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PUBLIC AWARENESS AND FACILITY PREPAREDNESS IN THE PREVENTION AND MANAGEMENT OF EBOLA VIRUS DISEASE IN THE TAMALE METROPOLIS OF GHANA

SAMAKU NABILA SEINI

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PUBLIC AWARENESS AND FACILITY PREPAREDNESS IN THE PREVENTION AND MANAGEMENT OF EBOLA VIRUS DISEASE IN THE TAMALE METROPOLIS OF GHANA

BY

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DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere and all source materials used for the thesis have been duly acknowledged.

Candidate: Samaku Nabila Seini

Signature: ..... Date: .....

Supervisor: Prof. Dr. Juventus Benogle Ziem

Signature: ..... Date: …….

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ABSTRACT

Ebola Haemorrhagic Fever is a severe infection, characterized by person-to-person transmission through close contact with patients with or without haemorrhagic symptoms, dead bodies or by infected body fluids. An acute serious illness, caused by the Ebola virus is often deadly if untreated. The study assessed the level of public awareness and hospital preparedness in the prevention and management of the Ebola Virus Disease in the Tamale metropolis of the Northern region of Ghana. A descriptive cross-sectional study employing a mixed method research design of both quantitative and qualitative methodology was used involving the people of Tamale metropolis of ages 18 years and above. A non-probability sampling technique was used. This was done to purposively recruit participants from the various facilities used. In all, 400 respondents were interviewed. Overall, 84.8% (306) of respondents identified viruses as the cause of Ebola Virus Disease. However, 38.3% (149) said the disease can be treated. All Health Care Workers (HCWs) interviewed knew about the existence of Personal Protection Equipment (PPEs) and their importance in disease control. Despite their high knowledge level, 83.3% (25) had never seen the special PPEs used for EVD control. General knowledge by respondents about Ebola was generally low as all respondents did not know the natural host of EVD. Health workers had never seen the PPEs designed for EVD but knew about them. Hence, government and stakeholders should give education on the cause and transmission of the EVD on radio as health education to the public.

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My appreciation also goes to the Field Technicians for having spared me their precious time to administer my questionnaire.

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DEDICATION

I dedicate this work to my entire family for their prayers and support throughout my education.

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LIST OF ABREVIATIONS/ACRONYMS

AFENET	African Field Epidemiology Network
CDC	Centre for Disease Control
CHPs	Community Health Planning and Services
EHF	Ebola Haemorrhagic Fever
EIDs	Emerging Infectious Diseases
ELISA	Enzyme-Linked Immunosorbent Assay
EVD	Ebola Virus Disease
GHS	Ghana Health Service
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information Systems
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IDSR	Integrated Disease Surveillance and Response strategy
IPC	Infection Prevention and Control
MHMT	Metropolitan Health Management Team
MoH	Ministry of Health
NGOs	Non-Governmental Organisation
OPD	Out Patient Department
PHEIC	Public Health Emergency of International Concern
PPEs	Personal Protective Equipment

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RNA	Ribonucleic Acid
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Emergency Fund
UVRI	Uganda Virus Research Institute
VHTs	Village Health Teams
WHO	World Health Organization
WHO-AFRO	World Health Organization -African Regional Office

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Ebola Haemorrhagic Fever is a severe infection, characterized by person-to-person transmission through close contact with patients with or without haemorrhagic symptoms, dead bodies or by infected body fluids. An acute serious illness, caused by the Ebola virus is often deadly if untreated.

Ebola Virus Disease (EVD) is first known to have appeared in 1976 with two simultaneous outbreaks, one in Nzara, a town in Sudan, and the other in Yambuku, a village in the Democratic Republic of Congo. The latter which occurred in a village near a river known as the Ebola River is where the disease got its name (WHO, 2014).

The recent outbreak in West Africa which occurred in 2014 is by far the largest in terms of coverage and most complex Ebola disease outbreak from the time the virus was first discovered in 1976 till date. More cases and deaths were recorded in this outbreak than all the other outbreaks pooled together. Starting in Guinea, it spread across land borders to two countries, Sierra Leone and Liberia. Only one case was identified in Nigeria which was a traveller who went there by air. Another case was reported in Senegal. This was also an imported case. The most unsparingly affected countries; Guinea, Sierra Leone and Liberia are also known to have very weak health systems, and also lack human and infrastructural resources probably due to the fact that they only recently came out of long periods of wars and insecurity. The WHO Director-General on August 8, declared this outbreak as a disease of Public Health Emergency of International Concern (WHO, 2014).

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1.1.1 Causes of Ebola Virus Disease

Ebola is a deadly disease caused by the Ebola virus. The Ebola virus is related to the Marburg virus by its form and structure, but distinct in the way it stimulates antigen production. There are five strains, and four of them are known to be pathogenic in humans. After entering the body, it kills cells, making some of them explode. It wrecks the immune system, causes haemorrhage and damages almost every organ in the body.

The disease is generally limited to Africa and outbreak in one community can rapidly spread to other areas (Moran, 2014). Transmission of infection can occur through contact with infected persons body fluids and dead bodies. Direct contact with infected wild animals or consuming their meat is also implicated as an important cause of the disease in humans. Even though monkeys have long been implicated as an important reservoir of the disease, a colony of monkeys imported from the Philippines infected with the virus did not appear to cause disease in humans despite its high capacity to cause the disease in monkeys (WHO, 2015). Scientific evidence nonetheless, also shows that filoviruses in general do not persist in nonhuman primates that have been experimentally infected thus suggesting that monkeys are unlikely to be the natural host of the Ebola virus (WHO, 2016). All these opinions and evidence from past outbreaks as well as the natural reservoir of infection still remains largely speculative to researchers (WHO, 2015).

1.1.2 Diagnosis of Ebola Virus Disease

According to the World Health Organization (2016), distinguishing EVD from other infectious diseases such as malaria, typhoid fever and meningitis can be very difficult.

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The laboratory diagnosis can be made by one or a combination of the following investigations:

Antigen-capture detection tests; Antibody-capture enzyme-linked immunosorbent assay (ELISA); Serum neutralization test; Electron microscopy; Virus isolation by cell culture and Reverse transcriptase polymerase chain reaction (RT-PCR) assay.

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1.1.3 Control and prevention

A range of potential treatments including immune therapies, blood products, and drug therapies are currently being evaluated. Licensed vaccines are not available yet, but undergoing human safety testing are 2 potential vaccines. There is enough evidence from the current and previous epidemics to suggest that, transmission can be interrupted through Infection Prevention and Control (IPC) measures.

1.1.4 Management and containment of cases

The main stay of management is through supportive care by rehydration with oral or intravenous fluids and specific treatment of symptoms, which improves survival. Appropriate control of outbreak can be achieved by effective surveillance and contact tracing, active case management, good laboratory service, social mobilization and safe burials. Community engagement is key to successful control of outbreaks. At the individual level, creating awareness on risk factors is effective in Ebola prevention and control.

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1.2 Problem Statement

The first Ebola outbreak occurred some 38 years ago in Central Africa and since then some 19 other outbreaks occurred primarily from Central African countries mostly in Sudan (1976, 1979, and 2004), Democratic Republic of Congo (1977, 1995, 2007, 2008, and 2012), Gabon (1994, 1996, 2001, and 2002), Uganda (2000, 2007, and 2012), and the Congo (2001-2002, 2003, and 2005). A total of 2,403 patients were infected during these outbreaks with over 1,594 deaths (mortality rate of 63%) (Moran, 2014).

In December 2013, another Ebola epidemic started in Guinea spreading to Liberia, Nigeria and Sierra Leone and became by far the largest Ebola outbreak in history. By August 13, 2014, there were 2,127 confirmed cases of which 1,145 of them died representing 54% case fatality rate. By country, Sierra Leone experienced 810 cases, Liberia 786 cases, Guinea 519 cases, and Nigeria 12 cases, with fatality rates of 43.0%, 52.5%, 73.2%, and 33.3%, respectively (Moran, 2014).

There was an outbreak of another viral subtype in southern Sudan occurring at the same time of the West African epidemic but this Sudanese subtype had a lower degree of virulence, producing a mortality rate of 50%. Some other isolated cases were reported in Gabon, Uganda, and La Coˆte D'Ivoire (Ivory Coast) but each time they were genetically different from those previously isolated.

Between December 30, 2013, and September 14, 2014 (a 37-week period) a total of 4,507 cases were reported to the WHO. Given the limitations of case identification and the possible weakness in contact tracing and laboratory identification, it is possible that these

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figures were likely underestimated and the real figures might have been much higher than reported (Mamumur et al., 2014).

Guinea, Sierra Leone and Liberia registered most cases during the epidemic. Weak health systems, lack of human and infrastructural resources, probably due to the fact that they only recently came out from long periods of wars and insecurity could have contributed to the intense spread of infection (WHO, 2016).

Despite the fact that no case of EVD was registered in Ghana during the recent outbreak in West Africa, the country is still at risk of the epidemic due to its geographical proximity and brisk trans-border trade with some of the worst affected countries like Liberia and Sierra Leone in the West African sub-region. There is therefore the need to implement various interventions that would prevent the spread of infection should the event that another epidemic starts.

Disease control during disease outbreak depends on applying a set of interventions including urgent case management, surveillance and contact tracing, efficient laboratory service, safe burials practices and social mobilization (WHO, 2014). Increasing knowledge on protective measures and risk factors for Ebola infection both at the individual and community levels can efficiently reduce human transmission (Heymann et al., 1999). Health care workers who care for the sick without following standard hospital Infection Prevention Control (IPC) practices are at risk of acquiring the disease. These IPC practices include hand washing and use of Personal Protective Equipment (PPEs) to prevent contact with infected materials through splashes. Laboratory staffs are also at great risk of infection as they work mostly with blood and other body fluids from patients (WHO, 2014).

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Community- and health facility-based preventive and control measures are central to successful outbreaks control (WHO, 2014). Data on the level of community and health facility preparedness in the management and control of Ebola Virus Disease in the Tamale Metropolis is unknown. Consequently, this study sought to assess the level of public awareness and hospital preparedness of EVD in the Tamale metropolis since that is key to case management and disease control.

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1.3 **Specific Research Questions**

i. What is the level of public knowledge on the Ebola virus disease?
ii. What are the measures implemented to contain Ebola?
iii. How prepared are the health workers in controlling and managing EVD in the Tamale Metropolis?

1.4 Objective of the Study

1.4.1 Main Objective

To assess the level of public awareness and facility preparedness in the prevention and management of the Ebola Virus Disease in the Tamale metropolis of the Northern region of Ghana.

1.4.2 Specific Objectives

i. To assess the level of knowledge of the public on Ebola Virus Disease
ii. To determine the level of preparedness of the health workers in the control and management of Ebola Virus Disease in the Tamale Metropolis.
iii. To assess the measures put in place to contain suspected cases of Ebola Virus Disease

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1.5 Significance of the Study

The findings of this study would be beneficial to the general public and health care workers who are at risk of this deadly infection. It would also help in the education of the general public about the Ebola virus disease. It is hoped that this research would provide health planners with insight into factors responsible for the spread of the disease and also recommend effective strategies to help curb the situation when the need arises.

This work would play a vital role to institutions such as the Ministry of Health, Ghana Health Service, Non-Governmental organisations and other stakeholders in improving health care delivery in the country as a whole.

1.6 Conceptual Framework/Theory

Protection motivation theory was initially developed to clarify how people respond to fear appeals or fear-provoking health threat communications (Sutton, 2002). Protection Motivation Theory can be considered as a variation of the Health Belief Model. The protection motivation means the motivation to guard oneself against a health threat. It is defined operationally as the intent to adopt the validated action. There are four determinants of intention specified by the model that have received the most empirical attention, these are vulnerability and severity during the threat appraisal phase which is equivalent to the perceived susceptibility and severity in the HBM, response efficacy which is the belief that the validated action is effective in bringing down the threat, and finally, perceived self-efficacy that is, the belief that one can effectively carry out the recommended action in the coping appraisal phase (Bandura et al., 1997). Under the threat appraisal with a disease like Ebola, the individual looks at how vulnerable he is to the disease. The Ebola disease occurred in the West Africa in countries with trans-border

trade relationship with Ghana. This made Ghanaians more vulnerable to the Ebola disease. After an individual has appraised the threat level, he now looks at the coping appraisal. That is, the response efficacy. Would he be able to practice the recommended behaviour to protect himself from the disease and self-efficacy, whether he can successfully practice the recommended behaviour? The individual then makes his intention of practicing the recommended behaviour to protect himself from acquiring the Ebola disease leading to a health protective behaviour. Hence, a person will be more motivated to guard himself or herself. The person would have a resilient intent to adopt the recommended action to the degree that he or she believes that the threat is liable to occur if the current course of action is sustained. The outcome will be severe if the threat occurs and the endorsed line of action is efficient in lowering the possibility or the severity of the threat. Finally, he or she is capable of carrying out the recommended action. Below is a diagrammatic representation of the theory (Figure 1.2).

