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HEALTH SEEKING BEHAVIOUR AND PRACTICES ON IMMUNIZATION FOR UNDER FIVE YEARS CHILDREN AFTER EBOLA VIRUS DISEASE OUTBREAK. A CASE STUDY IN MARGIBI COUNTY-LIBERIA

BY

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DECLARATION

I, Nathaniel K. Dovillie, declare that except for the other people's investigations which have been duly acknowledged, this work is the result of my own original research, and that this dissertation, either in whole or in part has not been presented elsewhere for another degree.

Student : _____ Date: _____

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Supervised by: _____ Date: _____

Prof. Philip Baba Adongo

DEDICATION

On this glorious day, I dedicate this thesis to the memory of my late father Mr. Joseph M. Dovillie, and to my beloved wife Mrs. Beatrice Vah-Dovillie and children for the courage and support they give me in attaining my academic journey.

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ABSTRACT

Introduction

Epidemics can be lethal and if not approached appropriately, it may take away many lives and even disrupt the stability of a nation. In most cases, Children (0 - 59months) are found to be one of the most susceptible populations. In Africa, childhood immunization remains a critical health service. Outbreak of the Ebola virus disease led to collapse of health services including immunization services. Hence, this study seeks to investigate factors influencing health seeking behaviour for childhood immunization in post Ebola virus disease outbreak in Margibi County.

Methodology

A cross-sectional design using quantitative approach was used. A total of 400 respondents were enrolled and interviewed in this study. Systematic randomized sampling technique was used in the selection of participants. For the data analyses process, StataMP 13 software was used for the descriptive and statistical analyses.

Results

Findings from this study show that the Ebola virus disease outbreak adversely affected parents' behaviour towards accessing immunization services for wards. The fear for Ebola vaccine and closure at health facilities were the leading influencing factors for less access of immunization for children under five in post Ebola Margibi County. Fear for Ebola vaccine [OR=1.96 (95%CI= 0.968-3.972), p=0.05] accounted for 75.23% of all reasons for vaccine refusal. Participants' knowledge on immunization was found to be high (90.53%). Parents and caregivers with higher education were 2.02 times more likely to vaccinate their child/children compared to those with no education. Education was significantly correlated to accessing vaccination after Ebola outbreak [AOR= 2.33, (95%CI=1.335-4.071), p <0.05]

Conclusion:

Ebola virus disease outbreak posed several challenges to childhood immunization services. Fear and low educational status adversely influence parent's healthy behaviour for childhood immunization services after Ebola disease outbreak.

In order to reduce fear for immunization in post Ebola outbreaks, health authorities must timely, regularly, and accurately disseminate information through trusted medium for public consumption.

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LIST OF ABBREVIATIONS

CDA	County Development Agenda
CDC	Center for Disease Control
CFR	Case Fertility Rate
EHV	Ebola Hemorrhagic Virus
EPI	Expanded Program on Immunization
EVD	Ebola Virus Disease
FGDs	Focus Group Discussions
GVAP	Global Vaccine Action Plan
IDIs	In-depth Interviews
IPC	Infection, Prevention and Control
ITNS	Insecticide-treated nets
MOHSW	Ministry of Health and Social Welfare
NESRP	National Ebola Strategic Response Plan-Liberia
PI	Principle Investigator
PIRI	Periodic Intensification of Routine Immunization
UNICEF	United Nation Children Education Fund
WHO	World Health Organization
SPSS	Statistical Package for Social Science
BCG	

OPERATIONAL DEFINITIONS

Under fives	All children between the ages 0 (at birth) to 59 months of life
Immunized	A child who have had full coverage of BCG, OPV, Pentavalent, Measles, and Yellow fever
Every day	Every day refer to the seven days of the week as in the Webster dictionary. However, it refers to the working days (Monday - Friday) of the week.
Up to date	Up to date, as use in this work is limited to the date and time of the development of the research proposal.
Single parent	For the purpose of this study, single parent refers to a parent who brings up a child or children alone because he or she is unmarried, widowed, cohabiting, or divorced
Educated	In this work, the term educated refers to persons of formal education from Senior High School level and above
No-education	Refers to person(s) who completed Junior High School level including people with no formal education

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to study

Immunization is one of the best ways of increasing human immunity worldwide. It is a tool for preventing and eradicating communicable diseases. Currently, it averts about two to three million deaths every year in all ages. It is estimated that 84% of infants as at 2013 were vaccinated with three doses of diphtheria worldwide. In the Americas, Europe, and Western pacific for example, they had maintained over 90% of DPT coverage (Burton, et al., 2009).

Although efforts were being made to improve immunization services, about 27 million infants had not been vaccinated against measles and tetanus by 2007. Though global routine measles vaccine coverage reached 82% by then, nearly 23.2 million children were unvaccinated. Of this figure, 15.3 million accounting for 65% of unvaccinated children live in 8 countries mainly in Africa. In Ethiopia for example, over 1 million children under five years were unvaccinated leading to 16% death attributed to vaccine preventable diseases (Burton, et al., 2009). Further, Machingaidze, et al., (2013) documented that 1.5 million children died globally from vaccine preventable diseases (VPDs) in 2010, approximately 19.3 million children did not receive DTP3 worldwide in 2010, with more than one-third of these children residing in Africa.

Currently, there are 14 vaccine preventable diseases including; Haemophilus influenza type b(Hib), Diphtheria, Hepatitis A, Hepatitis B, Influenza, Measles,

Mumps, Pertusis (whooping cough), Pneumococcal disease, Polio, Rubella (German measles), Tetanus (lockjaw), Rotavirus, Varicella (chickenpox) (CDC, 2013). In Liberia, although vaccine preventable diseases remain significant contributors to the high rate of children (0 - 59 months) mobility, mortality and disability, the country has been making efforts to reduce these effects. In 2007 for example, it was recorded that the Expanded Program on Immunization (EPI) had major achievements in the indicators as follow; BCG 86%, DPT 88%, TT 27%, YF 88%, and measles 95% (Burton, et al., 2009; Riedmann, 2010). By 2013 however, measles coverage dropped from 95% in 2007 to 76.3%; and pentavalent 3 a combined vaccine that include DPT was at 92.1%. On the other hand, measles and pentavelant 3 coverage of children under one year of age(<1yr of age) also dropped from 76.3% in 2013 to 46.9, and from 92.1% to 46.55% in May - August 2014 respectfully (MOH-Liberia, 2015).

In the wake of all these health indicators challenges, one of Africa's deadliest and infectious diseases (epidemics), the EVD occurred in the Western region affecting three countries including Liberia. The epidemic has had a significant impact on the health delivery system of the Country. About two-thirds (2/3) of all health facilities were either closed or operated below capacity with compromised quality of healthcare been provided to the general public. Between 22nd March 2014 and 10th April 2014, 6 confirmed cases were reported involving 2 counties (Lofa and Margibi). Between 25th May 2014 and 25 July 2014, Liberia reported an additional 301 cases (86 confirmed 112 probable and 101 suspects) from 7 of its 15 counties. During this period, 37 health care workers from 3 counties (Bong, Lofa, and Montserrado) had contracted the disease (MOH-Liberia, 2015).

The prevalence rate of infection amongst healthcare providers was quite alarming. Thus, immunization activities became extremely dormant in the country including Margibi County. Hence, the EPI program conducted a special training on infection prevention and control (IPC) for vaccinators in all 31 health facilities of the County as a way of providing safety for the program staff. Following this, a countywide Periodic Intensification of Routine Immunization (PIRI) was conducted aimed at increasing the County's immunization coverage (Bray, 2015; MoH-Liberia, 2014).

1.2 Ebola and its effect

Ebola and Marburg viruses which affected West Africa between 2013 and 2015 are both of the family filoviridae and are amongst the most virulent human pathogens. The Zaire strain of the virus was identified to be the causative agent of the West African outbreak in the 2014-2015 epidemics. This strain of the virus was first identified in the People's Democratic Republic of Congo formerly Zaire in 1976. The epidemics of the disease is through contact with a body fluid of an infected person or animal (Bray, 2015; Rajak et al., 2015).

The Filoviridae family includes Marburg, Ebola Zaire, Ebola Sudan, and Ebola Ivory Coast that are endemic in the African region. These viruses are spread among human by person to person contact. Beside the disease being endemic in Africa, it has also occurred in Europe and North America from monkeys imported from Africa and the Philippines. The source of filoviruses remains unknown but fruit bats have been found to have primary cases of infection in outbreaks in Africa (Bray, 2015).

Exposed persons to EVD usually experience abrupt fever within 6 to 12 days (range of 2 to 21 days). There is no evidence that an asymptotic person within the incubation period can be infectious. Signs and symptoms of the disease include fever, body pain, chills, malaise, vomiting, headache etc are among early symptoms. Diarrhea, bleeding, cardiovascular symptoms are among late sign and symptoms. Laboratory findings has revealed that EVD patients develop leukopenia, thrombocytopenia and serum transaminase elevations as well as renal and coagulation abnormalities (Bray, 2015; Rajak et al., 2015).

1.3 Problem Statement

Health sector indicators that were making some level of progress prior to the EVD outbreak experienced a significant decline at a rapid pace particularly in the EPI program. The unavailability of vaccines and its complements coupled with inaccessibility of trained staff, and misconception of facility vaccine created fear and mistrust amongst community members (Ebola impact on health system, 2015).

The number of children receiving routine vaccinations reduced drastically from 10,000 per month in early 2014 to less than 4,000 by November (Acaps, 2015; Green, 2014; MoH-Liberia, 2014). For example, Measles coverage of children under one year of age (<1yr of age) dropped from 76.3% in 2013 to 46.9% in 2014, while "Pentavalant" 3 coverage also dropped from 92.1% in 2013 to 46.55% in May - August 2014 (MOHsw-Liberia, 2015).

Patients' reluctance or inability to access care at health facilities for multiple reasons had reduced service utilization rate in 2014 (NESRP, 2014). Human resources for

health, already scarce and unevenly distributed in the Country have been greatly impacted. According to the World Health Organization report as at 18 February, 833 HCWs had been reported infected, with 488 of whom had died from EVD (WHO, 2015).

1.4 Research questions

1. Does EVD outbreak influence health seeking behaviour for immunization?

2. How has the outbreak influenced perception and practices towards immunization for under fives?

3. What effect did the EVD outbreak pose on immunizations?

1.5 Objectives

The primary objective of the research was to assess the health seeking behaviour and effect of EVD on immunization for children less than five years in post Ebola outbreak Liberia.

Specific objectives:

1. To examine the influence of the EVD outbreak on health seeking behaviour for immunization services.

2. To establish the impact of Ebola outbreak on immunization coverage in Margibi County.

3. To explore the perception of caregivers/parents on immunization services after the Ebola Virus Disease outbreak.

1.6 Narrative to framework

Since the introduction of vaccines, the world has seen remarkable improvement in the prevention and control, and eradication and elimination of many diseases globally. However, there are factors that influence the attainment of targets set by WHO and UNICEF ranging from disease outbreaks, perceptions, education, amongst others.

