.2%) were single, 117 (39.1%) were married and very few 5 (1.7%) were divorced. Slightly over half of the health workers correctly identified Lassa fever as a viral illness 151 (52%), another 80 (27%) thought it was a bacterial illness while 32 (11%) and 30 (10%) thought that it was both a viral and zoonotic illness. The study found that 298 (99.7%) agreed that they were at risk of contracting Lassa fever.

5.2 Conclusions

In conclusion, this study showed that knowledge on the management of Lassa fever both in governmental and private health facilities were less desirable putting Healthcare workers at risk of the virus.

All the 299 health care workers that participated in this study indicated that they had heard about Lassa fever, 3.3% of participants indicated that they had treated or taken care of a patient

suffering from Lassa fever. The other 289 (96.7%) had not treated neither had they taken care of such patients. Proper and effective control practices and prevention strategies are crucial in the management of Lassa fever. None of the hospitals had a special wardrobe put in store for the management of Lassa fever.

This study showed that knowledge on the management of Lassa fever both in governmental and private health facilities were less desirable putting Healthcare workers at risk of the virus. Furthermore, compliance to the control and prevention of Lassa fever management among healthcare workers is lacking due to the fact that none of the clinics and hospital have infection protective control practice put in place towards Lassa fever management.

Intensified health education on Lassa fever and its transmission to manage LF among health care workers is needed to sustain this high level of awareness and knowledge among health care workers and correct any existing misconceptions. As a result, this will go a long way to protect the health care workers against this deadly disease, Lassa fever.

Compliance to the control and prevention of Lassa fever management among healthcare workers is lacking due to the fact that none of the clinics and hospital have infection protective control practice put in place towards Lassa fever management.

5.3 Recommendations

The researcher recommends that the director of the Maryland county health team should put in place proper and effective control practices and prevention strategies are crucial in the

management of Lassa fever for the health care workers in the various health facilities in Harper District, Maryland County, Liberia.

Both the public and private health facilities must consistently put priority in place to implement standard infection prevention and control interventions when caring for febrile patients to prevent nosocomial infections including Lassa fever.

Sensitization on knowledge of LF by the Williams V S Tubman University through media platforms must be all year round in the county with an added focus on the students of the college of health science.

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Appendix I: Consent Form

Good morning/afternoon/evening. I request a permission from your to participate in a research study by Neonora Ade Payne Barclay, a Master Degree student at the University of Eastern Africa, Baraton. This study is title *Knowledge, Attitude and Practices toward Lassa fever management among healthcare workers in Maryland County, Liberia*.

The objective of this study is to assess explore the relationship between knowledge, attitude and practice towards Lassa fever management among healthcare workers in Maryland County, Liberia. This is not to evaluate or criticize you but to generate knowledge as an essential step towards solving the lack of knowledge among healthcare in Maryland County.

All information obtained will remain strictly confidential and your name or identity will not be required. The summary of this study will be published, but in such a way that your identity will not be revealed.

There are not foreseeable risks to you in completing this survey though it will involve reviewing aspects of your life. Some questions will test your knowledge of Lassa fever but there are no right or wrong answers, so do not feel shy if you do not know the answer to a question.

Also, you are not obliged to answer any question you do not want to, and you may stop the interview if you do not want to proceed.

Do you have any questions before we start? (Answer questions)

Do you agree to participate in this study?

Participant's signature_____

Witness signature_____

Investigator's signature_____

Investigator's Contact: 0880-295512/ barclayade@gmail.com

Appendix II: SURVEY QUESTIONNAIRE

Instruction: Check the answer based on your knowledge of the Lassa fever virus disease.