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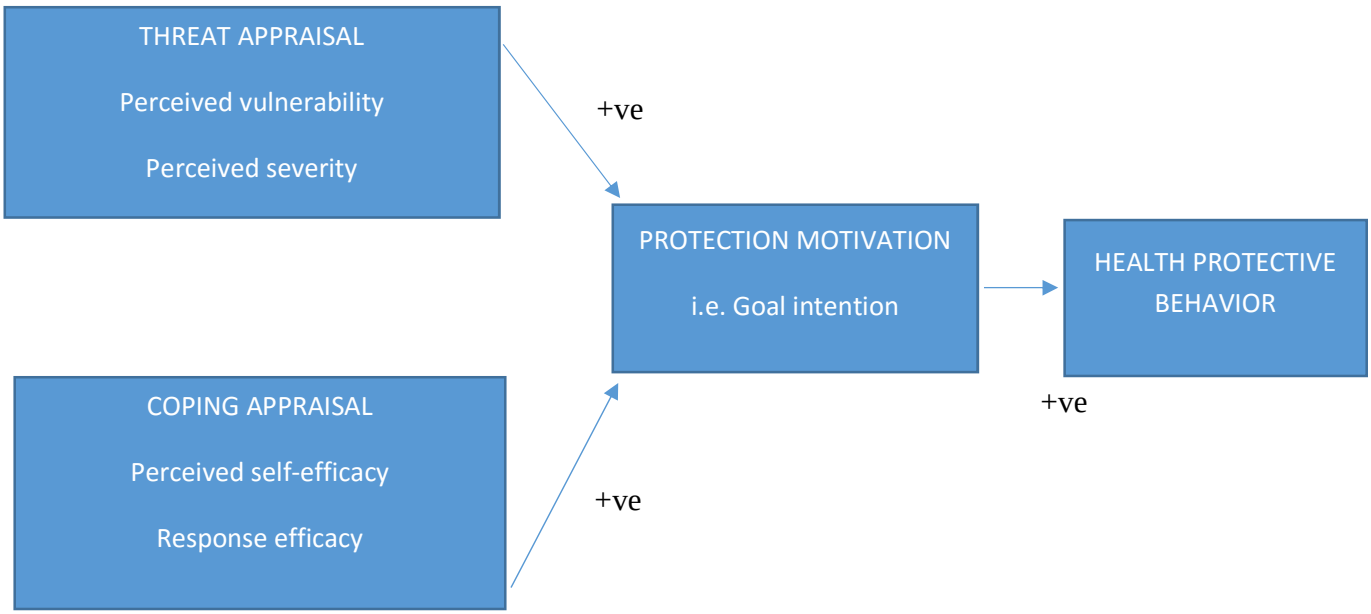
Figure 1.2 Conceptual Framework



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1.7 Scope of the Thesis

This study is made up of six main chapters. **Chapter one** contains the introduction to the study, background to the study as well as problem statement and the research questions. The Conceptual frame work, main objective and specific objectives and justification of the study are also covered in this chapter. **Chapter two** contains the literature review. **Chapter three** is methodology containing study type/design, study area, study population and study units. This chapter also outlines the sample size and sampling method, variables and data sources including study instrument, plan for data analyses and presentation of results, quality control and ethical consideration. Study limitations and plan for dissemination of results is also covered in this chapter.

In **chapter four**, results and analysis are presented in tables and graphs with accompanying narratives. **Chapter five** discusses the results in reference to relevant literature and **Chapter six**, the last chapter gives the summary of the results, conclusions from the results and gives recommendations for implementation.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Ebola virus causes the acute viral correlated signs and symptoms known as Ebola haemorrhagic fever (EHF). It is known to have first appeared in 1976 in two simultaneous outbreaks, one in Nzara, a town in Sudan, and the other in Yambuku, a village in the Democratic Republic of Congo. The latter happened in a village near a river known as Ebola, where the disease got its name.

The Ebola virus is related to the Marburg virus by its form and structure, but distinct in the way it stimulates antigen production. There are five strains, and four of them are pathogenic in humans.

2.1 Cause and Transmission of Ebola Virus Disease

Ebola Haemorrhagic Fever is a severe infection, characterized by person-to-person transmission through close contact with dead bodies, patients, or by infected body fluids. It is an acute serious illness, caused by the Ebola virus which is often deadly if left unmanaged.

In 1989, a new subtype of the Ebola virus was discovered in Reston, Virginia. This new finding led to the assumption that monkeys could be the source of the virus. The virus infected a colony of monkeys imported from the Philippines, and despite its high capacity to cause the disease in monkeys; it did not appear to cause disease in humans. The source of the virus is however still unknown (WHO, 2015). There are still unproven theories that rodents or other wild animals, particularly monkeys, harbour the virus. Direct contact

with infected wild animals or consuming their meat is thought to be an important cause of disease in humans. Despite opinions and experiences in past outbreaks, the natural reservoir of infection remains unknown to researchers in the medical field. Scientific evidence nonetheless, does show that filoviruses, such as the Ebola virus, does not continue to exist in nonhuman primates (monkeys) that have been experimentally infected; hence monkeys are not likely to be the natural reservoir of the Ebola virus but only inadvertent hosts. The natural reservoir of the virus is still unknown.

However, transmission of Ebola is by patients who are already presenting symptoms of the disease, and infection only occurs upon direct physical contact with the blood or body fluids of a confirmed Ebola patient. Transmission of the outbreak therefore can be contained through careful monitoring for high temperature among persons who have visited, or come into direct contact with persons from the site of the outbreak (Moran, 2014).

For most human transmission, the WHO states that physical contact with skin and mucous membranes of patients is responsible. Ebola is transmitted via direct interactions with virus-infected body fluids such as saliva, blood, vomitus, stools and possibly sweat. Parenteral injections with infectious material are associated with an increased infection risk and a higher mortality rate. Genital secretions of recuperating patients several weeks after illness have been shown to contain the Ebola virus; however, the likelihood for a recovered case to cause transmission through sexual contacts is yet to be confirmed. There has been no proof that, close personal contact with a non-symptomatic, non-febrile, Ebola-infected individual in the course of the incubation period or recovery results in transmission (WHO, 2014).

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Poor infection prevention and control (IPC) serves as an efficient amplifier of transmission of viral haemorrhagic fevers (VHF). In primary healthcare facilities, also called peripheral health units, healthcare workers lacked the supplies and training to apply rigorous symptom screening, and infection prevention and control practices recommended for Ebola treatment units. Such deficits increased the risk of occupational and nosocomial infection for healthcare workers and non-Ebola disease patients, respectively. The majority (66%) of healthcare workers infections occurred in peripheral health units and hospitals. As healthcare workers became infected, colleagues became frightened and demoralised, and the community's trust of the health system becomes further eroded (Ratnayake et al., 2016)

Studies on Ebola virus disease has shown evidently that, it is not naturally transmitted by the aerosol route, a malfunction of a testing instrument has a potential to generate aerosols or droplets that could place multiple laboratory workers under the risk of exposure. One manufacturer of clinical instruments has acknowledged this risk in their letter to customers stating that although its diagnostic instruments are generally designed to prevent formation of sample aerosols during testing, [the manufacturer] cannot provide assurance that dispersion of infectious disease agents, including Ebola virus, is completely prevented during specimen testing or if an instrument malfunctions or is misused. Patients with late Ebola Virus Disease have an extremely high viral load. The likelihood of transmission of Ebola Virus Disease from small amounts of material during the removal of personal protective equipment (PPE) is disturbing to laboratory workers and suggests a level of risk significantly greater than that of the usual blood-borne pathogens (Dubov et al., 2016).

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According to Carlos et al., (2015), in health facility and Ebola Virus Disease isolation units, methods of direct transmission is very confusing when it includes transmission by droplets, splashes, and needle stick. Also, in aerosol associated transmission with certain clinical procedures such as intubation must be regarded as a risk. Although the correct answers for the question on transmission increased, it remained low at 59.1%. As a result of the complexities of transmission methods in the health-care setting, there is the need to develop a new approach for managing these difficulties (Carlos et al., 2015).

A direct contact with an infected case of Ebola Virus Disease is required for transmission as indicated in epidemiological studies in some African communities. One of the primary cases acquired Ebola Virus Disease while visiting the local hospital in Sudan with no identified direct contact with a hospitalized Ebola Virus Disease case. Conveying how Ebola Virus Disease transmits in the health care setting remains a difficult issue. When two nurses in the USA acquired Ebola Virus Disease while wearing personal protective equipment with no apparent breaches in protocol, standards of personal protective equipment for Ebola Virus Disease were advanced by both CDC and WHO (Carlos et al., 2015)

Almost all healthcare workers are always at risk for exposure to blood-borne pathogens, but nurses are the most susceptible among health professionals that provide direct care to patients. This makes them vulnerable to high risks of biological exposure during medical procedures. It has been estimated globally that, greater than 50% of clinical nurses will experience at least one needle-prick injury in their careers. The Centre for Disease Control provides information regarding the identification and management of patients suspected of Ebola Virus Disease (Mohsen et al., 2016).

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Within the healthcare settings, Ebola is spread by direct contact with objects, blood or body fluids of a person who is infected with Ebola Virus Disease. Personal Protective Equipment (PPE) should fully cover the entire body and also prevent any exposure of the eyes, nose, and mouth to reduce the risk of accidental contamination of ones' self. All Personal Protective Equipment must be used in accordance with CDC recommendations on a comprehensive infection control and also applicable Health Occupational Safety guidelines, including PPE, and Respiratory Protection standards (Mohsen et al., 2016).

The transmission of the Ebola virus is probably due to close residence with the wild animals like African green monkeys, chimpanzees, fruit bats, duikers and baboons. The likelihood of sexual transmission of Ebola virus disease owing to the presence of Ebola virus RNA in semen and vaginal secretions is high. Plants, birds and arthropods can become possible reservoirs of Ebola virus. The Ebola Virus Disease outbreaks in 2001 and 2003 had traces of the virus found in the carcasses of gorillas and chimpanzees, which are believed to be the source of most human infections. The first Ebola outbreak in Congo was due to the re-usage of infected needles and syringes. These were unsterilized, a crucial factor in the transmission of Ebola virus (Swapnil et al., 2016).

Studies indicated that, the viral load of filoviruses in the carcass of animals that died of Ebola Virus Disease were higher than those of carcasses of healthy reservoir species (Spengler et al., 2016).

Serologic data, epidemiology and the detection of Ebola viral RNA supports the role of bats and nonhuman primates in Ebola virus transmission from animal reservoirs to humans. The Ebola virus has yet to be isolated in nature from any of the bat species or

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monkeys. In contrast to the Ebola virus, experimental evidence confirms fruit bats, especially the *Rousettus aegyptiacus* species as a reservoir for Marburg virus. Marburg Virus transmission from bats to humans have been documented (Spengler et al., 2016).

2.2 Clinical Presentation of Ebola Virus Disease

Until they develop symptoms, humans are not known to be infectious. First symptoms are the abrupt onset of fever, fatigue, headache, muscle pain and sore throat. These symptoms are followed by vomiting, diarrhoea, symptoms of impaired kidney and liver function, rash, and in a number of cases, both internal and external bleeding such as blood in the stools and oozing blood from the gums. Platelet counts, elevated liver enzymes, and low white blood cell are the usual laboratory findings. Ebola Haemorrhagic fever has an incubation period of 2 to 21 days, normally 5-12 days in most cases. Ebola Haemorrhagic Fever epidemics have shown that, the disease begins with acute fever, vomiting and diarrhoea that can be bloody and also referred to as “diarrhée rouge” in most French-speaking African countries. Headache, abdominal pain and nausea, are common. Dysphagia, conjunctiva infection, haemorrhagic symptoms such as gum haemorrhage, epistaxis, haematemesis, purpura, melaena and hiccups, may further result. Maculopapular rash on the trunk of some patients may also show. As the disease progresses, dehydration and significant wasting occur. There is common involvement of the central nervous system at a later stage, manifested by lassitude, delirium, or coma. The patient will either noticeably improve to convalesce by the second week of the disease, or will have multiple organ malfunctions resulting in death through shock (WHO, 2014).