In this study, attention is been drawn to how individual perception (Fear of vaccine, Fear of the ETU, Vaccine misconceptions, and Proximity of health facility) can directly influence the likelihood of parental decision (health seeking behaviour) especially for childhood immunization activities. Similarly, the modifiers (Absence of health workers, parent's knowledge on immunization) have a two way stream influence on the individual's perception towards seeking health. Together, the individual's perception, modifiers and the likelihood of action influence the immunization program in attaining its set goals (immunization coverage).

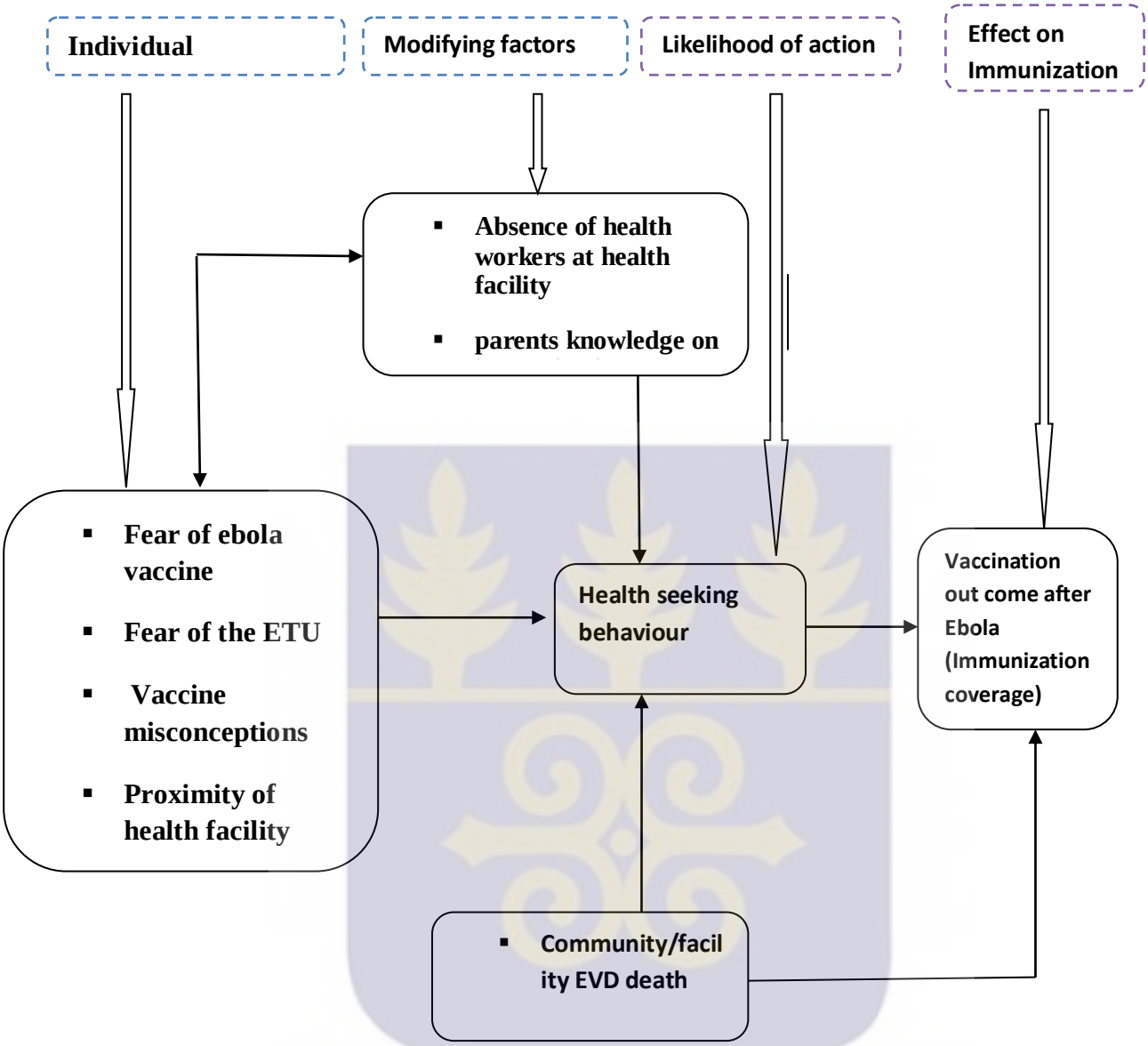

Figure 1.1 Conceptual Framework

1.7 Justification

The impact and severity of the Ebola outbreak have had reflective effect on the health sector. Two-thirds of health facilities were either closed or operating below capacity with compromised quality of care. Between May 22 and September 10, 2014, about 73 out of 139 infected healthcare providers died as a result of the virus. Health sector indicators making some progress declined greatly. Up to the date of this study, limited

research work has been done to assess factors influencing low vaccine immunization coverage in post epidemic Liberia (MoH, 2015).

According to the Ministry of Health 2015 PIRI report, the EPI program obtained 17% of the 30% target set for its first post Ebola measles outbreak intervention. Major factor contributing to the coverage was found to be the high refusal rate of parents/caregivers to allow their wards to be immunized (Yokie & Govergo, 2015). Thus with these compounded findings, this study sought to investigate sufficient causal effects that influenced health seeking behaviour towards immunization of under five children in post EVD outbreak Liberia.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Global coverage of immunization

Immunization is a cost-effective public health intervention to reduce morbidity and mortality associated with infectious diseases (Adedire, Ajayi, & Ajumobi, 2014). Improving immunization coverage is vital to preventing vaccine preventable diseases and promoting good health worldwide. In spite of the global promotion as a major public health intervention, improvement in the coverage of some countries' immunization program remains low Bonsu, et al., (1997).

In India for example, a study that was conducted in 2007 in a rural settlement revealed that large number of children had not been fully immunized. The study was conducted to examine the role of health infrastructure and community health workers in expanding immunization coverage in India with a sample size of 43,416 age 2-35 months (Datar, Mukherji & Sood, 2007).

Annually, WHO and UNICEF collect and analyze data from all member nations conducting immunization activities. Key amongst these indicators is the Bacille Calmette-Guerin (BCG) and Diphtheria-tetanus-pertussis vaccines which are used to determine childhood immunization coverage. These immunization coverage levels and trends help in monitoring the performance of immunization services locally, nationally, and internationally. Additionally, the findings from the study may be used to guide strategies for eradication, elimination and control of vaccine preventable

diseases; and to identify areas of the immunization system that may require additional resources and/or attention for improvement.

Not until the 1980s that immunization gained prominence and encountered a remarkable change in the coverage, the global coverage of the program had been a serious challenge. By the 1990s, DPT coverage had increased from 20% as in the 1980s to 75%. While it is true that some countries reported significant declines in the coverage after the 1990s, the global coverage was fairly maintained. By the 2000s, there was a steady increase in coverage of DPT 3 that reached as high as 81% in 2006 worldwide (Burton, *et al., 2009)*.

Despite these gains, countries like Pakistan faces numerous challenges that continue to impede improvement in its immunization program coverage. These challenges range from unprecedented urbanization, poor housing facility, overcrowding, and out of pocket payment for health services. These factors have had great influence on mother's/parents health seeking behaviour for under five year children (Rehman, Shaikh, & Ronis, 2014).

By the year 2000, countries reaching and sustaining 90% coverage of children with routine life-saving vaccinations had doubled. Updated records on the world's immunization status in 2014 reveal that 129 countries had immunized at least 90% of all children with the 3 doses of DTP vaccine. In 2012, the world 194 WHO Member countries endorsed the Global Vaccine Action Plan (GVAP), and are committed to ensuring that no one misses out on vital immunizations with a target of 90% DTP3

vaccination coverage in all countries by 2015 (Adedayo & Mbbs, 2009; WHO/UNICEF, 2015).

While there is a focus to improve the survival of children, other non-vaccine preventable diseases like malaria continue to cause major morbidity and mortality amongst children under five years of age particularly in African nations. About 20% (n=1.2 billion) of the world's population are at high risk of malaria, with 49% of this population living in Africa (Nonvignon *et al.*, 2010).

In a study conducted in Ethiopia, perceptions, and treatment seeking behaviour for malaria among women with children under five years indicates that though mothers were aware of signs and symptoms of the disease, the use of preventive measures were noted very low. Only 5.6% of the total study population (n=2087) had at least an insecticide treated net (ITN) in use. The utilization of public health facilities was found to be less than 40%. Concerted efforts to scale-up the distribution of ITNs and improvement in the knowledge of the community on the link between malaria and mosquitoes, and the availability of anti-malaria drugs at all levels was seen as a major problem (Deressa & Ali, 2009).

2.2 Overview of Africa's immunization coverage

Access to and the utilization of routine immunization services is considered the strength of character for the prevention and control of vaccine preventable diseases. However, due to Africa's unique regional economic, political and ecology, immunization programs face particular challenges and obstacles compared to other continents. In Nigeria for example, the findings of a study by Fredrickson, et al.,

(2004) revealed that parents refusal were based on several counts including fear of side effect of vaccine (52%), religious (28%), belief that the disease was not harmful (26%), unreliable service provider, and anti-government sentiments (8%).

Vaccine refusal in Africa continues to affect the overall immunization coverage particularly with children immunization programs. A recent study conducted in Ethiopia indicated that though awareness amongst parents and caretakers on immunization are high, only 36% of children 12-13 months were fully vaccinated by 2011 evidenced by vaccination cards. Several factors were identified as determinants leading to the finding. These factors include antenatal care follow ups, health facility birth, and knowledge on when a child is to start and end immunization among others. However, parents residence and mother's socio-demographic characteristics show no association with the low immunization coverage (Etana & Deressa, 2012).

Since the introduction of the EPI program in 1974, six traditional antigens were initially introduced by WHO in the routine immunization program of African countries. During the implementation of the Universal Childhood Immunization (UCI), routine immunization coverage increased from 20% to about 57% in the 1980s. This increase however, experienced a decline in the 1990s when the UCI support ended. Resource mobilization became a challenge for EPI activities. A key result of this was the task of achieving and maintaining targeted coverage, getting community participation, retaining trained and committed staff and above all stable leadership and governance at all levels.

Currently, efforts are being made by the Global Community through an alliance called the Global Alliance for Vaccines and Immunization (GAVI) to developing African countries to strengthen immunization programming activities. Analyzed coverage data from country administrative reports from WHO/UNICEF estimates that the routine immunization performance shows progress during the last ten years (Tarantola, Hacen, Lwanga, & Clements, 2014).

Though immunization plays a major role in the survival of African children particularly the under five years, the socio-economic and demographic characteristics of mothers are major contributing factors to under fives survival. Variables such as mother's age, level of education, marital status, place of living, occupation, religion, autonomy, contraceptive use, polygamous union, and socio-economic status play pivotal role in the survival of the under fives particularly in the rural settings. It was also found that older parents (35 years and above) of under fives were more likely at risk of under five deaths as opposed to younger parents (20 years of age) for the under fives (Chibwana, Mathanga, Chinkhumba, & Campbell, 2009; Kanmiki et al., 2014).