1. Which year were you born? ☐
2. Gender : Female ☐ Male ☐
3. Marital Status: Married ☐ Divorced ☐ Single ☐
4. Education Level: Primary ☐ Secondary ☐ University ☐ College/Polytechnic ☐ Postgraduate ☐
5. Religion: Christian ☐ Muslim ☐ Others _____ ☐
6. **OCCUPATION** : Consultant ☐ Doctor ☐
7. Physician Assistant ☐ Registered Nurse ☐ Midwife ☐
8. Laboratory Technician ☐ Pharmacist ☐

9. **HOW LONG HAVE YOU BEEN A HEALTHCARE WORKER?**

☐ 0– 1year ☐ 1 -5 years ☐ Over 5 years

10. **Have you ever heard about Lassa fever** Yes ☐ No ☐

11. Have you ever treated/taken care of a patient with Lassa fever?

Yes ☐ No ☐

12. How many hours do you work per day? ☐

KNOWLEDGE ON THE MANAGEMENT OF LASSA FEVER

1. Lass fever is a
   - ☐ Virus illness
   - ☐ Bacterial illness
   - ☐ Fungi illness
   - ☐ Zoonotic illness
2. Onset symptoms of Lassa fever include the following
   - ☐ Fever
   - ☐ General weakness
   - ☐ Malaise
   - ☐ Stomach pain
3. Other few days symptoms include
   - ☐ Sore throat
   - ☐ Muscle pain
   - ☐ Chest pain
   - ☐ Hair loss
4. In severe cases, Lassa fever can cause
   - ☐ Facial swelling
   - ☐ Bleeding
   - ☐ Fluid in the lung
   - ☐ Shock
5. Incubation period of Lassa fever
   - ☐

- 1 – 3 days
- 6 – 21 days
- 1 – 5 days
- 2 – 10 days

6. Lassa fever is transmitted by
   - Flies
   - Mosquitoes
   - Bats
   - Mastomy’s natalensis rodents
7. Transmission of Lassa fever include
   - Direct contact with blood/secretions of LF-infected person.
   - Contact with urine/feces of infected rodent
   - Eating bush meat
   - Eating rat meat
8. Other means of transmission include
   - Contaminated medical equipment, such as re-used needles.
   - Hugging and shaking hands.
   - Sexual contact with an infected person.
   - Poor hygiene.
9. Lassa fever can be diagnosed by
   - Physical examination
   - Laboratory testing
   - Radiography test
   - Urine testing
10. Treatment of Lassa fever include
    - Ribavirin intravenously
    - Antibiotic tablets
    - Antifungal
    - Antiemetic
11. Supportive care of Lassa fever
    - Fluid and electrolytes
    - Oxygenation
    -

Vaccination

☐ Herbal medication

ATTITUDE TOWARDS LASSA FEVER MANAGEMENT

1. Healthcare works are a risk of contracting Lassa fever. Yes ☐ No ☐
2. My specialty has nothing to do with the management of Lassa fever.

   Yes ☐ No ☐
3. Lassa Fever is a preventable disease with positive health-seeking behavior.

   Yes ☐ No ☐
4. As a health care worker, I have a role to play in the prevention and spread of Lassa fever in the hospital and community. Yes ☐ No ☐
5. I will refuse to treat suspected Lassa fever patients in order to protect myself.

   Yes ☐ No ☐
6. Good infection prevention and control practice at all times irrespective of patient status are ideal in health facilities. Yes ☐ No ☐
7. Good patient education regarding Lassa fever can mitigate the spread of Lassa fever in the hospital settle. Yes ☐ No. ☐
8. Training of health care workers on infection prevention and control regarding Lassa fever will improve the infection prevention and control practices among healthcare workers.

   Yes ☐ No ☐
9. The facilities in this hospital are sufficient to protect staff from getting infected with Lassa fever. Yes ☐ No ☐
10. Early identification treatment can improve outcomes in the case management of Lassa Fever. Yes ☐ No ☐