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2.4 Prevention and Control of Ebola Virus Disease

Good outbreak control depends on applying a set of interventions including case management, surveillance and tracing of contact, an efficient laboratory service, safe burials practices and social mobilization. Community participation is central to successfully controlling outbreaks (WHO, 2014). Increasing knowledge of protective measures and risk factors for Ebola infection that individuals can take is an efficient way to reduce human transmission (Heymann et al., 1999).

Reducing risk should focus on several factors such as reducing the risk of animal-to-human transmission from interactions with infected fruit bats or monkeys and the ingestion of their raw flesh. Gloves and other protective apparel should be worn when handling animals. Raw animal products, that is, blood and meat should be properly cooked before it is consumed (WHO, 2014). Other factors include reducing the risk of transmission from person to person through direct or close contact with individuals with symptoms of Ebola, especially with fluids from their bodies. Gloves and appropriate personal protective paraphernalia should be worn always when caring for ill patients in the house. Washing of hands frequently is obligatory after taking care of patients at home, as well as after visiting patients in hospital. Containment interventions of outbreaks including prompt identification of individuals who may have been in direct contact with someone infected with Ebola Virus Disease. Monitoring the health of these infected individuals for 21 days, safe burial of the dead, and the importance of isolating the sick from the healthy in order to prevent further spread of the infection (WHO, 2014). The importance of good personal hygiene and maintaining a clean and healthy environment at all times cannot be over emphasised in prevention of the disease.

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The Standard Universal Precautions have tentatively shown to reduce risk of body fluid or blood exposure among health care professionals. It was shown that lack of knowledge about barriers to safe practice, modes of transmission, work experience, heavy workload, inaccurate risk assessment, uncomfortable personal protective equipment (PPE) and the belief that compliance to universal safety precautions is not necessary. They were associated with non-compliance to the universal safety precautions. These Standard Universal Precautions (SUP) include specific recommendations for appropriate waste management, hand washing, use of gloves, masks, gowns and protective eyewear when in contact with blood or secretions containing blood. Regardless of their infection status, universal precautions should be consistent in attending to all patients according to the Centre for Disease Control and Prevention (CDC) guidelines (Mohsen et al., 2016).

Poor infection prevention and control (IPC) practices serves as an effective amplifier of transmission of viral haemorrhagic fevers (VHF). In primary healthcare facilities, also called peripheral health units (PHUs), healthcare workers lacked the supplies and training to apply rigorous symptom screening and IPC practices recommended for Ebola treatment units (ETU).

As healthcare workers became infected, colleagues became frightened and demoralised, and the community's trust of the health system was further eroded (Ratnayake et al., 2016)

To protect healthcare workers, authorities within the health care facilities must provide protocols to safely use personal protective equipment (PPE), and also implement environmental and administrative controls with continuous safety checks through direct observation of healthcare workers (Mohsen et al., 2016).

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Globally, it has been estimated that between 20-40% of all hospital acquired infections are caused by cross-infection from the hands of healthcare workers (Mohsen et al., 2016). The hands of health workers should be washed or alcohol-based rubs should be used after gloves are removed and between patient contacts. Hands of healthcare personnel should be washed after contact with body fluids, blood, secretions, contaminated equipment and excretions. It is sometimes necessary to wash hands between procedures on the same patient to prevent contamination of different body sites. A preparedness plan that includes rigorous education, training and practice of any staff that directly interact with or care for patients is very critical to ensure the safe management of patients with Ebola Virus Disease. In the out-patient or Emergency Departments, prompt recognition and appropriate infection prevention and control management of patients with Highly Infectious Diseases is needed (Mohsen et al., 2016).

Prevention of transmission of infectious pathogens, including Ebola virus, to healthcare personnel includes 3 tiers of the hierarchy of controls. This standard approach to controlling workplace hazards involves using physical engineering controls that can remove or reduce exposure to a hazard. Also, the administrative controls that involve management policy and work practice training, on the use of personal protective equipment (PPE) should be adhered. A supplementary method is used when engineering and administrative controls alone cannot provide sufficient protection. Effective use of PPE requires comprehensive supporting programs for medical evaluation and training of employees and proper selection, fit, maintenance, and storage of equipment (Cummings et al., 2016).

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2.4 Management of Ebola Virus Disease

Ebola virus disease has a high fatality rate; currently without any known treatment or vaccine with proven efficacy and safety, has gotten many people are extremely fearful of this infection. Approximately 2,127 patients across four West African countries as of August 13, 2014, have been infected with the Ebola virus over the past nine months. Approximately 1 in 2 among these patients, has eventually died from the disease (Moran, 2014).

Pandey and his colleagues also reported that a collective approach of contact-tracing with quarantine, case isolation and sanitary funeral practices must be implemented with the greatest urgency in order to reverse the spread of the outbreak (Pandey et al., 2014).

A number of clinical care guidance documents have been produced by organisations with EVD experience. Such guidelines and recommendations have been informed by published observational studies and case reports, as well as specific hands-on experience and expert opinion. Since there are no approved treatments available for EVD, the clinical care of patients is primarily supportive. Patients with confirmed EVD should be cared for in a setting capable of intensive and frequent monitoring of vital signs, fluid balance and neurologic status. Since aggressive supportive care has the potential to increase survival, the patient should be cared for in an ICU setting. Numerous patients that have been treated in ICU settings who developed severe multi-organ dysfunction and required ventilator and dialysis support, have recovered (Health Department, South Africa, 2015).

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The role of interferon and applying a non-specific anti-viral approach during the incubation period of virus infection as an essential protection to put the host's immune system into an alert state and to slow down the viral replication was recently discovered. However, the success in disease management is still not reached. The role of interferon in the treatment of Ebola has been widely discussed and its effectiveness has been proven in some animal models (Joob et al., 2015).

However, in addition to interferon mentioned, other nonspecific anti-viral approaches for possible usefulness in the treatment of Ebola have been discussed. Examples of some of these include melatonin and antibodies, such as intravenous immunoglobulin (IVIG). Focusing on melatonin, the possibility for its use as a new drug against Ebola was first raised. Melatonin was noted to have an activity targeting many pathological processes that have been observed in Ebola virus infections. It was then proposed that melatonin just might have some advantages as a new treatment for the Ebola virus disease. Anderson *et al*., (2015) recently concluded that melatonin had positive roles in the reduction of pro-inflammatory cytokines and improving the appropriate immune response that could be beneficial in the management of Ebola virus infection. Whiles focusing on antibodies, immune sera are also mentioned for its effectiveness against the Ebola Virus. However, the safety and availability of antibodies remain as important factors for further discussion (Joob et al., 2015).

There is still no clear evidence confirming the efficacy of interferon or other nonspecific anti-viral approaches towards the treatment of Ebola. Further clinical trials are needed (Joob et al., 2015).

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The effectiveness of favipiravir against Ebola virus in animal models is one such new potential antiviral drug. This drug is currently used for management of the Ebola virus infection in some settings. The great concern however, is the lack of supporting evidence from scientific clinical trials to support it (Joob et al., 2015).

The treatment of EVD patients is aimed primarily at preventing multiple organ failure mainly through supportive care. This substantially increases patient survival as a result of multiple intensive care strategies that are implemented. Secondary bacterial and or fungal infections that are associated with dialysis procedures, mechanical ventilation and intravascular catheters are significant infection threats for EVD patients. Bacterial infection may also complicate the severe clinical situation of EVD. Broad antibiotic therapy may be applied empirically, although a delay in a timely performance of laboratory diagnosis is a major risk for EVD patients, especially in regard to multidrug-resistant Gram-negative pathogens that are predominant in regions

where Ebola virus is endemic (Hogardt et al., 2015).

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2.5 Level of Preparedness of Health Workers

For health personnel to be capable of diagnosing specifically the Ebola virus in humans, several diagnoses need to be carried out. It can be difficult to distinguish Ebola Virus Disease from several infectious diseases such as malaria, meningitis and typhoid fever. The following investigations are done to confirm that symptoms are caused by Ebola virus infection using: Antigen-capture detection tests; Reverse transcriptase polymerase chain reaction (RT-PCR) assay, Antibody-capture enzyme-linked immunosorbent assay (ELISA), serum neutralization test, Virus isolation by cell culture and electron

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microscopy. Laboratory testing on inactivated samples should be conducted under extreme biological containment environment since the samples from patients are life threatening biohazard risk. The need to have a standard protocol for the identification, diagnosis, containment and control of the Ebola virus infection cannot be underestimated as Heymann et al., (2014) reports that; below average hospital infection control practices especially a failure in barrier nursing and personal protection were the instantaneous cause of the increased transmission rates within hospitals. A surgical intervention for an illness that was diagnosed as an acute abdomen was known 2 weeks later to have been Ebola Haemorrhagic Fever (EHF) and was confirmed to have been an exact risk for transmission of Ebola virus to the health workers (Heymann et al., 2014). In the course of this surgical intervention, barrier nursing practices was not used by many personnel who were in the operating theatre where latex gloves and other protective materials were in short supply. Therefore, the first lesson learnt was that disease recognition and disease response systems and very essential public health practices in developing countries must continue to be enforced and practiced routinely for it to be straightened. Training and acquisition of skills set in surveillance, prevention and disease control is very necessary (Heymann et al., 2014).

Consequently, healthcare workers lacked training on infection control measures including barrier nursing that are essential for healthcare worker safety so that the much needed patient care is provided (Mbonye et al., 2014).

Recent information from the outbreaks suggests Ebola cases were either missed through active case finding teams or were actually removed from the isolation facilities by patient relatives even after they were confirmed to have the Ebola virus disease. The violation of

this infection control and isolation recommendations can only worsen the outbreak trends as it actually did in West Africa (Mbonye et al., 2014).

When caring for patients, healthcare workers should always maintain standard safety precautions regardless of their initial diagnosis of patients. These include the use of personal protective equipment to prevent splashes or other contact with infected materials, respiratory hygiene, safe injection practices, basic hand hygiene, and safe burial practices. When caring for patients with suspected or confirmed EVD, healthcare workers should apply extra infection control measures to prevent themselves from getting in contact with contaminated materials or surfaces such as clothing and bedding including the patient's blood and body fluids (WHO, 2015). When in close proximity, that is, within 1 metre of patients with Ebola Virus Disease, face protection, a clean non-sterile long-sleeved gown, and sterile gloves for some procedures should be worn by the health personnel. Personnel working in the laboratory are also at risk. Specimen collected for investigation of Ebola infection from humans and animals should be processed in suitably equipped laboratories and should be handled by trained staff (WHO, 2014).

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The 2014 Ebola virus Disease (EVD) outbreak exposed the level of epidemic unpreparedness of countries, hospitals and healthcare workers (HCW) in Africa and the world as a whole (Ogoina et al., 2016). With over 15,000 reported Ebola cases, followed by nearly 5,500 deaths as of 21 November 2014, the unprecedented and overwhelming epidemic of Ebola virus disease in West Africa ignited an increasing global concern about the risk of introduction and further spread of the disease by repatriation and international travel. For this reason, the World Health Organization advised all nations to

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prepare for the detection, investigation and management of suspected and confirmed EVD cases.

In light of the non-specific nature of the initial symptoms, suspected patients essentially included all travelers with unexplained febrile illness, have recently arrived from areas with ongoing EVD transmission, especially when accompanied by gastrointestinal symptoms. Current assessment is that, travel-associated cases will remain rare across Europe, but the occurrence of EVD in returning healthcare workers is a realistic situation. The recent experiences with both types of EVD cases in Europe and the United States, with local transmission to healthcare workers, show the importance of being prepared (Jong et al., 2014).

Ebola Virus Disease "EVD" is now widely affecting most parts of West Africa, and it is beginning to spread to other countries as well. The universal response to the Ebola epidemic was truly assertive, and as such, needs an urgent public health intervention. The combined efforts of community workers, political and religious leaders, ordinary citizens, and Non-Governmental Organizations in controlling the outbreak is required (Mohsen et al., 2016).