Other causes of increase in under five deaths in Africa can be attributed to other factors ranging from socio-cultural, socio-economic, inadequate/poor health systems, political, and education amongst others. In Malawi for example, a study revealed that less than 20% of children less than five years receive appropriate anti-malaria treatment or healthcare within 24 hours of unset of illness. The study found that socio-cultural factors were strongly associated with under five deaths in Africa (Chibwana et al., 2009).

From these studies, one can conclude that Africa's problem of under five deaths is far beyond just focusing on childhood immunization. In a similar study conducted in Tanzania, it was found that early treatment-seeking behaviours were highly influenced by Africa's socioeconomic factors. Educated parents have similar patterns of delay to those of less educated parents (Kassile, Lokina, Mujinja, & Mmbando, 2014).

2.3 Determinants of immunization in Africa

Due to the dynamic nature of the African communities, with respect to the socio-economic and political structure, the determinants of vaccine coverage vary. In Nigeria for example, a cross-sectional study conducted in 2008 assessing knowledge of parents with children between the age of 12-23 months of life showed that the knowledge and attitudes of mothers/parents towards childhood immunization was very high constituting 99.1% with >55% of them being knowledgeable of the symptoms of common vaccine preventable diseases within their community. Vaccination coverage for all vaccine preventable diseases was found to be 61.9%. Eight years after the introduction of a private organization to conduct immunization activities in this community, the coverage of vaccines increased considerably. Completeness was significantly correlated with knowledge of mothers on immunization (Odusanya, Alufohai, Meurice, & Ahonkhai, 2008).

In Ethiopia on the other hand, it was found that 96% of mothers had heard of childhood immunization and, 79.5% of all mothers also knew the benefits associated with vaccine/immunization. About 36% of all children within the study were fully immunized by vaccine card. However, complete immunization coverage amongst

children within the study area remains low despite the level of awareness of immunization/vaccine among mothers within the study area (Etana & Deressa, 2012).

2.4 Immunization situation in Liberia

According to the health ministry's report 2015, Liberia launched its EPI program in 1978 four years after the global indroduction of the EPI program with the aim of providing protection of children (0 month to 59 months). The program targeted six vaccine-preventable diseases to include: Tuberculosis (TB), diphtheria, pertussis, tetanus, poliomyelitis, and measles for children and tetanus toxoid (TT) for women of child bearing age (14-49 years). The program covers the entire country including the five health regions, 15 counties, and 89 health districts. This service is provided in both public and private health facilities certified by the program. By 2009, the coverage for DPT rose from 31% in 2004 to 93%. As part of efforts to increase immunization coverage in Liberia, the program introduced the use of the auto-disposable syringe in 2005 in addition to increase in the number of health facility, expansion of the cold chain system, increased outreach activity and increased partner support to the program. Despite the enormous challenges faced by the country in achieving and sustaining the core indicator for the attainment of MDG 4; the immunization coverage in 2011 for the childhood antigens had an encouraging coverage as: BCG 78%, OPV3 77%, pentavalent 3 78%, measles 73%, and yellow fever 71%.

During the Ebola epidemic 2014 to 2015, patient's attrition and inability to access care at health facilities declined for multiple reasons particularly between the periods May-August, 2014. Hence, measles and pentavalent 3 coverage of children under one

year of age (<1yr of age) dropped from 76.3% in 2013 to 46.9%, and from 92.1% to 46.55% in May - August 2014 respectively (MOH-Liberia, 2015).

Margibi County is one of few counties in Liberia that was highly hit by the Ebola Virus Disease. The epidemic spread in almost all parts of the county. The prevalence rate of infection amongst healthcare providers at health facilities was quite alarming. Since the outbreak, immunization activities have been extremely dormant in the county. Based on this, with the aid of the Expanded Program on Immunization (EPI) at the Ministry of Health, conducted a special training on infection prevention and control (IPC) for vaccinators in all 31 health facilities of the County. Following this, a countywide Periodic Intensification of Routine Immunization (PIRI) was conducted. All children 9 - 59 months received measles vaccine, and 6-59 months got a dose of vitamin A. Social mobilization and vaccine refusal remained a major challenge in the implementation of these activities in the County (Yokie & Govergo, 2015).

2.5 Epidemiology of Ebola Virus Disease

Ebola virus infection is one of the world's most deadly and contagious diseases that affects both human and animal with a case fertility ranging between 25% and 90% (Adongo et al., 2016; Green, 2014). The virus is a member of the family filoviridae and the causative agent of Ebola Hemorrhagic Virus (EHV). Its effect is severe and often fatal among the human primates resulting into high case fertility rates (WHO/UNICEF, 2015). The illness can however affect both human and non-human primates (Monkeys, gorillas and chimpanzees). EVD is a zoonotic infection with an incubation period between 2 - 21 days and an observed average of 8 to 10 days (Adongo et al., 2016).

The disease was first discovered in the Democratic Republic of Congo (Zaire) in 1976 with a CFR of 88% amongst human population. Following this, several other human outbreaks of the Virus (EVD) continue to occur in other parts of the world including Sudan, USA, the Philippines, Uganda, Ivory Coast, South Africa and Russia (WHO, 2015). The worst case of virus in the history of the world occurred recently in the West African region between 2013 and 2015. The outbreak affected over 28,511 people and destroyed about 11,298 lives in Guinea, Sierra Leone and Liberia (Chippaux, 2014; Shears & O'Dempsey, 2015).

The classification of the Filoviridae is in a state of instability. The virus is known predominantly for its tendency to cause fatal hemorrhagic disease of humans with person-to-person spread, but the pathogenicity varies from asymptomatic infection (Ebola Reston) to outbreaks with death rates of 77% to 88% (Ebola Zaire) (Green, 2014; System Ebola Epidemiology Team, 2014). Occurrences of the disease have happened in Europe and North America from monkeys imported from Africa and the Philippines. Contact with the tissues of dead nonhuman primates was a source of infection for humans on at least two occurrences in Africa. However, the mortality of the viruses for nonhuman primates suggests that nonhuman primates are incidental victims of infection and are not true pool hosts. The source of *Filoviruses* in nature remains unknown, bats roosted in buildings or caves visited by people were subsequently found to have being primary cases of infection in outbreaks in Africa (Swanepoel et al., 1996).

By 8 Nov. 2015, a total of 11,314 people had died out of 28,635 cases worldwide from EVD in 10 countries with the highest being recorded in three West African

countries (Liberia, Sierra Leone and Guinea). Out of these cases and deaths, Liberia accounts for 10,672 cases and 4808 deaths (Response & Report, 2014; World Health Organization, 2015).

2.6 Ebola outbreak in Liberia

Liberia with a population of about 4,092,310 (national census, 2008), bordered by Guinea in the north, Sierra Leone in the west, Ivory Coast in the east and south by the Atlantic Ocean, has a total land area of 43,000 square miles. The Country has 15 sub-political divisions call county and include: Bong, Bomi, Gbapolu, Grand Gedeh, Grand Bassa, Grand Kru, Grand Cape Mount, Lofa, Nimba, River Cess, River Gee, Sinoe, Maryland, Margibi and Montserrado that houses the national capital Monrovia. The outbreak came as a result of a cross-border infection from neighboring Guinea in the northern part of the Country in March 2014. This wave of infection affected 372 health workers and led to the death of about 180 of them (MOH/Liberia, 2015).

The first report of suspected cases of strange virus hemorrhagic fever in Liberia were reported to the Ministry of Health and Social Welfare (MOHSW) from Foya, Lofa County on 17th March 2014 through the World Health Organization Liberia office. Between 22nd March 2014 and 10th April 2014, 6 confirmed cases were reported involving 2 counties (Lofa and Margibi). Between 25th May 2014 and 25 July 2014, Liberia reported an additional 301 (86 confirmed, 112 probable cases and 101 suspected cases) from 7 of the 15 counties in the country. During this period, 37 health care workers from 3 counties (Bong, Lofa, and Montserrado) were infected (MOH-Liberia, 2015).

Due to the severity of the outbreak (EVD), weak health system, and the limited laboratory capacity to conduct EVD test, all deaths were recorded as EVD death. Hence, 3446 deaths were recorded as EVD-related death from July to December of 2014. Until a post EVD impact assessment is done, it is difficult to determine a more comprehensive crisis magnitude on the country (MOH/Liberia, 2015).

After the May 9 2015 declaration of the Country been free of Ebola virus disease, Margibi County reported through the World Health Organization six weeks later of a positive case involving a 17 year old boy. Evidence from sample proves no relationship of this strain to that of the strain in neighboring Guinea. The source of the index case remains a mystery. However, the report concluded that this strain was similar to the 2014 strain in Liberia(WHO, 2015; Green, 2014; Trad, Fisher, & Tambyah, 2014).

2.7 EVD Outbreak and Health Service Delivery

The impact and severity of the Ebola epidemic have had profound effect on the health sector. Two-thirds of health facilities were either closed or operating below capacity with compromised quality of care. Health workers' attrition and reluctance to serve was fueled by the number of health care workers that were affected by the Ebola virus. Between May 22 and September 10, 2014, about 73 health care workers had died of the disease out of 139 that became affected. Health sector indicators that were making progress declined greatly. Patients' reluctance or inability to access care at health facilities for multiple reasons reduced service utilization rate during the outbreak (MOH-Liberia, 2015).

The impact of the EVD outbreak became very grave because of the Country's inadequate resource and healthcare authorities inexperience in dealing with an infectious epidemic of such an unprecedented scale. The Country has limitations in EPI-surveillance, data collection and management including the lack of appropriate laboratory facilities to commiserate with the testing needs. More besides, the lack of adequate and appropriate practices of infection prevention and control in health facilities across the Country led to the rapid spread and subsequent death of many healthcare providers ranging from medical doctors to drivers and office aids (MOH-Liberia, 2015).

One of such counties greatly affected by the disease outbreak is the county of Margibi County. Of the 36 functional health facilities, the only government run and referral hospital suffered the highest hit of the disease outbreak. This effect led to the temporal and spontaneous closure of the hospital which also affected all other peripheral facilities, hence affecting the overall health delivery in the County (*Margibi County Development Agenda*, 2012).

Currently, there are several works under going to restore sanity and dignity back to the health service delivery in the County ranging from human resource development, construction and reconstruction at all facilities, rebuilding the relationship and community trust in the service delivery (MOHsw-Liberia, 2015).

