KNOWLEDGE, PERCEPTION AND MISCONCEPTIONS OF EBOLA VIRUS DISEASE AMONG AVIATION WORKERS AT MURTALA MUHAMMED AIRPORT, LAGOS

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DEDICATION

This research work is dedicated to the Almighty God who has brought me this far. He's the Lord that never fails. All glory and honour be ascribed unto him

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ABSTRACT

Ebola Virus Disease, also known as Ebola hemorrhagic fever (EHF), is a severe, often fatal illness in human. It is also a life threatening viral infection with a case fatality rate varying from 25% to 90%. The incubation period from infection with the virus to onset of symptoms is 2 to 21 days. Much of studies conducted on EVD are more premised on the transmission and prevention rather than people's perception and misconception of the virus. This study was therefore designed to access the knowledge, perception and misconception of EVD among Aviation Workers in Murtala Muhammed Airport, Lagos.

This was a cross sectional study using a three stage sampling technique to select 422 respondents from four departments selected at the Murtala Muhammed Airport, Lagos. A validated semi structured, self-administered questionnaire was used to elicit information on the knowledge, perception and misconceptions of EVD. Knowledge of EVD was accessed using a 22 point scale and knowledge scores were categorized as ≤12 poor; ≥13-17 fair and ≥18-22 good. Perception was accessed using a 9 point scale and perception scores were categorized as ≤5 and ≥6-9 as high and low perception respectively. Misconceptions on EVD were categorized as 1-4 as low and 5-7 as high misconception respectively. Data were analyzed using descriptive statistics, T-test and Chi-square.

Age of respondents was 36.5±8.6 years, 56.2% males and 43.8% females. Majority 87.9% had completed tertiary education. About one-third 30.6% of the respondents work at the Federal Airport Authority Nigeria, 23.5% at Nigeria Civil Aviation Authority, 22.5% at Port Health Authority and 23.5% at Nigerian Immigration Service. Many 71.3% of the respondents had spent less than 7 years on the job. Most of the respondents 79.4% were in the senior staff category, 20.6% were junior staffs and most 73.7% have had direct contact with travellers. Many 62.6% have heard about EVD before the outbreak in Nigeria but 37.4% were not aware of it. Knowledge score was 14.7±2.40 with 10.7% as good, 73.5% as fair and 15.9% as poor knowledge respectively. The major source of information on EVD was TV and radio 90.5%. Mean perception score was 6.3±1.4 with 72.5% having positive perception and 27.5% having negative perception. Many of the respondents 66.8% disagreed while slightly less than one third 30.8% agreed that frequent hand wash can prevent contacting Ebola. Misconception score was 4.77± 1.38 and

misconceptions reported on EVD included, drinking and bathing with salt water 15.1%. In addition, 10.7% reported that EVD is an incurable and deadly disease.

Findings suggest the need for continuous education on knowledge, perception and misconceptions of Ebola virus disease. There is also need for relentless effort in educating the public on the etiology of the deadly disease by use of behavioral change communication materials such as behavioral change communication materials, social media, internet and mobile phones to increase enlightenments about the disease.

Keywords: Knowledge, Perception, Misconception, Ebola Virus Disease (EVD)

Word count: 471

CERTIFICATION

I certify that this project was carried out by Jasini John IJANADA in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

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LIST OF ABBREVIATIONS

EVD- Ebola Virus Disease

EHF- Ebola Hemorrhagic Fever

NHPs- Non Human Primates

SHFV- Simian Hemorrhagic Fever Virus

USAMRIID- United States Medical Research Institute of Infectious Disease

ELISA- Enzyme Linked ImmunoSorbent Assay

IFA- Immuno Fluorescence

MSF- Medicines Sans Frontieres

WHO- World Health Organization

CDC- Centers for Disease Control

CDCP- Centers for Disease Control and Prevention

UNICEF- United Nations Children's Fund

HBM- Health Belief Model

FAAN- Federal Airport Authority Nigeria

NAMA- Nigerian Airspace Management Agency

NCAA- Nigerian Civil Aviation Authority

AIB- Accident Investigation Bureau

NIMET- Nigerian Metrological Agency

NIS- Nigerian Immigration Service

PHS- Port Health Services

NDLEA- Nigerian Drug Law Enforcement Agency

NAFDAC- National Agency for Food and Drug Administration and Control

SSS- State Security Service

NSCDC- Nigeria Security and Civil Defence Corps

SAHCOL- Skyway Aviation Handling Company

NAHCO- Nigerian Aviation Handling Company

NAHC- Nigerian Aviation Handling Company

RA- Research Assistants

PPE- Personal Protective Equipment

IHR- International Health Regulations

EOC- Emergency Operations Center

IMS- Information Management System

NFELTP- The Nigeria Field Epidemiology and Laboratory Training Program

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Ebola virus disease (EVD), previously known as Ebola haemorrhagic fever (EHF), is a severe, often fatal illness in human (WHO, 2015). The disease can be contracted by humans and non-human primates (NHPs) and it is a severe illness that is characterized by fever, headache, vomiting, diarrhoea, muscle pain, stomach pain, and inexplicable bleeding or bruising (WHO, 2014). Also, a maculopapular rash is sometimes observed. Despite the traditional name of "Ebola haemorrhagic fever," major bleeding is not found in the majority of patients, and severe haemorrhage tends to be observed only in the late stages of disease (Mike, Daniel, Martin and Jennifer, 2015). Some patients develop progressive hypotension and shock with multiorgan failure, which typically results in death during the second week of illness. In contrast, patient who survive infection commonly show signs of clinical improvement during the second week of illness (Mike et al., 2015).

It is also a life threatening viral infection that comes on very suddenly and rapidly progresses to severe toxicity due to dehydration from extravasations of fluids out of circulation. It appears seemingly sporadically and is often fatal in its infected host (WHO, 2015). The average EVD case fatality rate is around 50%. Case fatality rate has varied from 25% to 90% in the past outbreaks (WHO, 2015).

Ebola virus disease is caused by infection with one of the special viruses under the genus Ebola virus, in the family Filoviridae (Kuhn, Becker, Ebihara, Geisbert, Johnson, Kawaoka and Jahrling, 2010). Ebola Virus Disease first appeared in 1976 in two simultaneous outbreaks; one in Nzara, Sudan and the other in Yambuku, Democratic Republic of Congo (formerly known as Zaire). The latter outbreak occurred in a village near the Ebola River, from which the disease takes its name. Since then, it has been responsible for 30 known outbreaks in humans, ranging from 1 to over 14,000 infected

cases. As of December 3, 2014, the current Ebola outbreak was responsible for about 88% of all cases since 1976, and for 79% of all EVD deaths (WHO, 2014).

The EVD is native to Africa and is believed to have developed first in animals before spreading to humans. The first case of EVD outbreak in West Africa was reported in March 2014. This EVD outbreak is the largest and most complex since the Ebola virus was first discovered in 1976. There have been more cases and deaths in the 2014-2015 EVD outbreak than all others combined (WHO, 2015). The EVD has also spread between countries starting from Guinea, then spreading across land boarders to Sierra Leone and Liberia, by air traveller to Nigeria and USA, and by land to Senegal and Mali (WHO, 2015).

As of August 2015, there were 27,988 confirmed cases of Ebola virus disease reported, with 11,299 reported deaths in West Africa. Sierra Leone has the highest number of reported cases of 13,494, with 3,952 reported deaths. They are followed by Liberia which has recorded 10,672 cases with 4,786 deaths. Guinea on the other has recorded 3,786 cases with 2,524 deaths, and Nigeria has recorded about 20 cases with 8 deaths (WHO, 2015). Outside Africa, the United States of America has recorded 4 cases with just one death while Italy, Spain, United Kingdom, Mali and Senegal had 1 reported cases each with no death reported (WHO, 2015).

The most severely affected countries, Sierra Leone, Liberia and Guinea, have very weak health systems, lack human and infrastructural resources, and have only recently emerged from long periods of conflict and instability. On August 2014, the World Health Organization (WHO) Director General declared the West Africa outbreak a Public Health Emergency of International Concern under the International Health Regulations 2005 (WHO, 2015).

Ebola is confirmed to be transmitted through two main routes: firstly, it is thought that fruit bats of the Pteropodidae family are natural Ebola virus hosts. Ebola virus is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of the infected animals such as chimpanzees, gorillas, fruit

bats, monkeys, forest antelopes and porcupines found ill or dead or in the rainforest. Secondly, EVD can also be contracted through human to human transmission via direct contact through broken skin or mucous membranes with the blood, secretions, organs or other bodily fluids of the infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids. This route has not been confirmed but has been purported as the most likely transmission mechanism in the 2014-2015 outbreaks (Olival and Hayman, 2014).

Health care workers have frequently been infected while treating patients with suspected or confirmed EVD. This has occurred through close contact with patients when infection control precautions are not strictly practiced (WHO, 2015). Burial ceremonies in which mourners have direct contact with the body of the deceased person can also play a role in the transmission of Ebola virus (WHO, 2015). People remain infectious as long as their blood contains the virus. So far the recommendation to avoid sex after being infected by the virus was limited to three (3) months after the appearance of the first symptoms of the disease (WHO, 2015).

The incubation period, that is, the time interval from infection with the virus to onset of symptoms is 2 to 21 days. Humans are not infectious until they develop symptoms. First symptoms are the sudden onset of fever fatigue, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, symptoms of impaired kidney and liver function, and in some cases, both internal and external bleeding oozing from the gums and blood in the stools. Laboratory findings include low white blood cells and platelet counts and elevated liver enzymes (WHO, 2015).

1.2 Statement of problem

Ebola virus disease is a severe and fatal illness in humans. It is also a life-threatening viral infection which has been declared a public health problem by the director general of World Health Organisation in August, 2014.

Dr. Peter Piot, the scientist who co-discovered the Ebola virus stated that the 2014-2015 EVD outbreaks in West Africa is not following its usual linear patterns as mapped out in

previous outbreaks (Kucharski, Piot, 2014). He reported that the virus is “hopping” all over the West African epidemic region. Past epidemics have occurred in remote regions, but this outbreak has spread to large urban areas which have increased the number of contacts an infected person may have and has also made transmission harder to track and break (Kucharski, Piot, 2014). It is therefore increasingly clear that this phenomenon represents a worrying source of concern for communities, health practitioners and policy makers since everybody is at risk of contracting the disease in areas that are endemic, and have overburdened health care systems.

There were 27,988 confirmed cases of Ebola virus disease reported, and 11,299 reported deaths in affected countries. Sierra Leon has the highest number of reported cases of 13,494, with 3,952 reported deaths. Liberia has recorded 10,672 cases with 4,786 deaths; Guinea has recorded 3,786 cases with 2,524 deaths, while Nigeria has recorded about 20 cases with 8 deaths (WHO, 2015). The worrying phenomenon has prompted expansive studies on the disease especially in endemic areas e.g. Sierra Leon, Liberia and Guinea. Most of these studies have basically explained the clinical, immunological and some other aspects of its epidemiology.

The first known case of Ebola virus disease in Nigeria was in a traveller exposed in Liberia who was under medical observation in a hospital in Monrovia, Liberia for possible Ebola virus disease. Despite advice against travelling, on July 20 he flew by commercial airline from Monrovia via Accra, Ghana, to Lomé, Togo, then changed aircraft, and flew to Lagos (Faisal, Rajni, Emmanuel, Frank and Olukayode, 2014). On arrival at the Murtala Mohammed International Airport Lagos, on July 20, 2014, he was acutely ill and immediately transported to a private hospital where he was noted to have fever, vomiting, and diarrhea (CDC; 2014). The patient was later isolated and tested for Ebola virus infection while local public health authorities were alerted about a suspected case of Ebola. A blood specimen sent to Lagos University Teaching Hospital (LUTH) was confirmed positive for acute Ebola virus infection. The patient died on July 25 (Faisal et al., 2014).

In Nigeria, where the epidemic was properly managed, there is less work done on knowledge, perception and misconceptions of EVD especially with reference to aviation workers. Aviation workers have important role to play as they are the people that have direct contact with travellers coming in to the country which was the route the first case of Ebola got through to Nigeria. Their roles are equally indispensible in the identification of ill travellers, screening of travellers and treatment of suspected cases. In order to play these roles effectively, their knowledge of the disease, perception, misconception and other predisposing factors relating to the disease are essential.

It is against this background that this study was designed to assess the knowledge, perception and misconceptions of EVD among aviation workers. The study was also set to identify the gap in knowledge about the disease and factors that can promote the prevalence of the disease among aviation workers at Murtala Muhammad Airport, Lagos.

1.3 Justification of the study

Since the first case of Ebola Infection was reported in Nigeria in July 2014, there has been awareness and public enlightenment on Ebola virus. This has rightly precipitated a series of remedial actions and reactions at all levels of society. At the other extreme, rumours on folk remedies abound on the social and electronic media for example text messages. Nigerians, stricken with the fear of contracting the Ebola virus, are willing to experiment on any remedy, no matter how far-fetched. Even those supposedly enlightened have believed and acted on these myths. So far, Nigeria reported a total of 20 case and eight deaths, since the virus was brought to Nigeria (Lagos) on July 20, 2014 (WHO, 2014). However, media reports have it that four Nigerians have died from the excessive intake of salt, which is one of the misconceived but widely publicised preventive measures. This is a tragic illustration of the truth of the saying that ignorance is itself a disease.

Much of the studies conducted on Ebola Virus are more premised on the transmission and the preventive measures, particularly in Nigeria where the virus has been properly and adequately put under control. There has been little documentary research on the knowledge, perceptions and misconceptions of Ebola Virus and especially among

Aviation Workers in Nigeria prior to and after the outbreak of the disease. Aviation workers represent an important group in Nigeria with reference to the EVD. The first index case in Nigeria came in through the aviation route and subsequent cases have also been through this route.

This study sought to access the knowledge, perceptions and misperceptions about Ebola Virus Disease (EVD) among aviation workers who are the front line personnel in the Airport. The findings from this study will provide information on the knowledge, perception and misconception of EVD among aviation workers in Murtala Muhammed Airport, Lagos.

The findings from this study also have the potential to inform policy makers on EVD prevention, treatment and management among aviation workers. It could also help in designing health promotion and education activities among Aviation Workers in the General Aviation Terminal Lagos, Lagos, Nigeria.

1.4 Research questions

This study was designed to answer the following questions:

1. What is the knowledge of Aviation workers on Ebola Virus Disease?
2. What are the perceptions of Aviation Workers on Ebola Virus Disease?
3. What are the misconceptions of Aviation Workers about Ebola Virus Disease?

1.5.1 Broad objectives

To assess the knowledge, perception and misconception of aviation workers on the Ebola Virus Disease at the international terminal of the Murtala Muhammed Airport, Lagos.