A survey of hospitals in 40 European and western Asian countries was conducted to gain insights into the preparedness of European hospitals and possibly identify potential gaps in preparedness at the hospital level, focusing on the capacity and willingness to admit patients with suspected EVD and also on specific preparedness of hospitals in various activities in response to the current Ebola crisis. Out of 236 hospitals that were involved in a study by Jong et al., (2014), it was revealed that 26 (11%) of the respondents did not know whether such patients would be admitted, 99 (42%) indicated that they would not

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admit EVD patients, and 111 (47%) stated that they would admit suspected EVD patients.

In a study in Saudi Arabia, the EVD concern among the general public and clinicians was heightened by the 2012 Coronavirus outbreak, which had 1,564 cases and 564 deaths globally. Like many countries, Saudi Arabia has invested a lot of resources in Ebola preparedness including the rigorous screening of pilgrims, the training of clinicians on how to manage EVD and designate special rooms and teams in many hospitals for the care and treatment of EVD patients. To date no Ebola case has been identified or reported in Saudi Arabia. However, like other healthcare providers across the globe, in Saudi Arabia the clinicians are also challenged by misinformation and fear of EVD (Almutairi et al., 2015).

A number of studies agreed that lack of knowledge and lack of sufficient personal equipment and its proper usage contributed to the problems in controlling the 2014 West African Ebola virus disease outbreak (Shagari et al., 2016).

A study in Liberia reported on limited supplies of essential drugs, personal protective equipment and inadequate training on the safe removal of personal protective equipment, as well as ambulances. Also, a lack of masks, protective clothing, and boots as well as disinfectants such as chlorine was reported in two prefectures in Guinea. Majority of healthcare workers in Ghana raised concerns over the lack of personal protective equipment and also, the anecdotal evidence of healthcare workers that abandoned wards and patients after being confronted with a patient that was suspected to have been in contact with an Ebola patient and exhibited Ebola virus disease-like symptoms. The apprehensions of these health care workers with regard to their individual safety seem to

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be justified given that the incidence of Ebola virus infection in health care workers was 42 times higher compared to non-health care workers in Guinea and up to 103 times higher in Sierra Leon (Shagari et al., 2016).

The significance of sufficient logistics for controlling the Ebola outbreak was illustrated by a mathematical model for disease transmission. This model was developed to assess the effect of additional hospital beds on Ebola virus transmission between June 2014 and February 2015 in 12 districts of Sierra Leone. About 56,600 (reported and unreported) Ebola cases were estimated to have been prevented as of February 2015 as a direct result of increased numbers of hospital treatment beds. It was also concluded from the model that a further 12,500 cases would have been prevented if more beds had been available at least a month earlier. This demonstrated that, the lack of adequate preparedness at hospital level directly escalated the magnitude of this epidemic. Addition of more beds might have been sufficient to result in an early halt in the entire outbreak or at least dramatically reduce it in size. An uneven distribution in this context, of resources in the affected areas might have greatly contributed to the scale of the outbreak (Shagari et al., 2016).

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The Preparedness Dashboard demonstrates an increase in overall preparedness at the country level among the priority countries. Moreover, 11 of 14 countries have achieved a score of 50% against the Ebola Preparedness Checklist, which shows they are adequately equipped to test their preparedness response systems (Mohsen et al., 2016).

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2.6 Structures Implemented To Contain Suspected Cases of Ebola

The transmission of Ebola in W. Africa according to Mbonye et al., (2014) identified persistent transmission in health care settings involving several health workers contacting and dying from the Ebola virus disease as one of the major means of spreading the disease.

The establishment of epidemic taskforce comprising of several stakeholders is useful in disease control. The task force should be implemented at the national, regional, district and facility levels to provide leadership and technical support at the different levels.

There should be designated surveillance focal points at regional, district, and sub-district health levels. These personnel should be well trained to enable timely investigation, detection, and reporting of priority diseases. The surveillance system can further be enhanced during epidemics to allow daily tracing of all contacts of viral haemorrhagic fever patients and abrupt investigation and isolation of suspected cases. This would ensure that transmission within the community is controlled quickly (Mbonye et al., 2014).

The need to have a standard protocol for the identification, diagnosis, containment and control of the Ebola virus infection cannot be underestimated as Heymann et al., (2014) reports that; disease detection and disease response systems and basic public health practices must continue to be enforced and practiced routinely for it to be strengthened.

A good laboratory network should be available within districts, regional referral hospitals and at the national level where samples can be analysed. Also, there should be dimensions in the collection of specimen, processing, storage and an efficient mechanism for specimen shipment (Mbonye et al., 2014). There has been rapid deployment of

international mobile laboratories since the identification of Ebola in Guinea in March 2013, through Global Outbreak Alert and Response Network and WHO networks (Mbonye et al., 2014).

Vital to outbreak and control operations was the Emerging and Dangerous Pathogens Laboratory Network (EDPLN). Deployable laboratories from multiple international organizations have been established near Ebola treatment centers (ETC) in Sierra Leone, Liberia, and Guinea. The organizations providing laboratories are European Union Mobile Laboratory Consortium (EM Lab), China Centers for Disease Control Lab, Institute Pasteur Lyon, Institute Pasteur Paris, Institute Pasteur Dakar, Institut National de Recherche Bio-Médicale Mobile lab in Democratic Republic of Congo, Public Health England Mobile lab, National Institute for Communicable Diseases in South Africa, Public Health Canada Mobile Lab, United States Centers for Disease Control (CDC), Russian Rospotrebnadzor Mobile Lab, US First Area Medical Laboratory, US Naval Medical Research Center Mobile Lab and US National Institutes of Health (Field et al., 2017).

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CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter looks at the research methods used in this study. It describes the study design, the study area as well as the study population. The sample size calculations, sampling procedure, study variables and data sources as well as study instrument are also described in this chapter.

3.2 Study Area and Population

The study was carried out in the Tamale metropolis of the Northern Region of Ghana. The metropolis is one of the 26 administrative districts of Northern region of Ghana. It is located in the central part of the Region and shares boundaries with the Sagnarigu District to the west and north, Mion District to the east, East Gonja to the south and Central Gonja to the south-west. The Metropolis has a total estimated land size of 750km sq (TAMA-2014). Geographically, the Metropolis lies between latitude 9º16 and 9º 34 North and longitudes 0º 36 and 0º 57 West.

Tamale is strategically located in the region and by this strategic location, the Metropolis has a vibrant market potential for local goods from the agricultural and commerce sectors.

There are 115 communities in the Metropolis. Some located in the rural parts of the Metropolis and the other in the urban parts. Most of the rural communities have a large expanse of land for agricultural production. These communities, however, still lack basic economic and social infrastructure such as good road networks, schools, hospitals,

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markets and recreational centers, thereby hindering socio-economic development (GSS, 2014).

The total population in the Metropolis was estimated at 233,252 from the 2010 population and housing census. The total population living in the urban areas is (80.8%) and that of the rural areas is (19.1%). Males constituted 111,109 and females 112,143. The number of people above 11 years of age who were Literate was 140,184, while school enrolment at age 3 years and above is estimated at 84,897 (GSS,2010).

There are 23 health facilities in Tamale metropolis according to the metropolitan health directorate 2014 annual report. Eight (8) of these are privately owned and the remainder are government facilities.

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3.2.1 Climate

The Tamale Metropolis is about 180 meters above sea level. The land is undulating with a few isolated hills. The Metropolis receives only one rainfall season in a year and this affects effective agricultural production all year round in the area. Daily temperature in the Metropolis varies from season to season. During the rainy season residents experience high humidity, slight sunshine with heavy thunder storms, compared to the dry season which is characterized by dry Harmattan winds from November-February and high sunshine from March-May.

3.2.2 Health

The Health services in the Metropolis are managed at three (3) levels namely: Metropolitan Health Administration level, Sub-district level and the Community level.

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At the administration level, the Metropolitan Health Management Team (MHMT) is responsible for overall planning, monitoring, supervision, evaluating, training, co-coordinating of all health programmes in the Metropolis. It is also responsible for conducting operational research and linking up with other agencies and NGOs in health provision and promotion.

There are about 23 health facilities in the metropolis comprising of government hospitals, private hospitals, health centers/clinics, rehabilitation/nutritional centers and CHIPs compounds. The only teaching hospital in the Northern part of Ghana is located in the metropolis.

3.3 Study Type and Design

From July 2015 to August 2015, a cross sectional study was carried out in the Tamale Metropolis area of the Northern Region to assess the level of public awareness on their knowledge on Ebola Virus disease and Hospitals preparedness. In order to achieve this, both quantitative and qualitative data collection procedure were used.

3.4 Quantitative Study

The quantitative area of the study involved administration of questionnaires to a sample population age of 18 years and above. The respondents used for the study included patients who visited some facilities in the metropolis for health care and health care workers (HCW).

3.4.1 Sample Size Determination

The sample size for the study was determined using the published table by Israel, 2013 as shown by table 1. In short, from the table, using a 5% confidence interval, a population

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greater than 100,000 should use a sample size of 400. Tamale Metropolis has a total population of 233,252; hence a total sample of 400 was used.

Table 3.1 Sample Size Determination

Size of Population	Sample Size (n) for Precision (e) of:			
	±3%	±5%	±7%	±10%
500	a	222	145	83
600	a	240	152	86
700	a	255	158	88
800	a	267	163	89
900	a	277	166	90
1,000	a	286	169	91
2,000	714	333	185	95
3,000	811	353	191	97
4,000	870	364	194	98
5,000	909	370	196	98
6,000	938	375	197	98
7,000	959	378	198	99
8,000	976	381	199	99
9,000	989	383	200	99
10,000	1,000	385	200	99
15,000	1,034	390	201	99
20,000	1,053	392	204	100
25,000	1,064	394	204	100
50,000	1,087	397	204	100
100,000	1,099	398	204	100
>100,000	1,111	400	204	100
a = Assumption of normal population is poor (Yamane, 1967). The entire population should be sampled.				

Source: Glenn D. Isreal, 2013 Determining Sample Size

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3.4.2 Sampling Procedure

In order to obtain the required sample, 10 health facilities within the Metropolis were purposively visited during OPD hours. The health facilities include Central Hospital, West hospital, Kabsad, SDA hospital, Bilpela health center, Kalpohini health center, Choggu health center, Vittin health center, St. Lucy clinic, and Nyohini health center.

They were selected because together they provided over 90% of OPD services in the Metropolis. The total sample size of 400 was allocated equally to all Health Facilities, that is, 40 per facility.

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3.5 Qualitative Study

This involves in-depth interviews of management officials of the hospitals. Who were chosen purposively because of their expertise required to satisfy the questions of the study objectives. They were abreast with the plans and future goals of their facilities for eventualities such as the outbreak of Ebola in 2014. Management officials from the four hospitals in Tamale comprising of the medical directors, nursing directors and the laboratory directors were selected. Health workers (such as doctors, nurses and laboratory personnel) were also interviewed. A total of thirty respondents were interviewed for the qualitative study.

3.6 Data Collection

At the OPD level, consenting patients were recruited until the required number (40) was met. For each patient, a structured questionnaire was administered to obtain information on patients' demography and their knowledge on causes, diagnosis, management and prevention of Ebola Virus Disease. At each facility, volunteer HCW were interviewed to

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assess their knowledge level on Ebola Virus Disease and preparedness in managing a case. Finally, facility heads or his/her representative was interviewed to assess the facilities' preparedness in managing a case of EVD should an epidemic occurs.

3.7 Ethical Considerations

Before commencement of work, an introductory letter was obtained from the department of School of Allied Health Sciences, University for Development Studies. Each time we visited the facility, permission to carry out the work was obtained from facility management and head of OPD. At the individual level, the study protocol was explained and only those who agreed to be part of the study were included. Throughout the study, individuals who no more wanted to participate in the study were told that they could opt out freely. They were also assured that information obtained was kept confidential.

3.8 Data Analysis

Data obtained from the questionnaire were entered into Microsoft excel for Windows version 13. Data was cleaned for data entry errors and exported to a statistical package SPSS version 16 for analysis. Univariate analysis was done for socio-demographic characteristics of respondents and also for areas that require only descriptive statistics.

The qualitative data was analysed by transcribing the recorded tapes of the in-depth interviews after which the central themes were extracted and manually analysed. The themes were supported by some quotations from the respondents. Special attention was paid to communications that were non-verbally exhibited by respondents. Their hesitations to the discussions were noted as well.