2.8 Social impact of EVD

In December of 2014, the Ministry of Health- Liberia conducted a mixed method (Quantitative -Qualitative) study design that looks at the knowledge, attitude and practice to measure the success of social mobilization efforts aimed at educating the general public on Ebola. A total of 1,140 households were sampled from six (6) out of fifteen Counties including Montserrado, Grand Gedeh, Lofa, Nimba, Rivercess and Grand Cape Mount to determine perceptions and practices for health seeking across the country. The survey also explored the perception of the communities on EVD particularly in relation to causes, sign and symptom, prevention, treatment and curability amongst others. Sample size for each county was proportioned to the population of that county. Montserrado county for example whose population accounts for one third of the overall country's population (National census, 2008) accounted for 47% of total samples, whilst Nimba was19%, and Lofa 13 %.

The survey result reviled that more males were interviewed as opposed to female (60% VS. 40%) respectively. While the median age range between 25 and 34 years. It was also found that almost all respondents (98%) reported changing at least one behaviour to reduce their risk of contracting the Ebola virus disease. However, it is not clear if patient inability or reluctance to access health care from health facility was one of those behavioural changes adopted to reduce risk of contracting the disease (MOH-Liberia, 2015).

The Ebola virus disease did not only affect the social fabric of these three affected West African countries but the world to a greater extend as was evidenced by the denial of residence of non-affected countries. The level of spread and the magnitude of its effect brought fear and panic to the world particularly West African countries

not affected by the disease. In Ghana for example, as a result of what was been heard and seen on both national and international televisions fear changed the perceptions of many people including healthcare providers. In the publication "Beyond Knowledge and Awareness authored by Adongo et al, (2016) varying perceptions grew at all levels of society ranging from healthcare professionals to the ordinary community member. Many perceived the disease as been airborne and could be transmitted by just going closer to the home of an infected person. Others believed that the disease could also be transmitted through mosquito bite and flies.

Interestingly, these perceptions have the propensity to serve as recipe for stigmatization and discrimination of persons, family members, and neighbors of persons with the EVD. Moreover, the study revealed possible stigmatization and discrimination of would be health workers who may work in treatment unit(s) (Adongo et al., 2016)

2.9 Impact of EVD and immunization coverage

While it is true that information/statistics on the EVD outbreak is still undergoing scrutiny, its impact on the country and its people cannot be under estimated or ignored. One of such impact is the long-term effect on EVD survivals. About 7.6% of survivals suffer eye defect while 24.5% are reporting body pain and 4.7% seek medical attention because of intense fatigue. The EVD impact did not only affect the population directly, but its impact also affected the health system including its infrastructures. Most health facilities were either closed or operated below capacity. By June 2014, about 62% of health facilities were closed. As of 5th November 2014, 46% of health facilities had reopened but with reduced hours of work. Hence, health services utilization which is measured by the number of curative consultations per

capita, declined from 0.8 in June to 0.4 between July and September 2014. As a result of the impact of EVD on the health system, immunization activities declined leading to an outbreak of measles in the country. An outbreak of measles was reported from Lofa County with at least three confirmed cases in December 2014. Though some level of interventions were taking place, there were suspected cases being reported in February of 2015 (Acaps, 2015).

2.10 Case management and Treatment protocol

Up to date, there is no W.H.O approved treatment for the virus or post exposure prophylaxis for non-exposed individuals. However, due to the severity of the outbreak in West Africa, attention has been drawn to potential anti-Ebola activity of a number of drugs approved for use in human and found to be used in phase II and phase III trials. Meanwhile, there are efforts been made to develop treatment for this disease. One of such efforts is the development of the ZMapp drug that is seriously under consideration of being an alternative treatment. Patient management and care require a multidisciplinary approach (Bray, 2015; CDC, 2015).

Survival of patients from EVD largely depends on supportive care as yet there are no approved drug(s) of choice for the management. People who survive from the disease develop antibody for at least 10 years against that specific strain of the virus; it is not known if this protection last for the person's life time(CDC, 2015).

In the absence of a recognized drug of choice for the treatment of Ebola and a standardized protocol for management of EVD patients by WHO, Liberia developed a treatment protocol for the management of cases at ETUs. The treatment guideline

focuses areas such as the EVD clinical management, nursing care for EVD patients, pregnancy and breast-feeding, pediatrics, mental health and psychosocial support, nutrition, experimental drugs and Ebola survivors (MoH-Liberia, 2014).

Though the outbreak in these three West African countries has come to an end, WHO, UNICEF and other clinical and research institutions continue to investigate and provide medical care for survivals. It is estimated that there are a little over 10,000 potential survivals. Survivals of this dreadful and life threatening disease continue to show a complex and more complicated findings ranging from a number of both short- and long-term medical and psychosocial problems. Transmission of the virus from survival to a non-affected person was more focused on male survivals as study showed that male survivals could carry or harbor the virus in semen for as long as up to 10 months or more. This knowledge brought about the need to do a more extensive research in both sexes. Currently, study has shown that the breast milk of female survivals may contain Ebola virus RNA in low amount. Resent study proves that Ebola virus RNA has been detected at low levels in breast milk up to 16 months after the onset of symptoms (WHO, 2016).

2.11 Conclusion:

Since the introduction of the Expanded Program on Immunization in 1974, the world has continued to experience remarkable improvements in the prevention and control of childhood preventable diseases. However, several factors including culture, socio-economic, political, religion and other disease outbreaks have had adverse effect on the program in attaining and maintaining set targets by WHO and UNICEF.

In Africa, socio-economic, culture, and disease outbreaks influences continue to impede the attainment of global EPI targets. However, studies conducted show that socio-economic and demographic characteristics are contributing factors to the survival of children. The attainment and maintenance of global targets remain a major challenge in Liberia as disease outbreak (EVD) has worsened the attainment of these targets (MOH/Liberia, 2015). Disease outbreaks, culture, level of education, beliefs, and facility proximity are all contributing factors to the kind of Perceptions communities have built towards childhood immunization.

Though childhood immunization is succeeding in the eradication and elimination of childhood diseases, strategies for efficient provider-parent communication are needed to address potential concerns about vaccine refusal and low coverage particularly in the African setting.

CHAPTER THREE

3.0 METHODS

3.1 Study area

The study was conducted in Margibi County, Liberia with geographical coordinates as 6°30'00'' N and 10°15'00'' W. The county was selected based on the level of casualty as a result of the Ebola virus disease outbreak and the bases of convenience (road accessibility) (*Margibi County Development Agenda*, 2012). Margibi is one of the most affected counties of the Ebola virus disease outbreak of 2014/2015 with four health districts (Mamba-kaba, Kakata, Gibi, and Firestone). The County has a population of about 237, 801 (National Census, 2008) with a growth rate of 2.1%. The total land area of the County is 2,866.67 square miles. About 188,000 acres of the total area is been utilized by rubber farming (*Margibi County Development Agenda*, 2012).

The County has two seasons; the dry and rain. Its climate is partly hot and humid with an annual average of 80 ^{0}F. The dry season runs from December to March in the coaster areas and a little longer in the inland areas. The average annual rain fall along the coast is put at 200 inches, while the inland receive an average of about 85inches annually.

The main economic activity in the county is plantation employment in the two largest rubber plantations namely Firestone and Salala. Agriculture and fisheries make up 52% of the County's Gross Domestic Product (GDP) with rubber alone constituting for 21% of the overall Agriculture and fishery GDP. The Agricultural (food)

productive capacity is below average compared to other counties. Subsistence farming accounts for about 80% of all food crops production (*Margibi County Development Agenda*, 2012).

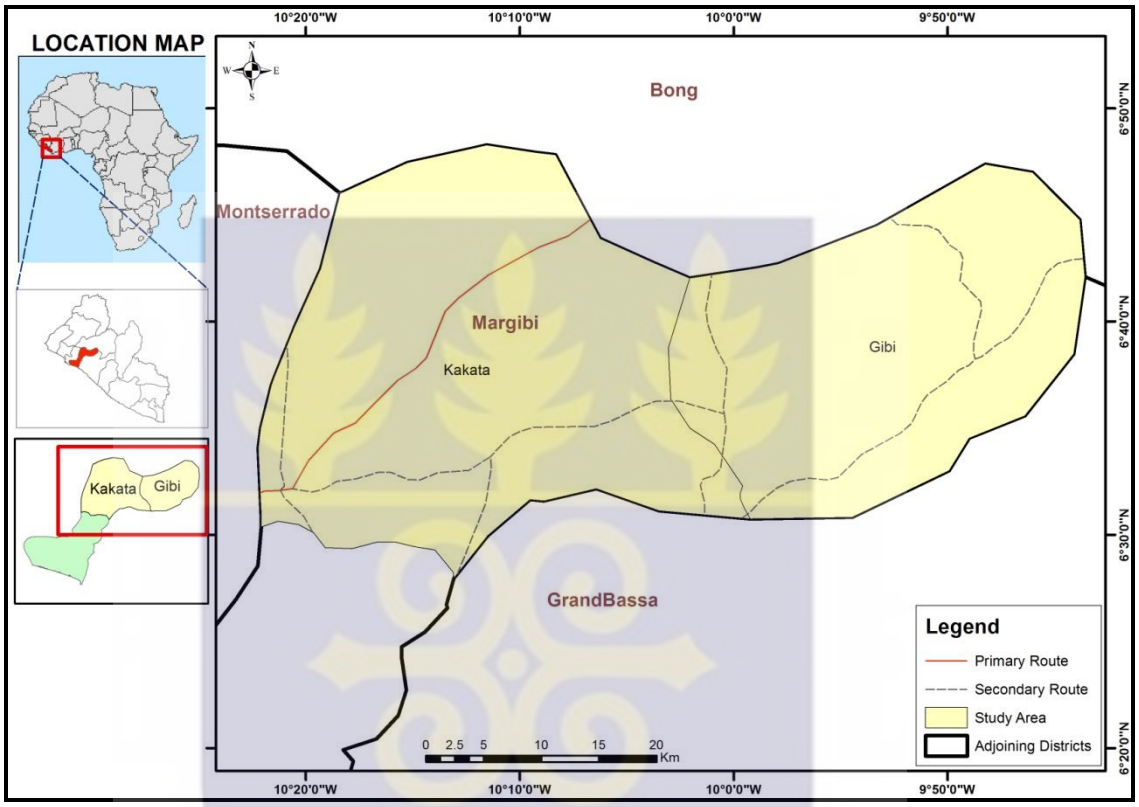

Figure 3.1: Map of Margibi County

(Source CERSGIS Ghana, 2015)

3.2 Study Design

For the purpose and nature of this study, a cross-sectional study using quantitative approach was used in data collection.

3.3 Sampling method:

In order to obtain a representativeness of the County, both cluster sampling and purposive sampling techniques were used. The County has four health districts. Two

of these districts-Gibi and Kakata- were randomly selected and further divided into cluster or communities. Each of these communities was selected based on population proportionate to health facility catchment population.

Individual households were selected using systematic random sampling technique. In this process, researcher identified the center of the community, draw a currency note and use the end series number to indicate the first house by checking the houses in front of him until the series number is reached. If the last series number was greater than the number of houses directly in front of him, the number was then divided by two (2) to arrive at a more feasible number to begin. When the first house was completed, he stands at the front door of the completed house and identify the next house directly opposite him until intended sample participants were completed.