1.5.2 Specific objectives

1. To assess the knowledge of aviation workers on Ebola Virus Disease.
2. To determine the perceptions of Ebola Virus Disease among the Aviation workers.
3. To identify the misconceptions of Ebola Virus Disease among the Aviation workers.

1.5.3 Hypothesis

1. There is no significant difference between respondents' socio demographic characteristics (age, gender, level of education and department) and level of knowledge on Ebola virus disease (EVD).
2. There is no significant difference between respondents' socio demographic characteristics (age, gender, level of education and department) and level of perception of Ebola virus disease (EVD).
3. There is no association between respondents' level of knowledge and perception on Ebola virus disease (EVD).
4. There is no association between respondents' perception and misconceptions of Ebola virus disease (EVD).
5. There is no association between respondents' level of knowledge and misconceptions of Ebola virus disease (EVD).

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of Ebola Virus Disease

Ebola virus disease (EVD), previously known as Ebola haemorrhagic fever (EHF) is a severe disease that can be contracted by humans and non-human primates (NHPs); it appears seemingly sporadically and is often fatal in its infected host. It is caused by infection with one of the special viruses under the genus Ebola virus, in the family Filoviridae (Kuhn et al., 2010).

Ebola Virus (EVD) is a severe and often fatal disease in humans and non-human primates (monkeys and chimpanzees) caused by the Ebola virus; characterized by high fever and severe internal bleeding; can be spread from person to person; is largely limited to Africa. A virus of African origin, belonging to the genus Filo virus, that causes a highly contagious infection characterized by fever, respiratory symptoms, bleeding, and sometimes central nervous system involvement with coma. In many patients there is progressive organ failure leading to death (Kuhn et al., 2010).

Ebola is confirmed to be transmitted through two main routes; firstly, through direct contact with a symptomatic, infected individual's blood or other bodily fluids (including mucus, vomitus, semen, faeces, saliva, and urine); and secondly, through direct contact with objects that and Outcomes for Movement and Monitoring of Travellers at Points of Entry have been recently tainted with these blood or bodily fluids of a human or non-human primate (Kuhn et al., 2010). In addition, it is thought to be introduced into a human or non-human primate population by direct contact with the blood or other bodily fluids of an animal host (thought to be fruit bats or duikers); this route has not been confirmed but has been purported as the most likely transmission mechanism at this time (Olival and Hayman, 2014).

The main symptoms of Ebola include fever, headache, vomiting, diarrhoea, muscle pain, stomach pain, and inexplicable bleeding or bruising (Kuhn et al., 2010). The cause of

Ebola haemorrhagic fever is Ebola virus infection that results in coagulation abnormalities, including gastrointestinal bleeding, development of a rash, cytokine release, damages to the liver and massive viremia (large number of viruses in the blood) that leads to damaged vascular cells that form blood vessels. As the massive viremia continues, coagulation factors are compromised and the micro vascular endothelial cells are damaged or destroyed, resulting in diffuse bleeding internally and externally (bleeding from the mucosal surfaces like nasal passages and/or mouth and gums and even from the eyes termed conjunctiva bleeding). This uncontrolled bleeding leads to blood and fluid loss and can cause hypertensive shock that causes death in many Ebola-infected patients (Olival and Hayman, 2014).

Ebola haemorrhagic fever is diagnosed preliminarily by clinical suspicion due to association with other individuals with Ebola and with the early symptoms described above. Within a few days after symptoms develop, tests such as ELISA, PCR, and virus isolation can provide definitive diagnosis. Later in the disease or if the patient recovers, IgM and IgG antibodies against the infecting Ebola strain can be detected; similarly, studies using immunohistochemistry testing, PCR, and virus isolation in deceased patients is also done usually for epidemiological purposes.

Several concurrent strategies should be employed to prevent the spread of Ebola virus. Strict infection control measures and the proper use of personal protective equipment are essential to prevent transmission to healthcare workers. In addition, individuals who have been exposed to Ebola virus should be monitored, so that they can be identified quickly if signs and symptoms develop. Other preventive measures may eventually include vaccination. However, at present, there are no approved vaccines to prevent Ebola virus disease (Mike et al., 2015).

Research on developing a vaccine against Ebola viruses is on-going; successful vaccines have been developed that work in experimental animals (mice and guinea pigs but not against macaques monkeys). With new and larger outbreaks of Ebola haemorrhagic fever possible, researchers are intensely working to develop an effective vaccine utilizing

genetically modified viruses, recombinant viruses, and inactivated Ebola viruses. Unfortunately, none are currently available (WHO, 2014).

2.2 Historical background of Ebola virus disease (EVD)

The family Filoviridae consists of two genera, the Ebola and Marburg viruses, which are among the most virulent pathogens in humans. The Zaire species of Ebola virus is the causative agent of the 2014-2015 epidemics in West Africa, in which the case fatality rate has been reported to be as high as 70 percent; rates in earlier outbreaks have reached 80 to 90 percent. Marburg virus has caused a similar disease in a smaller number of outbreaks in Central Africa (WHO, 2012).

Epidemics of Ebola virus disease are generally thought to begin when an individual becomes infected through contact with the body fluids of an infected animal. Once the individual becomes ill or dies, the virus spreads to others who come into direct contact with their blood or other body fluids. On rare occasions, Ebola virus disease has resulted from accidental laboratory infections, and there is concern that the virus might be used as an agent of bioterrorism (Mike et al., 2015).

Nearly 40 years since the first recognized Ebola outbreaks in Zaire and Sudan in 1976, a number of publications have described the clinical and laboratory features of this disease. That information is now being supplemented by a rapidly increasing number of case reports and large patient series from the epidemic in West Africa that describe the clinical manifestations and course of Ebola virus disease among those in West Africa, as well as those treated in American and European hospitals (Kucharski et al., 2014).

Although most features of Ebola virus disease in West Africa match earlier descriptions, two aspects appear to differ:

- Major hemorrhage is less common. Thus, the term "Ebola virus disease" is now being used, rather than the earlier name “Ebola hemorrhagic fever”.
- Volume losses from vomiting and diarrhea make a greater contribution to severe illness than previously recognized (Mike et al., 2015).

Ebola virus is a non-segmented, negative-sense, single-stranded RNA virus that resembles rhabdoviruses (rabies) and paramyxoviruses (measles, mumps) in its genome organization and replication mechanisms. It is a member of the family *Filoviridae*, taken from the Latin “filum” meaning thread-like, based upon their filamentous structure (Mike et al., 2015). In the past, Ebola virus and Marburg viruses were classified as "hemorrhagic fever viruses", based upon their clinical manifestations, which include coagulation defects, bleeding, and shock. However, the term "hemorrhagic fever" is no longer used to refer to Ebola virus disease since only a small percentage of Ebola patients actually develop significant hemorrhage, and it usually occurs in the terminal phase of fatal illness, when the individual is already in shock (WHO, 2014).

The genus Ebola virus is divided into five species (Zaire, Sudan, Ivory Coast, Bundibugyo, and Reston). The following four species cause disease in humans: The Zaire virus, since it was first recognized in 1976, has caused multiple large outbreaks in Central Africa, with mortality rates ranging from 55 to 88 percent. It is the causative agent of the 2014-2015 West African epidemics (CDCP, 2014). The Sudan virus has been associated with a case fatality rate of approximately 50 percent in four epidemics: two in Sudan in the 1970s, one in Uganda in 2000, and another in Sudan in 2004. The Ivory Coast virus has only been identified as the cause of illness in one person, and that individual survived. The exposure occurred when an etiologist performed a necropsy on a chimpanzee found dead in the Tai Forest, where marked reductions in the great ape population had been observed (Mike et al., 2015). The Bundibugyo virus emerged in Uganda in 2007, causing an outbreak of Ebola virus disease with a lower case-fatality rate (approximately 30 percent) than is typical for the Zaire and Sudan viruses. Sequencing has shown that the agent is most closely related to the Ivory Coast species.

The fifth Ebola virus species, the Reston virus, differs markedly from the others, because it is apparently maintained in an animal reservoir in the Philippines and has not been found in Africa. The Ebola Reston virus was discovered when it caused an outbreak of lethal infection in macaques imported into the United States in 1989. This episode brought the filo viruses to worldwide attention through the publication of Richard Preston’s book, The Hot Zone (Miranda and Miranda, 2011). Three more outbreaks

occurred among non-human primates in quarantine facilities in the United States and Europe before the Philippine animal supplier ceased operations. None of the personnel who were exposed to sick animals without protective equipment became ill, but several animal caretakers showed evidence of seroconversion (Miranda and Miranda, 2011).

Nothing further was heard of the Reston virus until 2008, when the investigation of an outbreak of disease in pigs in the Philippines unexpectedly revealed that some of the sick animals were infected both by an arterivirus (porcine reproductive and respiratory disease virus) and by Ebola Reston virus. Serologic studies have shown that a small percentage of Philippine pig farmers have IgG antibodies against the agent without ever developing severe symptoms, providing additional evidence that Ebola Reston virus is able to cause mild or asymptomatic infection in humans (Mike et al., 2015).

The filo viruses were first recognized in 1967, when the inadvertent importation of infected monkeys from Uganda resulted in explosive outbreaks of severe illness among vaccine plant workers in Marburg, Germany who came into direct contact with the animals by killing them, removing their kidneys, or preparing primary cell cultures for polio vaccine production (Miranda and Miranda, 2011). The causative agent, designated Marburg virus, has caused a number of outbreaks in Africa, including one in Uganda that was recognized in the beginning of October 2014, and was declared over in November 2014 (Nancy, Zhi-Young and Gary, 2014).

The other genus (Ebola Zaire and Sudan), Ebola virus, were first recognized when two outbreaks occurred in Zaire and in Sudan in 1976. Outbreaks of Ebola virus disease have been confined to Sub-Saharan Africa. An epidemic caused by the Zaire species caused several hundred cases in 1995 in Kikwit, Democratic Republic of the Congo, and the Sudan virus infected more than 400 people in Gulu, Uganda in 2000. The 2014-2015 Ebola epidemic, caused by the Zaire species of virus, is not only the first to occur in West Africa, but is far larger than all previous outbreaks combined (Mike et al., 2015).

In addition to causing human infections, Ebola virus has also spread to wild non-human primates, apparently as a result of their contact with an unidentified reservoir host

(possibly bats). This has contributed to a marked reduction in chimpanzee and gorilla populations in Central Africa, and has also triggered some human epidemics due to handling of and/or consumption of sick or dead animals by local villagers as a source of food.

2.3 Ebola virus disease outbreak in West Africa

Although all previous Ebola virus outbreaks occurred in Central Africa, an epidemic began in the West African nation of Guinea in late 2013 and was confirmed by the WHO in March 2014 (Mike et al., 2015). The initial case is believed to have been a two year old child who developed fever, vomiting, and black stools, without other evidence of haemorrhage (WHO, 2014). The report stated that there were 49 cases, including 29 deaths, in four Guinean districts bordering Liberia and Sierra Leone; seven blood samples were sent to Institut Pasteur in France, where polymerase chain reaction testing found Ebola virus in six of the samples (WHO, 2014). The outbreak subsequently spread to Liberia, Sierra Leone, Nigeria, Senegal, and Mali, Spain, the United States, and the United Kingdom. Sequence analysis of viruses isolated from patients in Sierra Leone indicated that the epidemic resulted from sustained person-to-person transmission, without additional introductions from animal reservoirs (DCDP, 2014).

2.3.1 Prevalence of Ebola virus in West Africa

Approximately 28,000 probable, suspected, and laboratory confirmed cases attributed to Ebola virus have been identified, with more than 11,000 deaths in affected countries (Nancy et al., 2014). These cases included 881 infected healthcare workers, of whom approximately 60 percent have died. The magnitude of the EVD outbreak, especially in Liberia and Sierra Leone, has probably been underestimated, due in part to individuals with Ebola virus disease being cared for outside the hospital setting early in the epidemic. In areas of West Africa where transmission was limited (e.g. Senegal, Nigeria, Mali), the disease has been eliminated. In areas of widespread transmission, the rate of new infections slowed significantly by the spring of 2015, and has continued to decline. As an example, the number of new cases has remained below 10 cases per week since the end

of July 2015, and WHO declared Liberia to be free of Ebola virus transmission on May 9th, 2015 (WHO, 2015).

As of August 2015, there were 27,988 confirmed cases of Ebola virus disease reported, while 11,299 reported deaths (WHO, 2015). Sierra Leon has the highest number of reported cases of 13,494, with 3,952 reported deaths. They were followed by Liberia which has recorded 10,672 cases with 4,786 deaths. Guinea on the other has recorded 3,786 cases with 2,524 deaths, while Nigeria has recorded about 20 cases with 8 deaths (WHO, 2015). United States of America has recorded 4 cases with just one death while Italy, Spain, United Kingdom, Mali and Senegal had 1 reported cases each with no death reported (WHO, 2015).

The most severe affected countries, Sierra Leone, Liberia and Guinea, have very weak health systems, lack human and infrastructural resources, and have only recently emerged from long periods of conflict and instability (WHO, 2015). On August 2014, the World Health Organization Director General declared the West Africa outbreak a Public Health Emergency of International Concern under the International Health Regulations 2005 (WHO, 2014). Cases of Ebola virus disease have also occurred in residents and healthcare workers who were exposed to the virus in West Africa, and were then treated in hospitals in the United States and Europe (Mike et al., 2015). As an example, on September 30, 2014, the first travel-associated case of Ebola was reported in the United States. An individual who was asymptomatic while travelling from Liberia to Dallas, Texas developed clinical findings consistent with Ebola virus disease approximately five days after arriving in the United States, and subsequently died. Two nurses involved in his care developed Ebola virus disease, but recovered (Mike et al., 2015).

2.3.2 Epidemiology of Ebola virus disease in West Africa

In August 2014, an outbreak of Ebola virus disease was reported in the Democratic Republic of the Congo. The index case was a pregnant woman who butchered an animal that had been killed by her husband. As of November 2014, a total of 66 cases of Ebola virus disease (confirmed and probable), including 49 deaths, had been connected to this

EVD outbreak (CDC, 2015). Sequence analysis has shown that the Zaire strain of Ebola virus causing this outbreak is most closely related to one that caused the 1995 outbreak in Kikwit; there is no connection with the current epidemic in West Africa (Nancy et al., 2014).

Perhaps the greatest mysteries regarding the filo viruses are the identity of their natural reservoir(s) and the mode of transmission to wild apes and humans. While Marburg virus has been isolated directly from bats captured in Uganda, only Ebola virus sequences, not infectious virus, have been detected in samples collected from bats in Central Africa (Laura and Staff, 2014). However, data suggest that bats are at least one of the reservoir hosts of Ebola viruses in Africa. The transmission pathway from bats to humans and the possible role of bats in the initiation of the 2014-2015 West African out-break have not been defined (Laura and Staff, 2014).