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CHAPTER FOUR

RESULTS

4.1 Demographic Characteristics of Respondents

A summary of the demographic characteristics is presented in table 4.1. In all 400 respondents were interviewed for the quantitative arm of the study. The overall age ranged from 18 to 57 years with a median age of 34 years and a modal age of 28 years. By age category, while 44.0% (176) were within the age category of 30-40 years, 28.2% (113) were above 40 years and 27.8% (111) below 30 years of age. Females constituted 53.7% (213) and males 46.3% (184). Overall, 53.9% (215) of the respondents were not married, 45.4% (181) were married and 0.8% (3) were divorcee. All the respondents had some level of formal education; 14.1% (53) had only basic education, 36.3% (137) had secondary education, 17.5% (66) had technical and vocational education and 32.1% (121) had tertiary level of education. With regards to their occupation, 37.8% (151) were students, 24.3% (97) were traders, 18.3% (73) were teachers, 8.8% (35) were nurses and 10.8% (43) were unemployed.

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Table 4.1 Respondents' demographic characteristics

Variable	Frequency (n)	%
Age group / years		
<30	111	27.8
30-40	176	44
>40	113	28.2
Total	**400**	**100**
Sex		
Male	184	46.3
Female	213	53.7
Total	**397**	**100**
Marital status		
Single	215	53.9
Married	181	45.4
Divorced	3	0.8
Total	**399**	**100**
Educational status		
Basic	53	14.1
Secondary	137	36.3
Technical/Vocational	66	17.5
Tertiary	121	32.1
Total	**377**	**100**
Occupation		
Student	151	37.8
Teacher	73	18.3
Nurse	35	8.8
Trader	97	24.3
Unemployed	43	10.8
Total	**399**	**100**

Source: field study, 2015 (totals don't tally as a result of missing data)

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4.2 Knowledge of Respondents on Causes and Transmission of Ebola Virus Disease

Respondents' knowledge on causes and transmission of EVD is given in Table 4.2. From the table, 84.8% (306) of respondents said a virus causes EVD while 6.9% (25) said bacteria was the cause. Another 8.3% (30) were not sure of the cause. Of those who knew of the right causative agent (virus), 53.1% (161) were females and 46.9% (142) were males.

With respect to their level of education, 91.5% (43) of those with basic education, 92.9% (105), of those with secondary education, 76.6% (48) of those with vocational/technical education and 77.7% (94) with tertiary level of education knew of the right cause of the disease.

Of the 394 participants who said they knew of the reservoir host of EVD, 47.7% (188) and 42.6% (168) said only monkeys and fruit bats respectively are known natural host of EVD while 8.9% (35) mentioned both monkeys and fruit bats as natural host. Only three 0.8% (3) of the respondents mentioned cattle as the natural hosts.

With respect to the mode of transmission of EVD, 65% (260) of the respondents said EVD can be transmitted through all the options mentioned, 3.8% (15) of them said the disease can be contracted through pricks from contaminated needles only, while 26.0% (104) and 5.3% (21) believed contact with body fluids alone and wild animals only were the sources of EVD infections respectively.

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Table 4.2 Knowledge of respondents on Cause and transmission of Ebola Virus Disease

Demographics	Knowledge of cause and transmission of EVD													
	Cause				Natural host					Mode of spread				
	Viral	bacterial	unsure	Total	Monkey	Fruit bat	Cow	Monkey and fruit bat	Total	Body fluids	Contaminated needles	Wild animals	All	Total
Age														
<30 years	74(77.9%)	8(8.4%)	13(13.7%)	95(100%)	50 (46.3%)	43 (39.8%)	2 (1.9%)	13 (12.0%)	108(100%)	29(26.1%)	3 (2.7%)	6 (5.4%)	73 (65.8%)	111 (100%)
30-40 years	142(88.8%)	10(6.2%)	8(5.0%)	160(100%)	79 (45.1%)	83 (47.4%)	0 (0%)	13 (7.4%)	175 (100%)	41 (23.3%)	6 (3.4%)	11 (6.2%)	118 (67.0%)	176 (100%)
>40 years	90(84.9%)	7(6.6%)	9(8.5%)	106(100%)	59 (53.1%)	42 (37.8%)	1 (0.9%)	9 (8.1%)	111(100%)	34 (30.1%)	6 (5.3%)	4 (3.5%)	69 (61.1%)	113 (100%)
Total	**306 (84.8%)**	**25 (6.9%)**	**30 (8.3%)**	**361 (100%)**	**188 (47.7%)**	**168 (42.6%)**	**3 (0.8%)**	**35 (8.9%)**	**394 (100%)**	**104 (26%)**	**15 (3.8%)**	**21 (5.3%)**	**260 (65%)**	**400 (100%)**
Sex														
Male	142 (83.5%)	8 (4.7%)	20 (11.8%)	170 (47.5%)	103 (56%)	63 (34.2%)	3 (1.6%)	15 (8.2%)	184 (47.1%)	48 (26.1%)	6 (3.3%)	3 (1.6%)	127 (69%)	184 (46.3%)
Female	161 (85.6%)	17 (9%)	10 (5.4%)	188 (52.5%)	85 (41%)	102 (49.3%)	0 (0%)	20 (9.7%)	207 (52.9%)	55 (25.8%)	9 (4.2%)	18 (8.5%)	131 (61.5%)	213 (53.7%)
Total	**303 (84.6%)**	**25 (7%)**	**30 (8.4%)**	**358 (100%)**	**188 (48.1%)**	**165 (42.2%)**	**3 (0.8%)**	**35 (9%)**	**391(100%)**	**103 (25.9%)**	**15 (3.8%)**	**21 (5.3%)**	**258 (65%)**	**397(100%)**
Education														
Basic	43 (91.5%)	0 (0%)	4 (8.5%)	47 (13.8%)	30 (56.6%)	19 (35.8%)	0 (0%)	4 (7.6%)	53 (14.3%)	13 (24.6%)	5 (9.4%)	4 (7.5%)	31 (58.5%)	53 (14.1%)
Secondary	105 (92.9%)	5 (4.4%)	3 (2.7%)	113 (33.1%)	75 (54.8%)	57 (41.6%)	0 (0%)	5 (3.6%)	137 (36.9%)	35 (25.5%)	4 (2.9%)	10 (7.3%)	88 (64.3%)	137 (36.3%)
Vocational/technical	46 (76.6%)	7 (11.7%)	7 (11.7%)	60 (17.6%)	18 (27.3%)	35 (53%)	1 (1.5%)	12 (18.2%)	66 (17.8%)	18 (27.2%)	6 (9.1%)	4 (6.1%)	38 (57.6%)	66 (17.5%)
Tertiary	94 (77.7%)	11 (9.1%)	16 (13.2%)	121 (35.5%)	53 (48.1%)	48 (41.7%)	0 (0%)	14 (12.2%)	115 (31%)	34 (28.1%)	0 (0%)	3 (2.5%)	84 (69.4%)	121 (32.1%)
Total	**288 (84.5%)**	**23 (6.7%)**	**30 (8.8%)**	**341 (100%)**	**176 (47.4%)**	**159 (42.9%)**	**1 (0.3%)**	**35 (9.4%)**	**371 (100%)**	**100 (26.5%)**	**15 (4%)**	**21 (5.6%)**	**241 (63.9%)**	**377 (100%)**

Source: field study, 2015 (totals don't tally as a result of missing data)

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4.3 Knowledge of Respondents on Clinical Presentations of Ebola Virus Disease

The results of respondents' knowledge on clinical presentation of EVD are presented in Table 4.3. In all, 64.6% (255) of them indicated fever as a common clinical presentation and 20.5% (81) said bodily weakness. Another 11.4% (45) and 3.5% (14) of the respondents respectively indicated bleeding and loss of vision as important clinical presentations of EVD. The knowledge level of the clinical presentations was highest among females compared to their males counterparts (54.3% vs. 45.7%, $p < 0.05$). In general, respondents that knew the clinical presentation of EVD were higher in participants with secondary school education (35.5% (132)) and tertiary level education (32.5% (121)) (Table 4.3).

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Table 4.3 Knowledge of respondents on clinical presentation of Ebola Virus Disease

Demographics	Knowledge of clinical presentation				
	Fever	Weakness	Loss of vision	Bleeding	Total
Age					
<30 years	72 (65.5%)	22 (20.0%)	2 (1.8%)	14 (12.7%)	110 (27.8%)
30-40 years	111 (63.1%)	40 (22.7%)	7 (4.0%)	18 (10.2%)	176(44.6%)
>40 years	72 (66.1%)	19 (17.4%)	5 (4.6%)	13 (11.9%)	109 (27.6%)
Total	**255 (64.6%)**	**81 (20.5%)**	**14 (3.5%)**	**45 (11.4%)**	**395 (100%)**
Sex					
Male	111 (62%)	53 (29.6%)	6 (3.4%)	9 (5%)	179 (45.7%)
Female	141 (66.2%)	28 (13.1%)	8 (3.8%)	36 (16.9%)	213 (54.3%)
Total	**252 (64.3%)**	**81 (20.7%)**	**14 (3.6%)**	**45 (11.5%)**	**392 (100%)**
Education					
Basic	28 (52.8%)	13 (24.5%)	7 (13.2%)	5 (9%)	53 (14.2%)
Secondary	88 (66.7%)	27 (20.4%)	7 (5.3%)	10 (7.6%)	132 (35.5%)
Vocational/technical	37 (56.1%)	13 (19.7%)	0 (0%)	16 (24.2%)	66 (17.7%)
Tertiary	89 (73.6%)	21 (17.3%)	0 (0%)	11 (9.1%)	121 (32.5%)
Total	**242 (65.1%)**	**74 (19.9%)**	**14 (3.8%)**	**42 (11.3%)**	**372 (100%)**

Source: field study, 2015 (totals don't tally as a result of missing data)

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4.4 Knowledge of Respondents on the Prevention and Control of Ebola Virus Disease

Participants' knowledge on the prevention of EVD was variable. While 42.1% (131) of respondents indicated frequent hand washing as a preventive measure, 38.3% (119) of them said avoidance of dead animals was the most effective means of prevention. Only 4.2% (13) and 15.4% (48) of respondents respectively said personal protective equipment (PPEs) and isolation of infected persons could help prevent the disease.

Knowledge on prevention of EVD was, however, slightly higher in male respondents, 87.2% (157) compared to their female counterpart (83.9% (151)). Similarly, knowledge on prevention of EVD was relatively higher among respondents with Secondary school level education (36.9% (108)) followed by respondents with tertiary level education (34.1 (100)).

With respect to Ebola vaccine, 51.8% (190) said there is an approved vaccine for EVD, 25.1% (92) said there was no approved vaccine and 23.2% (85) did not know whether or not there was any vaccine. In order to control the spread of the disease, 94.6% (351) of the respondents said affected dead bodies should be immediately buried, 3.8% (14) were of the view that affected bodies should be burnt, while 1.6% (6) said bodies should be either burnt or buried immediately.

Gender analysis showed that 28.7% (50) of males and 22.1% (42) of females said no approved vaccine exists for EVD. Similarly, with respect to the respondents' level of education, 38.8% (45) with tertiary level of education, 29.8% (17) with vocational level

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of education, 25.5% (12) with basic school level of education and 14.5% (18) with secondary level of education said no approved vaccine exists.

In all, 94.6% (351) of respondents agreed that affected bodies should be immediately buried, 3.8% (14) said affected bodied should be immediately burnt while 1.6% (6) said bodies should be burnt and buried immediately as shown in Table 4.4.