CONTROL PRACTICE AND PREVENTIONS TOWARD LASSA FEVER MANAGEMENT

1. This hospital is perfectly equipped to manage Lassa fever.

   Yes ☐ No ☐

2. The personal protective equipment (PPE) available are:

   a) Sterile gloves Yes ☐ No ☐

   b) Non-sterile gloves Yes ☐ No ☐

   c) Goggle Yes ☐ No ☐

   d) Gown Yes ☐ No ☐

   e) Cover up shoes Yes ☐ No ☐

   f) Facemasks Yes ☐ No ☐

3. I usually wear PPE when caring for patients. Yes ☐ No ☐

4. Proper disposal of infectious medical wastes Yes ☐ No ☐

5. The practice of universal precaution on all patients Yes ☐ No ☐

6. As a healthcare worker, I practice single-use syringes and needles. Yes ☐ No ☐

7. We completely sterilized our equipment. Yes ☐ No ☐

8. The hospital has an isolation center or room. Yes ☐ No ☐

9. Suspected/confirmed cases of Lassa fever are put in isolation. Yes ☐ No ☐

10. Wash/sanitized my hands before and after contact with the patient. Yes No

11. The hospital has a special wardrobe put in store for the management of Lassa fever.

Yes ☐ No ☐

THANKS FOR PARTICIPATING IN THIS RESEARCH STUDY

Appendix III: Ethical Approval

OFFICE OF THE DIRECTOR OF GRADUATE STUDIES AND RESEARCH
UNIVERSITY OF EASTERN AFRICA, BARATON
P.O. BOX 2500-30100, Eldoret, Kenya, East Africa

B1622052021 May 22, 2021

TO: Ade Neonora Payne
Department ofPublic Health
University of Eastern Africa, Baraton

Dear Ade,

RE: Knowledge, Attitude and Practices Towards Lassa Fever Management among Health Care Workers in Maryland County, Liberia

This is to inform you that the Research Ethics Committee (REC) of the University of Eastern Africa Baraton has reviewed and approved your above research proposal. Your application approval number is UEAB/REC/16 /05/2021. The approval period is 22nd May 2021 – 22nd May, 2022.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by the Research Ethics Committee (REC) of the University of Eastern Africa Baraton.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton.

Prior to commencing your study, you will be expected to obtain an approval from the study site in Liberia and also obtain other clearances needed.

Sincerely yours,

Jackie K. Obey

Prof. Jackie K. Obey, PhD
Chairperson, Research Ethics Committee

University of Eastern Africa, Baraton
22 MAY 2021
P. O. Box 2500-30100, ELDORET
Research Ethics Committee

Appendix IV: Permission by the Ministry of Internal Affairs

REPUBLIC OF LIBERIA
MINISTRY OF INTERNAL AFFAIRS
Harper City, Maryland County

Office of the Superintendent

June 03 2021

Miss Neonora Ade Payne
Pleebo City
Maryland County

Dear Miss Payne:

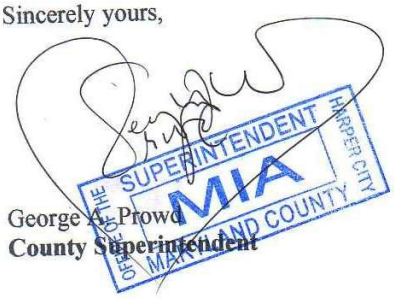
We write in response to your request to permit you carry on some form of research in the county.

It is our willingness especially in the spirit of Education to grant you go ahead in order to fulfill your studies at the University of Eastern Africa, Baraton, ELDORET, KENYA, East Africa.

We wish you well in your endeavor.

Thanks

Sincerely yours,



George A. Prowd
County Superintendent

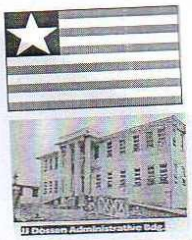
prowdgeorgea@gmail.com - 231 886855526 / 0776635921

Appendix V: Permission by Maryland County Health Officer

County Health Officer (CHO)
Maryland County Health Team
Harper City, Maryland County
Cell #: +231 886586667
e-mail:methogeorge@yahoo.com

J.J. Dossen Memorial Hospital

Harper City, Maryland County
Republic of Liberia



June 4, 2021

Ade Neonora Payne
Department of Public Health
University of Eastern Baraton, Kenya

Dear Ade

I have reviewed your approval letter from the Director of Graduate Studies and Research to carry on a research on "Knowledge, Attitude and Practices towards Lassa Fever Management among Health care workers in Maryland County, Liberia.

The Maryland County Health Team is pleased to inform you that, your request is accepted and you can go on with your research. We will support fully to have a successful work.

Thanks

Signed: _____

Dr. Methodius T. George
County Health Officer (CHO)
Maryland County Health Team
Harper City, Maryland County

COUNTY HEALTH OFFICER
CHO
MARYLAND
MARYLAND COUNTY