The World Health Organization, the Centres for Disease Control and Prevention, Médecins Sans Frontières (MSF), the U.S. military, the Cuban Ministry of Health, the International Red Cross, and countless other agencies have deployed individuals to these countries to assist in efforts to combat the outbreak (Dixon and Schafer, 2014). The EVD outbreak of 2014 is the largest Ebola epidemic in history (WHO, 2014). On September 2014, the CDC reported that if sufficient changes have not been made in community behaviour and additional interventions have not been made, that the count of Ebola cases may reach 1.4 million in Liberia and Sierra Leone by January 20, 2015 (Martin, Charisma, Scott and Barbara 2014). Never before has there been such a need for mass education and large-scale public health interventions.

2.4 Ebola virus disease outbreak in Nigeria

The first known case of Ebola virus disease in Nigeria was in a traveller exposed in Liberia. On July 17, 2014, while under observation in a hospital at Monrovia, Liberia, for a possible Ebola virus disease, the patient developed fever and, while symptomatic, left the hospital against medical advice. Despite advice against travel, on July 20 he flew by commercial airline from Monrovia via Accra, Ghana, to Lomé, Togo, then changed aircraft, and flew to Lagos (Faisal et al., 2014). On arrival at the Murtala Mohammed

International Airport Lagos, on July 20, 2014, he was acutely ill and immediately transported to a private hospital where he was noted to have fever, vomiting, and diarrhoea (CDC, 2014). During hospital admission, the patient was queried about Ebola and said he had no known exposure; he was initially treated for presumed malaria. Based on the patient's failure to respond to malaria treatment and his travel from an Ebola-affected country in the region, treating physicians suspected Ebola (CDC, 2014). The patient was isolated and tested for Ebola virus infection while local public health authorities were alerted about a suspected case of Ebola. A blood specimen sent to Lagos University Teaching Hospital (LUTH) was confirmed positive for acute Ebola virus infection. The patient died on July 25 (Shuaib et al., 2014).

Port Health Services conducted early contact tracing at the airport and worked with airlines and partners to ensure notification of the outbreak through International Health Regulations (IHR) 2005 mechanisms. The An emergency operations centre (EOC) case-management team took over management of each laboratory-confirmed or suspected case, triaged potential patients, and decontaminated areas inhabited by them. Patients with suspected infection were isolated in the suspected case ward at the Ebola treatment facilities, initially in Lagos and subsequently in Port Harcourt (CDC, 2014). A contact tracing team staffed and supervised by skilled, dedicated epidemiologists was established to investigate all primary contacts and alert the case management team of symptomatic contacts for assessment and possible reclassification (CDC, 2014). When a contact became ill with a suspected case, the contact tracing team gathered data on persons exposed to that contact from the date of symptom onset in the event the suspected case should become laboratory confirmed. Having the capacity to conduct Ebola laboratory diagnosis in Nigeria at the Lagos University Teaching Hospital facilitated rapid identification of confirmed cases and quick discharge of persons with suspected Ebola who tested Ebola negative (Faisal et al., 2014).

As of September 2014, 19 laboratories confirmed Ebola cases and one probable case had been identified. A total of 894 contacts were identified, and approximately 18,500 face-to-face visits were conducted by contact tracers to assess Ebola symptom development (CDC, 2014). Persons with suspected Ebola were transported to a suspected case

isolation ward by the case management team, and persons who subsequently tested Ebola positive were moved to the confirmed case ward at the same facility in either Lagos or Port Harcourt (CDC; 2014). Eleven patients had been discharged, one additional patient had a confirmed diagnosis in the convalescent stage, and eight had died (seven confirmed; one probable) for an overall case fatality ratio of 40%. (CDC, 2014).

The three generation spread of Ebola (all 19 confirmed and probable cases) to date can be traced to the index case through contact networks. Twelve of the 20 patients were exposed in two health facilities in Lagos. Four of the cases have been associated with a suspected case in a patient who travelled while ill via commercial aircraft from Lagos to Port Harcourt, Rivers State, and back. After the patient who travelled was discovered, manifests were collected from both flights, and attempts were made to contact passengers to ensure they had not become ill because 21 days had passed since the travel occurred (Faisal et al., 2014). No ill or deceased passengers were identified. Overall, no new cases have occurred since August 2014 in Lagos and September, 2014 in Port Harcourt, suggesting that the Ebola outbreak in Nigeria might have been contained (Faisal et al., 2014).

2.5 Prevention of Ebola Virus Disease

Strict infection control measures and the proper use of Personal Protective Equipment (PPE) are essential to prevent transmission to healthcare workers. In addition, individuals who have been exposed to Ebola virus should be monitored, so that they can be identified quickly if signs and symptoms develop. Other preventive measures may eventually include vaccination. However, at present, there are no approved vaccines to prevent Ebola virus disease (CDC, 2014).

2.5.1 Infection control precautions

When caring for patients with confirmed or suspected Ebola virus disease, health care personnel should follow infection prevention and control recommendations from the United States Centers for Disease Control and Prevention (CDC) and the World Health Organization (Mike et al., 2015). Recommendations include isolation of hospitalized patients with known or suspected Ebola virus disease; proper hand hygiene; the use of

standard, contact, and droplet precautions; and the correct use of appropriate personal protective equipment (PPE). If possible, aerosol-generating procedures should be avoided, but if they must be performed, patients should be placed in an airborne infection isolation room (Dixon and Schafer, 2014). The type of PPE used, and its careful placement (donning) and removal (doffing), are critical to prevent nosocomial transmission of Ebola virus.

The CDC and the WHO have issued detailed guidelines on the use of PPE for managing patient with suspected or confirmed Ebola virus disease. The type of PPE depends in part upon the patient's clinical presentation (e.g. presence or absence of diarrhoea, vomiting, bleeding) (Mike et al., 2015).

Highlights from these guidelines include the following:

- Rigorous and repeated training of healthcare workers in correct donning and doffing of PPE. In addition, healthcare workers should demonstrate competency in performing Ebola-related infection control practices and procedures.
- The type of PPE used by healthcare workers should cover all clothing and skin, and completely protect mucous membranes. Such PPE includes double gloves, boot covers, fluid-resistant gowns or coveralls, single-use disposable hoods that cover the head and neck, single-use disposable full face shields, and PAPR or N95 respirators. Additional measures, such as waterproof aprons, may also be required, depending upon the patient's symptoms. The combination of PPE used should be determined by the healthcare facility providing care.
- Healthcare workers should perform frequent disinfection of gloved hands using an alcohol-based hand rub, particularly after touching body fluids. In addition, they should immediately disinfect any visibly contaminated PPE using approved disinfectant wipes.
- A trained monitor should actively observe and supervise each worker donning and doffing PPE. Monitors should not serve as an assistant for taking off PPE.

The use of the recommended PPE for healthcare workers caring for Ebola patients for extended periods of time can potentially result in heat-related illness (WHO, 2015). This

may be of particular concern in West Africa. Recommendations to help prevent heat-related complications include: staying well hydrated; working short shifts until the healthcare worker can adjust to the heat; taking time to rest and cool down; and watching for signs of heat-related illness (Martin et al., 2014).

2.5.2 Environmental infection control

If a patient with suspected or confirmed Ebola virus disease is being cared for in a healthcare setting, specific precautions should be taken to reduce the potential risk of virus transmission through contact with contaminated surfaces. This includes frequent cleaning of the floor in the doffing area (i.e., where PPE is removed).

2.5.3 Monitoring and travel restrictions

The CDC and WHO provide information about restrictions on travel and transport of asymptomatic person who have been exposed to Ebola virus (CDC, 2015). Asymptomatic persons who have had a possible exposure at any risk level should be monitored for signs and symptoms of Ebola virus disease. Monitoring should continue for 21 days after the last known exposure; the development of fever and/or other clinical manifestations suggestive of Ebola virus disease should be reported immediately.

2.5.4 Breastfeeding and infant care

Ebola virus can be transmitted through close contact of an infected mother with her children. The CDC recommends that mothers under investigation or with confirmed Ebola virus disease avoid close contact (including breastfeeding) with their infant if the infant can receive adequate care and nutrition in other ways (Daniel, Jonathan, Scott, Felix, Matthew, 2015). There are no guidelines to suggest when women can resume breast feeding.

2.5.5 Sexual transmission

Patients recovering from Ebola virus disease may continue to have infectious virus in certain body fluids (e.g. urine, semen, vaginal secretions, and breast milk), even after virus is no longer present in the blood. However, the risk of virus transmission from these

sites in convalescent patients remains unclear (Deen, knust, Broutet, Sesay and Formenty, 2015). Although sexual transmission of Ebola virus has never been conclusively demonstrated, an individual may have transmitted the related Marburg virus to his wife following the 1967 outbreak. In addition, during the epidemic in West Africa, sexual transmission is being considered the source of exposure for several cases (Daniel et al., 2015).

To prevent sexual transmission of Ebola virus, the CDC and WHO suggest Ebola survivors refrain from sexual activity (oral, anal, vaginal); condoms should be used if abstinence is not possible (CDC, 2015). In addition, hand hygiene should be practiced following contact with semen. It is not known when unprotected sexual activity can be safely resumed. For men, the WHO suggests that the semen be tested for Ebola virus by reverse-transcription polymerase chain reaction (RT-PCR) three months after the onset of disease (Mike et al., 2015).

2.5.6 Vaccination

No approved vaccines are available to prevent the spread of Ebola virus (Nancy et al., 2014). Given the epidemic of Ebola virus disease in West Africa, accelerated paths toward licensure and introduction into field use are underway (Nancy et al., 2014). A number of experimental vaccines have successfully protected laboratory primates against an otherwise lethal Ebola virus challenge. These include a DNA vaccine followed by a recombinant human adenovirus type 5 vector encoding the Ebola Zaire and Sudan surface glycoproteins (GP), the recombinant adenovirus vaccine alone, a virus-like particle vaccine, a recombinant vesicular stomatitis virus (VSV) vector encoding Ebola surface GP and a chimpanzee-adenovirus type 3 vaccine (ChAd3) encoding Ebola virus GP (Mike et al., 2015). All of these vaccines have demonstrated efficacy in nonhuman primates when administered before virus challenge.

Prior to the outbreak in West Africa, the only vaccines that had been evaluated in humans were a multi-dose DNA vaccine and the recombinant adenovirus type 5 vaccine, and both proved safe and immunogenic in Phase I trials (Qiu, Wong, Audet, Bello and Fernado 2014). However, since recombinant vaccines employing human adenovirus 5 may be ineffective in persons with prior immunity to the adenovirus vector, alternative vaccines

have been explored. The WHO expert panel that convened in September, 2014 identified both the ChAd3 and VSV vaccines as the most advanced candidates for use in the West African outbreak (WHO, 2015).

2.6 Public health response to Ebola virus disease

An effective public health response depends upon effective communications between government authorities, medical professionals, and the local populace to explain the need for monitoring, sample collection and testing, isolation and other infection control measures, and the potential benefits of treatment (Mike et al., 2015). Preventive interventions also include educating and supporting affected communities to modify long-standing funeral practices and to avoid contact with bush meat and bats (Daniel et al., 2015). Anthropologists and others with specialized knowledge of local cultures should therefore be included as members of response teams (Martin et al., 2014).

Several measures have been implemented to help contain the Ebola virus disease outbreaks for 2014-2015 epidemics. These include:

- The World Health Organization declared the Ebola outbreak a Public Health Emergency of International Concern. This mandated countries to develop national preparedness capacities, including the duty to report significant events, conduct surveillance and contact tracing, as well as exercise public health powers, while balancing human rights and international trade (WHO, 2014).
- The United Nations created a special mission to help contain the outbreak. This is the first time that the UN has created a mission for a public health emergency (Mike et al., 2015).
- In the United States, public health authorities monitored healthcare workers who cared for patients with Ebola virus disease and travelers who arrived from areas with widespread transmission (Mike et al., 2015).
- Community care centers have been established in parts of West Africa to isolate patients who are awaiting Ebola diagnostic test results, and provide basic care (e.g. oral rehydration) to patients who have confirmed Ebola virus disease pending transfer to Ebola treatment units (Deen et al., 2015). The spread of Ebola virus has

been successfully limited in areas where there have been adequate resources and an effective public health response (Mike et al., 2015).

2.6.1 Public Health Response to Ebola virus disease in Nigeria

The threat to Nigeria posed by the arrival in Lagos of a patient acutely ill with Ebola was potentially enormous. Lagos is Africa's largest city and is also a transit hub for the region with air, land, and sea ports of entry (Faisal et al., 2014). The dense population and overburdened infrastructure create an environment where diseases can be easily transmitted and transmission sustained (CDC, 2014). Suboptimal infection control practices in health centres lacking necessary equipment and supplies increase the risk for Ebola transmission to health care workers. Contact tracing efforts are burdened by the complex nature of transit, commercial, and public health notification and reporting mechanisms. The implementation of a rapid response that made use of the available public health assets was the highest priority at the onset of the outbreak, as was organizing the response using proven structures for the delivery of public health in Nigeria. To effectively address Ebola in this complex environment, the response was mounted quickly and used an IMS; both actions are largely credited with helping contain the outbreak early (Faisal et al., 2014).

Initially, NCDC and the Lagos State Ministry of Health established an Incident Management Centre, which served as the overall implementing arm of the national response. The initial Incident Management Centre was subsequently recast as the national EOC, in line with IMS nomenclature and national structures aimed at emergency response (WHO, 2014). The EOC expanded its operations to Rivers State when cases emerged there, and oversaw the monitoring of contacts in Enugu State with state health officials as part of the early outbreak response. There was a stated expectation that all partner organizations, donors, and response teams would work through the EOC structure, reporting to an Incident Manager (IM). In turn, the IM would be responsible to deliver accountable and transparent results to the NCDC and the federal Ministry of Health (Faisal et al., 2014). The IM, responsible for oversight of the response, was selected based on IMS experience and competency rather than rank in government or public service.

With the emerging Ebola outbreak, the Nigerian government moved quickly to enforce coordination of the national and state Ebola response efforts using the IMS/EOC structures and drew from its successful experiences. Specifically, the Ebola EOC IM was the polio EOC Deputy IM, and seeded the Ebola EOC with several secretariat and technical staff members from the National Polio EOC (Faisal et al., 2014). Critical to demonstrating both national and state commitment, the Deputy IM was a senior member of the Lagos State Ministry of Health (Ebola was imported to Lagos State), with access to human and financial resources within the state health system. The EOC developed a functional staff rhythm that facilitated information sharing, team accountability and resource mobilization while attempting to minimize the distraction of teams from their highest priorities (Faisal et al., 2014).