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Table 4.4 Knowledge of respondents on prevention and control of Ebola Virus Disease

Demographics	Knowledge on prevention and control of Ebola Virus Disease												
	Methods of prevention					Approved Vaccine				Management of dead bodies			
	Handwashing	Avoid consumption of wild animals	PPE's	Avoid body contact	Total	Yes	No	Don't know	Total	immediate burial	burning	All the above	Total
Age													
<30	27 (34.2%)	38 (48.1%)	5 (6.3%)	9 (11.4%)	79 (25.4%)	56 (54.9%)	26 (25.5%)	20 (19.6%)	102 (27.8%)	94 (94.0%)	4 (4.0%)	2 (2.0%)	100 (27.0%)
30-40	68 (47.9%)	49 (34.5%)	4 (2.8%)	21 (14.8%)	142 (45.7%)	78 (48.4%)	40 (24.8%)	43 (26.7%)	161 (43.9%)	155 (95.7%)	5 (3.1%)	2 (1.2%)	162 (43.7%)
>40	36 (40.0%)	32 (35.6%)	4 (4.4%)	18 (20.0%)	90 (28.9%)	56 (53.8%)	26 (25.0%)	22 (21.2%)	104 (28.3%)	102 (93.6%)	5 (4.6%)	2 (1.8%)	109 (29.4%)
Total	**131(42.1%)**	**119(38.3%)**	**13 (4.2%)**	**48 (15.4%)**	**311 (100%)**	**190(51.8%)**	**92(25.1%)**	**85(23.1%)**	**367(100.0%)**	**351(94.6%)**	**14(3.8%)**	**6(1.6%)**	**371(100.0%)**
Sex													
Male	70 (44.6%)	52 (33.1%)	7 (4.5%)	28 (17.8%)	157 (51%)	76(43.7%)	50(28.7%)	48(27.6%)	174(47.8%)	165(95.9%)	7(4.1%)	0(0.0%)	172(46.7%)
Female	58 (38.4%)	67 (44.4%)	6 (4%)	20 (13.2%)	151 (49%)	114(60.0%)	42(22.1%)	34(17.9%)	190(52.2%)	186(94.9%)	4(2.0%)	6(3.1%)	196(53.3%)
Total	**128 (41.6%)**	**119 (38.6%)**	**13 (4.2%)**	**48 (15.6%)**	**308(100%)**	**190(52.2%)**	**92(25.3%)**	**82(22.5%)**	**364(100%)**	**351(95.4%)**	**11(3.0%)**	**6(1.6%)**	**368(100.0%)**
Education													
Basic	25 (59.5%)	10 (23.8%)	0 (0%)	7 (16.7%)	42 (14.3%)	10(21.3%)	12(25.5%)	25(53.2%)	47(13.7%)	38(82.6%)	6(13.0%)	2(4.3%)	46(13.0%)
Secondary	39 (36.1%)	34 (31.5%)	5 (4.6%)	30 (27.8%)	108 (36.9%)	82(66.1%)	18(14.5%)	24(19.4%)	124(36.0%)	124(91.2%)	8(5.9%)	4(2.9%)	136(38.4%)
Vocational/technical	16 (37.2%)	24 (55.8%)	3 (7%)	0 (0%)	43 (14.7%)	20(35.1%)	17(29.8%)	20(35.1%)	57(16.6%)	60(100%)	0(0.0%)	0(0.0%)	60(16.9%)
Tertiary	48 (48%)	36 (36%)	5 (5%)	11 (11%)	100 (34.1%)	55(47.4%)	45(38.8%)	16(13.8%)	116(33.7%)	112(100%)	0(0.0%)	0(0.0%)	122(31.6%)
Total	**128 (43.7%)**	**104 (35.5%)**	**13 (4.4%)**	**48 (16.4%)**	**293 (100%)**	**167(48.5%)**	**92(26.7%)**	**85(24.7%)**	**344(100%)**	**334(94.4%)**	**14(4.0%)**	**6(1.7%)**	**354(100.0%)**

Source: field study, 2015 (totals don't tally as a result of missing data)

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4.5 Knowledge of Respondents on the Management of Ebola Virus Disease

On assessing respondents' knowledge on availability of treatment, less than half of the respondents (41.6% (162)) indicated there is no treatment for EVD, 38.3% (149) said there is treatment and 20.1% (78) of respondents did not know of any form of treatment.

Of the respondents who know there is no available treatment for EVD, 47.2% (51) were <30 years, 40.7% (70) were between ages 30-40 years and 37.6% (41) were >40 years. Knowledge on the availability of treatment was higher among female respondents (45.4% (94)) who knew there is no treatment available as against 38.0% (68) of their male counterparts. Similarly, knowledge was highest among respondents with tertiary level of education (44.6% (54)) and lowest (30.2% (16)) among participants with basic level of education as shown in Table 4.5 below.

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Table 4.5 Knowledge of respondents on management of Ebola Virus Disease

Demographics	Knowledge on management of EVD			
	Available treatment			
	TRUE	**FALSE**	**Don't know**	**Total**
Age				
<30	38 (35.2%)	51 (47.2%)	19 (17.6%)	108 (27.8%)
30-40	65 (37.8%)	70 (40.7%)	37 (21.5%)	172 (44.2%)
>40	46 (42.2%)	41 (37.6%)	22 (20.2%)	109 (28.0%)
Total	**149(38.3%)**	**162(41.6%)**	**78(20.1%)**	**389(100.0%)**
Sex				
Male	75(41.9%)	68(38.0%)	36(20.1%)	179(46.4%)
Female	74(35.7%)	94(45.4%)	39(18.8%)	207(53.6%)
Total	**149(38.6%)**	**162(42.0%)**	**75(19.4%)**	**386(100.0%)**
Education				
Basic	11(20.8%)	16(30.2%)	26(49.1%)	53(14.5%)
Secondary	57(44.2%)	52(40.3%)	20(15.5%)	129(35.2%)
Vocational/technical	19(30.2%)	27(42.9%)	17 (27.0%)	63 (17.2%)
Tertiary	52(43.0%)	54(44.6%)	15(12.4%)	121(33.1%)
Total	**139(38.0%)**	**149(41.3%)**	**78 (21.3%)**	**366(100.0%)**

Source: field study, 2015 (totals don't tally as a result of missing data)

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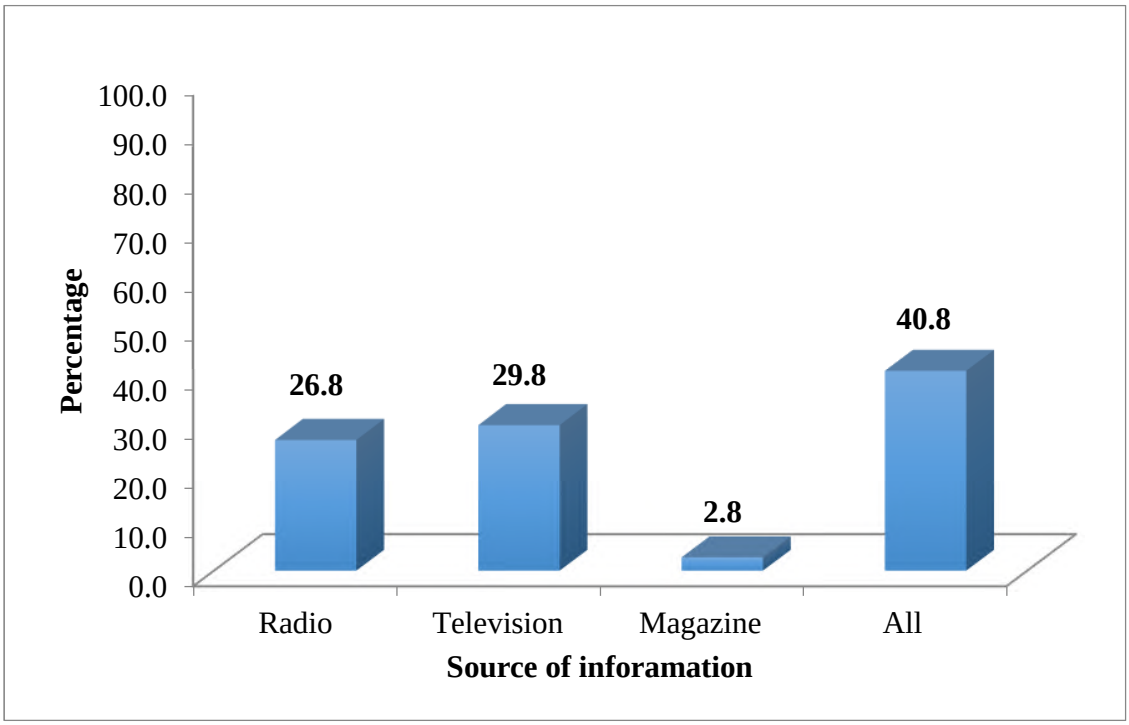
4.6 Knowledge of Respondents on the Sources of Information of Ebola Virus Disease

The participants indicated they had information about EVD from varied sources including radio, television and magazine. Overall, 26.8% (107) of the respondents had heard about the disease solely from the radio, 29.8% (119) heard from the television, 2.8% (11) heard of it from the magazine and 40.8% (163) of the respondents heard about the disease from all sources as is shown in the figure below.



Source: field study, 2015

Figure 4.1: Participants' Sources of information of Ebola Virus Disease

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4.7 Preparedness of Health Care Workers on Ebola Virus Disease

All the 30 Health Care Workers (HCWs) that were interviewed knew about personal protection equipment (PPEs) and their importance in disease control. Despite their knowledge level, 83.3% (25) had never seen the special PPEs designed for EVD control. Of the 13.3% (4) who had seen one, only one person had used one before during an Ebola preparedness training workshop.

Of the HCWs interviewed, 66.7% (20) had undergone training on EVD management and control. The untrained staff either did not get the opportunity or were too busy with work to attend the programme. Running taps were generally available for hand washing. And in situations where running taps were not available, Veronica buckets were improvised in place of running water. In many places, hand washing protocols were generally seen posted on the walls of the hospitals; especially where a Veronica buckets were situated. In one of the facilities, however, protocols on Ebola prevention was seen on the walls as well.

Half of the health facilities had disease control units, which served as their surveillance units to help in contact tracing; some of which had undergone training on disease surveillance purposely for Ebola tracking.

Majority of the HCWs, (93.3%) were of the view that Ebola cases could be missed since many health staff lack the requisite training to be able to detect and manage outbreak should it occur.

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There has been no case of Ebola; hence, there has been no special way of reaching the facilities by the community or individual for a suspected case. Therefore, a respondent said …." *They come in as normal patients with either cholera, or whatever and it is the professionals who would now separate them by clinical judgment..."*

Overall, 90% (27) of the HCWs indicated their preparedness in the event of an Ebola outbreak while 10% (3) said they were not adequately prepared to deal with any Ebola outbreak for now.

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4.8 Preparedness of the Health Facilities towards Ebola Virus Disease

Of the health facilities visited, only one (1) had established communication channels to deal with EVD should an epidemic occurs. Education communication materials, in the form of posters and management protocols were visibly displayed in all facilities visited. In two of the health facilities, management had redeployed extra staff to the Out Patient Departments (OPD) to increase staff capacity to deal with any outbreak. In three of the facilities, management had instituted periodic Infection Prevention Control (IPC) training to build staff capacity for EVD outbreak.

In all, only Central hospital was in the process of constructing a separate biosafety level-4 isolation unit in preparedness for Ebola outbreak. The rest of the facilities operate isolation units located within the main building of the facilities.

Disease control units served as surveillance teams in 50% of facilities that had such units. The remaining 50% of the facilities with no disease control unit relied on the regional Ghana Health Service disease control unit for support; these were mostly the private facilities.

There were no enough PPEs for each facility since most had just one from the Regional Health Directorate or none at all. However, most health staff were of the view that, gloves, disinfectants, face masks were enough and adequate for use. No scheduled training for staff on the use of PPEs was observed since it was only one available.

Laboratory technicians in 50% of facilities had no special training on specimen collection pertaining to Ebola. The other 50% of facilities claimed their disease control unit provided in-service training for laboratory technicians on Ebola specimen collection. The disease control units were responsible for transporting samples to and from the facilities.

Most respondents said there were enough reagents for diagnostic testing for other diseases but not for Ebola. Respondents were of the view that the Regional disease control unit would add their support when they got a suspected case.

Essential information on Ebola to the general and at risk population was mainly done during health talks at the OPD level; and only in the morning shift, with no special outreach to the surrounding communities accessing health care services in those facilities. One facility held durbars with the community quarterly to share ideas but had not had one in the past year.

On immediate and future plans, all 100% of the facilities were planning more training on Ebola, acquiring more PPEs, equipping their laboratories to be able to do most diagnostic tests and also to beef up on the education of the general public.

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CHAPTER FIVE

DISCUSSION OF RESEARCH FINDINGS

5.0 Introduction

This study was to assess the knowledge level of the public on Ebola virus disease and how prepared hospital facilities are in managing or controlling possible outbreak should it occur in the Tamale Metropolis.