In the event where the intended sample size was not obtained from that community, the procee continue to the nearest community in same faction until the intended samples/participants were obtained. The selection of participant was based on the selection criteria outlined in the document. Additionally, the researcher was interested in the youngest child between the ages of 1-2 years in gathering the information. Assumingly, these age groupings had some experiences with the period of concern for the study May to December, 2015.

Table 3.1: Sample calculation by district

Name of district	Population	Population proportion	Projected sample
Kakata	88704	86.2%	344.8
Gibi	14,250	13.8%	55.2
Total	102,954	100.0%	400.0

3.4 Sample size:

The sample size was calculated using a single population proportion formula using the following parameters: 95% confidence level (1.96), margin of error (0.05), level of health seeking behaviour and practices after outbreak on childhood immunization is not known, a 50% worse case (pi). With this assumption a total of 400 respondents were enrolled into the study. The sample size was calculated using the Piface statistical tool version 1.76.

The calculation establishes a minimum sample size of 384.5. The Cochran formula was also used to determine the sample size using the same variables as in the Piface calculation. Cochran formula:

$\mathbf{n=N/1+N*(e)^2}$ (Cochran, 1963)

Where n=sample size, N=population size, e=acceptable sampling error, *95%confidence level.

However, 10% of the minimum sample size was added to account for any unforeseen circumstances during the data collection process. The sampling procedure involved a two-staged sampling scheme aimed at obtaining 345 and 55 respondents in Kakata and Gibi study areas respectively, using a probability to population size.

3.5 Study variables

Variables used in this study were categorized into dependent variable and independent variables. The dependent variable used in the study was vaccination outcome after outbreak whilst the independent variables were fear for Ebola vaccine, fear for the Ebola treatment unit (ETU), facility proximity, and parent's knowledge on immunization.

3.5 Variables

Independent variable	**Dependent variable**
Fear for Ebola vaccine	Vaccination outcome after outbreak
Fear for ETU	(vaccination coverage)
Facility proximity	
Parent's knowledge on immunization	

3.6 Participant Inclusion and Exclusion criteria

Inclusion in the study did require that the participant was a caregiver of at least a child 6 months to two (2) years of age and resides in the district and/or community. To be a responded also ment that he/she was an adult (18 years or above) as required by the constitution of Liberia, and speaks English. Individuals who did meet these requirements were excluded from the study.

3.7 Data collection process

Data were collected during the month of June 2016 using structured questionnaire through interviewing inhabitants within the study areas. The questionnaire was

developed after critical discussions with public health officials with the health centers resident within the respective study areas.

After the structuring of the questionnaire, a pretesting was done using 50 respondents after which the questionnaire was finally concluded before the final print out of the tools.

All data were collected with the aid of four data collectors, one supervisor and one county health team member. The County health team assistant presence was to authenticate the data collected as the County is expected to make use of the findings for improvement of the health delivery on immunization of childhood vaccines. These assistants were trained on interviewing techniques, observational and data recording.

3.8 Data management and analysis

Coded data entry was done using the SPSS (Statistical Package of Social Science) Version 23.0 and Excel software packages prior to analysis. Data was subjected to cleaning with the aim of avoid missing values, outliers and other inconsistencies. Consistency and completeness of data were inspected using frequency and 2 by 2 tables.

Descriptive statistics including frequency distributions and measure of central tendencies were calculated for dependent and independent variables. Bivariate and multivariate analysis using binary logistic regressions were done to determine the presence of a statistically significant association between explanatory variables and the outcome variables.

Crude and Adjusted Odds Ratio (OR) with 95% Confidence Intervals (CI) were done to establish association between independent variables and the dependent variable using Stata statistical tool. The multivariate logistic regression analysis was done using enter method to assess the relative effect of the significant independent variables on acute dependent variable.

Multivariate logistic regressions analyses were used to determine the presence of an association between explanatory variables and vaccination after Ebola outbreak by controlling the effect of other variables. To limit many variables and unstable estimates in the subsequent models, only variables that reached a p-value less than 0.05 at the bivariate analysis level were kept in the model.

Data were presented using figures and tables. Tables and graphs were generated using the Microsoft excel statistical tool Pac for comparative analysis and easy understanding.

3.9 Limitations

The structure of this study is across-sectional in design. Data collected was exclusively quantitative making it difficult to access a more detailed reason and effect of the findings. The study targeted caregivers most of whom were females. Due to the timing of data collection which coincided with farm harvest and festivals in the study area, qualitative data collection was almost impossible.

3.10 Ethical considerations

Ethical approval was obtained from the Ghana Health Services Ethical Review Committee, and a permit obtained from the County Health Team of Margibi County Liberia, where the research was conducted. Selected participants were adequately informed and asked to sign a consent form as detailed in appendix 1.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio demographic characteristics of respondents

The total number of respondents enrolled during the study was 400 with 85% (339) as female respondents and 15% as male respondents. Age of respondents was stratified into six groups with an interval of 4 years. Majority of respondents 128 (32%) were in the 24-28year group with minority having ages more than 43 (10.75%). The remaining age groups with corresponding proportions and percentages are outlined in Table 4.1.

In terms of marital status, higher percent (35.5%) of the respondents were in the singles, with the least been widowed (4.76%) as indicated in Table 4.1. Other categories of relationships observed among the respondents together with their percentages are outlined in Table 4.1. Regarding occupation, housewife accounted for the majority (42%) followed by those in the self-employed category with 40.41%. Meanwhile, the employed in formal work was 7.16%.

Regarding respondents' educational status, about 71% of respondents were found to have no education, while, 29% (116) were educated.

Concerning religion on the other hand, the dominant religion among the respondents was found to be Christianity (85.5%) with Muslim respondents forming about 13% (Table 4.1). Again, the majority of respondents 158 (60.5%) were found to be residing in urban communities of the districts with minority (39.5%) residing in rural

communities as indicated in Table 4.1. However, responses to socio demographic characteristics were stratified according to the type of districts, which were Kakata and Gibi.

Table 4.1: Socio demographic characteristics of respondents (n = 400)

Demographic characteristics	Kakata **(%)**	Gibi **(%)**	**Total (%)**	X^2 **value**	**P-value**
Age groups					
18-23	61 (82.43)	13 (17.57)	74 (100.00)	3.297	0.654
24-28	111 (86.72)	17 (13.28)	128 (100.00)		
29-33	74 (88.10)	10 (11.90)	84 (100.00)		
34-38	46 (92.00)	4 (8.00)	50 (100.00)		
> 39	36 (83.72)	7 (16.28)	43 (100.00)		
Don't know	17 (80.95)	4 (19.05)	21 (100.00)		
Educational status					
No education	104 (86.67)	16 (13.33)	120 (100.00)	0.948	0.967
Primary	57 (83.82)	11 (16.18)	68 (100.00)		
Junior High	84 (88.42)	11 (11.58)	95 (100.00)		
Senior High	71 (85.54)	12 (14.46)	83 (100.00)		
College	19 (86.36)	3 (13.64)	22 (100.00)		
Vocational	9 (81.82)	2 (18.18)	11 (100.00)		
Sex					
Male	53 (86.89)	8 (13.11)	61 (100.00)	0.025	0.876
Female	292 (86.14)	47 (13.86)	339 (100.00)		
Religion					
Christian	291 (85.09)	51 (14.91)	342 (100.00)	2.906	0.234
Muslim	49 (92.45)	4 (7.55)	53 (100.00)		
Others	5 (100.00)	0 (0.00)	5 (100.00)		
Residence					
Rural	208 (85.95)	34 (14.05)	158 (100.00)	0.046	0.830
Urban	137 (86.71)	21 (13.29)	242 (100.00)		
Marital Status					
Divorced	18 (81.82)	4 (18.18)	22 (100.00)	1.604	0.808
Married	100 (87.72)	14 (12.28)	114 (100.00)		
Single	124 (87.32)	18 (12.68)	142 (100.00)		
Widow	17 (89.47))	2 (10.53)	19 (100.00)		
Cohabiting	85 (83.33)	17 (16.67)	102 (100.00)		
Occupation					
Housewife	146 (87.95)	20 (12.05)	166 (100.00)	2.204	0.531
Farmer	31 (79.49)	8 (20.51)	39 (100.00)		
Self employed	135 (85.44)	23 (14.66)	158 (100.00)		
Employed	25 (86.29)	3 (10.71)	28 (100.00)		

4.2 Health service structures (Respondents = 400)

Health service structures were based on nearness (distance in walk) of health facility to respondents, time period to get to the nearest health service facility and vaccination services from Monday to Friday. From Table 4.2, majority of respondents (45%) indicated that the closest health facility was far as against the minority (3.8%), who admitted that the health facility was close to them. Based on time to reach the nearest health facility, more than 50% picked <30 mins and more than >30 mins - 60 minutes. About 60% of the respondents admitted enjoying vaccination services from Monday to Friday with 15% responding in contrast. However, about 25% of respondents could not exactly tell if the service was been provided Monday to Friday as shown in Table 4.2.

Table 4.2: Health services structures encountered during study period (n = 400)

Variables	Kakata **(%)**	Gibi **(%)**	**Total (%)**	X^2 **value**	**P-value**
Knowledge on vaccination services from Monday to Friday					
No	49 (81.67)	11 (18.33)	60 (100.00)	0.1563	0.693
Yes	209 (86.01)	34 (13.99)	243 (100.00)		
Don't know	87 (89.69)	10 (10.31)	97 (100.00)		
Respondent distance from H. facility (in walk)					
< 30 mins	151 (86.78)	23 (13.22)	174 (100.00)	6.161	0.104
> 30 mins – 1hr	128 (83.12)	26 (16.88)	154 (100.00)		
> 1hr to 2 hrs	41 (95. 35)	2 (4.65)	43 (100.00)		
2hrs and above	11 (73.33)	4 (26.67)	15 (100.00)		

4.3 Vaccination / immunization behaviours among respondents

Vaccination/ immunization behaviours for the study included having any child below 5 years, idea on the commencement of immunization, having vaccination card, presence of child for vaccination and vaccination after Ebola outbreak. From Table 4.3 which displays the various vaccination/immunization variables by percentage showed that more than 90% of the respondents had at least one child below 5 years.

Majority of the respondents (76% and 83%) had some idea of when immunization begins as well as having possession of vaccination card for their child respectively. Further, about 90% of respondents with child below 5 years indicated that they have at least once in their lifetime sent their child for vaccination, although minority (7.9%) accepted not sending their child for vaccination. Regarding immunization after Ebola outbreak, more than 50% of respondents did not access vaccination for their wards as compared to 177 (44%) who vaccinated their children after the Ebola outbreak as shown in Table 4.3.