The overall design of the response rested within a senior strategy team made up of the IM, Deputy IM, and primary partner agencies (Doctors without Borders, the United Nations Children's Fund, the World Health Organization, and CDC). Six response teams were developed within the EOC specific to an Ebola response, including: 1) Epidemiology/Surveillance, 2) Case Management/Infection Control, 3) Social Mobilization, 4) Laboratory Services, 5) Point of Entry, and 6) Management/Coordination CDC; 2014. Terms of reference and priority activities were developed by the strategy team to guide each operational team's work; operational teams developed their own staffing, lists of material and financial needs, and a goal-oriented operational plan. The strategy group reviewed and approved all of the teams' work and needed resources. Technical partners assigned staff throughout the operational teams in technical advisory roles aimed at building the capacity of the local teams and ensuring quality work (CDC, 2014).

As an example of work planning efforts, the EOC Point of Entry team, led and staffed heavily from the Port Health Service, was responsible for identifying, listing, documenting, and risk-ranking of all the contacts of the index patient at the airport, including those on aircraft and those exposed during airport transit/handling of the index patient. Early in the response, this team mobilized to identify and track the index patient's contacts in the airport and outside Nigeria (CDC, 2014). Port Health Service worked with

airline and airport authorities and other stakeholders to gather information about contact passengers, decontaminate affected areas of the airport, and send a notice through the World Health Organization-International Health Regulations system to avoid possible spread of the disease (CDC, 2014). The Point of Entry team also established entry and exit screening at ports, which is being rolled out at additional ports and will continue for the duration of the regional outbreak to minimize the likelihood of either further importation or exportation of Ebola (CDC, 2014).

The Epidemiology/Surveillance team was responsible for contact tracing, operational research, management of alerts and rumours, and implementing community-based surveillance. For successful contact tracing, the Epidemiology/Surveillance management team included over a dozen trained, dedicated NFELTP, WHO, and CDC epidemiologists and was provided the target of listing all contacts of the index and subsequent Ebola cases in the response, and monitoring them in person daily to measure body temperature and check for the presence of other Ebola signs and symptoms (e.g., vomiting, diarrhoea, and haemorrhage). In response, the team developed a staffing plan for Lagos that included over 150 contact tracers, vehicles, telephones, and mobile data platforms that the contact tracers could use to administer their questionnaires and report contact responses. In addition, the operational research arm of the Epidemiology/Surveillance team conducted a community Ebola assessment that informed training and communication efforts (Faisal et al., 2014).

Directly linked to the contact tracing was the Social Mobilization strategy. This included teams of three social mobilizers who were trained and deployed to conduct house-to-house, in-person visits within specific radii of the homes of the Ebola contacts. For high-density areas, house-to-house teams covered a 500m radius, 1km in medium density areas and 2km for low density (*7*). As of September 2014, approximately 26,000 households of persons living around Ebola contacts had been reached with house-to-house visits in Lagos and Rivers states (Faisal et al., 2014).

As of September 2014, the Nigeria response had successfully limited the outbreak to 20 laboratory confirmed and probable cases (in two states) with the last cases occurring on

August 18 and August 31 in Lagos and Port Harcourt, respectively. This limited spread and the rapid scale-up against the backdrop of the large, dense, urban environments of Lagos and Port Harcourt suggest early response efforts were successful; this is likely directly attributable to the Nigerian government's strategic use of its public health institutions and the EOC/IMS structure to manage the response (Faisal et al., 2014). The EOC/IMS approach should be a central part of national and subnational preparedness efforts for public health threats. EOC/IMS is a key component of the global health security agenda, along with Integrated Disease Surveillance and Response/International Health Regulations (IHR, 2005) (CDC, 2014).

In what WHO described as a "spectacular success story", the country held the number of cases to 19, with 7 deaths. World-class epidemiological detective work eventually linked all cases back to either direct or indirect contact with the air traveller from Liberia. WHO declared Nigeria free of Ebola virus transmission on 20th October, 2014 (WHO, 2015).

2.7 Treatment of Ebola Virus Disease

Treating patients with Ebola requires a multidisciplinary approach. All healthcare workers involved in the care of infected or potentially infected patients should use infection control precautions, including the proper use of personal protective equipment. (CDC, 2015). The mainstay of treatment for Ebola virus disease involves supportive care to maintain adequate cardiovascular function while the immune system mobilizes an adaptive response to eliminate the infection (CDC, 2014). In addition, several experimental antiviral therapies have been used in patients with Ebola virus disease during the 2014-2015 outbreaks in West Africa.

The efficacy of these agents is unclear and is an active area of investigation. In addition, the availability of these drugs is limited. Thus, decisions about whether or not to use antiviral therapy, the choice of antiviral therapy, and the timing of administration of antiviral therapy should be made in conjunction with public health officials. (Qiu et al., 2014).

2.7.1 Supportive therapy

The most important aspects of supportive therapy involve preventing intravascular volume depletion, correcting profound electrolyte abnormalities, and avoiding the complications of shock (WHO, 2014).

2.7.2 Fluid and electrolyte replacement

Fluid and electrolyte replacement can be administered orally or intravenously depending, in part, upon the stage of illness and the clinical presentation. As an example, in resource-limited settings, oral therapy to prevent or correct dehydration may be suitable for patients in the early phase of illness who respond to oral anti-emetic and anti-diarrheal therapy (Marshall, Aneeshk, Mehta, Jay and Kent, 2014). However, patients in shock, and those who are unable to tolerate or manage self-directed oral replacement therapy, will require intravenous fluids.

2.7.3 Respiratory support

Invasive mechanical ventilation (intubation) may be the best option for patients with progressive respiratory failure. When considering the management of such patients with Ebola virus disease, clinicians should recognize that some types of respiratory support present a hazard of generating infectious aerosols. The use of non-invasive mechanical ventilation or high-flow oxygen therapy (e.g. vapotherm) is generally not recommended given the potential for continuous aerosol production. (Marshall et al., 2014).

2.7.4 Antimicrobial therapy

As with other severely ill patients, persons with Ebola virus disease may require evaluation and/or treatment of other concomitant or possible infections (e.g. malaria) In addition, empiric antimicrobial treatment should be administered to patients with clinical evidence of bacterial sepsis, which may be a late complication. In some case series, empiric antimicrobial therapy was used for all patients at the time of initial presentation, or for patients who had evidence of gastrointestinal dysfunction, even if clinical evidence of bacterial sepsis was absent. However, data are currently lacking to justify this approach (Qiu et al., 2014).

2.7.5 Antiviral therapy

There are no approved medications for the treatment of Ebola virus disease or for post exposure prophylaxis in persons who have been exposed to the virus but have not yet become ill. However, the expanding epidemic in West Africa has focused attention on the potential anti-Ebola activity of a number of drugs developed for other purposes, which are either approved for use in humans or have been found to be safe in Phase II and Phase III trials. The urgent need for effective treatments has also accelerated the evaluation of several experimental therapies that had been developed specifically to treat or prevent Ebola or Marburg virus infection, but have only been tested in laboratory animals. In addition, there is renewed interest in the potential value of convalescent plasma and whole blood transfusions from Ebola survivors.

2.8 Conceptual framework

The Health Belief Model

The Health Belief Model (HBM) was first developed in the 1950s by social psychologist (Rita, Julita and Regan 2012). The model has been broadly applied in predicting health related behaviours, preventive health behaviours, sick role behaviours and clinic use. According to the HBM, there are six main constructs which influence people to take action towards their health. They are: Perceived susceptibility, perceived severity, perceive threats, perceived barriers, perceived benefits, cues to action and self-efficacy.

Perceived susceptibility: This refers to ones chances of getting a condition. It looks at the participants beliefs about what would happen if they did not take medications, precautions. This include how likely they would be to develop complications or have shortened life expectancy.

Perceived severity: Perceived susceptibility refers to the perception of an individual that he/she may be susceptible to a certain disease (Chakraborty, 2012). It is operative more in the personality or attitudinal spheres of an individual, indicating that his/her perception of personal susceptibility may result in both denial and acceptance of the susceptibility

Perceived threat: Perceived threat of a given health condition also operates at the psychological level and is demonstrated though an individual's attitude or behaviour. The seriousness can be measured by the outcome of a disease in an individual's life and how he/she is responding to the outcome in his/her life (Chakraborty, 2012).

Perceived benefits: These refers to belief in the efficacy of the advised action to reduce risk/ seriousness of impact A person's likelihood of adopting preventive health behaviour is largely dependent on the positive ratio of perceived benefit over perceived barriers. When perceived benefits of the recommended action exceeds the perceived barriers associated with the implementation of that action, the more likely a person is going to take preventive health actions.

Perceived Barriers: Change is something that comes easily to most people; the last construct of the HBM addresses the issue of perceived barriers to change. This is an individual's own evaluation of the obstacles in the way of him or her adopting a new behaviour. Of the entire construct, perceived barriers are the most significant in determining behaviour change. In order for a new behaviour to be adopted, a person needs to believe the benefits of the new behaviour outweigh the consequences of continuing the old behaviour (Centres for Disease Control and Prevention, 2004).

Cues to action: These are strategies to activate "readiness" Behaviour is influenced by cues to action. Cues to action are events, people, or things that move people to change their behaviour. The HBM suggests that with enough susceptibility and severity of the health threat, and with a perceived benefit of the health action, sometimes a cue acts as a trigger to take the recommended health action. Examples include illness of a family member, media reports (Graham, 2002), advice from others, reminder postcards from a health care provider (Ali, 2002), or health warning labels on a product.

Self-Efficacy: This was added to the original four beliefs of the HBM (Rita et al., 2012). Self-efficacy is the belief in one's own ability to take action towards health (Rita et al., 2012).

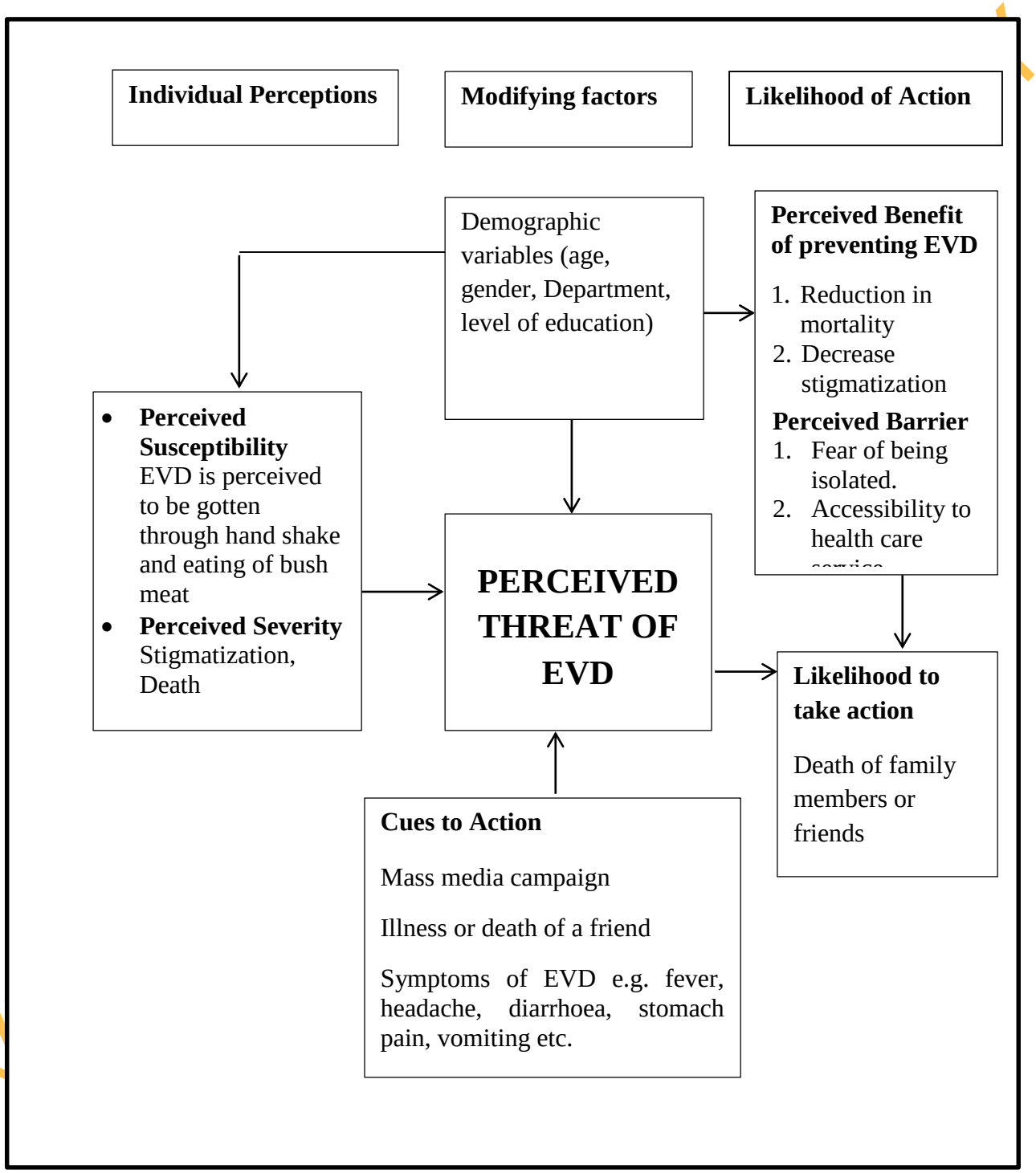
2.8.1 The application of HBM

The HBM will be used as the foundational framework for this project The recognition of the susceptibility of the disease to occur, and the acceptance of its seriousness are more likely to pose a health threat to an individual and force him/her to adopt a health behaviour (Chakraborty, 2012). The foundation of the HBM is that individuals will take action to prevent, control, or treat a health problem if they perceive the problem to be severe in nature, if they perceive that the action will yield or produce an expected outcome; and because of the perceived negative consequences of the disease (Samuel, 2014). The HBM states that an individual's behaviour can be predicted based on certain issues that the individual may consider (perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) when making a decision about a particular behaviour concerning his or her health (Rita et al., 2012). These concepts were proposed to account for people's "readiness to act." An added concept, cues to action, would activate that readiness and stimulate overt behaviour, while the concept of self-efficacy or one's confidence is the ability to successfully perform an action. These concepts were added to help the HBM fit better the challenges of changing habitual unhealthy behaviours.

Using HBM, the likelihood of individuals with Ebola adhering to biomedical prescription is determined first by its susceptibility which refers to the perception of vulnerability of contacting the EVD. How do individuals perceive Ebola and its outcomes mostly leading to death? An individual's perception of Ebola will likely motivate him or her to adhere to medical examinations and treatment. The severity, is the perception of Ebola as a serious illness, ranging from perceiving complications, such as internal and external bleeding, high body temperature, vomiting, to viewing Ebola as a life-threatening disease (*Question 13, 19 and 29 in Appendix I*). The fear of the disease is called "threat," and the belief that one can do something to avoid the threat is called "efficacy (*Question 20, 24 and 35 in Appendix I*). The benefits are the supportive care patients will receive to prevent intravascular volume depletion. Patients may lose large amounts of fluid through vomiting and diarrhoea, requiring rapid volume replacement to prevent shock. Patients will also benefit from hemodynamic monitoring and intravenous fluid repletion (Mike et

al., 2015). The perceived barriers as pointed out by Hewlett points to the obvious dangers of ostracism and isolation faced by those suspected of having the virus. They cannot travel, others may stigmatize them so that they cannot go to the market or gatherings, and people may stay away from their area. Finally, cues to action deals with strategies to activate readiness. It provides how to inform, promote awareness and reminders to take action.