5.1 Demographic Characteristics of Respondents

Overall, 400 adult respondents were included in the study with many more females interviewed compared to males. Since the sample recruitment took place at the health facility level, the higher numbers of the female gender seems to agree with their higher health seeking behaviour reported in literature (Galdas, 2000; Bowman, 2010); Lubega et al., 2015). Despite the fact that the study was conducted in the Northern region of Ghana which is generally reported to have the least literacy rate, in our study all participants had at least basic education (School for Life, 2007). This high literacy rate could have been attributed to the fact that most participants were purposively recruited to be able to speak English in order to overcome any communication gaps with the research team.

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5.2 Knowledge of Respondents on Causes and Transmission of Ebola Virus Disease

Theoretically, the Ebola virus is currently known to be the only causative agent of EVD (WHO, 2014), therefore the fact that 85% of our respondents indicated virus as the cause shows high knowledge level with respect to the cause of EVD. A lot of the respondents were torn between the monkey and fruit bat as the natural host of the EVD virus. The World Health Organisation is however, of the view that monkeys are thought to be only accidental hosts. The natural host of the virus is still unknown (WHO, 2014). As a result

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of the belief that monkeys and fruit bats are the reservoirs, many people fear that the disease, which is currently limited to the African sub-continent, may cause undesirable epidemics in this region (Moran, 2014). However, serological data, epidemiology and the detection of Ebola viral RNA supports the role of bats and nonhuman primates in Ebola virus transmission from animal reservoirs to humans. The Ebola virus has yet to be isolated in nature from any of the bat species or monkeys. In contrast to the Ebola virus, experimental evidence confirms fruit bats, especially the *Rousettus aegyptiacus* species as a reservoir for Marburg virus. Marburg Virus transmission from bats to humans have been documented (Spengler et al., 2016).

Over the years, disease outbreak resulted in the dissemination of information through the media and to create intense public awareness with regards to causes and natural host of the diseases (Moran, 2014).

All respondents knew the various modes of transmission of EVD. Most of them knew it could be transmitted via contact with bodily fluids of infected persons. These findings confirm the WHO position on the mode of transmission of the Ebola virus disease. The WHO states that physical contact with skin and mucous membranes of patients is responsible for most human transmission. Ebola is transmitted via direct contact with virus-infected body fluids such as saliva, blood, vomitus, stools and possibly sweat. Ebola virus has been shown to be present in the genital secretions of recuperating patients several weeks after illness. A direct contact with an infected case of Ebola Virus Disease is required for transmission as indicated in epidemiological studies in some African communities. Remarkably, although an earlier study indicated that, there was no transmission in the community without direct contact (Carlos et al., 2015). There has

however been no proof that, close personal contact with a non-symptomatic, non-febrile, Ebola-infected individual in the course of the incubation period or recovery results in transmission (WHO, 2014). Only few knew pricks from contaminated needles as another mode probably since most were not health workers even though parenteral injections with infectious material are associated with a high infection risk and a high fatality rate (WHO, 2014).

In health facility and Ebola Virus Disease isolation units, thoughts of direct transmission is very confusing when it includes transmission by droplets and splashes, needle stick and when aerosol associated transmission with certain clinical procedures (i.e. intubation) must be regarded as a risk. Although the correct answers for the question on transmission increased, it remained low at 59.1%. As a result of the complexities of transmission methods in the health-care setting, there is the need to develop a new approach for managing these difficulties (Carlos et al., 2015).

Almost all healthcare workers are always at risk for exposure to blood-borne pathogens, but nurses are the most susceptible among health professionals that provide direct care to patients. This makes them vulnerable to high risks of biological exposure during medical procedures. It has been estimated globally that, greater than 50% of clinical nurses will experience at least one needle-prick injury in their careers. The Centre for Disease Control provides information regarding the identification and management of patients suspected of Ebola Virus Disease (Mohsen et al., 2016).

Ebola is contracted by direct contact with objects, blood or body fluids of a person who is infected with Ebola Virus Disease. Personal Protective Equipment (PPE) should fully cover the entire body and also prevent any exposure of the eyes, nose, and mouth to

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reduce the risk of accidental contamination of ones' self. All Personal Protective Equipment must be used in accordance with CDC recommendations on a comprehensive infection control and also applicable Health Occupational Safety guidelines, including PPE, and Respiratory Protection standards (Mohsen et al., 2016).

In general, the high knowledge of the causative agent, natural host and the mode of transmission of EVD is encouraging and is important for disease control should it occur.

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5.3 Knowledge of Respondents on the Clinical Presentations of Ebola Virus Disease

WHO, 2014 stated that the disease begins with acute fever, diarrhoea that can be bloody and vomiting. Headache, nausea, and abdominal pain are common. Conjunctiva infection and haemorrhagic symptoms such as epistaxis and gum haemorrhage. This is in agreement with the findings of this study since all the respondents knew one form of clinical manifestation of EVD including fever. In fact, fever was the most common clinical symptom known by majority of respondents followed by bleeding.

5.4 Knowledge of Respondents on Prevention and Control of Ebola Virus Disease

Hand washing was the most known method of Infection Prevention of EVD followed by avoidance of consumption of wild animals with the least being use of PPEs. The consumption of wild life as a mode of spread is in consonance with Daszak et al., (2000), where intrusion into wildlife habitat may have been a significant factor in Africa for the global emergence of Ebola viruses.

In contrast to the fact that EBV is known to have a very high fatality rate without any known vaccine, in our study, majority said there is effective vaccine against EVD (WHO, 2014).

In most Ghanaian cultures, funerals are a show of family prominence where even the less affluent spend their last cedi in giving their dead a befitting burial (Prince, 2014). This probably accounts for the reason why almost all respondents wanted the dead to be buried immediately. The immense reverence for the dead by Africans who believe there is more to life after death could have accounted for burial of the bodies rather than burning (Prince et al., 2014).

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5.5 Knowledge of Respondents on the Management of Ebola Virus Disease

Over two-third of the respondents either said there was no treatment or did not know of any treatment while a third of the respondents said there was treatment for EVD in contrast to what is known (WHO, 2014).

A number of clinical care guidance documents have been produced by organisations with EVD experience. Such guidelines and recommendations have been informed by published observational studies and case reports, as well as specific hands-on experience and expert opinion. Since there are no approved treatments available for EVD, the clinical care of patients is primarily supportive. Patients with confirmed EVD should be cared for in a setting capable of intensive and frequent monitoring of vital signs, fluid balance and neurologic status. Since aggressive supportive care has the potential to increase survival, the patient should be cared for in an ICU setting. Numerous patients that have been treated in ICU settings who developed severe multi-organ dysfunction and required ventilator and dialysis support, have recovered (Health Department, South Africa, 2015).

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5.6 Knowledge of Respondents on the Sources of Information of Ebola Virus Disease

The radio, television and the print media were cited as sources of information for EVD for the respondents from the study. Comparatively, the television was cited by majority of the respondents. This wide sources of information could be the reason all respondents having heard of the disease Ebola and the knowledge on the mode of spread.

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5.7 Preparedness of Health Care Workers on Ebola Virus Disease

All Health Care Workers (HCWs) interviewed knew about Personal Protection Equipment (PPEs) and their importance in disease control. Despite their knowledge level, majority had never seen the special PPEs designed for EVD control. Only one person had used one before during an Ebola preparedness training workshop. The use of other commonly PPEs was, however, not assessed.

The 2014 Ebola virus Disease (EVD) outbreak exposed the level of epidemic unpreparedness of countries, hospitals and healthcare workers (HCW) in Africa and the world as a whole (Ogoina et al., 2016). Hence, a lot more training on wearing and use of the apparel needs to be done for Health Care Workers in order to adequately prepare them towards managing infectious diseases such as EVD.

However, many of the HCWs interviewed had undergone training on EVD management and control. Untrained staffs were either too busy with work or did not get the opportunity to attend the programme. These untrained health care workers could pose a danger to people around them if standard IPC is not practiced. Heymann et al., (2014), reports of a surgical intervention for an illness that was diagnosed as an acute abdomen but later known to have been Ebola Haemorrhagic Fever. Such incidental cases could

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pose great risk for transmission of Ebola virus to health workers as barrier nursing practices are not commonly used by many personnel who are in the hospital environments.

Hand washing was the main Infection Prevention Control (IPC) practiced by HCW as running taps or veronica buckets with running water were often seen situated at vantage points for use with hand washing protocols posted near the sources of water. This conforms to the WHO recommendations on IPC practices when caring for patients, regardless of their presumed diagnosis (WHO, 2014). The standards issued by the WHO in 2014 indicated these infection prevention methods to include basic hand hygiene, use of personal protective equipment to prevent splashes or any form of contact with infected materials, respiratory hygiene, safe injection practices and safe burial practices. Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient's blood, body fluids and contaminated surfaces or materials such as clothing and bedding.

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There has been no case of Ebola in Ghana hence; there has been no special way of reaching the facilities by the community or individual for a suspected case. Majority of the HCWs were of the view that Ebola cases could be missed since many health staff lack the requisite training to detect and manage outbreak should it occur. Ebola Virus Disease in the initial stages mimics diseases such as malaria, typhoid fever and many other infections and would require skills to detect one. The transmission of the outbreak can be contained through careful monitoring for high risk patients (Moran, 2014).

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Ebola Virus Disease "EVD" is now widely affecting most parts of West Africa, and it is beginning to spread to other countries as well. The universal response to the Ebola epidemic was truly assertive, and as such, needs an urgent public health intervention. The combined efforts of community workers, political and religious leaders, ordinary citizens, and Non-Governmental Organizations in controlling the outbreak is required (Mohsen et al., 2016).

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5.8 Preparedness of the Health Facilities towards Ebola Virus Disease

Only one of the facilities had communication channels to disseminate information to their staff in case of an epidemic. Education communication materials, in the form of posters and management protocols were visibly displayed in all facilities visited. Essential information on Ebola to the general and the at risk population was mainly done through health talks at the OPD level; and only in the morning shift, with no special outreach to the surrounding communities accessing health care services in those facilities. One facility holds durbars with the community quarterly to share ideas but had not held one in the past year.

IPC training was conducted in almost all the facilities for their staff to build their capacity should there be a possible EVD outbreak. This agrees with Mbonye et al., (2014) as they believed that for effective disease outbreak response, there is the paramount need for strong and effective health systems. There is also the need for isolation, adequate numbers of well-trained health care workers with the right infrastructure, adequate medicines, equipment for case referral and infection control supplies (Mbonye et al., 2014).

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Some of the health facilities visited had disease control units, which served as their surveillance units to help in contact tracing; some of which had undergone training on disease surveillance purposely for Ebola tracking. The need to have a standard protocol for identification, diagnosis, containment and control of the Ebola virus infection cannot be underestimated as it is reported by Heymann et al., (2014) that; disease detection and disease response systems including basic public health practices (hand washing), must continue to be enforced and practiced routinely for it to be strengthened.

Organising more IPC training, acquiring more PPEs, equipping their laboratories and also strengthening the education of the general public were in the future plans of all the facilities including the redeployment of more staff to the outpatient department which is the first point of call when visiting the facility to handle the pressure in the event of an incident.

A number of studies agreed that lack of knowledge and lack of sufficient personal equipment and its proper usage contributed to the problems in controlling the 2014 West African Ebola virus disease outbreak (Shagari et al., 2016).

There has been rapid deployment of international mobile laboratories since the identification of Ebola in Guinea in March 2013, through Global Outbreak Alert and Response Network and WHO networks.

Vital to outbreak and control operations was the Emerging and Dangerous Pathogens Laboratory Network (EDPLN). Deployable laboratories from multiple international organizations have been established near Ebola treatment centers (ETC) in Sierra Leone, Liberia, and Guinea. The organizations providing laboratories are European Union Mobile Laboratory Consortium (EM Lab), China Centers for Disease Control Lab,

Institute Pasteur Lyon, Institute Pasteur Paris, Institute Pasteur Dakar, Institut National de Recherche Bio-Médicale Mobile lab in Democratic Republic of Congo, Public Health England Mobile lab, National Institute for Communicable Diseases in South Africa, Public Health Canada Mobile Lab, United States Centers for Disease Control (CDC), Russian Rospotrebnadzor Mobile Lab, US First Area Medical Laboratory, US Naval Medical Research Center Mobile Lab and US National Institutes of Health (Field et al., 2017).

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CHAPTER SIX

SUMMARY OF RESULTS, CONCLUSION AND RECOMMENDATIONS

6.1 Demographic Characteristics of Respondents

Of the 400 respondents interviewed, their ages ranged from 18 to 57 years with a median age of 34 years and a modal age of 28 years. Females constituted 53.7% (213) and males 46.3% (184).

All the respondents that participated in the study had some level of formal education. Though 400 respondents were interviewed, some answers were not provided to some questions by all respondents. Therefore there were missing values for some responses. Hence, some of the totals do not tally to the 400.

6.2 Knowledge of respondents on Causes and Transmission of Ebola Virus Disease

Overall, 84.8% (306) of respondents said the cause of EVD is virus, 6.9% (25) said the cause is bacteria while 8.3% (30) were not sure of the cause. Of those who knew of the right cause (virus), 53.1% (161) were females and 46.9% (142) were males. Among the 394 participants that responded to this question, 47.7% and 42.6% said monkeys and fruit bats respectively are the natural host for EVD, while 8.9% (35) mentioned both monkeys and fruit bats as natural host. Only three (3) of the respondents mentioned cattle as the natural hosts. With respect to the mode of transmission of EVD, while 65% (260) of the respondents said EVD could be transmitted through contact with body fluids, 3.8% (15) said the disease could be transmitted through pricks from contaminated needles.

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6.3 Knowledge of respondents on Clinical Presentations of Ebola Virus Disease

In all, 64.6% (255) of participants indicated fever and bodily weakness as a common clinical features of EVD and 20.5% (81) said bodily weakness. Another 11.4% (45) and 3.5% (14) of the respondents respectively indicated bleeding and loss of vision as important clinical features of EVD.

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6.4 Knowledge of Respondents on Prevention and Control of Ebola Virus Disease

Participants' knowledge on the prevention of EVD varied. While 42.1% (131) indicated frequent hand washing as an important preventive measure, 38.3% (119) of them said avoiding contacts with dead animals was the most effective means of prevention. Only 4.2% (13) and 15.4% (48) of respondents respectively said Personal Protective Equipment (PPEs) and isolation of infected persons could help prevent the disease. With respect to Ebola vaccine, 51.8% (190) said there is an approved vaccine for EVD, 25.1% (92) said no approved vaccine exists and 23.2% (85) did not know whether or not there was any vaccine. With respect to means of controlling the spread of the disease, 94.6% (351) of the respondents said affected dead bodies should be immediately buried, 3.8% (14) were of the view that affected bodies should be burnt, while 1.6% (6) said bodies should be burnt and buried immediately.

6.5 Knowledge of Respondents on Management of Ebola Virus Disease

With respect to the management of EVD, 41.6% (162) said no treatment exists for EVD, 38.3% (149) said there was treatment while 20.1% (78) of respondents did not know of any form of treatment.

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6.6 Sources of Information

Overall, 26.8% (107) of the respondents had heard about the disease solely from the radio, 29.8% (119) solely from the television, 2.8% (11) heard solely from the magazine while 40.8% (163) of the respondents had heard from all the sources.

6.7 Preparedness of Health Care Workers for Ebola Virus Disease

All the 30 Health Care Workers (HCWs) interviewed knew about personal protection equipment (PPEs) and their importance in the disease control. Despite their knowledge level, 83.3% (25) had never seen the special PPEs designed for EVD control. In most areas, running tap water was available for hand washing and in the absence of that, Veronica buckets were improvised.

In many locations of the facilities, hand-washing protocols were generally seen posted on walls of the hospitals; especially where Veronica buckets were situated.

6.8 Preparedness of the Health Facilities

Of all the health facilities visited, only one (1) had established communication channels to deal with EVD should an epidemic occurs. Education communication materials, in the form of posters and management protocols were visibly displayed in all facilities visited. In two of the health facilities, management had redeployed extra staff to the Out Patient Departments (OPD) to increase staff capacity to deal with any outbreak. In three of the facilities, management had instituted periodic Infection Prevention Control (IPC) training to build staff capacity for EVD outbreak.

On the immediate and future plans, all the facilities were planning more training on Ebola, acquisition of more PPEs, equipping their laboratories to be able to do most diagnostic tests and also to beef up on the education of the general public.

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CONCLUSION

In conclusion, the knowledge level of EVD was variable among the respondents. Most respondents know about the causes, mode of transmission and clinical presentation of the disease. Their knowledge level on prevention and disease control as well as disease management was below 50%. HCW were mostly aware of ways to control the disease, however, most health facilities lack the capacity in terms of facilities to control the disease should it occur.

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RECOMMENDATIONS

The Ministry of Health should give education on the causes, transmission and natural host of the EVD to the general public as increased knowledge is paramount to the prevention and control of the EVD.

The National Commission for Civic Education (NCCE) should ensure a lot of pictorial representation of the signs and symptoms of EVD posted at all institutions including schools, offices and places where people gather to increase the awareness of the signs and symptoms.

The Ministry of Health, Ghana Health Service in their educative programs should educate the general public on the unavailability of an existing vaccine or available treatment for the EVD.

It is recommended also that, the channels of education should be through the television and radio as majority of the respondents got their information through these media.

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Heads of health facilities should increase training of their staff in IPC and the use of PPEs to adequately equip them to manage the EVD should it occur.

Heads of health facilities should provide standard bio-safety structures, PPEs and other equipment to make work easier. They should also provide communication channels to deal with Ebola Virus Disease should an epidemic occur.

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APPENDIX

QUESTIONNAIRE

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF ALLIED HEALTH SCIENCES

QUESTIONAIRE FOR (MALES AND FEMALES) INFORMED CONSENT

Hello, my name is **SEINI SAMAKU NABILA** and I am a student of the University for Development Studies offering a master's degree program in Community Health and Development. I am conducting a study on "Assessment of the Ebola Virus Disease; Preparedness of hospitals in the Tamale metropolis**"** .The Tamale Municipality is my case study area. I would very much appreciate your participation in this study .This information will help the Municipal Health Directorate ,private agencies, the community and other decision making bodies to plan how to make readily accessible information on what to do in case of an outbreak of Ebola irrespective of your location.

The interview would last between 30 to 45 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to any other than the Municipal Health Directorate and the University.

Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. However I hope that you will participate in this study since your views are important.

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At this time do you want to ask me anything of this study? May I begin the interview now?

Signature of interviewer ---------- Date----------

Respondent agrees (A) Yes (B) No Record the time ----------

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QUESTIONNAIRE

Instruction for Data Collectors

- ✓ ***Make sure that you interview residents 18 years and above living in the community***

SECTION A

SOCIO – DEMOGRAPHIC DATA

1. How old are you? ……..
2. Sex [ ] Male [ ] female
3. Marital status, [ ] Single [Married [ ] Cohabiting [ ] Widow[ ] Divorced [ ]
4. Religion, Islam [ ] Christian [ ] Africa Traditional Religion [ ] Other, specify…….
5. Employment status student, Unemployed [ ]Self-employed [ ] Gainfully employed [ ]
6. Educational status,…… Illiterate [ ] Basic [ ] Secondary [ ] Technical/vocational [ ] Tertiary [ ] others (specify)…….

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7. Locality……

8. Ethnicity, Dagomba [ ] Gonja [ ] Konkomba [ ] other, specify……

SECTION B: KNOWLEDGE ON EBOLA

1. Have you ever heard about Ebola? Yes [ ] No [ ]

2. Where did you hear of it?
   A. Radio [ ]
   B. Television [ ]
   C. Magazine [ ]
   D. Friend [ ]
3. Ebola is a disease of
   A. Viral origin [ ]
   B. Bacterial origin [ ]
   C. Fungal origin [ ]
   D. Don't know [ ]
4. What West African country was hit hardest by Ebola?
   A. Nigeria [ ]
   B. Liberia [ ]
   C. guinea [ ]
   D. Sierra Leone [ ]
5. The natural host of Ebola is believed to be……..
   A. Monkey [ ]
   B. Mosquito [ ]
   C. Fruit bat [ ]
   D. cow [ ]
6. How does the virus spread?
   A. Contact with blood or bodily fluids of an infected person [ ]
   B. Exposure to contaminated needles [ ]
   C. Transmitted from wild animals to humans [ ]
   D. It is not a communicable disease [ ]
   E. All the above [ ]
7. Incubation period of the virus is…….
   A. 2 days to 21 days [ ]
   B. 2 days to 28 days [ ]
   C. 7 days [ ]

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D. 3 days [ ]

8. Which of the following is not a sign and symptom of Ebola?
   A. fever [ ]
   B. weakness [ ]
   C. loss of vision [ ]
   D. Internal and external bleeding [ ]
9. Most common diagnostic method is?
   A. PCR and ELISA [ ]
   B. virus isolation [ ]
   C. Based on signs and symptoms [ ]
   D. Electron microscope [ ]
   E. All the above
10. The various species of Ebola virus include? (tick more than one if possible)
   A. Tai forest virus [ ]
   B. Reston virus [ ]
   C. Zaire virus [ ]
   D. Bundibugyo virus [ ]
   E. Sudan virus [ ]
11. Which of the above caused the recent outbreak? .....
12. Measure for care providers of an Ebola patient include?
   A. Isolation [ ]
   B. Use of personal protective equipment [ ]
   C. sterilization of equipment [ ]
   D. all the above [ ]
13. There is treatment for Ebola …….. true [ ] false [ ] don't know [ ]
14. There is an approved vaccine for the virus …… Yes [ ] No [ ] Don't know [ ]
15. Infected persons who have recovered can still spread infection…..
   A. up to 7 weeks after recovery [ ]
   B. only during incubation period [ ]
   C. only period which the patient is suffering from the disease [ ]
   D. cannot spread disease at any stage [ ]
16. Case fatality of recent outbreak is ……
   A. 47% [ ]
   B. 68% [ ]
   C. 10% [ ]
   D. 23% [ ]
17. Management of dead bodies of persons who died of Ebola is ……
   A. immediate burial [ ]
   B. burning [ ]
   C. preservation [ ]

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D. all the above [ ]

18. Do you have community health team/personnel? .....
19. Is there a special means of transporting a suspected case to the health facility ?
    ……
20. What are your expectations from the hospitals?
    ……
    ……
    ……
    ……
21. What are you recommendations for preventing Ebola in this country?
    ……
    ……
    ……
    ……

SECTION C; LEVEL OF PREPAREDNESS OF HEALTH WORKERS

1. What is personal protection equipment?
2. Have you seen one before?
3. Have you used one?
4. How often do you get training on infection prevention? When was the last training?
5. Since the recent Ebola outbreak, have you received any training on managing Ebola?
6. Has there been a simulation on receiving a suspected case in this facility?
7. How often do you implement barrier nursing in your line of work?
8. How prepared are you personally to combat Ebola?
9. Do you know of any surveillance system in this facility to trace contacts/cases at the community level?
10. In your opinion, how do you think a case can be missed and what impact would that have?
11. What are your suggestions in preventing Ebola in this Metropolis?

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SECTION D: STRUCTURES IMPLEMENTED TO CONTAIN SUSPECTED CASES OF EBOLA AND COMMUNICATION LINKS BETWEEN FACILITIES AND COMMUNITIES

1. Is there intersectoral communication mechanism setup in this facility? (risk assessment and managing an operational response should a case occur)
2. What is done or being done to increase the awareness of staff at the OPD level?
3. Is there more staff at the OPD for reinforcement? How many?
4. Do they receive regular training on infection control on assessing patients? How many times in the past two months?
5. Are there measures for isolation of suspected cases (possibly in a separate isolation) for investigation? Where can I find the isolation unit?
6. Do you have a surveillance service to monitor communities for suspected cases or unexplained deaths of symptoms Ebola related?
7. Do you have a surveillance protocol for monitoring or detection? May I have a look at it?(Who is termed a suspected case?)
8. How do you communicate to other health facilities? Is there a hotline? What is the number/code?
9. Have you identified, designated isolation units for patient care (biosafety level 4 or 3)?
10. Are there sufficient PPEs and other disinfectants materials in this facility? (how many? Ball figure)
11. Do you provide regular training or simulations for your staff?(donning and removing PPEs)
12. Are laboratory technicians trained on collection, storage and transport of samples from suspected cases and deactivation of specimen ensuring biosecurity measures?
13. Is there an established transport for rapid shipment of specimen to Nuguchi?
14. Are there enough reagents and equipment to perform diagnostic tests?
15. Do you provide essential information on EVD to general and at risk population? Eg communities

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16. How does the community communicate to the facility in case of a suspected case identified at their level?
17. What form of social mobilization and risk communication is established if and when an outbreak occurs?
18. What are the immediate future plans of this facility in the fight against Ebola?

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