Table 4.3: Vaccination/Immunization behaviours among respondents (n = 400)

Variables	Kakata **(%)**	Gibi **(%)**	**Total (%)**	X^2 **value**	**P-value**
Idea on commencement of immunization					
No	34 (87.18)	5 (12.82)	39 (100.00)	5.557	0.062
Yes	253 (84.33)	47 (15.67)	300 (100.00)		
Don't know	52 (96.30)	2 (3.70)	54 (100.00)		
Vaccination card for child					
No	58 (87.88)	8 (12.12)	66 (100.00)	0.231	0.631
Yes	280 (85.63)	47 (14.37)	327 (100.00)		
Child for vaccination					
No	27 (87.10)	4 (12.90)	31 (100.00)	0.001	0.972
Yes	310 (85.87)	51 (14.13)	361 (100.00)		
Vaccination after outbreak of Ebola					
No	191 (88.02)	26 (11.98)	217 (100.00)	1.214	0.271
Yes	149 (84.18)	28 (15.82)	177 (100.00)		

Figure 4.1 graphically displays the various reasons for vaccination among respondents. Findings from this study indicate that, the dominant reason for vaccination among respondents was found to be; 'for protection against diseases' about 90%, with least influential driver as 'others are doing so' (2.63%).

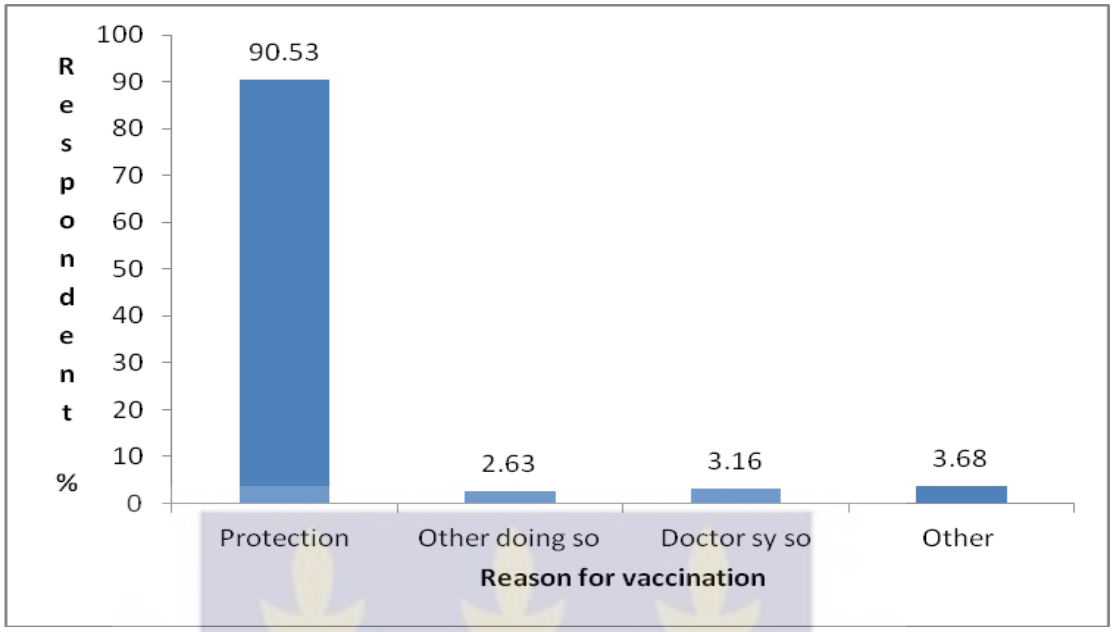

Figure 4.1: Reasons for vaccination among respondents by districts

Table 4.4 provides summary statistics for discrete vaccination/immunization variables including number of child per respondents with child below 5 years, and the number of vaccinations the child has received. From Table 4.4, the average number of children below 5 years was found to be 1.20 child with range spanning from 1 child to 4 children. Averagely, children below 5 years were estimated to be 17.76 months old, having the ranging fluctuating between 1 month and 47 months. The mean number of vaccination received by child less than 5 years was estimated at 3 times, also ranging from 1 to 4 (Table 4.4).

Table 4.4: Summary statistics for immunization behaviour among respondents

Variables	N (Number of respondents	Mean	Standard deviation	Minimum	Maximum
Number of child (Under 5 years)	399	1.20	0.44	1	4
Age of child (months)	365	17.76	7.34	1	47
Number of vaccination	379	2.90	0.66	1	4

In other perspectives however, figure 4.2 below illustrates graphically, the various drivers that affected the absence in vaccination among respondents during the study period. The main drivers for not attending vaccination services after the Ebola outbreak were, fear of the Ebola vaccine (75.23%) and the closure of facilities which accounts for 5.14% of respondents who did attend clinic for childhood immunization immediately after the outbreak. However, other influencing factors were facility distance (3.74%), fear of the ETU (3.27%), and no staff at facility accounting for about 1.40% of respondent's reason for not accessing immunization services after the outbreak.

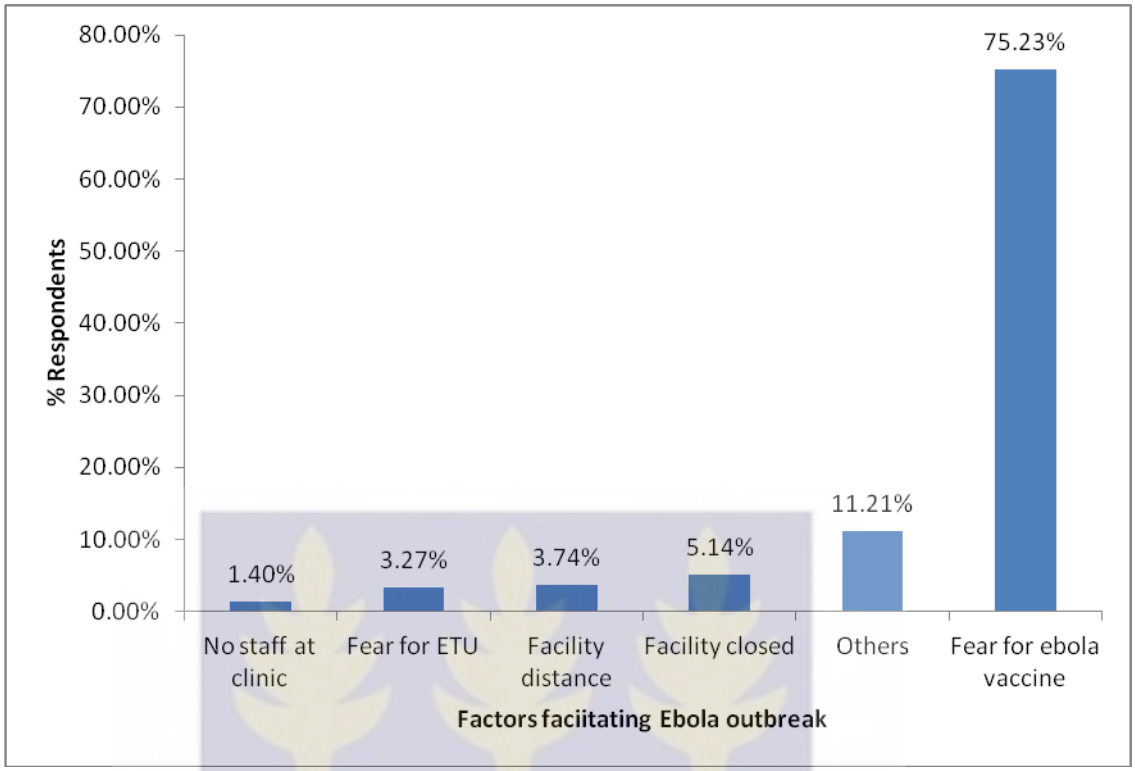

Figure 4.2: Reasons for no vaccination among respondents after Ebola outbreak

4.4 Factors associated with fear for Ebola vaccine

Respondents' background characteristics were tested using Chi Square analyses to find out if these background variables are statistically significantly associated with fear for Ebola vaccine (Dependent variable). The background characteristics included respondents' residential status, marital status, sex, education level completed, religious background, occupation, age and respondents relationship to child. Sex of respondent ($p<0.05$) was significant but other independent variables were not significantly associated with fear for Ebola vaccine as illustrated in table 4.4 below.

Table 4.5: Association between fear for Ebola vaccine and background characteristics

	Fear for Ebola vaccine		
Independent variables	**Degree of freedom (df)**	**Chi-square value**	**P -value (< 0.05)**
Residence of respondent	1	0.123	0.722
Marital status	4	3.352	0.501
Sex of respondent	1	3.653	0.056*
Respondent's education completed	5	5.604	0.347
Religion of respondent	2	1.554	0.460
Occupation	3	4.402	0.221
Age of respondent	5	2.531	0.772
Relationship to child	4	3.883	0.422

*: Significant at $p < 0.05$

4.5 Bivariate Analyses of sex of respondents and fear for Ebola vaccine

A further binary logistic regression analysis was done to determine the strength of association between the outcome variable (fear for Ebola vaccine) and the significantly correlating independent variable (Sex of respondent) at 95% confidence interval. The result indicated a crude odds ratio of 1.96 which means that female respondents are about two times more likely to associate fear for Ebola vaccine compared to their counterparts [OR=1.96 (CI= 0.968-3.972), p=0.056)].

4.6 Bivariate analysis

A Chi square analysis using Pearson correlation coefficient was undertaken between vaccination after Ebola (dependent variable) and the independent variables. These independent variables included sex of respondent, marital status, educational status,

religion of respondent, distance of respondent from health facility, knowledge on vaccination days (Mondays to Fridays), knowledge on when immunization begins, and the availability of vaccination card. Independent variables that exhibited significant correlation ($p < 0.05$) with the dependent variable (vaccination after Ebola) are outlined in Table 4.5 below.

Table 4.6: Association between vaccination after Ebola and some independent variables

	Vaccination after Ebola		
Independent variables	**Degree of freedom (df)**	**Chi-square value**	**P -value (< 0.05)**
Sex of respondent	1	6.932	0.008*
Marital status	4	3.657	0.454
Education status	1	10.946	0.001*
Religion	2	0.929	0.628
Age of respondent	4	9.688	0.046*
Distance (based on time walk) to health facility	3	5.602	0.133
Knowledge on vaccination days (Mondays to Fridays)	1	36.273	< 0.001*
Availability of vaccination card	1	27.093	< 0.001*
Knowledge on when immunization begins	1	49.686	< 0.001*

*: Significant at $p < 0.05$

4.7 Multivariate analysis

Logistic regression analysis was undertaken between the dependent variable (vaccination after Ebola outbreak) and the significantly correlating independent

variables with p-value < 0.05 shown in Table 4.5 above. Both dependent and independent variables were categorical in nature. These analyses provide the adjusted odd ratios for independent variables regarding likelihood of success for the dependent variable respectively.

In adjusting for sex of respondents using male respondents as base category, vaccination card, respondent's educational status, knowledge of vaccination days (Mondays to Fridays) and respondent's knowledge on when wards' immunization begins, and age (24-28yrs, and 39yrs and above) with p-value < 0.05, accounted for vaccination after Ebola outbreak (Table 4.6). However, age category (29-33yrs, 34-38yrs) indicating with p-value > 0.05 did not account for vaccination after Ebola when adjusting for sex of respondents. As a result, female respondents were 0.74 less likely to vaccinate their wards than male respondents [AOR = 0.74, (95% CI = 0.308 – 1.752), p > 0.05].