Figure 2.1: The Health Belief Model



Adapted from Glanz et al., 2002.

CHAPTER THREE

METHODOLOGY

This chapter outlines the research design, study area, study population, sampling technique, methods and instruments for data collection, procedure for data collection and data analysis.

3.1 Study design

The research design for this study was a descriptive cross-sectional study design using questionnaire, to collect information on the general knowledge, perceptions and misperceptions of Ebola Virus Disease among Aviation Workers in Murtala Muhammed Airport Lagos.

3.2 Study area

The study was conducted at the Murtala Muhammed Airport Lagos. The airport is at Ikeja in Lagos and was built during the World War II. It was originally known as Lagos international Airport, it was renamed in the mid-1970s during the construction of the new international terminal after a former Nigerian military head of state General Murtala Muhammad. The international terminal was modelled after Amsterdam Airport Schiphol. The new terminal opened officially on 15th March 1979.

The airport consists of two terminals; an international and domestic terminal, located both at one kilometre from each other. Both terminals share the same runway. The domestic terminal used to be the old Ikeja Airport. International operations moved to the new international airport when it was ready while domestic operations moved to the Ikeja Airport, which became the domestic airport. The domestic operations were relocated to the old Lagos domestic terminal in 2000 after a fire. A new domestic privately funded terminal known as MMA2 has been constructed and was commissioned on 7 April 2007.

The international terminal consists of workers from eighteen departments. The major departments are; Federal Airport Authority Nigeria (FAAN), they are also referred to as the landlords in the aviation industry, Nigerian Airspace Management Agency (NAMA),

Nigerian Civil Aviation Authority (NCAA), Accident Investigation Bureau (AIB) and Nigerian Metrological Agency (NIMET). Others include Nigerian Immigration Service (NIS), Foreign Affairs, Port Health Services (PHS), Customs, Nigerian Drug Law Enforcement Agency (NDLEA), National Agency for Food and Drug Administration and Control (NAFDAC), State Security Service (SSS), Nigerian Air force, Nigerian Police, Nigerian Army, Nigeria Security and Civil Defence Corps (NSCDC), Baggage Handlers which include Skyway Aviation Handling Company (SAHCOL) and Nigerian Aviation Handling Company (NAHCO).

3.3 Study population

The study population consist of Aviation workers working at the Murtala Muhammed Airport Lagos. The respondents included staff of the Federal Airport Authority Nigeria (FAAN), Nigerian Civil Aviation Authority (NCAA), Port Health Authority (PHA) and Nigerian Immigration Service (NIS).

3.4 Inclusion criteria

1. Aviation workers belonging to FAAN, PHA, NIS and NCAA departments and who work at the international airport Lagos.
2. Aviation workers who can speak and read English.
3. Aviation workers who give consent to participate in the study.
4. Both male and female staff of the four departments selected for the study.

3.5 Exclusion criteria

1. Aviation workers who are not willing to give consent to participate in the study.
2. Aviation workers who do not belong to the four departments selected for the study.
3. Aviation workers who are not available during data collection.

3.6 Sample size

The sample size for this study will be calculated using (Lwanga & Lemeshow, 1991) sample size formula:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Where n=minimum sample size required

Z= confidence limit of survey at 95% (1.96)

P= Prevalence taken to be at 50%

d=absolute deviation from true value (degree of accuracy) = 5%

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384.2 \text{ approximate} = 384$$

A non-response rate of 10% will be added to the sample size calculated to make sample size 422 in order to address any possible case of incomplete response.

$$384 = \frac{384 \times 10}{100} = 38.4$$

Total = 422.4 approximate = 422.

3.7 Sampling technique

A three stage sampling technique was used for this study. It involved the following stages:

Stage 1: The departments selected for the study were first stratified into those that have their offices and staff at the airport and those that do not have all their staffs situated at the airport. Four departments had their offices and staffs at the airport and fourteen departments do not have their offices situated at the international terminal, Lagos.

Stage 2: The departments were further stratified into two; those that have direct contact with passengers and those that do not have direct contact with passengers. Three of the departments (FAAN, PHA and NIS) have direct contact with passengers while one (NCAA) department do not have direct contact with passengers.

Stage 3: In each of the four selected departments, (FAAN, PHA, NIS and NCAA) there was no documented figure on the total number of staff in each department. Therefore, questionnaires were administered to all the workers in the selected department based on their availability and consent to participate.

3.8 Method and instrument for data collection

A validated semi-structured self-administered questionnaire in English was used to obtain quantitative data on knowledge, perception and misconception of Ebola Virus Disease among aviation workers in the Murtala Muhammed Airport Lagos. The questionnaire contained both open-ended and closed-ended questions under the following sections:

A. Socio-demographic characteristics
B. Knowledge of Aviation workers on EVD
C. Aviation Workers perception of EVD
D. Aviation workers misconception on EVD

The researcher reviewed all open-ended portion of the questionnaire; codes were later developed for coding responses.

3.9 Validity and reliability of instrument

Validity: Several steps were taken to ensure the validity of the instrument. First validity of the content was achieved through consultation of relevant literatures and previous research works to develop relevant questions. Secondly, the questionnaire was reviewed several times by the supervisor for content and structure validity.

At the end of the pre-test, items that were not easily understood were rephrased and those that were found to be irrelevant were removed. Adequate spaces were provided for each response and some new questions were added.

Pre-test of the research instrument

The instrument: questionnaire was pretested among aviation workers working at Nnamdi Azikiwe International Airport Abuja. After the pre-test, appropriate modifications was made to the instrument based on the outcome from the pre-test.

Reliability: The data from the pre-test were subjected to Cronbach's Alpha model test to check how reliable the instrument was. This was done by self-administering the questionnaire once to about 10% equivalent of the study participants at the site chosen for the pre-test and subsequently the coefficient reliability was obtained using SPSS

computer software. A reliability coefficient of 0.735 was obtained, higher than the average correlation coefficient of 0.5 thus showing the instrument was very reliable. The outcome of the pre-test was used to correct and modify questions not adequately or appropriately answered by the respondents.

3.10 Data collection process

The administration of questionnaire was carried out by the researcher with the help of four (4) trained research assistants (RA): two females and two males. They were trained on the objectives of the study, understanding of the instrument for data collection, building rapport with respondents, interviewing skills, and the ethical issues involved in research prior to the time of data collection. The questionnaire was self-administered since the research participants could read and write in English language. The respondents were selected based on the inclusion criteria and consent of respondents was sought verbally. Administering of the questionnaires began in the morning at about 7.30am and lasted till evening 4.00pm for two weeks. Every department selected for data collection was visited and participants were surveyed in each department. Consent of the participants was sought before distribution of the questionnaire by explaining to them the purpose of the research, time to be spent and the benefits of the research. The questionnaires were retrieved immediately from the respondents after completion each day and checked for completeness by the researcher to guarantee quality assurance throughout the data collection process.

3.11 Data management and analysis

All questionnaires were reviewed and edited by the researcher for completeness and accuracy on daily basis. The questionnaires were then serially numbered for control and recall purposes. Sorting and collation of questionnaires was also carried out. The researcher checked on the quality of the information collected by going through each questionnaire. A coding guide was developed after carefully reviewing the responses. The data was inputted into the computer and the analysis was carried out using the SPSS software version 20. Frequency counts were run to detect missing cases and data cleaning

was carried out. Data were analysed using descriptive statistics and inferential statistics such as Chi square test and T-test.

3.12 Ethical considerations

The study followed ethical principles guiding the use of human participants in research. Approval was provided by the Airport Manager through the Head of Operations, Federal Airport Authority Nigeria (see appendix II for the letter of approval). Permission was obtained from the head of each department before the distribution of instrument. Four research assistants were trained to assist in the distribution and retrieval of the questionnaire. Special care was taken to ensure that there was no false compensation or inducement as a means of recruitment or as a way of keeping the study participants in the study.

Informed consent was sought to protect the right and dignity of the study participants. However, participants were given equal opportunity to give and withdraw their consent freely on or from participating during the study. Confidentiality of each participant was maintained during and after the collection of data.

3.13 Limitation of the study

The major limitation encountered was the workers busy schedule to complete the questionnaire. Most of the workers requested that questionnaires be dropped and retrieved later in the day. This led to so many unreturned questionnaires as the workers have shift duties. In order to overcome this limitation, the benefits of the study were clearly re-emphasized to respondents and they were asked to complete the questionnaire and return the questionnaire same day. Those who did not consent were excluded from completing the questionnaire.

This study also should have benefited from the use of qualitative methodology which was not used to provide in-depth understanding on the issue investigated.

CHAPTER FOUR

RESULTS

The findings from this study are presented in this chapter. They are organized into the following subsections:

- Socio demographic characteristics
- Knowledge on Ebola Virus disease,
- Perception on Ebola Virus disease
- Misconception on Ebola Virus disease

4.1 Socio-demographic characteristics of respondents

The ages of respondents ranged from 20 to 60 years with a mean of 36.47 ± 8.58 years as shown in Table 4.1. Many of the respondents (57.3%) fell between 31 to 45 years age group. The respondents were mostly educated with (87.9%) of them having completed tertiary education while only (12.1%) had secondary education. About one-third (30.6%) of the respondents are in the Federal Airport Authority of Nigeria, (23.5%) in Nigeria Civil Aviation, (22.5%) in Port Health Authority and (23.5%) in Nigeria Immigration Service department. Many (52.4%) of the respondents have spent between 7years and below on the job. Majority of the respondents (73.7%) have had direct contact with the passengers.

Table 4.1: Socio-demographic characteristics of the respondents (N=422)

Socio-demographic variable	Frequency	Percentage
Age (in years)		
30 years and below	121	28.7
31- 45 years	242	57.3
46-60 years	59	14.0
Sex		
Male	237	56.2
Female	185	43.8
Level of Education		
Primary	0	0.0
Secondary	51	12.1
Tertiary	371	87.9
Department you work in		
FAAN	129	30.6
NCAA	99	23.5
PHA	95	22.5
NIS	99	23.5
Level in the Organization		
Junior Staff	87	20.6
Senior Staff	335	79.4
Years on job		
0-7years	221	52.4
8-14years	136	32.2
15-21years	41	9.7
22-28years	15	3.6
29-45years	9	2.1
Do you have direct contact with travellers?		
Yes	311	73.7
No	111	26.3

4.2 Respondents knowledge on Ebola Virus Disease (EBV)

Majority of the respondents (62.6%) reported to have heard about Ebola before the outbreak in Nigeria while only 37.4% were not aware of it. The major source of respondents' information on Ebola Virus disease includes TV/Radio (90.5%), internet (78.9%), friends and family (61.4%), posters (50.7%), and text message (45.3%). Many (69.9%) of the respondents reported Ebola Virus Disease as a haemorrhagic fever while about half (43.6%) of the respondents reported high body temperature as symptoms of Ebola. Other details are presented in Table 4.2.

Respondents knowledge on causes of Ebola in humans shows that more than one third of the respondents 39.8% reported contact with infected victims or object can cause Ebola virus disease, 32.5% reported that eating infected animals like monkeys and bush meat can cause Ebola in humans, 6.4% reported Ebola virus as the cause of Ebola in human, 5.2% unhealthy and dirty environment, (3.3%) irregular hand wash with soap or sanitizer, (1.9%) wickedness in leadership while only (0.9%) reported American intervention and traditional burial right as the cause of Ebola in human (Table 4.2).

In Table 4.3, assessing respondents' knowledge on prevention of Ebola virus disease, majority of the respondents (84.8%) reported that presence of EVD is confirmed by both internal and external bleeding and almost all the respondents (96.2%) agreed that EVD can be prevented through hand washing with soap and detergent. Majority of the respondents (97.4%) reported that EVD can be prevented by avoiding contact with travellers. Majority (95%) also agreed that Quarantining and isolating suspected patients is a control measure to prevent the spread of Ebola virus disease while 4.1% of the respondent disagree about the point.

The three commonest mode of transmission of Ebola reported by the respondents includes touching contaminated objects (80.1%), Eating infected Animals (93.4%) and through body fluids from infected individuals (94.8%) while only few (12.1%) and (13.3%) reported that it can be transmitted through air and political conspiracy respectively. Majority of the respondent (74.9%) reported that Ebola can be gotten from an infected person who does not have fever or the symptoms while most of the respondent (76.1%) disagree that mosquito can spread Ebola, (15.4%) reported that Ebola

can be spread through mosquito bite. When asked if someone can get Ebola through eating of bush meat, majority (60.2%) of the respondents reported correctly that Ebola can be transmitted through eating of bush meat. About half (50.5%) of the respondents disagree that someone who survives Ebola can spread the virus while (40%) believe someone cured of Ebola can still spread the virus. Ebola can be brought to Nigeria through imported meat was agreed to by majority (85.5%) of the respondent while more than half of the respondents (68.2%) reported to believe that Ebola can be contagious even before they begin to show symptoms on the patients, (21.6%) reported that EVD cannot be contagious before the patient begin to show symptoms. More than half of the respondents agreed that Ebola can be contacted during incubation period (67.3%), while majority of the respondent (89.3%) reported that transmission can be through handshake or other environmental sources (e.g. water, other fluid and food) as Shown in Table 4.4.

The mean knowledge score obtained by the respondents was 14.66 ±2.40. The knowledge of the respondents was categorized into Poor (0-12), Fair (13-17) and Good (18-22). Only 10.7% had good knowledge of EVD while majority of the respondents (73.5%) had fair knowledge of EVD. About fifteen percent (15.9%) of the respondents had poor knowledge of Ebola Virus disease (Figure 4.1).

Table 4.2: Respondents' Knowledge on concept of Ebola Virus Disease (N=422)

Knowledge Variable	Frequency	Percentage
Heard of Ebola before outbreak in Nigeria		
Yes	246	62.6
No	158	37.4
Source of information on EVD**		
TV/radio	382	90.5
Internet	333	78.9
Friends and family	259	61.4
Religious gathering/community	123	29.1
Text message	191	45.3
Posters	214	50.7
Social media	363	86.0
EVD is also known as haemorrhagic Fever**		
Yes	295	69.9
No	43	10.2
Don't know	80	19.0
Symptoms of Ebola**		
High body temperature	184	43.6
Bleeding	34	8.1
Body weakness	10	2.4
Body Pains	10	2.4
Sickness	14	3.3
Cold and cough	20	4.7
Head ache	21	5.0
Nausea	9	2.1
Red eye	6	1.4
Sore throat	2	0.5
Rashes	15	3.6
Loss of body fluid^{++}	49	11.6

Causes of Ebola in Humans**		
American Invention	4	0.9
Touching contaminated objects and infected blood	168	39.8
Eating infected animals	137	32.5
Ebola Virus	27	6.4
Irregular Hand Wash with soap and sanitizer	14	3.3
Kills body metabolism	11	2.6
Medical Problem	12	2.8
Traditional burial right	4	0.9
Unhealthy and dirty Environment	22	5.2
Wickedness in Leadership	8	1.9

**Respondent could name more than one source of information; hence, the total did not add up to the total study group of 422.
++Vomiting, Diarrhoea and stooling.

Table 4.3: Respondents' Knowledge of Prevention of Ebola Virus Disease (N=422)

Knowledge Variable	Frequency	Percentage
Presence of Ebola is confirmed by Both internal and External bleeding		
Yes	358	84.8
No	30	7.1
Don't know	34	8.1
EVD can be prevented through hand washing with soap/detergent		
Yes	406	96.2
No	14	3.3
Don't know	2	0.5
Avoiding Contact with Travellers prevent EVD		
Yes	411	97.4
No	8	1.9
Don't know	3	0.7
Quarantining and isolating suspected patients is a control measure to prevent the spread of EVD		
Yes	401	95.0
No	17	4.1
Don't know	4	0.9

Table 4.4: Respondents' Knowledge of mode of transmission of Ebola virus disease (N=422)

Knowledge Variable	Frequency	Percentage
Commonest mode of transmission of Ebola*		
Eating infected Animals	396	93.8
Body fluids from infected individuals	400	94.8
From Air	51	12.1
Touching Contaminated objects	338	80.1
Conspiracy and political	56	13.3
Ebola can be gotten from an infected person who doesn't have fever or the symptoms		
Yes	316	74.9
No	78	18.5
Don't know	28	6.6
Ebola can be spread through mosquito bite		
Yes	65	15.4
No	321	76.1
Don't know	36	8.5
Can someone get Ebola through Eating bush meat?		
Yes	254	60.2
No	141	33.4
Don't know	27	6.4
If someone survives Ebola can he/she still spread the Virus?		
Yes	185	43.8
No	213	50.5
Don't know	24	5.7
Can Ebola be brought to Nigeria through imported animals?		
Yes	361	85.5
No	39	9.2
Don't know	22	5.2
Ebola virus can be contagious even when they begin to show symptoms on the patient?		
Yes	288	68.2
No	91	21.6
Don't know	43	10.2
Can Ebola be contagious during the incubation period (2-12days)		
Yes	284	67.3
No	89	21.1
Don't know	49	11.6
Transmission can be through handshake or other environmental sources (e.g. water, other fluid, and food)?		
Yes	377	89.3
No	29	6.9
Don't know	16	3.8

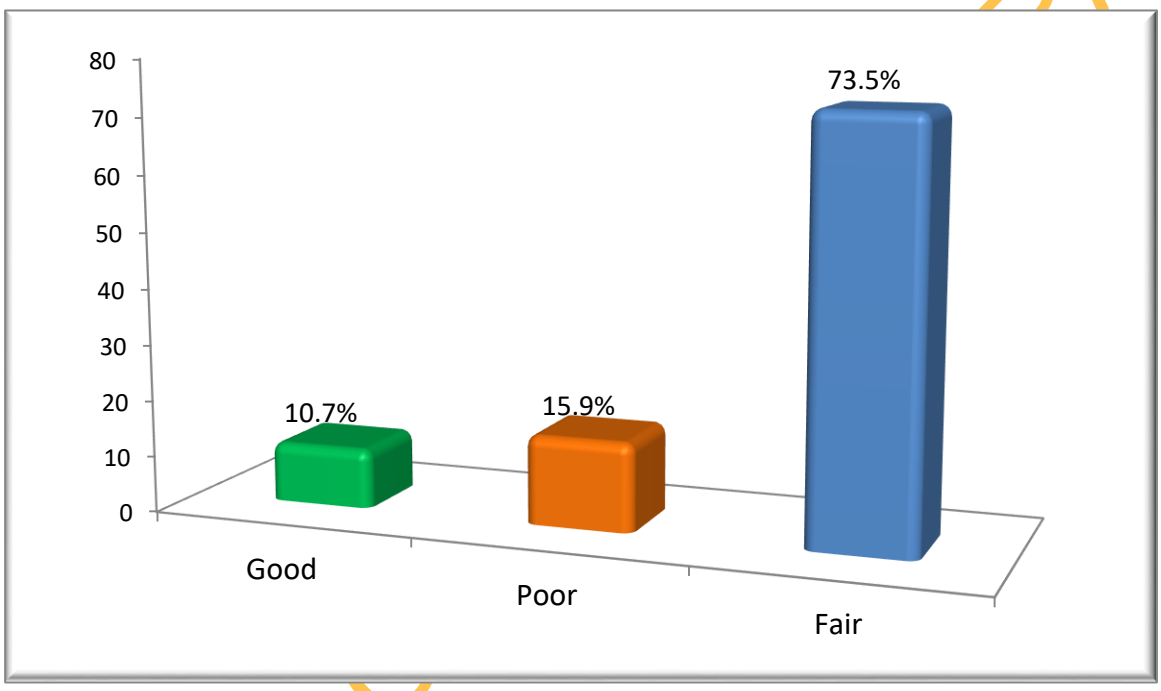


Figure 4.1: Respondents' Knowledge Category on Ebola Virus Disease (EVD)

4.4 Respondents Perception on Ebola Virus Disease

Table 4.5 shows the respondents perception on Ebola virus disease. Majority of the respondent agreed that wearing waterproof disposal gloves before touching the sick person, blood or other body fluids can prevent them from having Ebola while 3.8% disagreed that water proof disposal gloves prevent them from having Ebola. When asked about how frequent hand wash prevent Ebola virus disease, only 30.8% agreed while majority (66.8%) of the respondents disagreed that frequent hand wash can prevent from contacting Ebola virus disease. Some of the respondents (41.2%) also believed that wearing closed toe shoe does not prevent from contacting Ebola, while about 50.9% disagreed. More so, almost half of the respondent (48.8%) believed that anyone having fever of temperature of 100.4^{o}F/38^{o} C or higher confirms Ebola virus disease while 35.8% disagreed. Majority of the respondents (86.5%) agreed that wearing surgical mask, face shield, or goggle when providing direct care to a sick traveller could prevent transmission of Ebola Virus Disease. Almost all the respondent (91.7%) believed treating all body fluids as though they are infectious is a control measure against Ebola.

When asked if considering double gloving when cleaning large amount of blood or other body fluids can prevent them from contacting Ebola, majority (80.8%) agreed while only 8.8% disagreed. Few of the respondents (42.7%) believe that laboratory surfaces, door handle, lock, faucet, sink, walls, counter, and toilet seat cannot transmit Ebola while 53.1% disagreed. About 71.1% believed that package or luggage do not pose a risk as Ebola virus can be spread only through direct contact with blood or body fluids. Few of the respondents (18.5%) do not agree that package or luggage do not pose a risk as Ebola virus is only through direct contact with blood or body fluid.

The mean perception score of the respondents is 6.29±1.21. The perception was then categorized into Negative perception (0-5) and Positive perception (6-9). Majority of the respondents (72.5%) had positive perception of Ebola virus disease while few (27.5%) had negative perception as shown in Table 4.7.

Table 4.5 Perceptions of Respondents on Ebola Virus Disease (EVD)

Variable	Frequency	Percentage
Wear waterproof disposable gloves prevent me from having Ebola		
Agree	390	92.4
Disagree	16	3.8
Undecided	16	3.8
Frequent hand wash prevents me from EVD		
Agree	130	30.8
Disagree	282	66.8
Undecided	10	2.4
Closed toe shoe don't prevent me from EVD		
Agree	174	41.2
Disagree	215	50.9
Undecided	33	7.8
I believe Fever with temperature of 100.4°F/38°C† or high confirms EVD		
Agree	206	48.8
Disagree	151	35.8
Undecided	65	15.4
Wearing surgical mask prevents could prevent me from EVD		
Agree	365	86.5
Disagree	44	10.4
Undecided	13	3.1
Treating all body fluids as infectious prevents EVD		
Agree	387	91.7
Disagree	25	5.9
Undecided	10	2.4
Double gloving when cleaning fluids prevents EVD		
Agree	341	80.8
Disagree	37	8.8
Undecided	44	10.4
Lavatory surface, door handle cant transmit EVD		
Agree	180	42.7
Disagree	224	53.1
Undecided	18	4.3
Packages/Luggage's don't spread EVD		
Agree	300	71.1
Disagree	78	18.5
Undecided	44	10.4

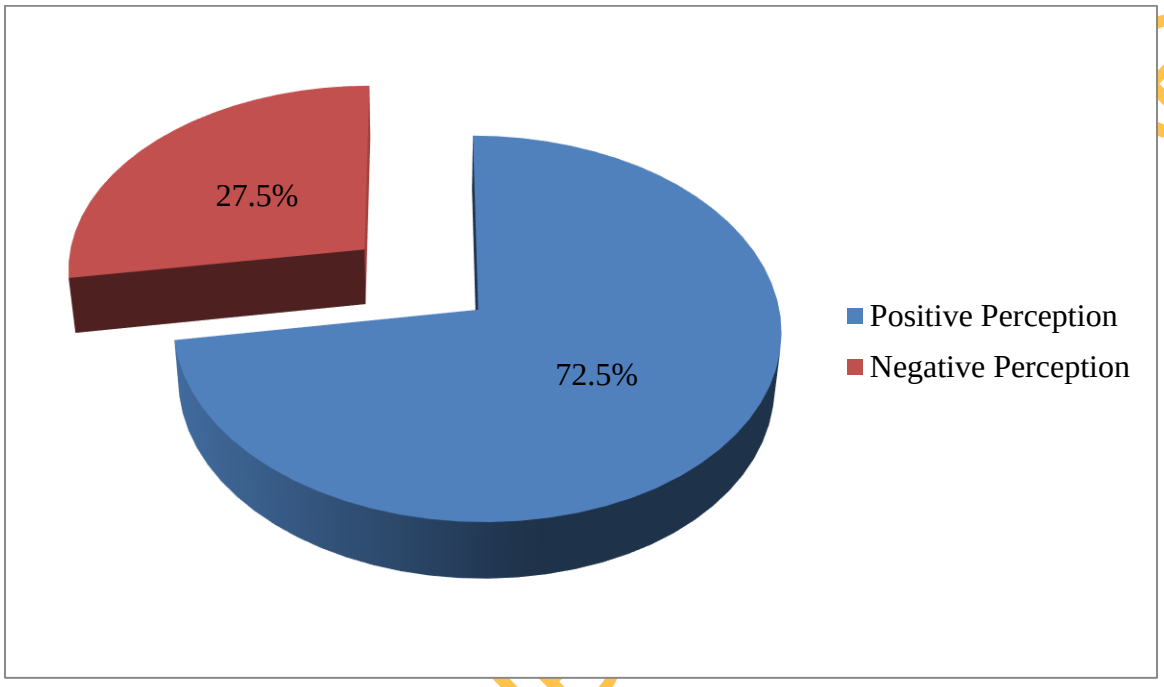


Figure 4.2: Perception category of respondents on Ebola Virus Disease (EVD)

4.5 Misconception on Ebola virus

More than half of the respondent (70.6%) supported the notion that if a suspected Ebola patient boards a plane, all the passengers on board are at risk of contracting the disease. Few (28.4%) disbelieve a suspected Ebola patient in the same plane do not put those on board at risk of contracting Ebola as shown in (Table 4.6a).

Majority of the respondents (73.0%) reported 'No' when asked if Ebola can be spread through air. EVD is a medical/spiritual problem was only supported by few of the respondents (31.3%). Many of the respondents (56.9%) believe Ebola virus disease is not a medical/spiritual problem. Only Few the respondents (12.1%) said 'Yes' that Ebola virus disease can be spread through mosquito bite while majority (81.0%) believe mosquito cannot spread Ebola virus. Assessing if Ebola virus disease can be cured with local/traditional herbs, only few of the respondents (14.0%) believe traditional herbs can cure Ebola virus disease. However, majority (66.1%) reported that Herb cannot cure the disease. Avoiding body contact in the public can prevent one from contacting the Ebola disease was supported by majority of the respondents (74.9%). Few of the respondents (16.8%) reported that avoiding contact in public cannot prevent contracting of Ebola as shown in Table 4.6a.

In Table 4.6b, the respondents were asked if they know/have other misconceptions about Ebola Virus disease, 37.7% of the respondents reported their misconceptions on Ebola virus disease. Out of those who reported their misconception, mostly reported misconception is Drinking and bathing with salt water (15.1%), incurable and deadly disease (10.7%), only God knows (10.7%), Environmental and scientifically created (9.4%), America conspiracy against Africans (9.4%), Juju/witchcraft (6.9%), political agenda to generate money (5.7%), Avoid body contact with infected victim (5.0%), Air borne (4.4%), Nigerian bush meat don't cause Ebola (3.8%), EVD is not real (3.8%), News and Media agenda settings (3.1%), Technological and Advancement (2.5%), Reduce the population of Africa (1.9%), EVD is hereditary (1.9%), race motivated (1.9%), Traditional belief/cured with herbs (1.9%), mosquito bite can transmit Ebola (1.3%) and ignorance (0.2%).

The mean misconception score of the respondent is 4.77± 1.38. The misconception on Ebola virus disease of the respondents was categorized in to High misconception (1-4) and Low Misconception (5-7). About 42.9% of the respondents were found to have high misconception on Ebola Virus Disease with 57.1% of the respondents have Low misconception on the disease as of the time of this study as shown in Figure 3.

Table 4.6a: Respondents Misconception on Ebola Virus Disease (EVD) (N=422)

Variables	Frequency	Percentage
Suspected EVD patient boards plane, other passengers at risk		
Yes	298	70.6
No	120	28.4
Don't know	4	.9
EVD spread through air		
Yes	92	21.8
No	308	73.0
Don't know	22	5.2
EVD is a medical/spiritual problem		
Yes	132	31.3
No	240	56.9
Don't know	49	11.6
Non response	1	.2
EVD can be spread through mosquito bite		
Yes	51	12.1
No	342	81.0
Don't know	29	6.9
EVD can be cured with traditional herbs		
Yes	59	14.0
No	279	66.1
Don't know	84	19.9
Avoiding body contact in Public prevents EVD		
Yes	316	74.9
No	71	16.8
Don't know	35	8.3

Table 4.6b: Other Misconception reported by respondents

Misconception Variable	Frequency	Percentage
Air borne	7	1.7
American conspiracy against Africa	15	3.6
Avoid body contact with infected victim	8	1.9
Drinking and bathing with salt and water	14	3.3
Environmentally and Scientifically Motivated	15	3.6
EVD is hereditary	3	0.7
EVD is not real	6	1.6
Ignorance	1	0.2
Incurable and Deadly disease	17	4.0
Juju and Witchcraft	11	2.6
Mosquito bite	2	0.5
News and media agenda settings	5	1.2
Only God knows	14	4.0
Politically Motivated	9	2.1
Race Motivated	3	0.7
Reduce the population of Africa	3	0.7
Technology and advancement	4	0.9
Traditional belief	3	0.7
Non response	263	62.3

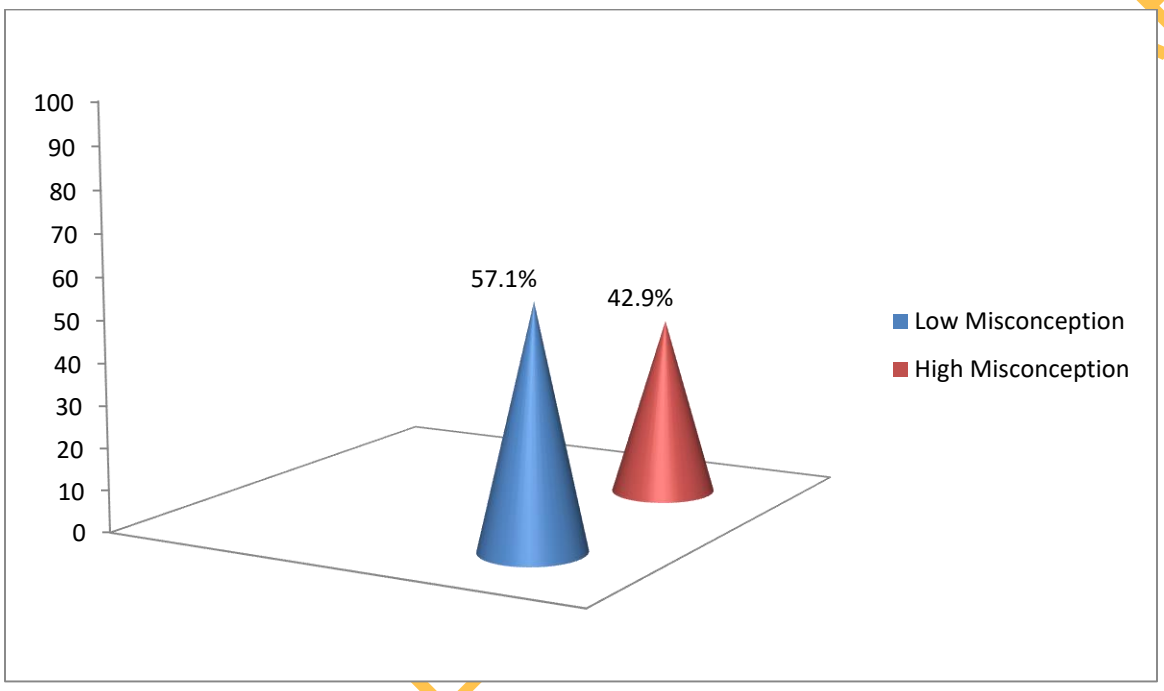


Figure 4.3: Level of Misconception on Ebola Virus Disease among Respondents'

Test of hypothesis

The level of significance used for testing all hypotheses was set at an alpha level of 0.05.

Hypothesis 1

Socio –demographic characteristics and level of knowledge of respondents.

General knowledge of respondents was categorised into poor, fair and good.

Age group and level of knowledge

In this study, relationship between age category and level of knowledge among the respondents' shows that poor level of knowledge was higher among worker of between 1-46 years (6.8%). Good and fair knowledge was highest among workers between 31-45years 0.8% and 95.0% respectively. This result was found not to be statistically significant (P-value of 0.495, P> 0.05). Therefore, there is no significant difference between workers' age category and their level of knowledge on Ebola virus disease. Chi-square test (X^2) was used to determine the association.

Gender and level of knowledge

In this study, poor level of knowledge was higher among male workers (6.3%) compared to female workers (4.3%) while average knowledge on Ebola virus disease was higher among female workers (95.7%) compared to male workers (92.8%). Good level of knowledge was higher among male workers (0.8%) compared to female (0.0%).This result was found not to be statistically significant (P-value of 0.299, P> 0.05). Therefore, there is no significant difference between workers' gender and their level knowledge on Ebola virus disease. Chi- square test (X^2) was used to determine the association.

Level of education and Level of knowledge on Ebola virus disease (EVD)

This study found poor level of knowledge to be more among workers with secondary level of Education (11.8%) compared to workers with tertiary level of Education. Average knowledge on Ebola virus disease was higher among workers with tertiary level of education (95.4%). Good level of knowledge was found in few workers (3.9%) with secondary level of Education (0.8%). This result was found to be statistically significant (P-value of 0.000, P< 0.05). Therefore, there is significant difference between workers' level of education and their level knowledge on Ebola virus disease. Hence, the null hypothesis H_o is rejected. As shown in Table 4.7 below.

Table 4.7 Association between respondents' level of education and Level of knowledge on Ebola virus disease (EVD)

Socio-demographic characteristics	Poor Knowledge (%)	Fair Knowledge (%)	Good Knowledge (%)	X^2	Df	P-value
Education				19.381[a]	2	0.000
Primary	0.0	0.0	0.0			
Secondary	11.8	84.3	3.9			
Tertiary	4.6	95.4	0.0			

* No respondents with primary level of Education

Workers department and level of knowledge

This study found poor level of knowledge higher among workers in NIS (Nigeria immigration service (12.1%) compared to workers in other agencies in the study. Workers in NCAA (Nigeria civil Aviation) had fair knowledge on Ebola virus disease while only 2.0% of the respondent in NIS (Nigeria immigration service) had good knowledge on Ebola virus disease. This result was found to be statistically significant (P-value of 0.000, P< 0.05). Therefore, there is significant difference between workers' level of education and their level knowledge on Ebola virus disease. Hence, the null hypothesis H_o is rejected. As shown in Table 4.8 below.

Table 4.8 Association between respondents' department and level of knowledge

Socio-demographic characteristics	Poor Knowledge (%)	Fair Knowledge (%)	Good Knowledge (%)	X^2	df	P-value
Departments				18.185[a]	6	0.006
FAAN	3.1	96.9	0.0			
NCAA	3.0	97.0	0.0			
PHA	4.2	95.8	0.0			
NIS	12.1	85.9	2.0			

Hypothesis 2

Socio –demographic characteristics and level of perception of respondents

Age group and perception on Ebola virus disease

In this study, relationship between age category and perception among the respondents showed that low perception on Ebola virus disease was found more among worker between 46 to 60 years. Highest perception on Ebola virus disease was found among workers of 30years and below. This result was found to be statistically significant (P-value of 0.022, P< 0.05). Therefore, there is no significant difference between workers' age category and their perception on Ebola virus disease.

Table 4.9 Association between respondents' age group and perception on Ebola virus

Socio-demographic characteristics	Low Perception (%)	High Perception (%)	X^2	df	P-value
Age group			7.631[a]	2	0.022
30yr and below	0.0	0.0			
31-45yrs	84.3	3.9			
46-60yrs	95.4	0.0			

Gender and Perception on Ebola virus disease (EVD)

In this study, negative perception on Ebola virus disease was found more among male workers (31.2%) compared to female workers (22.7%), with female workers (77.3%) having positive perception on Ebola virus disease compared to the male workers (68.8%). This result was found not to be statistically significant (P-value of 0.052, P> 0.05). Therefore, there is no significant difference between workers' gender and their perception on Ebola virus disease. Chi- square test (X^2) was used to determine the association.

Level of education and Perception on Ebola virus disease (EVD)

Assessing association between level of education and respondent perception on Ebola virus disease, this study found negative perception on the disease to be more among workers with secondary level of education (31.4%) compared to those who attained tertiary level of education (27.0%). Positive perception on Ebola virus disease was higher among respondent that attained tertiary level of education (73.0%) compared to those with secondary level of education (68.6%). This result was found to be statistically significant (X^2=0.438, P-value of 0.508, P>0.05). Therefore, there is no significant association between workers' level of education and their perception on Ebola virus disease. Chi- square test (X^2) was used to determine the association.

Workers department and level of knowledge

In this study, NIS workers (Nigeria immigration service) (33.3%) had more negative perception on Ebola disease compared to workers in other agencies; FAAN had 29.5%, NCAA (Nigeria civil Aviation) and Port health Authority (PHA) both having 23.2% in the study. Positive perception on Ebola virus disease was found to be more among workers in NCAA (Nigeria civil Aviation) and Port health Authority (PHA) with 76.8% respectively compared to FAAN (70.5%) and workers of Nigeria immigration service (NIS) having 66.7%. This result was found not to be statistically significant (X^2=3.741, P-value of 0.291, P>0.05). Therefore, there is significant difference between workers' level of education and their level knowledge on Ebola virus disease. Chi- square test (X^2) was used to determine the association.

Hypothesis 3

The null hypothesis (H_0) states that there is no association between level of knowledge and perception on Ebola virus disease. Level of knowledge was categorized into poor, fair and good while perception was categorized into positive and negative. Chi- square test (X^2) was used to determine the association and the result is presented in the Table 4.10 below.

Table 4.10: Association between respondents' level of knowledge and perception on Ebola virus disease (EVD)

Socio-demographic characteristics	Low Perception (%)	High Perception (%)	X^2	Df	P-value
Level of Knowledge			8.122[a]	2	0.017
Poor	52.2	47.8			
Fair	26.2	73.8			
Good	0.0	100.0			

P-value is 0.017 and is less than 0.05. Therefore there is significant association between workers level of knowledge and perception on Ebola virus disease. Hence, the null hypothesis H_o is rejected.

Hypothesis 4

The null hypothesis (H_0) states that there is no association between workers perception and misconception on Ebola Virus disease. Respondents' perception and misconception was stratified into low and high perception.

In this study, association between respondents' perception and misconception on Ebola virus diseases shows that misconception was higher among workers with high perception (59.8%) on Ebola virus disease. This association was found not to be statistically significant. The chi-square test shows that P- value is greater than 0.05 (X^2=3.301, p=0.069). Therefore indicating there is no significant association between various respondents' perception and misconception on Ebola virus disease. Hence, the null hypothesis H_o is rejected.

Hypothesis 5

The null hypothesis (H_0) states that there is no significant relationship between respondent's level of knowledge and misconception on Ebola virus disease (EVD). Chi square was used to determine if there was significant difference between workers level of knowledge and misconception on Ebola virus disease (EVD).

Association between respondents' Level of Knowledge and Misconception on Ebola Virus disease shows that lower misconception was higher among workers with poor knowledge (60.0%) while higher misconception was found among workers with fair knowledge (58.2%).This association was not statistically significant as the chi-square test shows that P- value is greater than 0.05 (X^2=3.264, p=0.195). Therefore indicating there is no significant association between respondents' level of knowledge and misconception on Ebola virus disease.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This cross-sectional descriptive study was conducted to understand the knowledge, perception and misconception on Ebola virus disease as a way of preventing and controlling the spread of Ebola virus. This chapter will focus on the findings of the study. It is organized into the following subsections: socio-demographic information; knowledge relating to Ebola virus disease, perception on Ebola virus disease; misconception on Ebola virus disease. Other sub-sections are conclusion, recommendation and suggestion for further research.

5.1 Socio demographic characteristics of the respondents

The socio-demographic characteristics shows that greater number of those studied were within the age range of 31-45 years. The mean age of the respondents was 36.47±8.58years. The mean age is similar to the study conducted by (Gidado et al., 2015) among community people in Lagos state. Majority of the respondents were male. This is a trend that has also been observed in similar studies conducted on Ebola (Ministry of Health Liberia, 2015). The respondents' levels of education indicate that tertiary education is highest with only few of the respondents having Secondary educations and no respondent have primary level of Education. This is due to the minimum entry requirement for civil service office job which ensured that a good number of the respondents were enlightened. Most of the respondent reported having direct contact with travellers this can be justified as the respondents of this study are recruited from various transportation agencies that control movement of people and goods in and out of the country.

5.2 Knowledge of the respondents on Ebola Virus Disease (EBV)

The public health significance of Ebola Virus Disease is not only in its potential to cause significant mortality and morbidity at community level, especially during outbreaks, but also its potential for nosocomial spread (Gupta, Mehta, Gupta, Arora and Setia, 2015). Maintaining a high index of suspicion should be based on adequate knowledge of the

disease among the care providers(Gupta et al., 2015) and also among agencies (aviation, immigration and port authority) who are at risks. More than half of the respondents have heard about Ebola virus disease and were aware that it is called a haemorrhagic fever. High awareness of the Ebola disease can be attributed to the increased public sensitization on the deadly diseases around the world especially in Africa in recent time. Similar trend was observed in the study conducted among people in Lagos state (Center for Public Policy Alternatives, 2014). Awareness of EVD in Nigeria is not as high as that of Sierra Leone; this may be because Sierra Leone, Guinea and Liberia were most affected by EVD (CRS, 2014). The major source of information among respondents in this study include T.V/radio (90.5%), social media (86.0%), internet (78.9%), and among family & friends (61.4%).This could be because of increase in the number of news channels, daily broadcasting of the events pertaining to public health significance and special discussion programmes with the experts about the spread and prevention of this disease. This finding was similar to with the study conducted by Apichaya et al., 2014 and Gupta et al., 2015 where television was the most important source of information for the public.

In this study only 15.1% had poor knowledge on the Ebola virus disease. This is lower compared to what was reported among respondents who attended the Kwara State specialist hospital, Sobi, Ilorin, Nigeria, West Africa from 1st October, 2014-1st December, 2014 (Shittu et al., 2015). This difference in knowledge can be justified due to increase in sensitization of the public about the disease. High percentage of the participants showed considerably high level of knowledge especially about the asymptomatic nature of the Ebola virus disease. For instance, symptoms of Ebola such as fever/high temperature, diarrhoea, bleeding, headache, dizziness, nausea, red eye, sore throat, rashes and general tiredness were reported as symptoms of Ebola by the respondents. Only 11.8% could not mention symptoms of Ebola disease. similar result was observed in a study carried out among US residents (Rolison and Hanoch, 2015).