Adjusting for educational status using educated respondents -Junior High and below- as the base category, vaccination card, knowledge of when immunization begins and knowledge on immunization days (Monday to Friday), age category (24-28yrs and 39yrs and above) (p < 0.05) accounted for vaccination after Ebola outbreak (Table 4.6). However, sex of respondents, age category (29-33yrs and 34-38yrs), with (p > 0.05) did not account for vaccination after Ebola outbreak when adjusting for educational status. As a result, educated respondents were 2.33 times more likely to vaccinate their child than uneducated respondents [AOR = 2.33 (95% CI = 1.335–4.071), p < 0.05].

Vaccination card, education completed, knowledge on when immunization begins, vaccination cards, age category (24-28yrs and 39yrs and above) ($p < 0.05$) accounted for vaccination after Ebola outbreak when adjusting for idea on the availability of vaccination services from Monday to Friday among respondents as the base category (Table 4.6). However, sex of respondents ($p > 0.05$) was not a contributing factor for vaccination after Ebola outbreak when adjusting for idea on the availability of vaccination services from Monday to Friday among respondents. As a result, respondents with knowledge on the availability of vaccination services from Monday to Friday were 2.61 times more likely to vaccinate their children than respondents without knowledge on the availability of vaccination services from Monday to Friday [AOR = 2.61, (95% CI = 1.539 – 4.424), $P < 0.05$].

The availability of vaccination cards, knowledge on vaccination days, and education, knowledge on when vaccination begins, and age category (24-28yrs and 39yrs and above) with ($p < 0.05$) significantly attributed to vaccination after Ebola outbreak when adjusting for knowledge on when immunization begins amongst respondents as the base category (Table 4.6). However, sex of respondents had no contribution with p-value > 0.05 on vaccination after Ebola outbreak when adjusting for knowledge on when immunization begins. As a result, respondents with knowledge on when immunization begins are 3.65 times more likely to take their children for vaccination than respondents without knowledge on when immunization begins [AOR = 3.65 (95% CI = 1.636 – 8.123), $P < 0.05$].

When adjusted for age of respondents, knowledge on when immunization begins, availability of vaccination card, knowledge of vaccination day (Monday to Friday), and education status ($p < 0.05$) accounted for vaccination after Ebola outbreak.

Meanwhile, respondents' sex ($p > 0.05$) was not found accountable for vaccination after Ebola outbreak when adjusting for age of respondents. As a result, respondents within age categories (24-28yrs and 39yrs and above) were 0.36 and 0.40 times less likely to vaccinate their children than respondents within other age categories [AOR = 0.36, (95% CI= 0.181-0.701) p = < 0.05; AOR= 0.40, (95% CI=0.165-0.971) p= <0.05].

Respondents' education status, knowledge on immunization day, knowledge on when immunization begins and age category (24-28yrs and 39yrs and above) with ($p < 0.05$) accounted for vaccination after Ebola outbreak when adjusting for availability of vaccination card for children less than five years as the base category (Table 4.6). However, age category (29-33yrs and 34-38yrs) and sex of respondents ($p > 0.05$) did not account for vaccination after Ebola outbreak when adjusting for availability of vaccination card. As a result, respondents with vaccination card were 2.49 times more likely to vaccinate their children under-five than respondents without card when adjusting for availability of vaccination card [AOR = 2.49, (95% CI = 1.110 – 5.607), $p < 0.05$].

Table 4.7: Logistic regression analysis on vaccination after Ebola

Independent variables	Vaccination after Ebola							
	Crude Odd ratio (OR)				Adjusted Odd ratio (AOR)			
	OR	p-value	95% CI		AOR	p-value	CI	
Sex of respondent								
Male	1.00				1.00			
Females	2.18	0.008*	1.201	3.965	0.74	0.488	0.308	1.752
Education status								
Junior High and below	1.00				1.00			
Senior High and above	2.08	0.001*	1.335	3.264	2.33	0.003*	1.335	4.071
Age of respondent								
18-23yrs	1.00				1.00			
24-28yrs	0.44	0.006	0.243	0.811	0.36	0.003*	0.181	0.701
29-33yrs	0.79	0.475	0.420	1.498	0.67	0.290	0.323	1.400
34-38yrs	0.86	0.699	0.418	1.793	0.64	0.288	0.276	1.464
39yrs and above	0.55	0.130	0.254	1.205	0.40	0.043*	0.165	0.971
Knowledge of vaccination days (Mondays to Fridays)								
No idea	1.00				1.00			
Having idea	3.74	<0.001*	2.357	5.933	2.61	<0.001*	1.539	4.424
Availability of vaccination card								
Not having	1.00				1.00			
Having	5.35	<0.001*	2.633	10.886	2.49	0.027*	1.110	5.607
Knowledge on when immunization begins								
No idea	1.00				1.00			
Having idea	8.12	< 0.001*	4.049	16.281	3.65	0.002*	1.636	8.123

*: Significant at $p < 0.05$

CHAPTER FIVE

5.0 DISCUSSIONS

5.1 Purpose of the study

Immunization for children 0-59 months has proven to be the most effective way of providing protection against diseases and reducing the fertility rate of children (Adedayo & Mbbs, 2009; Negeri & Heyi, 2015). Studies indicate that there are yet a huge number of African children unvaccinated (Burton, et al., 2009). In the wake of these, Ebola virus disease outbreak affected Liberia leading to the collapse of health services (MOH/Liberia, 2015).

Hence, the purpose of this study was to investigate/explore influences that the Ebola virus disease outbreak had had on health seeking behaviour of parents and caregivers after the outbreak for childhood immunization, access impact of the outbreak comparing pre-Ebola period, the Ebola period, and post Ebola period, and to explore perceptions of parents on immunization services after the outbreak.

5.2 Back ground of Socio-demographic characteristics

The study enrolled a total of 400 participants from two districts in Margibi County. In order to critically understand the social dynamics relating to the Ebola outbreak and its influences on the population, the population was further stratified into sex of respondent, age of respondent, marital status, educational level completed, religion, occupation and relationship to child. Findings show that female accounted for about 85% (339) as against male. A study conducted in Ethiopia on childhood coverage and its determinants supports finding that females are the dominant respondents in

childhood immunization surveys (Negeri & Heyi, 2015). Additionally, about 43% of female respondents were house wives.

5.3 Perceptions of Ebola virus outbreak on health seeking behaviour for immunization services

This study revealed that though caregivers had high knowledge on the importance of vaccination, their concerns to provide parental protection for their wards was a major driving force for their refusal to immunization services in both the Ebola and post Ebola periods. This observation confirms findings of a study done by Korkoyah and Wreh, (2015) that fear of Ebola vaccine was the main driver for low immunization attitude among respondents. Also Acaps, (2015) reported that for the fear of Ebola virus, health facilities that were opened after the Ebola virus outbreak recorded a decline in the frequency of consultations and admission.

From the study, the fear of Ebola vaccine could be due to mistrust in health workers or health service delivery as well as certain misconceptions resulting from misinformation. These misconceptions include children getting infected with the Ebola virus immediately after the injection of the vaccine into their blood stream as well as a means for the health workers increasing their financial status. Confirmed by study, information source plays a major role in vaccine refusal. Fredrickson, et al., 2004 confirm that parents refuse vaccine because of mistrust of information source. MHS 2015 report documented that mistrust of health workers were based on the fact that health workers were injecting patients including babies with Ebola virus mostly among women.

5.4 Factors influencing health seeking behaviour for immunization services.

In this study, educational status was found to be one of the determinants for vaccination among children under five years after the Ebola outbreak ($p < 0.05$). After a reclassification of educational status as provided in table 4.6, respondents categorized as educated respondents were found to be two (2) times more likely to have their children vaccinated compared to non-educated respondents (Junior High and below, including no formal education respondents). This may be due to the fact that literate respondents (senior high and above educational status) with children under five years had the ability to read and fully imbibe the importance of vaccination to child health thereby increasing vaccination seeking behaviour among respondents. Studies done by Negeri & Heyi, (2015) in Ethiopia that education status of respondents' plays a key role in child immunization supported this finding. Additionally, a study conducted by Bawah et al., (2010) found that in conjunction with low level education status, poverty is also another major contributing factor to immunization outcome in children under the age of five years. Their study also found that children from relatively better-off households, benefited far less from immunization services compared to those from poor households.

Further, the possession of vaccination card played a significant role in high vaccination coverage among children under five due to plethora of factors. For instance the possession of vaccination cards may serve as access to parents for child's vaccination health services, whereas the opportunity to gain information pertaining to vaccination schedule, thereby increasing vaccination seeking behaviour among guardians.

In addition, availability of vaccination services from Monday to Friday after the Ebola virus outbreak was found to play a key role in greater vaccination coverage among children less than five years. This observation could be due to the fact that health facilities were opened in full operations for immunization services throughout the week. Hence regardless of the occupation type of respondents, caregivers of children had the opportunity of getting their child vaccinated.

In support of this observation, Korkoyah and Wreh, (2015) indicated that during the Ebola outbreak, government health facilities were completely or partially closed to all patients resulting in lower immunization coverage. Again, access to immunization services from Monday to Friday could also be due to the presence of wide range of choices pertaining to government health service providers. For instance, MHS, (2015) reported that the lack of choices of government health providers during the Ebola virus outbreak led to increase preference for home birth hence reducing vaccination seeking behaviour among caregivers.

Also, sex of respondents was observed as one of the key determinants for vaccination among children under five years. From the present study, the odd of success regarding vaccination among children of female respondents was found to be higher than male respondents. This observation maybe due to the fact the female respondents are usually the caregivers. Hence female respondents are at good position to ensure that their ward (< 5 years) gets vaccinated (Korkoyah and Wreh, 2015). Studies done by Thandar, et al., (2015) in Myanmar highlighted that in more than 80% households, mothers are the decision-makers for seeking treatment outside the home for children under five years.

More than half of the respondents (84%) had high knowledge on the purpose of vaccination (protection); with about 75% of all respondents having knowledge on when vaccination should begin for their children. This finding is consistent with studies done by Etana & Deressa, (2012) in Woreda, Ethiopia, where more than half of the respondents knew the purpose of immunization.

Further, knowledge on when vaccination begins and ends was found to be significantly different for respondents from urban (Kakata) and rural (Gibi) districts. Findings by Etana & Deressa, (2012) that schedule of immunization differ significantly between urban and rural districts supports observation from this study. This disparity could be due to the intensity of advertisement pertaining to immunization within rural districts.

In a nutshell, vaccination cards, availability of vaccination service, sex orientation, education status, knowledge on vaccination schedule, and purpose of vaccination were identified as the major factors that significantly influenced immunization seeking behaviors among respondents.