Epidemiologic, clinical and experimental studies have established that ingestion of bush meat, body contact with the blood and fluid of infected person plays a role in the aetiology and pathogenesis of Ebola. It is a surprise that only 6.4% of the respondent

could state that Ebola virus is responsible for the cause of Ebola in Human. This findings is lower to what was observed in a study in Ilorin where only 22.2% of the respondents had the right knowledge of EVD being of viral origin (Shittu et al., 2015). This shows that people are not adequately informed about the disease as people are mixing the causes with the mode of transmission. It is interesting to see that some of the respondent believe wickedness in leadership, traditional burial right and America intervention are the cause of Ebola in humans. This justifies the need for relentless effort in educating the public more on the etiology of the deadly virus.

Due to increase in sensitization about the deadly virus this can be the likely reason for the increased knowledge of the respondent on ways to prevent Ebola virus. Majority of the respondents were aware that presence of internal and external bleeding confirms the presence of Ebola. Also, almost all the respondents knew that EVD can be prevented through hand washing with soap and by avoiding contact with travellers respectively. More so, majority were aware that quarantining and isolating suspected patient is a control measure to prevent the spread of EVD. Similarly, high knowledge of means of protection of Ebola virus disease was observed in a study carried out in Liberia (Ministry of Health Liberia, 2015)

The commonest mode of transmission was eating infected animals, contact with infected individuals and also contact with infected objects. This was mentioned by majority of the respondents. These findings corroborate the report in a study among health workers and community people in Lagos State (Center for Public Policy Alternatives, 2014) and also in Liberia (Ministry of Health Liberia, 2015).

About 15.4% of the respondent believed mosquito can spread the virus while 6.6% do not know. This is higher compared to what was reported in a study in Ilorin (Shittu et al., 2015). This shows there is still work to do among the general public to curb the fear and crude information on the Ebola disease. This study shows that people have doubt if someone who survives Ebola can still spread Ebola. The fear of cured patients might partially be explained by the fact that community acceptance of survivors was not part of the initial set of Ebola health messages in Nigeria. This was similarly reported in a study carried out in Five Counties, Liberia (CDC, 2015).

Findings in this study affirm the need for continual enlightenment o people on the prevention of Ebola to reduce the likelihood spreading the disease. About 21.6% believe it is not contagious when they begin to show symptoms on the patient. Similarly about 21.1% of the respondents reported that Ebola is not contagious during incubation period (2-21 days). Comprehensive knowledge is a critical component in increasing the likelihood of individuals to adopt the promoted prevention and medical seeking behaviours (Shittu et al., 2015).

Interestingly, majority of the respondents are aware that handshake and environmental source like fluid, food and water can transmit Ebola.

5.3 Perception of Respondents on Ebola Virus Disease

According to Centre for Disease Control and prevention using protective measures especially for individuals in the transportation agencies is essential (CDC, 2014). This is to curb the spread of the disease. In this study, risk perceptions on Ebola virus disease of the respondents were found to be positive. Majority of the respondent agree that wearing waterproof disposal gloves before touching the sick person, blood or other body fluids can prevent them from having Ebola. Also many agreed that wearing surgical mask, face shield, or goggle when providing direct care to a sick traveller could prevent transmission of Ebola virus disease. Almost all the Respondents in this study perceived that double gloving when cleaning large amount of blood or other body fluids can prevent them from contacting Ebola. However, less than half of the respondents (41.2%) believed that wearing closed toe shoe does not prevent from contacting the Ebola. It is of great importance that adequate information on Ebola Virus disease is made available to aviation workers on Ebola virus disease.

Furthermore, majority of the respondents perceived that frequent hand wash with water do not prevent contracting while one-third of the respondent perceived frequent washing of hands as a means of preventing Ebola disease. This finding is in support of study carried out in Liberia (Ministry of Health Liberia, 2015), while about 50.9% disagreed. More so, almost half of the respondent (48.8%) believed that anyone having fever of

temperature of 100.4°F/38° C or higher confirms Ebola disease while 35.8% disagreed, 15.4% were undecided.

More so, almost all the respondent believed treating all body fluids as though they are infectious is a control measure against Ebola. This is in line with the standard safety precaution given to health care workers and also people in the transportation agencies in preventing the spread of Ebola virus disease.

Quite a number of the respondents (42.7%) believe that laboratory surfaces, door handles, locks, faucets, sinks, walls, counters, and toilet seats cannot transmit Ebola. Workers in the transportation agencies need to be given adequate information on universal safety precautions on Ebola infection. This will offer general guidance for minimising the risk to staff. Although majority knew that package or luggage do not pose a risk as Ebola virus spread only through direct contact with blood or body fluids.

5.4 Respondents Misconception on Ebola Virus Disease

In this study, there were serious misconceptions about causes and treatment of EVD. Few believed that a suspected Ebola patient in the same plane do not put those on board at risk of contracting Ebola. Also that touching or shaking hands or avoiding contact in public cannot prevent contracting of Ebola.

Moreover, (21.8%) of the respondents believed that EVD is air borne. This was similar to the Sierra Leone (CRS, 2014) where nearly one-third believed that EVD is transmitted by air or through mosquito bites and also in other part of Nigeria (Shittu etal., 2015). EVD is a medical/spiritual problem was reported by one-third of the respondent. This is higher compared to what was reported among health workers in Lagos state (Gidado et al., 2015) where five percent of them believed the disease is mainly a spiritual problem supported by few of the respondents. Health workers having lower misconception can be attributed to the fact that they are health professionals with first-hand information on the concept and aetiology of the disease.

Furthermore, quite a number of the respondent still believe that Ebola virus disease can spread through mosquito and that traditional herbs, and bathing with salt water could treat EVD successfully can cure Ebola virus disease. This misconception corroborated what

was reported in various other studies (Shittu et al., 2015; CRS, 2014). Consumption of bitter Kola (*Garcina Kola*) was also reported among the respondents similar to what was reported in a study conducted in Lagos, Nigeria (Gidado et al., 2015) and also in Liberia (Ministry of Health Liberia, 2015). Other misconceptions about Ebola Virus disease discovered in this study include; incurable and deadly disease, Environmental and scientifically created, America conspiracy against Africans/wickedness against Africans, Juju/witchcraft, political agenda to generate money/politically motivated/corruption, EVB is not real, News and Media agenda settings, Technology and Advancement, Reduce the population of Africa population, EVD is hereditary, and race motivated. There is a need to address misconceptions about the disease, which include clearly spelling out modes of transmission in the local languages, developing clear messages in local languages on protective practices (including burials), developing special messages around community acceptance of EVD affected persons and families, supporting inter-personal engagement at grassroots levels in order to improve community response and ownership of the social mobilization efforts (CRS, 2014).

5.5 Implications of findings for Health Education

Health promotion and education is said to be a combination of educational and environmental supports for actions and conditions for living conducive to health. The findings of this study provide important information on knowledge, perception and misconceptions on Ebola virus disease where knowledge is especially lacking.

The findings of this study indicate the need to develop more specific health education programs including training and public enlightenment to increase knowledge, perception and misconception of EVD.

Training

This is an indispensable activity in human resource development. For a health promotion and education instructions to be effective in aviation industry, there is the need to ensure that workers are well trained. Public Health training are designed to improve every system where issues relating to public health are addressed in the system, by strengthening the technical, scientific, managerial and leadership competence of the

workers in the aviation industry. For example, professional conferences, in-service training, on-the job training, research training and production of materials such as monthly bulletin, production of health promoting and behavioural changing awareness banners at every strategic locations in the aviation industry. This training will serve as a foundation for improving the public health approach as well as achieving the health objectives of this study. Respondents' high misconceptions on Ebola virus disease creates a gap for governmental and non – governmental bodies to develop training programs in form of workshops and seminars targeted at aviation workers and other workers that have direct link to travellers and workers working on EVD.

This package of training will spells out the course of instructions and some informal learning opportunities that aviation workers should be exposed to. This will involve the development of a training curriculum. The curriculum should include Objectives (focused on knowledge, perception and misconceptions on EVD), contents (e.g. definition of EVD, causes of EVD, modes of transmission of EVD and preventive measures of EVD), methods (e.g. providing information on what the aviation workers already know or what will stimulate their interest in the training. This should include verbal instruction (teaching), use of pictures, reading materials, posters, discussion, question and answer etc), materials (e.g. PPE equipment such as gloves, boot covers, fluid-resistant gowns or overalls, single use disposable hoods that covers the head and neck, full face shields etc), modes of assessment should involve pre and post evaluation, feedback, comments, reactions and clarifications.

Public enlightenment

Public enlightenment has the potentials to dispel the inherent conceptions of those who have negative perceptions and misconceptions towards Ebola virus disease. The use of well-tailored information, education and communication materials such as behavioural change communication materials like advertisement in form of special radio programme, billboards, TV programs to give out information regarding the causes, modes of transmission and preventive measures on EVD, so as to reach out to a large number of the target population and thereby influence their knowledge, perception and misconception of EVD.

More should also be done to create meaningful and convincing health programs on the concepts of Ebola to the aviation workers in order to health educate them on healthy lifestyles through formulation of healthy policies.

5.6 Conclusion

The study has showed that majority of the respondents had fair knowledge of the Ebola virus disease, the mode of transmission and preventive measures. In addition, although respondents' perceptions were high, some of the reported perceptions were not consistent with scientific concepts of EVD. More efforts are therefore needed to be geared towards improving the knowledge of aviation workers including other people that might have direct connection to EVD prevention and control. This could help in reducing their negative perceptions and misconceptions on causes, complications, care and prevention of EVD. To prevent the spread of Ebola virus, there is need for government or its relevant agencies to initiate motivational strategies such as awareness and educational interventions to address misconceptions about EVD.

5.7 Recommendations

Firstly, understanding the etiology of Ebola virus is very important. The public's vague view about the causes and mode of transmission of Ebola disease virus must also be addressed. There is a need for training of the workers as some of them still lack significant information on Ebola by government and its relevant agencies.

Also, the government must be willing to provide free standard equipment such as gowns, gloves, masks; provide financial assistance to agencies that are at risk of being the primary contact of the disease to acquire their own Personal protective equipment as well as give life insurance to them.

5.8 Suggested topics for further study

- Ebola virus disease outbreak in Nigeria – Data management, Implementation and outcomes for movement and monitoring of travellers at points of entry.
- Attitude and practices related to Ebola virus disease in Nigeria.
- Impact of Ebola virus disease on the health system in Nigeria.

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APPENDIX I

Questionnaire on the knowledge, Perception and Misconception of Ebola Virus Disease among Aviation workers in Murtala Muhammed International Airport, Lagos.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTIC

Instructions: In this sections please tick (√) in the appropriate boxes that correspond to your answers.

1. Department you work in
   a. Federal Airport Authority Nigeria (FAAN)
   b. Nigerian Civil Aviation Authority (NCAA)
   c. Port Health Authority (PHA)
   d. Nigerian Immigration Service
2. Level in the organization a. Senior staff { } b. Junior Staff { }
3. Do you have direct contact with travellers? a. YES { } b. NO { }
4. How many years have you spent on the job...……
5. Level of education 1. Primary { } 2. Secondary { } 3. Tertiary { }
6. Gender: 1. Male { } 2. Female { }
7. Age as at last birthday in years……..

SECTION B: KNOWLEDGE ON EBOLA VIRUS DISEASE

Instructions: please tick the appropriate answer to the following questions on knowledge of Ebola Virus Disease (EVD)

8. Have you heard about EVD before its outbreak in Nigeria? 1. YES { }2. NO{ }
9. If yes when (state in years)……..
10. Where did you hear of Ebola? Tick as many

a. T.V and radio { } b. internet { } c. friends and family { }

d. Religious / community { } e. Text message { } f. Posters { }
g. Social Media { }

11. Ebola is also known as haemorrhagic fever. a. YES { } b. NO { }
c. DON'T KNOW { }

12 What are the symptoms of Ebola?.....
.....
.....

S/NO		YES	NO	DON'T KNOW
13	Presence of both internal and external bleeding best confirms presence of Ebola virus			
14	Ebola can be prevented through frequent hand washing with soap and use of sanitizers			
15	Avoiding contact with infected patients or their body fluids is a preventive measure against Ebola			
16	Quarantining and isolating suspected patients is a control measure to prevent the spread of the disease			

17. What are the causes of Ebola in humans.....
.....

18. The commonest modes of transmission of Ebola includes? Tick as many
a. Eating infected animals { } b. Body fluids from infected individuals { }
c. From the Air { } d. Touching contaminated objects { }
e. Conspiracy and Political { }

19. Which of these modes of transmission of Ebola are you familiar with?

S/NO	MODES OF TRANSMISSION	YES	NO	DON'T KNOW
i.	Can Ebola be gotten from a person who is infected but doesn't have fever or any symptoms?			

ii.	Can Ebola be spread through mosquito bites?			
iii.	Can someone get Ebola by eating bush meat?			
iv.	If someone survives Ebola, can he/she still spread the virus?			
v.	Can Ebola be brought to Nigeria through imported animals?			
vi.	Ebola virus can be contagious even before they begin to show symptoms on the patients			
vii.	Can Ebola be contagious during the incubation period i.e. between 2 to 21 days			
viii.	Presence of both internal and external bleeding best confirms presence of Ebola virus			
ix.	Transmission can be through handshakeor other environmental sources (e.g. water, other fluids, food).			

SECTION C: PERCEPTIONS ON EBOLA VIRUS DISEASE

Instructions; please specify which of the following is your perception on Ebola

S/NO		AGREE	DISAGREE	UNDECIDED
20	I believe wearing waterproof disposable gloves before directly touching the sick person, blood or other body fluids can prevent me from having Ebola			
21	I don't believe frequent hand washing and use of sanitizers can prevent me from having Ebola			
22	I don't believe using Closed-toe shoes and shoe covers protects one from contacting EVD			
23	I believe anyone having fever with temperature of 100.4°F/38°C† or higher confirms presence of EVD			

24	When providing direct care to a sick traveller, wear surgical mask, face shield or goggles could prevent transmission of EVD			
25	I believe treating all body fluids as though they are infectious is a control measure against Ebola			
26	Considering double-gloving if cleaning large amounts of blood or other body fluids can prevent me from contacting Ebola			
27	I don't believe lavatory surfaces: door handle, lock, faucet, sink, walls, counter, and toilet seat can transmit Ebola			
28	Packages or luggage do not pose a risk as Ebola virus is spread only through direct contact with blood or body fluids			

SECTION D; MISCONCEPTIONS ON EBOLA VIRUS

Instruction: Please tick the appropriate

S/NO		YES	NO	DON'T KNOW
29	If a suspected Ebola patient boards a plane, all the passengers on board are at risk of contacting the disease			
30	Touching or shaking hands with the public can cause Ebola			
31	Ebola can be spread through the air			
32	Ebola is a medical problem/spiritual problem			
33	Ebola can be spread through mosquito bites			
34	Ebola can be cured with local/traditional remedies such as herbs and concoction			
35	Avoiding body contact whenever you're in public can prevent one from contacting the disease			

36. What other misconceptions do you know/have about Ebola Virus.....
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Thank you.