CHAPTER SIX

6.0 SUMMARY, CONCLUSION, AND RECOMMENDATION

6.1 Summary

This study was an academic research work that targeted 400 participants from two districts in Margibi County. The study sought to investigate influencing factors of parents towards childhood immunization in post Ebola Liberia. Below listed are findings from the study:

1) As a result of the outbreak and the introduction of a trial vaccine in post Ebola Liberia, about seventy-five percent (75%) of parents developed fear for childhood vaccination in Margibi.
2) Though parents' knowledge on the importance of immunization was high, their knowledge on when immunization begins and ends for their children was found to be low.
3) Availability of child's vaccination card was a major factor that influenced parents' decision to access vaccination services.
4) Formal education was found to be a major factor for parents who accessed immunization services in post EVD Margibi.

6.2 Conclusion

From the study, it was found that most parents refused vaccination for their wards for fear of the trail Ebola vaccine coincided with the commencement of immunization services after the outbreak. Additionally, parents' knowledge on immunization schedule, and the availability of ward's vaccination card also affected the health seeking behaviour of parents for service utilization. Fourthly, parents with higher

level of education accessed immunization services for their wards as compared to those with low or no formal education.

6.3 Recommendations

Based on the findings, the study therefore makes the following recommendations.

1) The Ministry of Health-Liberia and partners to increase support for health communication programmes.
2) That EPI programmes go beyond health education to include health promotion as a way of improving parents' health seeking behaviour for childhood immunization services.

Therefore, it is recommended that EPI services be re-strategize health communicational and promotional programmes to suite all levels of health service utilization.

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APPENDICES

Appendix I: INFORMED CONSENT FORM

[Informed Consent Form for Parents of under fives]

This inform consent form is for parents or caretakers of under five years children participating in the research titled; "Health seeking behaviour and practices on immunization for under five years children after Ebola virus disease outbreak. A case study in Margibi County-Liberia".

Name of Principle Investigator: Nathaniel K. Dovillie

Name of institution: University of Ghana

Name of Sponsor: Disease Prevention & Control Division, Min. of Health, Liberia

Name of Project and Version: Health seeking behaviour and practices on immunization for under five years children after Ebola virus disease outbreak. A case study in Margibi County-Liberia

Part I: Information Sheet

Introduction:

My name is Nathaniel K. Dovillie, a student of the School of Public Health, University of Ghana conducting a study in the area of childhood immunization with special interest in knowing health seeking behaviour and practices after the Ebola virus disease outbreak. This research is in fulfillment of my academic study for MSc degree in Applied Social Science.

During the interview, should there be a word or question that is not clear and/or understood by you to response to, please feel free to ask the one to whom you are speaking for clarity before proceeding to answer.

Before we begin the interview, I will like to get your approval by signing at the bottom of this consent form.

Purpose:

This research is purely for academic reason. It is in fulfillment of my study at the School of Public Health, University of Ghana for master's degree in Applied Social Sciences. It is expected that findings from this research will help to improve the immunization program of our children.

We will be speaking to parents/caretaker of under five children because they are the caregivers and decision makers of these children.

Selection of Participants:

The selection of participants requires that you are a caretaker of at least one under five year child and is able to communicate in the English language. With my interaction with you, I am of the opinion that you can be one of my participants.

Voluntary Participation:

Participation in this study is completely voluntary. Besides, you are free to accept or not accept to form part of this study. I do know that it is sometimes difficult to agree to participate in research work for fear of insecurity. However, you can be assured that every information provided shall remain confidential and finding will only be used to improve the health of children.

Procedure:

You will be required to respond to questions read exactly as written on questionnaire sheet with options or you may request to read and select best option as indicated. Questions included in this questionnaire include personal data, knowledge, and practices on immunization. Should you feel not to answer any particular question in the questionnaire, you may skip and move on to others.

Additionally, participants of the focus group discussion will be required to freely speak their minds on issues raised for discussion.

All information collected will remain confidential and destroyed after 3 years period of final completion and submission.

Duration:

Due to the intensiveness of this study, please be aware that it will take about 30 minutes of your time to response to questions provided in the participant questionnaire, and it will take focus group discussants 2 to 3 hours to complete. The study from proposal development to its final publication of findings will take about 10 months

Risk:

This study does not pose any major risk to participants. However, it is possible that some of the questions may pose emotional stress for you. In the event of such incidence, I will refer you to a counselor for counseling.

Benefits:

There will be no direct and immediate benefits to you for participating in this study but you can assure that findings from this study will make meaningful contributions in improving the Nation's overall immunization program.

Sharing of Research Findings:

At the end of the study period, findings will be shared with the County Health Team of Margibi County and the Ministry of Health- Liberia. All information shared shall remain confidential and no finding will be to any particular respondent. Copies of this work will also be shared with the University of Ghana. Results may be published so that the world at large benefit from the study.

Who to Contact:

In the event that you have any further question(s) during and/or after the study, you may contact me (Nathaniel K. Dovillie) at +233576850328/+231886542363; e-mail: nkdovillie@gmail.com.

This proposal was reviewed and approved by the Ghana Health Services ethical review committee, and a permit was obtained from the County Health Team (Margibi) to conduct the study in the County. Should you wish to find out more about this study please contact the following address:

Ghana Health Services Ethical Review Committee,
Research & Development Division,
Ghana Health Service,
P. O. Box MB 190, Accra.
Tel: +233-0302681109/0302679323
Fax +233-0302685424
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M/s Hannah Frimpong
Administrative secretary
Ghana Health Service Ethical Review Committee
Tel: +233-0507041223

Mr. Joseph Korhene
Director,
Office of the Community Health Department
Margibi County Health Team
Kakata, Margibi County
Liberia
e-mail: jkorhene@gmail.com

Part II. Certificate of Consent

Certificate of Consent:

I the under singed, have been asked to give consent to participate in this research which involves questionnaire/focus group discussion. I like to state that I have read the information herein, or it has been read and explained to me. I have had the opportunity to ask questions and every question asked has been answered to my satisfaction. Hence, I consent voluntarily to participate in this study.

Name of Participant _____ Code:_____

Signature/thumb print_____

Date _____

Day/month/year

Statement by the researcher/person taking consent:

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

A copy of this Informed Consent Form will be made available to participant for reference.

Name of Researcher_____ Date: _____

Appendix 2: Questionnaires

Questionnaires

Section 1. Socio-demographic and family information

Please select appropriate answer and circle the corresponding number in next column

Column 2		Column 3		Column 4
1	Name of district	Urban----------0 Rural---------- 1		
2	Marital status	Married-----1 Divorced---2 Widow -----3	Single------4 Others -----5 (specify)	
3	Sex of respondent	Male ----------0 Female ----------1		
4	Level of education completed	No education-1 Primary------2 Junior high--3	Senior high-4 College ----5 Vocational sch.---6	
5	Religion of respondent	1. Christian----0 2. Muslim------1 3. other --------2		
6	What is your occupation?	House wife - 1 Farmer ------ 2	Self employ-3 Employed- 4	*What job does the respondent do?*
7	How old were you on your last birthday?	18-23yrs--1 24-28yrs--2 29-33yrs -3	34-38yrs ---4 39-above --5 I don't know-6	*Age of respondent.*
8	What is your relationship to this child?	Mother----------1 Father----------2 Grandmother---3	Anty ---------- --- 4 Other (specify)--5	
9	Name of nearest health facility.			
10	How far is the health facility from you?	> 30 minutes walk-- 1 1-2 hours walk-2	3-4 hours walk -- 3 > 5 hours walk -- 4	*Inquire other means of getting to the health facility and note*
11	Does the health facility give vaccine to children from Monday to Friday?	No ----------0 Yes ----------1 I don't know ---------2		

Section 2. Knowledge, practices and behavior of childhood immunization.

	Column 1	Column 2	Column 3
12	Do you have a child that is 2 yrs or less living with you currently?	Yes ---------- 1 No ---------- 0	*If no, do not include in survey*
13	How many of these age children currently live with you?		*Allow respondent to state child's age*
14	How old is this child?		*Verify from immunization card if available*
15	Do you take your child for vaccine?	No ---------- 0 Yes ---------- 1	*If no, proceed to question # 19*
16	Why do you take your child for vaccine?	For protection ----------1 Because others are doing so----2 The doctors say so----------3 Others ----------4	
17	Do you have vaccine (immunization) card for this child?	No----------0 Yes----------1	*If yes, record immunization dates in above column 2 against each antigen.*
18	How many times has this child received vaccination since May 2015?	One time ----------1 Two time ----------2 Three times -------3 I don't know ------4	
19	Did you take your child for vaccination immediately after the Ebola outbreak?	No.....0 Yes.....1	*Immediately here means within the 1st four months after the country was declared free of the virus*
20	If no why?	Fear for Ebola vaccine----------1 Fear of the ETU----------2 Facility distance----------3 Facility was closed----------4 No staff at the clinic----------5 Others (specify)----------6	
21	What were the last vaccines your child took?	OPV--------1 BCG--------2 Pentavalant-3 Measles-----4 YF----5 Pneumococcal-6 I don't know ---7	Verify from card if available and move to question # 22.
22	What was responsible for you not taking your child for vaccination?		
23	Do you know when should your child begin immunization?	No ----------0 Yes ----------1 I don't know ------2	*If no, move to question # 25.*
24	At what age should your child start and end taking vaccine?	At birth to nine months ---1 1 month to 1year ----------2 1year to 5years ---------- 3 I don't know ---------- 4	
25	How many vaccines should your child take	One----------1 Two----------2 Five----------5	

	to be certificated or fully protected?	Three----------3 Four----------4	Six----------6 I don't know --7	

Section 3. Focus Group Discussion points.

Column 1	Column 2	Column 3
Name of district		
Name of community/Town/settlement		
Were we all here during the Ebola outbreak?		*Follow up by asking; how did our children get treatment*
What do we know about immunization?		*Immunization means vaccine for the under five children*
How did you feel vaccinating your child right after the Ebola disease?		*Clarify what you mean by right after the disease.* ***(within the first 4 months after the outbreak May - August 2015)***
Does everyone in this community take their child/children for vaccine?		*If yes follow the flow of the questions*
Did your child go for vaccine right after the Ebola outbreak?		*If no, probe further for reason(s)*
Now that the Ebola is over, how do you feel about vaccinating your child?		
What can be done so that all children age 0 to 12 months take vaccine?		

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
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Tel: +233-302-681109
Fax + 233-302-685424
Email: Hannah. Frimpong@ghsmail.org

My Ref. GHS/RDD/ERC/Admin/App/16/
Your Ref. No.

Nathaniel K. Dovillie
University of Ghana
School of Public Health
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 95/12/15**
Project Title	"Health Seeking Behaviour and Practices on Immunization for Under Five Years Children after Ebola Virus Disease Outbreak. A Case Study in Margibi Count-Liberia"
Approval Date	12th April, 2016
Expiry Date	11th April, 2017
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra