PERCEPTION ATTITUDE AND ACCEPTABILITY OF EBOLA VIRUS SCREENING AMONG TRAVELLERS AT THE MURTALA MUHAMMED INTERNATIONAL AIRPORT LAGOS NIGERIA

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SUBMITTED TO

DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS
FACULTY OF PUBLIC HEALTH COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE (MSc) IN EPIDEMIOLOGY

FEBRUARY, 2015

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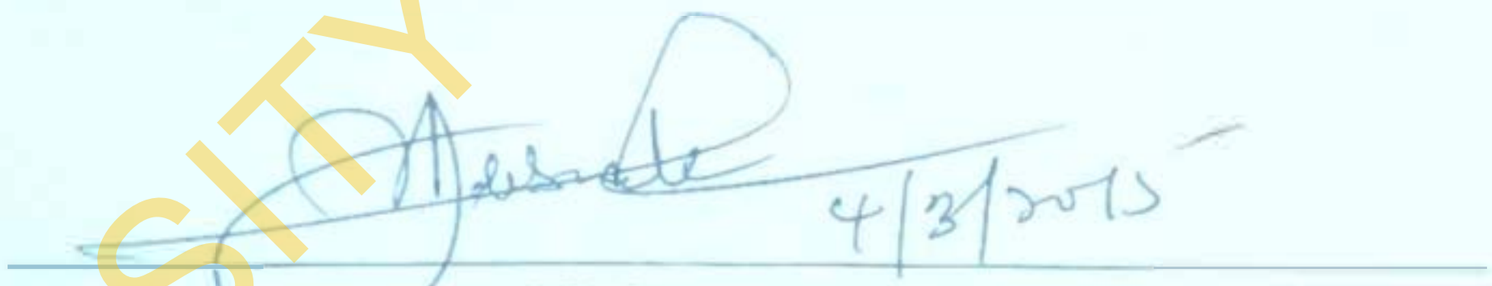

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DEDICATION

This thesis is dedicated to all the victims of the Ebola epidemic who lost their lives during the course of the 2014 outbreak and to those who volunteered as Ebola response personnel not considering the risk tied to such decision.

ACKNOWLEDGEMENTS

With deep sense of gratitude, I give honour to God, the giver of life. my hope and the strength of my soul.

My late grand mom, Mrs Deborah Ajayi, my ever loving mom, Dr. Modupeola Mofikoya. and my brother Mr. George O. who stood by me all during the stormy period of my life, they were pillars of support to me. May the Lord cause His face to shine upon you all continually.

I appreciate my amiable supervisors, Dr. IkeOluwapo Ajayi and Dr. Stephen Adebowale, for been an epitome of blessing to me. for their meticulous corrections. motherly approach, fatherly concerns, and their various contributions to my life. Your children will never lack destiny helpers.

My appreciation further goes to Dr. M. D. Dairo. Dr. A. Adekanbi and Miss. Esther Adelusi for being there for me.

I appreciate Mr. Ibukun Osadeyi. Mr. O. Okorie. Dr Taiwo Soyinka, Mr. A. Abiona, Dr. Dipo Ogunbode, Dr. Diran Olabisi, Dr. A. Ajibade. Mrs. M. Jegede, and Mr. E. Oye for your support, guidance, and kind words. May you never struggle to achieve greatness.

As many whose names was not mentioned but whose words of encouragement and support contributed to the accomplishment of this work: I say God bless you.

ABSTRACT

Ebola virus screening is a public health intervention used to identify persons with possible symptoms of the disease or at risk of exposure to the virus, thus enabling earlier intervention and management in order to reduce mortality and economic loss. Screening can also lead to diagnosis. Screening measures are based upon symptom and risk assessment and can be adapted for air, land, and sea points of departure and arrival.

The study was a descriptive cross-sectional study. Time location sampling technique was adopted. 480 study participants were interviewed using pre-tested self-administered semi structured questionnaire as data instrument for quantitative method while key informant interview was adopted for the qualitative method. Data was analysed using descriptive statistics, chi square and multiple logistic regression set at 5% level of significance.

Findings revealed that mean age of the participant was 33.5±12.3years. Age group 25-34years had the highest level of participants 124 (25.8%). 94.6% have heard about Ebola virus screening while 83.8% had heard about the Ebola virus disease. The mean knowledge score in this study was 8.7±1.8, the mean perception score was 5.4±1.0 while the mean attitude score was 43.4±5.5. Those that have good knowledge were 294 (61.3%), while those that had poor knowledge were 186 (38.8%). Those that have good perception were 264 (55.0%) while those that had poor perception were 216 (45.0%). 55.0% had good attitude to screening while 45.0% had poor attitude. Gender (x^2=8.5; p=0.004), marital status (x^2 =4.3; p=0.039) and those who allowed self to be screened because they believed the Ebola virus screening was for their safety (x^2=7.0; p=0.029) were found to be associated with the perception of travelers to screening. At logistic regression, men were found to be 2 times more likely to perceive the Ebola virus screening as good than women (OR=1.6; 95% CI=1.1-2.3). Departing passengers were found to be 2 times more likely to show good attitude to screening than arriving passengers (OR=1.6; 95% CI=1.0-2.2). Passengers who were comfortable with being screened via the use of infrared thermometer were found to be 3 times more likely to show good attitude to screening than those not comfortable with the screening (OR=2.9; 95% CI=1.4-5.8). Those who allowed self to be screened because they believed the screening was for their safety were found to be 3 times more likely to show good attitude to screening than those who allowed self to be screened because they saw others doing it (OR =2.7 ; 95% CI =1.2-6.3).

Findings from this study revealed that majority of the travellers have good to average knowledge of the Ebola virus disease/screening, the mode of transmission and current method of screening. A lot of people also know that their first point of call for medical service would be the hospital if suspected to have Ebola signs. Despite, this level of awareness of Ebola virus disease and its screening among travelers at the Murtala Muhammed Airport, many still do not have good perception and attitude towards the Ebola virus screening.

Keywords: Perception, knowledge, Attitude, Ebola virus disease, Screening.

Word count: 493

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Ebola virus is the causal agent for the Ebola disease. There are five strains or subtypes of the virus namely *Zaire, Sudan, Tai forest formerly known as cote d'Ivoire Ebola virus, Reston and Bundibugyo.* Ebola virus disease is a rare, acute, fatal and deadly disease caused by one of the Ebola virus strains, namely-'*zaire strain'* (CDC Report, 2014). The causal agent for this viral hemorrhagic fever belongs to the family *filoviridae*, genus *Ebolavirus*. This Zaire strain of Ebola virus was first discovered in an outbreak in Zaire (the present democratic republic of Congo) in 1976. The Zaire strain was the causative agent of the 2014 Ebola epidemic in West Africa region, where the case-fatality rate was estimated to be as high as 70% while earlier outbreak was 80-90% (WHO Report, 2014). The case fatality rate of Ebola virus disease in non-human primate is unknown but some ecological data suggest that Ebola virus has contributed to declines of up to 98% of local great ape populations in Gabon and the Republic of Congo (Walsh *et al.* 2003).

The virulent nature of the Ebola virus disease requires prompt intervention measures like efficient screening procedure to prevent further spread considering the global public health significance of this epidemic. Ebola virus screening is an active search for potential Ebola case, thus enabling earlier intervention and management in order to reduce mortality and economic loss. Screening can also lead to diagnosis.

At the Murtala Muhammed international Airport, screening is carried out at two sections namely the departure and arrival halls respectively. Departure/arrival screening is a public health intervention used to identify persons with possible symptoms of or risk of exposure to Ebola virus disease and to prevent them from further travel. Screening measures are based upon symptom and risk assessment and can be adapted for air, land, and sea points of departure and arrival. The departure/arrival screening process should be paired with travel restrictions to prevent the exportation/importation of Ebola to other countries, protect

travellers and air crew and foster compliance with public health recommendations for exposed or symptomatic persons. Effective exit screening prevents the introduction and spread of disease to other geographic areas (Bray M, 2007).

Identifying or screening for a new case of Ebola is non-specific in the context of differential diagnosis for other fever like malaria. The current method of screening involves the use of infrared thermometer for the measurement of travellers' temperature. A temperature value of 38.6^0C indicates fever and a fallout from standard body temperature (36.5-37.5^{0}C) and any passenger who presents such an extreme temperature value would be referred for secondary screening and eventually a blood test known as Polymerase Chain Reaction which can take 8 hours or longer to obtain laboratory results would be carried out. It is very expensive, impracticable and will slow down air travel. Studies have also found that Ebola virus is only detectable in blood sample of an infected person few days after the onset of symptoms (incubation period 2-21^0 C), so collection of blood samples for polymerase chain reactions should be carried out 2 or 3 days after the onset of symptoms for the purpose of reliable and valid diagnosis (Murphy FA, 2007). Other screening methods also involve Enzyme Linked Immuno-Sorbent Assay (ELISA), assessment of travel history, watching for other symptoms of Ebola such as vomiting, diarrhoea, headaches, muscular pain, rashes, joint pain, body weakness, and haemorrhage, and also distribution, collection and review of public health questionnaire to determine risk.

However, the perception of outgoing and incoming travelers towards the Ebola virus screening via the use of infrared thermometer is very important because it gives a view of travelers' opinions, how much awareness/knowledge the passengers have about the screening method and how the knowledge influences their perception as touching the screening method and in turn their attitude or disposition toward screening. This infrared thermometer screening method has been characterised by different experiences such as travelers being scared, or concerned about the adverse effect of exposure to infrared thermometer. Some feel it is all waste of time, while some object to screening. In effect, these attitudes pose negative impact and very inimical as touching halting Ebola virus spread, hence a need for adequate awareness, provision of information sheet for travelers on Ebola, and influencing travelers risk perception via proper re-orientation or establishment of counselling centres for disease in future outbreaks in order to prevent huge epidemic (Slovic, 2014).

Experience has also shown that passengers dislike the use of infrared screening thermometer on them believing it could have adverse effect on their body mechanisms later in life(Stephen, 2014). Some also believe secondary screening can take longer time and as such often causes delay for their flight schedules and businesses. These travelers' behaviour is a clear indication of the low level of knowledge, and perhaps lack of awareness or conscious acceptance of the fatal nature of the disease. This study will therefore assess the perception, attitude, and acceptability of the screening method by outgoing and incoming air travelers.

1.2 Problem Statement.

As at October, 2014, the World Health Organisation (WHO) has reported 15,935 confirmed, probable and suspected cases of Ebola virus disease in West Africa region with 5689 deaths. The average Ebola virus disease case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks. (WHO Report, 2014). Countries with wide spread transmission of the disease include Guinea, Liberia and Sierra Leone. Nigeria is among the countries with limited transmission. Despite the declaration by the WHO that Nigeria is Ebola virus free, the presence of the disease in other West Africa countries still pose serious threat to Nigeria.

Researching the area of the identification of the virus natural reservoir cannot be over-emphasized, which in no doubt can enhance prevention of the disease. Despite several heroic field studies, the epidemiology and ecology of Ebola virus, including the identification of its natural reservoir, and hosts, remains a formidable challenge for public health and scientific communities, hence a need for further research and future prevention. (Feldmann *et al.* 2005; Groseth, Feldmann & Strong 2007; Towner *et al.* 2008).

Migration of people from one location to another within or outside the country's boundary can contribute to the spread of the disease (Leendertz, 2014). As a result, the Nigeria Government has put appropriate measures in place to screen passengers on transit from other countries. However, some passengers often show bad attitudes to this measure and at times behave violently to the screening officials. This type of disposition is obviously not healthy and may impact negatively on efforts geared towards halting Ebola spread. The major antidote for such behaviour is strong awareness as regards the importance of the screening in reducing Ebola transmission

1.3 Justification.

Screening methods, such as temperature measurement, border surveillance, contact tracing, travel restrictions to epidemic zones must remain a priority, if the spread of the Ebola disease must stop, especially for affected countries, hence a step towards safeguard global health.

In effect, since all these remain a challenge for West African Countries including Nigeria, the need to enhance border security in order to reduce influx of illegal immigrants whose health status and travel history is not known cannot be overemphasized.

Also travel restrictions to outbreak zones should be put in place, contact tracing should be improved upon especially for countries where the disease is still being transmitted, thorough temperature screening and personal hygiene must be encouraged as a routine lifestyle.

Logical observation indicates strong association between efficient screening and reduction in further spread or transmission of the disease (CDC, 2014). This study is therefore necessary to provide information on perception, attitudes, and acceptability of Ebola virus disease screening in a notable Nigeria Airport. The study outcome will add to the framework developed to preventing future transmission of the disease into Nigeria.

Ebola virus has been categorized as grade (A) bioterrorism agent with high economic impact, mortality rates and resultant level of stigmatization seen across the affected countries within the West African sub-region. With this ongoing epidemic, strategies on halting further spread and preventing future outbreak should be a major priority for health stakeholders and decision makers globally.

Since the Ebola virus disease is re-emerging with no known drug or vaccine for treatment, the need for proper awareness, provision of information sheet on Ebola virus disease for travelers in order to positively influence travelers perceived risk as touching the use of infrared thermometer screening cannot be overemphasized (Burroughs T., 2002). This study will therefore assess the perception of incoming and outgoing air travelers on the disease, their attitude to infrared thermometer screening and acceptability of the screening method. This study was therefore designed to fill the gap

1.4 Broad Objective

The general objective of this study is to assess the perception, attitude, and acceptance of Ebola virus screening by the travelers at the Murtala Muhammed Airport, Lagos.

1.5 Specific Objectives

The specific objectives are to:

1) Determine the proportion of travelers who have good perception towards Ebola virus screening.
2) Determine the proportion of travelers who have good attitude towards Ebola virus screening.
3) Examine the acceptability of Ebola virus screening among travelers at the Murtala Muhammed International Airport, Lagos.
4) Identify socio-economic factors influencing the acceptability of Ebola virus screening by travelers.
5) Explore the Screening personnel's experience on the attitude of travelers towards Ebola virus screening.

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CHAPTER TWO

LITERATURE REVIEW

2.1 History of Ebola virus

There are five identified Ebola virus strains. Four of the five have caused disease in humans: Ebola virus (*Zaire ebolavirus*); Sudan virus (*Sudan ebolavirus*); Taï Forest virus (*Taï Forest ebolavirus*, formerly *Côte d'Ivoire ebolavirus*); and Bundibugyo virus (*Bundibugyo ebolavirus*). These four strains only cause Ebola virus disease in man (Le Guenno *et al.* 1995). The fifth, Reston virus (*Reston ebolavirus*), has caused disease in non-human primates but not in humans (Barrette *et al.*, 2009). Ebola viruses are found in several African countries. Ebola first appeared in 1970s in two simultaneous outbreaks, one in Nzara, Sudan, and the other in Yambuku, near the Ebola River in what is now the Democratic Rep. of Congo.

In the late 1970s, the international community was again startled, this time by the discovery of Ebola virus as the causative agent of major outbreaks of hemorrhagic fever in the Democratic Republic of the Congo and Sudan. International scientific teams that arrived to deal with these epidemics found that transmission had largely ceased; however, they could reconstruct considerable data from the survivors. In contrast, patients in the affected villages were segregated through traditional methods of quarantine, a step that controlled the situation outside the clinics. The international alarm and research efforts that arose in response to these outbreaks quickly dwindled when the only convincing evidence that Ebola virus infections were continuing among humans consisted of a small outbreak in the Sudan in 1979 and 1 case in Tandala, in 1977.

2.1.1 Ebola Virus in the United States

In 1989, Ebola appeared in monkeys imported into a Reston, Virginia, primate facility outside of Washington DC. Epidemics in cynomolgus monkeys (*Macaca fascicularis*) occurred in this facility and others through 1992 and recurred in 1996. Epidemiologic studies that were conducted in connection with both epidemics successfully traced the virus to a Philippine exporter but failed to detect the actual source of the virus. Attempts to work in the remote

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areas where the monkeys were captured have been too dangerous due to political instability. We do know that this virus strain *reston* has an apparent Asian origin and lesser pathogenicity than other Ebola subtypes for both macaques and humans, but its real origin not known. Nevertheless, current quarantine procedures for imported primates and vaccine requirements have protected the public.

2.1.2 The African Ebola Epidemics of 1994–1996

After Ebola appeared in Africa in 1976–1979, it was not seen until 1994. During 1981–1985, Ebola virus surveillance was carried out concurrently with intensified efforts and this surveillance may have identified several cases and estimated the seroprevalence among the population; however, the findings are subject to caveats because of problems with the validity of laboratory tests.

During 1994–1996, no less than five independent active sites of Ebola virus transmission were identified: Côte d'Ivoire in 1994, Democratic republic of Congo in 1995 and Gabon in 1994, 1995, and 1996. The previously known Zaire subtype of Ebola virus and the newly discovered Côte d'Ivoire subtype were both involved, and the sites were near tropical forests.

Zaire subtype was also circulating in Gabon, and at least 3 separate outbreaks in humans and nonhuman primates occurred. Thus, Gabon may well provide another site where the search for risk factors of human infection and the natural reservoir could be carried out. Notable among the epidemics were features such as the important role of a dead, naturally infected chimpanzee in bridging the virus to humans.

Below is the previous chronological order of Ebola virus disease outbreak (CDC Fact Sheet.2014).

Table 2.1.2: Previous chronological Ebola virus disease outbreak

Year	Country	Ebolavirus species	Cases	Deaths	Case fatality
2012	Democratic Republic of Congo	Bundibugyo	57	29	51%
2012	Uganda	Sudan	7	4	57%
2012	Uganda	Sudan	24	17	71%
2011	Uganda	Sudan	1	1	100%
2008	Democratic Republic of Congo	Zaire	32	14	44%
2007	Uganda	Bundibugyo	149	37	25%
2007	Democratic Republic of Congo	Zaire	264	187	71%
2005	Congo	Zaire	12	10	83%
2004	Sudan	Sudan	17	7	41%
2003(Nov-Dec)	Congo	Zaire	35	29	83%
2003(Jan-Apr)	Congo	Zaire	143	128	90%
2001-2002	Congo	Zaire	59	44	75%
2001-2002	Gabon	Zaire	65	53	82%
2000	Uganda	Sudan	425	224	53%
1996	South Africa (ex-Gabon)	Zaire	1	1	100%
1996 (Jul-Dec)	Gabon	Zaire	60	45	75%
1996(Jan-Apr)	Gabon	Zaire	31	21	68%
1995	Democratic Republic of Congo	Zaire	315	254	81%
1994	Cote d'Ivoire	Tai Forest	1	0	0%
1994	Gabon	Zaire	52	31	60%
1979	Sudan	Sudan	34	22	65%
1977	Democratic Republic of Congo	Zaire	1	1	100%
1976	Sudan	Sudan	284	151	53%
1976	Congo	Zaire	318	280	88%

2.2 Current Ebola Outbreak Situation Report.

Situation report on the Ebola outbreak contains a review of the epidemiological situation based on official information reported by ministries of health.

Total of 17,145 confirmed, probable, and suspected cases of Ebola virus disease have been reported in five affected countries (Guinea, Liberia, Mali, Sierra Leone, and the United States of America) and three previously affected countries (Nigeria, Senegal and Spain) up to the end of 30 November, 2014. There have been 6070 reported deaths with disease incidence slightly increasing in Guinea (77 new confirmed cases reported), stable or declining in Liberia (43 new confirmed cases), and case rising in Sierra Leone (537 new confirmed cases). The case fatality rate across the three most-affected countries namely (Guinea, Liberia, and Sierra Leone) in all cases with a recorded definitive outcome is 72%; in hospitalized patients the case fatality rate is 60%.

Table 2.2: Confirmed, probable, and suspected cases in Guinea, Liberia, and Sierra Leone as at November 30, 2014.

Country	Case definition	Cumulative cases	Cases in past 21 days	Cumulative deaths
Guinea	Confirmed	1929	306	1117
	Probable	210	*	210
	Suspected	25	*	0
	Total	**2164**	**306**	**1327**
Liberia[§]	Confirmed	2801	278	‡
	Probable	1792	*	‡
	Suspected	3042	*	‡
	Total	**7635**	**278**	**3145**
Sierra Leone	Confirmed	5978	1455	1374
	Probable	79	*	174
	Suspected	1255	*	35
	Total	**7312**	**1455**	**1583**
Total		17 111	2039	6055

Data are based on official information reported by ministries of health, through WHO country offices. These numbers are subject to change due to ongoing reclassification, retrospective investigation and availability of laboratory results

2.3 Ebola virus case in Nigeria.

The largest Ebola virus disease outbreak to date is ongoing in West Africa, particularly in Guinea, Sierra Leone and Liberia, with a total of 7,178 reported cases including 3,338 deaths as of 1 October 2014. A total of 20 new cases (19 laboratory confirmed, one probable) have been reported in Nigeria, with no new cases reported since 5 September 2014. All 20 cases stemmed from a single importation from a traveller returning from Liberia on 20 July 2014. The Nigerian index case had visited and cared for a sibling in Liberia who died from the disease on 8 July 2014. Despite being aware of his exposure to Ebolavirus in Liberia, the index case flew from Liberia to Lagos, Nigeria, on a commercial airplane on 20 July 2014, with a stopover in Lomé, Togo. The case became symptomatic while flying and he collapsed at Lagos airport upon landing, which prompted him to seek medical attention and led to a number people being exposed to Ebolavirus. Epidemiological investigation revealed that the index case had contracted Ebolavirus in Liberia; the patient died on 25 July 2014.

A total of 898 contacts were subsequently linked to this index case, including 351 primary and 547 secondary contacts. Of note, a nurse who had cared for the index case that later became symptomatic and tested positive for the Ebola virus disease reportedly travelled over 500 km to another location (Enugu), generating at least 21 potentially infected contacts. Importantly, one of the primary contacts of the index case had travelled to Port Harcourt, the capital of Rivers State, at the end of July 2014 and was cared for by a healthcare professional that subsequently became infected and died on 22 August 2014. This deceased healthcare worker was in turn linked to a total of 526 contacts in Port Harcourt. As of 1 October 2014, all contacts had completed the 21-day surveillance follow-up, including those under surveillance in Rivers State, with no new reported incident cases. The World Health Organization officially declared Nigeria free of active Ebola virus transmission on 20th October, 2014. This was made possible as a result interventions including timely implementation of careful contact tracing and effective isolation of infections individuals.

2.4 Ecology

Tropical rain forests in Africa constitute a common ecosystem for Ebola virus emergence such as the Western Congo Swamp forests near Yambuku, Taï Forest. Documented human and non-human Ebola hemorraghic fever outbreaks occurred mainly during wet seasons, marked by fruit abundance.

The natural reservoir of infection remains unknown, but the virus clearly has a zoonotic origin. In some outbreaks where information is available, the human index cases have invariably had direct contact with gorillas, chimpanzees, antelope or bats.

The search for a reservoir of Ebola virus has been very aggressive. Although great apes are generally involved in Ebola outbreaks, non human primate are not thought to be natural reservoirs but rather susceptible hosts based on the sudden sharp decline in populations of the great apes in Gabon and the Republic of Congo which coincided with Ebola virus outbreaks in humans (Pourrut *et al*. 2005). Several other animal and plant species have been investigated for susceptibility and to determine a natural reservoir of Ebola virus. During the 1976–1979 Ebola outbreaks, several ecological studies were conducted in order to identify the reservoir of the virus in nature. Ecological investigations using modern technologies were carried out during the subsequent episodes of Ebola outbreaks (1994–2010) especially in Kikwit, where thousands of rodents, insects and birds were screened. These investigations have not been successful for various reasons. One being that they are usually implemented retrospectively, several weeks or months after the index case has been infected by a putative reservoir. It is possible that by that time the putative reservoirs may have moved to another site. A surveillance system capable of early detection of Ebola cases could allow animal reservoir studies in 'real time', which is not always easy in remote places in African forests.

Experimental studies provide a more convenient, alternative method to identify animal reservoirs and need not rely on an actual outbreak. Studies on 33 varieties of 24 species of plants and on 19 species of vertebrates and invertebrates experimentally infected with Ebola virus gave the first evidence that both insectivorous and frugivorous bats can support the replication and circulation of Ebola virus (Swanepoel *et al*. 1996). This evidence along with reports of bat exposures for some of the Ebola index cases directed the research toward the bats as potential reservoirs.

Indeed, an ecological survey revealed the presence of Ebola Virus -specific antibodies in six bat species caught in the field (*Epomops franqueti, Hypsignathus monstrosus, Myonycteris torquata, Micropteropus pusillus, Mops condylurus* and *Rousettus aegyptiacus*) (Pourrut *et al.* 2005). Viral nucleic acid sequences of Ebola virus was also found in three species of fruit bat during the 2001–2003 outbreaks in Gabon and Republic of the Congo (Leroy *et al.* 2005). These studies were pre-dated by the ecological investigation of the 1998–2000 Marburg heamorrhagic fever outbreak in Durba village in northeastern DRC, which consisted of repeated occurrences of short transmission chains arising in workers in Goroumbwa Mine where large numbers of bats roosted (Swanepoel *et al.* 2007).

2.5 Mode of Transmission

In most outbreaks, Ebola virus is introduced into human populations via the handling of infected animal carcasses. In these cases, the first source of transmission is an animal found dead or hunted in the forest, followed by person-to-person transmission from index case to family members or health-care staff. Animal-to-human transmission occurs when people come into contact with tissues and bodily fluids of infected animals, especially with infected nonhuman primates (Leroy *et al.* 2004). Transmission has been reported in Côte d'Ivoire where an ethologist was infected through handling an infected, dead chimpanzee in the Taï Forest (Le Guenno *et al.* 1995). It was confirmed that the deaths of chimpanzees were indeed due to Ebola virus. In Gabon and the Republic of the Congo, outbreaks in humans were associated with extensive deaths of chimpanzees and gorillas (Rouquet *et al.* 2005).

The natural reservoir host of Ebola viruses remains unknown. However, on the basis of evidence and the nature of similar viruses, researchers believe that the virus is vector-borne and that bats are the most likely reservoir. Four of the five subtypes occur in an animal host native to Africa.

Because the natural reservoir of Ebola virus has not yet been identified, the way in which the virus first appears in a human at the start of an outbreak is unknown. However, researchers believe that the first patient becomes infected through contact with an infected animal, such as a fruit bat or non-human primate.

When an infection does occur in humans, the virus can be spread in several ways to others. Ebola is spread through direct contact (via broken skin or unprotected mucous membranes for

example, the eyes, nose, or mouth) with blood or body fluids (including but not limited to feces, saliva, sweat, urine, vomit. breast milk, and semen) of a person who is sick with Ebola, objects (like needles and syringes) that have been contaminated with the virus or infected fruit bats or primates (apes and monkeys).

Sexual transmission has been suggested in humans since filoviruses can be found in semen (Bausch *et al*. 2007). Aerosol infection is questioned since people sharing the same space with infected persons do not contract the infection even though aerosol infection of non-human primate has been demonstrated in the laboratory (Leffel & Reed 2004). In deductions, Ebola is not spread through the air or by water, or in general, by food. However, in Africa, Ebola may be spread as a result of handling "bushmeat" (wild animals hunted for food) and contact with infected bats. There is no evidence that mosquitoes or other insects can transmit Ebola virus. Only a few species of mammals (for example, humans, bats, monkeys, and apes) have shown the ability to become infected with and spread Ebola virus.

Once people recover from Ebola, they can no longer spread the virus to people in the community. However, because Ebola can stay in semen after recovery, men should abstain from sex (including oral sex) for at least three months. If abstinence is not possible, condoms may help prevent the spread of disease. There is no evidence that people can get sick from Ebola through sex (or oral sex) before symptoms appear.

Healthcare providers caring for Ebola patients and the family and friends in close contact with Ebola patients are at the highest risk of getting sick because they may come in contact with infected blood and body fluids of sick patients. During outbreaks of Ebola, the disease can spread quickly within healthcare settings (such as a clinic or hospital). Exposure to Ebola viruses can occur in healthcare settings where hospital staff don't wear appropriate protective clothing including masks, gowns, gloves, and eye protection. Also 60% Ebola outbreak occurs during handling of dead bodies of victims, implication is dead bodies of victims should be handled with care and cremated by expert to preventive further transmission.

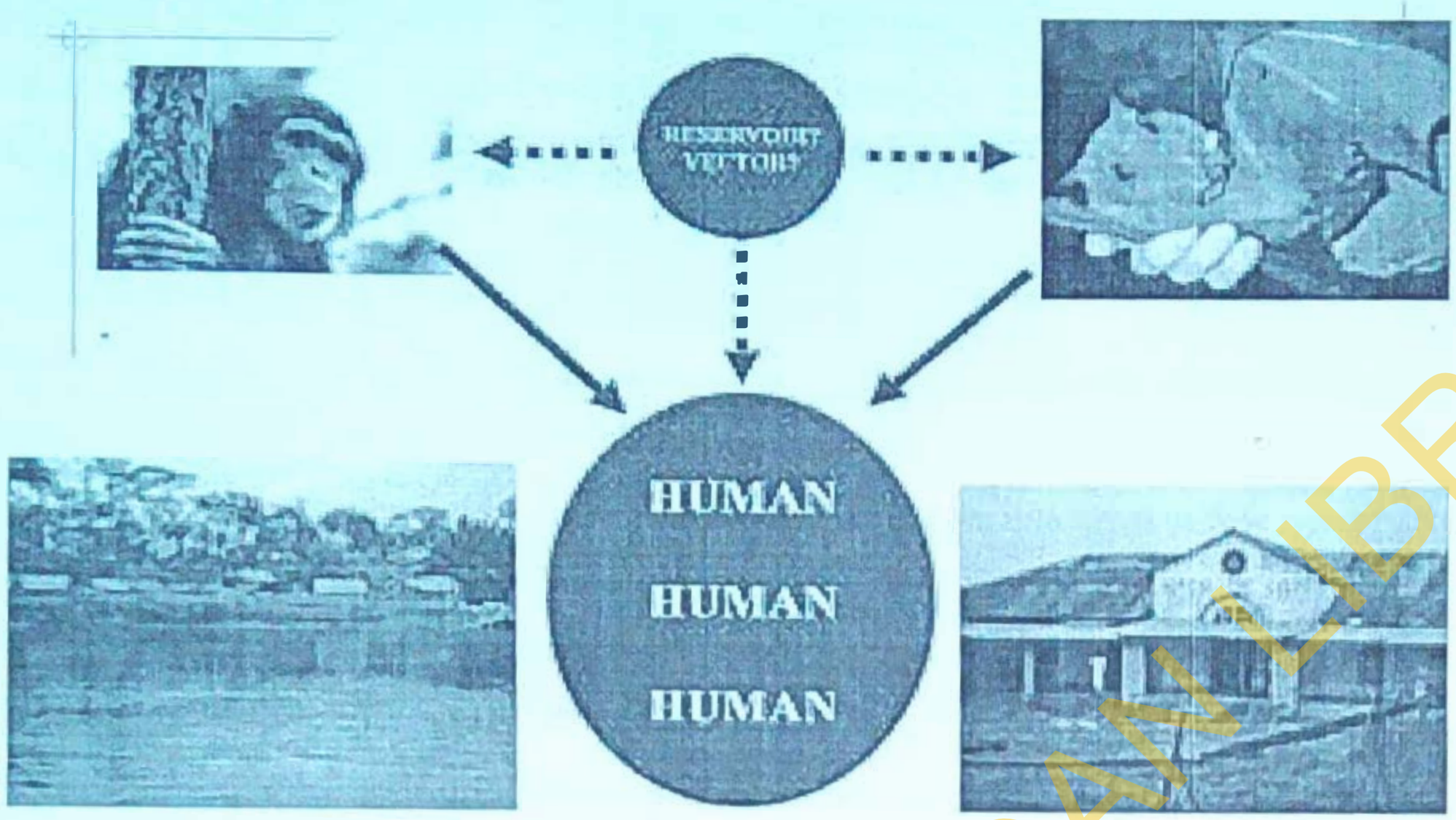

Figure 2.5: Shows the potential chains of transmission of Ebola virus which may be described as involving 3 stages, from primates or bats to humans (especially hunters) in the wild (index case), from index case to secondary cases (introduction into the domestic environment) and from patient to healthcare personnel in the clinical setting. Whilst primates and fruit bats are known to be sources of Ebola virus in nature, the reservoir has not yet been identified with any certainty.

2.6 Differential Diagnosis

In the absence of hospital or laboratory exposure these diseases have been acquired almost exclusively in rural areas. Some of the recent outbreaks in Africa, however, have occurred in cities, which may be contributing to difficulties with containment. Following an incubation period of 2 to 21 days, initial symptoms of Ebola virus disease are usually systemic and compatible with influenza: fever, myalgias, headache, and sometimes sore throat. At this point, such symptoms in a returning traveller who has a history of travel to West Africa countries currently experiencing Ebola outbreaks (Guinea, Liberia, Sierra Leone, and Nigeria) and who has a history of contact with an ill individual or who has travelled to an area affected by an outbreak, could suggest a risk of Ebola.

However, the most likely diagnostic possibilities would still be the following more common infectious diseases-

Bacterial: Typhoid, other enteric fevers, pyelonephritis, pneumonia, sepsis meningococcal disease, invasive streptococcal disease, and leptospirosis.

Helminthic: Acute schistosomiasis, Katayama syndrome.

Protozoal: Malaria, amoebic liver abscess.

Rickettsial: Typhus, Q fever, tickborne rickettsioses.

Viral: Influenza and other upper respiratory infectious agents, mononucleosis, Dengue fever, hepatitis A, and acute HIV infection. Conjunctivitis, petechiae, and a morbilliform (measles-like) skin rash appear later and are more suggestive of a Ebola virus disease. It should be noted that these symptoms do not occur until the second week of illness. At this point, a reasonable suspicion of Ebola virus disease would exist in the presence of a compatible travel history, the absence of a history strongly suggestive of other illnesses, and at least one negative blood smear for malaria. Additionally, it should be remembered that individuals with indigenous malaria immunity may have parasitemia but may be symptomatic for other reasons, including Ebola. The additional signs of hemorrhage and shock are strongly suggestive of Ebola virus disease.

2.7 Diagnosis

In Africa, laboratory confirmation of Ebola cases has been challenging and early recognition of the first outbreaks were severely hampered as a result. Because the disease was poorly known or rare, laboratory investigations were oriented towards the more common, endemic pathogens in the area.

Early laboratory confirmation of suspected clinical haemorrhagic fever cases is essential to implement appropriate control measures. However, confirmation that symptoms are caused by Ebola virus infection are made using the following investigative methods: antibody-capture enzyme-linked immunosorbent assay ELISA for the detection of Ebola IgG- and IgM-specific antibodies and virus antigens, serum neutralization test, reverse transcriptase polymerase chain reaction (RT-PCR) assay, electron microscopy, virus isolation by cell culture. Samples from patients are an extreme biohazard risk; laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions.

The identification of Ebola should be handled by the Centers for Disease Control and Prevention (CDC). These tests are typically done in a laboratory with higher biosafety level

containment. The Utah Public Health Laboratory (UPHL) can arrange for shipping of specimens safety to the Centre for Disease Control and Prevention.

2.8 Clinical features of Ebola virus Disease

The onset of the disease is abrupt after an incubation period of 2-21 days. The clinical features can be divided into four main phases as follows such as

(1) Phase A. Influenza–like syndrome: The onset is abrupt with non-specific symptoms or signs such as high fever, headache, arthralgia, myalgia, sore throat, and malaise with nausea.

(2) Phase B. Acute (day 1–6): Persistent fever not responding to anti-malaria drugs or to antibiotics, headache, intense fatigue, followed by diarrhoea and abdominal pain, anorexia and vomiting.

(3) Phase C. Pseudo-remission (day 7–8): During this phase the patient feels better and seeks food. The health situation presents with some improvement. Some patients may recover during this phase and survive from the disease and

(4) Phase D. Aggravation (day 9): In many if not most cases, the health status gets worse. The following symptoms may be observed:

- Respiratory disorders: dyspnoea, throat and chest pain, cough, hiccups
- Symptoms of haemorrhagic diathesis: bloody diarrhoea, haematemesis, conjunctiva injection, gingival bleeding, nosebleeds and bleeding at the site of injection consistent with disseminated intravascular coagulation
- Skin manifestations: petaechiae (not so obvious on black skin), purpura (morbiliform skin rash)
- Neuro-psychiatric manifestations: prostration, delirium, confusion, coma
- Cardio-vascular distress and hypovolaemic shock (death).

From these clinical manifestations, it is obvious that Ebola virus fever may mimic many other tropical diseases like malaria, typhoid fever or yellow fever at the start of the disease. In most outbreaks, recognition of the disease is delayed because physicians are not accustomed to this new illness and the symptoms are generally non-specific. Outside the epidemic, it appears quite impossible to recognise the first Ebola case in an outbreak on clinical grounds.

2.9 Control measures

The corner-stone for controlling an outbreak of Ebola is to interrupt the viral transmission chain. In order to reduce transmission, several strict public health measures need to be implemented as quickly as possible, including isolation of patients, identification of index case and tracking of all secondary contacts. Most of the time, outbreaks are managed by a core structure called the International Committee on Scientific and Technical Coordination, under the aegis of the World Health Organisation (WHO). This committee is in charge of implementing control measure activities on a daily basis and has the following working subgroups:

- Co-ordination committee, which is responsible for all epidemic response activities, chair daily meetings and write reports for public health authorities.
- The patient management team is involved in the isolation of clinical cases in a quarantine ward, training of medical and relief personnel on the proper use of protective equipments such as gloves, gowns, and masks and providing medical care based on symptomatic therapy to maintain the vital respiratory, cardio-vascular and renal functions. The Doctors, has developed expertise in this field from involvement in outbreak response.
- The hygiene and sanitation team is in charge of disinfection and burial of all Ebola and non-Ebola dead bodies under safe conditions. Local Red Cross volunteers usually perform these activities.
- The epidemiological surveillance team is in charge of active and passive case finding, contact tracing and rumour-verification of suspect cases or deaths in the community.
- Social mobilisation and health education are critical for controlling an Ebola outbreak. Ebola haemorrhagic fever outbreaks have many socio-cultural aspects that need to be studied deeply as communities can reject the anti-epidemic control measures imposed by the international scientific and technical committee. The existence of rumours and legends related to the outbreaks could obscure the viral nature of the disease. Sometimes the anti-epidemic control measures needed to be adapted to the local culture, for example, funeral practices control (Hewlett *et al.* 2005). The members of this team should include medical anthropologists, local Red Cross volunteers and opinion leaders such as teachers, religious groups for public sensitisation, education and information.

- The logistic support team is in charge of providing any administrative, logistic and technical support to the other teams, such as coordination of secretariat, transport and communication.
- The laboratory and research team is in charge of collecting, storing and shipping of clinical samples for diagnostic confirmation. This team is also responsible for ecological studies to determine the origins of an outbreak.
- Psychosocial support for the affected family or families has been neglected during previous outbreaks, but this issue has become more and more important due to stigmatisation of survivors and their families by the community.

2. 10 Treatment

Managing Ebola patients is a major challenge because there was no effective antiviral drug and no specific vaccine available. Only supportive care could be administered, to sustain cardiac and renal functions with prudent use of perfusion. Oral rehydration was recommended but sometimes not realistic because of throat pain, vomiting and intense fatigue. The main objective was to provide optimal care to the patient with maximum protection of the medical and nursing staff. For that purpose, medical and nursing staff had been trained in the wearing and removal of personal protective equipment (PPE) and other measures.

In a clinical experiment conducted late in the 1995 Ebola outbreak in Kikwit, human convalescent blood was used for passive immunisation to treat patients that had been infected naturally with Zaire strain of the Ebola Virus; seven out of eight patients who received blood transfusion from convalescent Ebola patients survived (Mupapa *et al.* 1999). However, the need to produce candidate vaccine able to confer interspecies cross-protection against all the species of the Ebola virus cannot be emphasized.

ZMapp is an example immediate drug developed by Mapp Biopharmaceutical Incorporation - an experimental drug treatment for use with individuals infected with Ebola virus. The product is a combination of three different monoclonal antibodies that bind to the protein of the Ebola virus. It has been effective in treating macaque monkeys with Ebola. It is too early to know if ZMapp can benefit Ebola patients because the drug is still in an experimental stage and has not yet been tested in humans for safety or effectiveness in clinical trials. Some patients infected with Ebola virus do get better spontaneously or with supportive care. The

best way to know if treatment with the product is effective is to conduct a randomized controlled clinical trial in people to compare outcomes of patients who received the treatment to patients who did not. No such studies have been conducted to date.

On September 2, the National Institute of Health announced a contract with Mapp Biopharmaceutical Incorporations to develop and manufacture ZMapp. As part of the project, Mapp Biopharmaceutical will manufacture a small amount of the drug for early stage clinical safety studies and nonclinical studies needed to demonstrate the drug's safety and effectiveness in people.

On October 21, World Health Organisation announced that testing of two experimental Ebola vaccines will begin as early as January in more than 20,000 front-line healthcare workers and others in West Africa. Two companies, Tekmira and BioCryst Pharmaceuticals, have received funding to develop potential drugs to treat Ebola.

2.11 Preparedness of countries to detect and control Ebola virus disease.

The re-emerging Ebola virus disease outbreak highlights the considerable risk of cases being imported into unaffected countries. With adequate levels of preparation, such introductions of the disease can be contained before they develop into large outbreaks. The success of Nigeria and Senegal in halting the transmission of the Ebola disease, strongly highlights the critical importance of preparedness. Key factors in preventing the spread of Ebola virus disease in both countries included strong political leadership, early detection and response, public awareness campaigns, and strong support from partner organizations.

Following the consultative meeting between the World Health Organisation and Partners on Ebola Virus Disease Preparedness and Readiness held in Brazzaville from 8–10 October, 2014, the World Health Organisation in collaboration with the United Nations and other partners, is accelerating the deployment of international preparedness teams to ensure immediate Ebola disease outbreak response capacity to help unaffected countries build on their existing preparedness work and planning. The prepared teams are formed with national and international implementing partners and networks such as the International Associations of National Public Health Institutes (IANPHI), the Global Outbreak Alert and Response

Network (GOARN), and national public health authorities such as the United State Centre for Disease Control and Prevention.

The initial focus of support by World Health Organisation and partners is highest on countries - Cote d'Ivoire, Guinea Bissau, Mali and Senegal – followed by countries such as – Benin, Cameroon, Central African Republic, Democratic Republic of Congo, Gambia, Ghana, Mauritania, Nigeria, South Sudan, and Togo. The criteria used to prioritize countries include geographical proximity to affected countries, trade and migration patterns, and strength of health systems. World Health Organisation is also expanding preparedness efforts to other countries in Africa and in all regions. World Health Organisations' immediate preparedness efforts are channelled into two streams: preparedness missions/country visits and the provision of guidance and tools. Building on existing national and international preparedness efforts, a set of tools has been developed to help any country identify opportunities for improvements in order to intensify and accelerate their readiness.

One of these tools is a comprehensive checklist of core principles, standards, capacities and practices, which all countries should have or meet. The checklist identifies 10 key components and tasks for both countries and the international community that should be completed within 30 and 60 days respectively from the date of issuing the list. These include: overall coordination, rapid response, public awareness and community engagement, infection prevention and control, case management and safe burials, epidemiological surveillance, contact tracing, laboratory capacity, and capacity building for points of entry. A team was deployed to Mali and Cote d'Ivoire in October. On the 10th of November, teams were deployed to Cameroon, Ghana, Guinea Bissau and Mauritania. On the 17th of November teams visited Benin, Burkina Faso, Gambia, and Senegal. On the 24th of November teams visited Togo. During the first week of December, 2014 teams visited the Central African Republic, Niger, and Ethiopia. The immediate objective of each mission is to ensure that the country is as operationally ready as possible to effectively and safely detect, investigate, and report potential Ebola virus cases and to mount an effective response that will prevent a larger outbreak from developing.

In-country training and capacity-building activities were undertaken during each mission, including technical working group meetings, field visits, table-top exercises and field simulation exercises. Key areas for improvement are identified on the basis of the mission activities, and strengths and weaknesses identified and discussed within the country. Where possible, one or more technical experts remain after the initial mission to maximize capacity building efforts and help ensure sustainability, in readiness for other public health events and emergencies. A plan of action with priorities and cost of implementation is prepared during the mission or just after, so that follow-up capacity-building activities can be carried out rapidly.

2.12 Use of Convalescent Blood as an Empirical Treatment during Outbreaks.

While there is no proven treatment available for Ebola virus disease (EVD), whole blood collected from patients in the convalescent phase of infection has been used as an empirical treatment with promising results in a small group of Ebola cases. During the current ongoing Ebola outbreak, whole blood collected from Ebola virus cases who recovered have been prioritized for investigation, as one of the treatment modalities. The concept that this treatment could be efficacious is biologically plausible, as convalescent plasma has been used successfully for the treatment of a variety of infectious agents.

This interim guidance to national health authorities and blood transfusion services outlines the steps required to collect convalescent whole blood from Ebola virus cases who recovered for transfusion into patients at the early stage of the disease, as an empirical treatment modality. It covers:

- The identification of patients recovered from Ebola virus disease as potential blood donors;
- Informed consent and selection of donors;
- Donor's blood grouping and screening for transmissible infections;
- Blood collection and donor care;
- Labelling, storage and data collection in blood transfusion services;
- Blood group compatibility testing;
- Storage and transportation of convalescent whole blood to the sites where transfusions is to be given;
- Selection of Ebola virus patients for this intervention;
- The clinical transfusion process;

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- Selection of Ebola virus patients for this intervention;
- The clinical transfusion process;

- Data collection at the transfusion site; and
- Assessment of the effectiveness of this empirical treatment.

The convalescent plasma should be collected, prepared, stored and transfused in facilities capable of initiating the process (Mupapa K &Massamba M, 1999).

Patients who have recovered from Ebola virus disease and who have been discharged from Ebola treatment centres or units could be potential donors for convalescent whole blood or plasma, from 28 days after their day of discharge. Ebola neutralizing antibodies are expected to be most effective when plasma is sourced from the areas of on-going active Ebola virus transmission. However, in circumstances where the demand is high and the system is challenged by an overwhelming number of active Ebola patients, convalescent plasma could also be sourced from the places linked to the current Ebola disease outbreak in West Africa, where the outbreak has come under control.

A database of patients who recovered from Ebola virus disease should be created as a potential donor. Only those Ebola patients who have been discharged according to the World Health Organisation criteria: clinically asymptomatic and twice tested negative for Ebola virus RNA by molecular techniques, should be considered as potential donors. The two samples for Ebola virus RNA testing should be taken at least 48 hours apart, and the test results should be negative on each sample. Discharge records of Ebola patients who recovered should be reviewed before considering them as potential convalescent whole blood donors.

The donor selection criteria used in the country should be reviewed in light of the potentially life-saving impact of these specific donations. An appropriate risk assessment should be done to assess the risk reduction value of each selection criteria against the risk impact of exclusion of the donor.

Consideration should also be given to the selection criteria based on specific age range of blood donation. For example, if the current age for blood donation in the country is 18-60 years, and there are significant numbers of Ebola virus cases who recovered outside this age range, the national health authorities may consider extending the age range to widen the potential donor pool. Recovered patients who are less than the recommended age limit for blood donation may donate blood with parental consent following a thorough medical

assessment, including an assessment of total blood volume to determine the acceptable volume to be collected (≤15% of total blood volume for whole blood). Depending on the weight or total blood volume of the potential donor, blood may be collected in small volume (200 mL) blood collection bags. Those above the upper age limit for blood donation should also be assessed by a physician for their suitability to donate.

2. 13 Current Health Care System and Innovation.

The current Ebola epidemic in West Africa is unlike any we have seen since the disease was first identified in the 1970s. It is by far larger in terms of numbers, geographic spread, but also more unpredictable in the behaviour of its spread than any other previous outbreak. The World Health Organisation and its partners have, in turn, had to adapt to a new and uncertain terrain with flexibility and innovation, mobilizing construction of treatment centres, fast tracking vaccine development, creating new guidelines to respond to a fast changing situation, implementing a global Ebola preparedness plan, all at an unprecedented speed and scope.

Ebola became epidemic in Guinea, Liberia, and Sierra Leone in large part because of their weak health systems. Particular weaknesses included insufficient numbers of qualified health workers, and inadequate surveillance and information systems. Other weaknesses include the absence of weak rapid response systems, few laboratories - all located in cities - unreliable supply and procurement systems for Personal Protective Equipments and other supplies, lack of electricity and running water in some health facilities, few ambulances, and limited public health education, community outreach and engagement.

When the outbreak started, existing public health services – which were already quite limited were diverted to Ebola. In addition, many health workers became ill and died from the virus. The net result is that people have encountered significant barriers in accessing needed care, whether for Ebola or for other, more typical health conditions. And the impact of this outbreak spans well beyond health; economies have been affected, food have become scarce, and development has stalled. The answer to stopping Ebola outbreaks of this amplitude is strengthening health care systems. But more importantly than simply strengthening existing capacity for Ebola, countries need to create resilient integrated systems that can be responsive and proactive to any future threat.

2. 14 Rapid, Sensitive, Safe and Simple Ebola Diagnostic Tests - A Priority.

The goal of interrupting chains of Ebola virus transmission depends heavily on laboratory support. This support is needed to confirm or discard suspected cases, guide triage and clinical decisions, aid contact tracing, and facilitate the early detection of cases in people with an exposure history. The World Health Organisation goal of aggressive case detection and isolation likewise depends on laboratory support. Efforts to contain the Ebola outbreaks in West Africa are currently hampered by complex diagnostic tests that impose a number of additional logistical challenges, including requirements for a high level of laboratory bio-safety and staff expertise in using sophisticated machines.

The standard molecular assays currently used in mobile and other laboratories supporting the Ebola response include the reverse-transcriptase polymerase chain reaction [RT-PCR test]. The test, which involves a number of laborious procedures, provides very accurate results when performed by trained staff. Each test requires a full tube of blood, takes from 2 to 6 hours, and costs around $100. These requirements are difficult to meet in resource-constrained West African settings, thus severely limiting testing capacity.

The time lost transporting patient samples over bad roads to West Africa's limited number of laboratories means that anxious patients and their families may need to wait several days for test results.

Lost time means that infected people may remain in the community, with a severe risk of unknowingly transmitting the virus to others. Moreover, in the absence of rapid laboratory support, people with other common infectious diseases, such as malaria and dengue, that have similar early symptoms may be unjustifiably held in an Ebola "transit" centre as a precautionary measure. If they did not have Ebola when entering the centre, they may unfortunately get it there. Apart from posing a severe risk to families and communities, undiagnosed patients contribute to the cyclical transmission pattern currently being seen, whereby cases begin to fall as control measures take effect, only to spike again as new chains of transmission are ignited.

Perhaps most importantly, a recent research study, based on the management of more than 700 Ebola patients in Monrovia, Liberia, strongly suggests that clinical decisions guided by

results from rapid point-of-care diagnostic tests could significantly improve treatment outcomes. Moreover, having such tests readily available could restore some order to West African health systems, which have been devastated by fear of contagion as well as by the demands of managing a deadly and dreaded disease. Apart from expediting the immediate outbreak response, rapid diagnostic tests will have an enduring value in countries where many other endemic diseases mimic the early symptoms of Ebola. Having such tests in hand will also leave health services better prepared for a possible relapse of Ebola disease in West Africa and elsewhere.

2. 15 Advice to National Authorities

The Pan American Health Organization / World Health Organization (PAHO/WHO) advises its Member States to consider implementing the following measures:

- **Surveillance - Detection of case with symptoms compatible with Ebola Virus Disease.**

In the current context, the most likely scenario that affected countries might have to face is the introduction of small number of cases. Therefore, to avoid further spread locally, it is critical that detection mechanisms be highly sensitive, so as to report to national public health authorities that an individual might be infected by the Ebola virus at the slightest suspicion, which, in turn should immediately communicate this occurrence through the channels established by the International Health Regulations (IHR), given that such an event is considered unusual.

The identification of a case of Ebola virus infection must take into account both the clinical manifestations and travel history to epidemic zones as reported by the patient. The detection of these unusual health events potentially associated with the introduction of the Ebola virus is very crucial as a means of preventing further spread. It is therefore important that the personnel are properly informed and trained. They need to be kept updated on the evolution of the spread of Ebola virus disease, and be trained to recognize the symptoms of Ebola virus disease, inquire about travel history, and understand the protocols in informing relevant authorities.

➢ Contact tracing

Contact person is defined as any person having had contact with the Ebola virus during the 21 days preceding the onset of symptoms in at least one of the following ways:

- Having slept in the same household with a case
- Has had direct physical contact with the case (dead or alive) during the illness
- Has had direct physical contact with the (dead) case at the funeral
- Has touched his/her blood or bodily fluids during the illness
- Has been breastfed by a case

When an individual with clinical and epidemiology history compatible with Ebola virus disease is identified or in the case of an unexplained death in a traveller with clinical and epidemiological history compatible with Ebola virus disease, even though laboratory diagnosis is pending, identification of contacts and their monitoring for 21 days after the last date of known exposure to Ebola virus should be initiated. If the patient with illness compatible to Ebola virus disease develops symptoms while on an aircraft, contact tracing must be made according to the risk assessment guidelines for diseases transmitted on aircraft- which indicates contact tracing of all those passengers seated within 4 rows ahead and 4 rows behind, as well as the crew on board. If the cleaning of the aircraft is performed by unprotected personnel, they should be considered as contacts. Contacts should be assessed in a designated area within the airport according to the airport contingency plan. When any international traveller in transit is among the identified contacts, the national authorities should determine the least disruptive and most acceptable way to secure the follow up of the contact. Continuation of international travel to the final destination should be preceded by communication to national health authorities in the relevant country.

➢ Laboratory Diagnostic

Once an individual with illness compatible with Ebola virus disease is identified, a sample must be taken (whole blood/serum) for the laboratory diagnosis. The sample should be obtained by trained health personnel with extreme biosecurity measures and additional protective equipment (non-sterile gloves, masks, goggles - preferably with an anti-fog visor, apron or waterproof apron and if possible, the disposable type). The sample should ideally be

taken at the hospital designated to handle cases compatible with Ebola virus disease and sent to the National Reference Laboratory.

Of note, is that the confirmation of Ebola virus infection can only be performed in patients who have already developed symptoms. The confirmation is not possible during the incubation period. In the case of dead of an individual with illness clinically and epidemiologically compatible with Ebola virus disease, an oral swab should be obtained. Autopsy in these circumstances is contraindicated.

➢ Case Management

Recognizing patients with symptoms compatible with Ebola virus disease can be detected at different levels of the health care system or at points of entry, and that they should be handled using standard infection control precautions. The patient should be transferred and managed in a designated health facility which must comply with the following characteristics:

- Contact isolation conditions,
- Appropriate provisions of Personal Protective Equipment,
- Health services personnel trained in infection prevention and control.

Ideally, patients should be kept in individual rooms. If this is not possible, patients should be placed in cohort, isolating separately those who have been confirmed with Ebola virus disease via laboratory tests and those still under investigation for Ebola disease.

The country should consider having a number of designated facilities compatible with their geographical and administrative management.

If the country does not currently have designated hospitals for isolating patients with symptoms consistent with Ebola virus disease, using those services that have already been identified for isolation of patients during the influenza pandemic and/or those used for isolation of patients with multidrug-resistant tuberculosis should be considered.

➢ Patient Referral

The referral of a patient with illness compatible with Ebola virus disease to the designated isolation facility should be performed by trained health care professionals in an appropriate vehicle. The vehicle must only transport essential personnel for patient care.

- Personnel providing direct care to the patient must wear gloves, impermeable gowns, surgical masks, goggles (preferably with anti-fog visor), and closed shoes

- The driver does not need to use Personal protective wears unless possible direct contact with the patient is anticipated.

2.16 Global Health is Local Health

The Ebola outbreak teaches us that public and population health can no longer be defined in terms of national boundaries. There is no longer a global or local/national health. Global health is local health. It is often disappointing to come across public health experts, policy makers, or academics, who put an artificial divide between population health for those living within and those living beyond their national shores. The realities of the current Ebola epidemic and past disease outbreaks such as SARS (Severe Acute Respiratory syndrome), Bird flu (H5N1 Avian flu), BSE (aka the mad cow disease), etc., present some of the profound reasons to agree that "local health is global health" and "global health is local health." (Azuine et al, 2014).

As part of the Worlds' power response, the United States has deployed a contingent of about 4,400 soldiers to the affected West African countries to help them in setting up healthcare facilities to treat Ebola patients. The fact that these soldiers were deployed by the President without the usual political arguments demonstrates the magnitude of risk perception of the epidemic among United States law makers. The United States has also instituted increased screening for airline passengers in the United States and Africa: a practice that had been in place since the outbreak started in affected West African countries such as Liberia, Sierra Leone, Senegal, and Nigeria.

The United States also dispatched a team of public health officials to learn how Africa's most-populous country, Nigeria, and Senegal, among the world's poorest nation, were able to mitigate the spread of the virus in their countries. The US spends far more on healthcare than the Ebola-hit West African countries combined. The fact that the US is learning from Nigeria and Senegal is instructive. Nonetheless, the turn of events with the Ebola outbreak and matters arising raise a number of issues pertinent to our past and ongoing knowledge of global health.

2.17 Bathing in Salt Water Goes Viral

Nigeria's example typifies a community united in a fight against an outbreak with all that it has in its arsenal. People reported those in their neighborhoods who showed signs of Ebola virus disease and were asked to seek medical help. People were part of the overall "contact tracing" by using text messages to contact health officials. The role of the people was so instrumental that, at one time, the country was agog with the notion of a cure for Ebola virus disease by "bathing with salt." The fake cure started from a message sent to a local traditional ruler by subjects. This single communication went viral on the social media and everyone was bathing with salt water to prevent or cure Ebola virus disease. Even as unscientific as this incident is, the fact that this practice went viral within a few hours bears testimony to the level of communal sharing between people, friends, families, colleagues and even strangers during such emergency. This is the Principal factor in public health that must be learned from Nigeria by other countries.

2.18 Moving Beyond Words

It is easy to pontificate and write pages of protocols on how to handle a public health emergency. But the reality and effectiveness of planning is only evaluated when a healthcare system is confronted by the magnitude of an outbreak such as Ebola. Only then can we see the shortcomings of human planning vis-à-vis implementation and the need to understand that global health is local health, that the world can learn from each other, and finally that there is an urgent need to put awareness and sensitization back in public health. Even as it puts in place multiple strategies to address the Ebola in the country, the United States, and other developed countries, must learn from history and resist attempts to use the outbreak to further alienate minorities and immigrant communities within their shores. As the world's global leader, the United States must not allow what happened in its dealing with the first Ebola virus disease patient to repeat itself and or obliterate its efforts to address racial and ethnic disparities in health.

CHAPTER THREE

METHODOLOGY

3.1 Study Area.

The study was carried out at the Murtala Muhammed International Airport (MMA1), Lagos State. The new terminal was opened officially on 15 March 1979. It is the main base for Nigeria's flag carrier airlines, Aero, and Arik Air. Murtala Muhammed International Airport is the nation's busiest airport with two terminals- international and cargo terminals open 24 hours daily while the domestic terminal opens16 hours daily.

At the Murtala Muhammed Airport, there is the Port Health unit, it has a functional clinic with several activities geared towards disease control. The Port health unit engages in several activities for disease control such as administering yellow fever and measles vaccine. In the control of Ebola virus disease, the Port health unit carried out a lot of activities such as temperature measurement for all incoming and outgoing passengers both at the local and international airport via the use of infrared thermometer to determine extreme temperature like 38.6 degree Celsius- a symptom of haemorraghic fever. In addition is the border surveillance at Seme and Idiroko borders with the aim to preventing illegal immigrant whose health status is unknown from coming into the country, evacuation of human remains from the aircraft in case of any mortality and aircraft decontamination.

The facilities available are vaccination section, public health central laboratory, and suspected Ebola patient ward. The staff strength is however not much, but more Environmental Health Officers, Doctors, and Computer scientists were recruited as Ebola response staff during the course of the outbreak. They worked hand in hand with the World Health Organisation drafted to Nigeria to assist during the outbreak. The environmental health officers carry out temperature measurement on passengers as daily job schedule till date while the Doctors examine any traveller referred for secondary screening.

3.2 Study Design

This was a descriptive cross sectional study.

3.3 Study Population

The study population consisted of passengers travelling via the international wing of the Muritala Muhammed Airport, Lagos.

3.4 Inclusion Criteria

Study participants were within ages of 18 and above. They were willing to participate in the study without being coerced. They were able to read and write.

3.5 Exclusion Criteria

Any traveller who objects to filling the questionnaire was be excluded. Passenger with any form of disability was excluded to prevent delay.

3.6 Sample Size Determination.

The minimum sample size required for this study was estimated using formula for descriptive study.

$$n = \frac{Z^2_{\alpha}(P)(1-P)}{d^2}$$

Z_{α} = Standard normal deviate set 1.96 corresponding to 95% confidence interval,

P= Proportion of interest in the target population estimated to have a particular characteristics,

Set at 50% = 0.50 (NB-There was no similar study on the subject in focus).

d= Level of precision at 5% = 0.05

Using p = 0.50, $n = \frac{(1.96)^2(0.5)(1-0.5)}{(0.05)^2}$

n= 384

For 20% non-response =1/ (1-F)

Where F was the percentage of non- response = 0.2

Non-response rate = 1.25

1.25 × 384 = 480

n = 480

3.7 Sampling Procedure

Time location random sampling was used. There are two wings at the departure hall of the Murtala Muhammed International Airport, namely wing Echo & Delta, and two wings at the arrival hall of the airport, namely wing Echo & Delta, respectively. Two operating airlines will be selected from each of the wing, making a total of 8 airlines randomly selected and 60 study subjects will be selected per operating airline. The 60 study subjects selected per airline shall be a mixture of incoming and outgoing passengers' for each of the flight.

For the sampling, study subjects were selected randomly from among the travellers on the queue at both the arrival and departure halls. It was ensured that the selected participants had at least two hours left before travelling in order to ensure sound mind response. The selection was made easier with the help of the immigration officers and carefully trained research.

Table 3.7 Number of participants/Questionnaires allocated to each wing

No of wings	Selected Airline/Flight	Participants/Questionnaire
Departure D	Arik	60
	Aero	60
Departure E	British Airways	60
	Airfrance	60
Arrival D	Delta	60
	Virgin Atlantic	60
Arrival E	Turkish	60
	Medview	60
TOTAL		480

3.8 Data Collection

Data collection was carried out using a mixed method approach namely quantitative and qualitative methods. Quantitative method was conducted using pre-tested self-administered semi-structured questionnaire while the qualitative arm of the study was conducted using a key informant interview. The study instrument was pre-tested to test its validity, comprehensibility and clarity. The questionnaire included information on socio-demographic characteristics (independent variables) and also information on perception, knowledge, attitude and acceptability (dependent or outcome variables) of Ebola virus screening services. The questionnaire was administered in a secluded area after which the study participants had gone through the infrared thermometer screening. Research assistants were fluent in English and some local Languages. Provision was also made for language translation in case of any lack of fluency.

For the qualitative method, the key informant interview involved the stakeholders/service providers' working at the port health unit, two Environmental Health Officers at the primary level of screening, and two Doctors/Nurses at the secondary level of screening, exploring extensively their experiences with incoming and outgoing travellers they have encountered or screened.

3.9 Scoring

Knowledge and perception were scored by assigning one mark to each correct answer and zero to incorrect answers. Total number of marks was obtained and thereafter disaggregated into two groups. A score of above 50% was categorised as good while below 50% was categorised as poor. Attitude was scored using five point likert scale ranging from strongly agreed to strongly disagreed. Highest score of five marks was assigned to the most correct option through to one.

3.10 Data Analysis

Data analysis was carried out using SPSS. Descriptive Statistics such as frequencies and percentages were used to summarize socio-demographic characteristics such as age, religion, ethnicity, and place of residence. Test of association between dependent and independent

variables was carried using Chi-square for categorical variables and student-t test for quantitative variables, respectively. Multiple logistic regression was carried out to determine independent predictors of perception, acccptability and attitude. Level of significance was set at 5%.

3.11 Ethical Consideration

Ethical approval was obtained from Ethical Review Committee of the Lagos State University Teaching Hospital. Permission to conduct this research was obtained from the Manager Federal Airports Authority of Nigeria on the platform of the Federal Ministry of Health, Public Health Department, Port Health Unit, Murtala Muhammed Airport, Ikeja. Written informed consent was obtained from the study participants. Voluntary participation and withdrawal from the research at anytime of the study was allowed without any repercussion. No identifying information were asked.

CHAPTER FOUR

RESULTS

The results of this study are presented in sections. Section one gives detailed information on the socio-demographic characteristics of the study subjects. Section two talks about the awareness and knowledge of air travellers on Ebola virus disease/screening, section three talks about the perception of air travellers towards the Ebola virus screening, section four explains the attitude of air travellers to the Ebola virus screening, section five talks about the acceptability of the Ebola virus screening by the air travellers.

Section six explains knowledge, perception and attitude score towards the Ebola virus screening, section seven talks about the frequency and corresponding percentages of knowledge, perception, and attitude grouping (good/bad) of air travellers towards the Ebola virus screening, seven eight explains the relationship between arriving-departing passengers and good perception towards the Ebola virus screening, section nine talks about the association between arriving-departing passengers and good attitude towards the Ebola virus screening.

Section ten talks about examining the acceptability of the bola virus screening among air travellers, section eleven explains the relationship between socio-demographic factors influencing the acceptability of the Ebola virus screening while section twelve talks about exploring screeners' experience as touching travellers attitude towards the Ebola virus screening—a key informant interview report.

4.1 Socio-demographic characteristics

The age distribution of the study participants is presented using a bar chart in figure 4.1. The mean age of the participants was 33.5±12.3years with the minimum and maximum age being eighteen (18) and eighty one years (81), respectively. Of all the participants, 31.0% fall in age category ≤ 24years. Those between the ages of 25-34years were 124 (25.8%), 35-44years were 109(22.7%), then 45-54years were 67 (14.0%), 55+years were 31 (6.5%).

The frequency distribution of other socio-demographic factors shown in table 4.1.Two hundred and ninety (60.4%) of the participants were males while one hundred and ninety (39.6%) are females. Two hundred and fifty three (52.7%) of the participants were single while 216 (45.0%) were married. Divorced were 6 (1.3%) and only five (1.0%) out of the study participant were widows.

Four hundred and eight (85.0%) had tertiary education, 66 (13.8%) had secondary education, four (0.8%) went to primary school while only two (0.4%) did not attend school.

Of the 480 study subjects, unemployed/student were one 168 (35.0%), those who had trading/business as occupation were 112 (23.3%), professionals were 96 (20.0%), and civil servants were 71 (14.8%). Farming accounted for 1.9%, artisans 0.2%. The two predominant religion of the respondents were Christianity accounting for by 398 (82.9%), and Islam 60 (12.5%). Traditional religion accounted for just nine persons (1.9%) among others.

Foreign nationals who participated in the study were 88 (18.3%) while Nigerians accounted for 398 (82.9%).

The airlines selected for this study were three locally owned airlines namely Aero, Medview Arik, and five foreign airlines namely British Airways, Airfrance, Delta, Turkish and Virgin Atlantic airlines. Equal number of study subjects 60 (12.5%) was randomly selected from each of the airline.

Out of the 480, outgoing passengers were 304 (63.3%) while arriving passengers accounted for 176 (36.7%).

Table 4.1: Socio-demographic Characteristics of Study Participant

Variables	Frequency	N =480 Percentage (%)
Age Group in years		
<24	149	31.0
25-34	124	25.8
35-44	109	22.7
45-54	67	14.0
55+	31	6.5
Gender		
Male	290	60.4
Female	190	39.6
Marital Status		
Single	253	52.7
Married/Divorced/Widow	237	47.3
Highest Level of Education		
Did not attend school	2	0.4
Primary	4	0.8
Secondary	66	13.8
Tertiary	408	85.0
Occupation		
Civil servants/Farming	80	16.7
Trading/Business	112	23.3
Unemployed/Student	168	35.0
Professionals	96	20.0
Artisans/Others	24	5.0
Religion		
Christianity	398	82.9
Islam	60	12.5
Traditional	9	1.9
Others	13	2.7
Nationality		
Nigerian	392	81.7
Non-Nigerian	88	18.3
Are you arriving or departing?		
Arriving	176	36.7
Departing	304	63.3

4.2. The frequency distribution of participants' response to questions on awareness and knowledge on Ebola virus disease/screening is shown in table 4.2

The respondents who have heard about Ebola virus disease were 479 (83.3%) while just 0.2% claimed not to have heard about the Ebola virus disease out of the total 480 study participants.

Of the four hundred and eighty study participants, 454 (94.6%) have heard about Ebola virus screening at one time or the other while 26 (5.4%) hadn't heard about it. Of this 454 (94.6%), 264 (58.1%) heard about the screening through health worker, 114 (25.1%) heard via the media, 28 (6.2%) through the magazine, 15 (3.3%) through posters, 8 (1.8%) through religious organisation, 6 (1.3%) via campaign, 5 (1.1%) via friends, and others such as television accounted for 14 (3.1%).

The major source of information on Ebola virus disease was by the internet 400 (83.3%) while 80 (16.7%) said they have never heard via the internet, 366 (76.3%) mentioned newspaper while 114 (23.8%) said they did not hear about the disease via the newspaper, 71.0% mentioned radio while 29.0% claimed not to have heard via the radio, 64.0% mentioned friends while 36.0% said they never got to hear about the Ebola virus disease through friends . 63.3% mentioned posters while 36.7% said they did not hear through posters. 58.8% mentioned health facility while 41.3% objected to having heard through health facility, and 53.1% mentioned campaign while 46.9% said not through campaign.

Out of the four hundred and eighty study subjects, 450 (93.8%) accepted they could be infected with the Ebola virus disease should they have contact with any bodily fluids of an infected persons such as sweat and blood while 30 (6.3%) declined to this fact. Also 369 (76.9%) said they know they could get infected with the Ebola virus when they consume bush meat infected with the virus such as fruit bat and monkey. 367 (76.5%) accepted they could be infected with the Ebola virus when they shake hands with someone infected with the virus already. 295 (61.5%) accepted transmission of Ebola virus disease can occur through sexual intercourse. One hundred and eleven (21.3%) believed the virus mode of transmission was also airborne.

The participants who said they knew that fever 38.6 degree Celsius is a major Ebola virus disease symptoms were 430 (89.6%), vomiting was mentioned by 421 (87.7%), haemorrhage

412 (85.8%), 373 (77.7%) mentioned diarrhoea. Furthermore, 241 (50.2%) mentioned sore throat while skin rashes was mentioned by 218 (45.4%).

Of the four hundred and eighty, 426 (88.8%) agreed that the Ebola virus incubating period in any infected individual is 2-21days (3weeks) while 7.5% agreed 10-31days, 2.3% agreed to 18-41days, 0.2% agreed 26-51days and those without opinion were 1.3%.

Table 4.2: Awareness and Knowledge of Respondents on Ebola Virus Disease/Screening

Variables (N=408)	Yes (n %)	Total
Have you heard about Ebola virus disease?	479(99.8)	480(100%)
If yes, what are your sources of information on Ebola virus disease?		
Internet	400(83.3)	480
Radio	341(71.0)	480
Newspaper	366(76.3)	480
Friends	307(64.0)	480
Health facility	282(58.8)	480
Posters	304(63.3)	480
Campaign	255(53.1)	480
Which of the following ways can one be infected with Ebola virus disease?*		
Handshake	367(76.5)	480
Sex	295(61.5)	480
Eating infected bush meat	369(76.9)	480
Inhalation	102(21.3)	480
Which of the following signs and symptoms can be used to recognise someone with Ebola virus disease?*		
Contact with bodily fluids of infected person	450(93.8)	480
Vomiting	421(87.7)	480
Sore throat	241(50.2)	480
Fever	430(89.6)	480
Diarrhoea	373(77.7)	480
Skin rashes	218(45.4)	480
Bleeding	412(85.8)	480

When does Ebola virus disease begin to show signs in victims?	Frequency(n)	Percent(%)
2-21days after contact with an infected person	426	88.8
10-31days after contact with an infected person	36	7.5
18-41days after contact with an infected person	11	2.3
26-51days after contact with an infected person	1	0.2
Others	6	1.3
Have you heard about Ebola virus screening?		
Yes	454	94.6
No	26	5.4
Sources of information about Ebola? (n=454)		
Health worker	264	58.1
Magazine	28	6.2
Media	114	25.1
Religious organisation	8	1.8
Friends	5	1.1
Posters	15	3.3
Campaign	6	1.3
Others	14	3.1

4.3 Perception of Air Travellers towards Ebola Virus Screening

When respondents were asked what to do when they come in contact with an infected person, 433 (90.2%), mentioned they would seek medical treatment, 12 (2.5%) mentioned going to church, 7 (1.5%) said they will cry, 5 (1.0%) said they will kill self, while 1 (0.2%) mentioned they will panic or be confused and another 1 (0.2%) mentioned they will infect others.

456 (95.0%) mentioned the Ebola virus screening is necessary at the airport while 5.0% said contrary.

Three hundred and thirty eight (70.4%) preferred being screened via the use of infrared thermometer, 69 (14.4%) prefer checking for the signs and symptoms of the disease, 44 (9.2%) perceive asking for travel history is mostly preferred, should anyone has gone to any country currently experiencing Ebola epidemic or the disease cessation just occurred.

About 22 (4.6%) were of the opinion that laboratory test is the best means of getting screened.

375 (78.1%) were of the opinion the use of infrared thermometer for screening has side effect while 105 (21.9%) feel contrary.

Three hundred and eighty (79.2%) were of the opinion that the Ebola virus screening does not affect their travelling schedule in any way while 100 (20.8%) said it does with respect to timing and meeting up with appointments.

Table 4.3: Perception of Travellers towards Ebola Virus Screening

What will you do, if you feel you have been exposed to the Ebola virus? N = 480	Frequency (n)	Percent (%)
Crying	7	1.5
Die/kill myself	5	1.0
Seek medical help	433	90.2
Ignorance/church	12	2.5
Panic/Confused	1	0.2
Don't know	1	0.2
Infect others	1	0.2
Do you think the use of infrared thermometer for Ebola virus screening is necessary at the airport?		
Yes	456	95.0
No	24	5.0
What are your preferred means of being screened?*		
Use of infrared thermometer	338	70.4
Checking for travel history	44	9.2
Checking for signs/symptoms	69	14.4
Laboratory test	22	4.6
Others	7	1.5
Do you think the use of infrared thermometer poses any side effect?		
Yes	105	21.9
No	375	78.1
Do you think the screening affects your travelling schedule in any way?		
Yes	100	20.8
No	380	79.2

*=Multiple Responses Recorded

4.4 Attitude of air travellers to the Ebola virus screening

One hundred and thirty nine (29.0%) study participants strongly agreed that they undergo Ebola virus screening quiet often, 35.8% agreed, 13.0% disagreed, 11.0% were undecided while strongly disagreed equally accounted for 11.0%. Nineteen (4.0%) strongly agreed that the Ebola virus screening is time wasting, 14.8% agreed, 9.6% were undecided, 35.0% disagreed while 36.7% strongly disagreed. Two hundred and four (42.5%) strongly agreed that the advantages of the Ebola virus screening outweigh its demerits, 36.3% agreed, 8.8% were undecided. 4.6% disagreed while 7.9% strongly disagreed.

Of the 480 study participants, 177 (36.9%) strongly agreed that the Ebola virus screening actually enabled them to know that fever is a sign of the disease, 45.6% agreed, 8.1% were undecided, 6.3% disagreed and 3.1% strongly disagreed. Thirty seven (7.7%) strongly agreed that the use of the infrared thermometer is dangerous to health, 13.3% agreed, 23.1% were undecided, 28.5% disagreed while 27.3% strongly disagreed. Two hundred and seventy (56.3%) strongly agreed that the Ebola virus screening via the use of infrared thermometer appeared dangerous to health, 36.5% agreed, 5.2% were undecided, 1.3% disagreed and 0.8% strongly disagreed.

One hundred and thirty seven (28.5%) strongly agreed that the medical officers who engage in the Ebola virus screening are competent, 36.9% agreed, 27.9% were undecided, 2.1% disagreed while 1.9% strongly disagreed. Two hundred and nine (43.5%) strongly agreed to willingness to undergo the Ebola virus screening when travelling, 43.8% agreed,7.7% were undecided, 3.1% disagreed and 1.9% strongly disagreed. Twenty five (5.2%) strongly agreed they are always afraid anytime they get screened, 12.3% agreed, 13.8% were undecided, 35.6% disagreed, while 33.1% strongly disagreed.

One hundred and ninety one (39.8%) strongly agreed they don't get scared when screened, 36.7% agreed they get scared when screened with the use of the infrared thermometer, 9.4% were undecided, 8.1% disagreed and 6.0% strongly disagreed.

156 (32.5%) strongly agreed they were satisfied with the screening me, 42.5% agreed, 18.5% were undecided, 4.0% disagreed while 2.5% strongly disagreed.

Table 4.4 : Attitude of Travellers towards Ebola Virus Screening

S/N	Variables N=480	n(%)				
	Statement	Strongly agreed	agreed	Undecided	disagreed	Strongly disagreed
1	I undergo Ebola virus screening quiet often	139(29.0)	172(35.8)	53(11.0)	63(13.1)	53(11.0)
2	I undergo Ebola virus screening quiet often	19(4.0)	71(14.8)	46(9.6)	168(35.0)	176(36.7)
3	The advantages of Ebola virus screening outweighs its disadvantages	204(42.5)	174(36.3)	42(8.8)	22(4.6)	38(7.9)
4	The Ebola virus screening has enabled me to know that fever is a sign of the disease.	177(36.9)	219(45.6)	39(6.3)	30(6.3)	15(3.1)
5	The use of infrared thermometer is dangerous to health	37(7.7)	64(13.3)	111(23.1)	137(27.3)	131(27.3)
6	The Ebola virus screening is for the protection of passengers	270(56.3)	175(36.5)	25(5.2)	6(1.3)	4(0.8)
7	The medical personnel who engage in the Ebola virus screening are competent	137(28.5)	190(39.6)	134(27.9)	10(2.1)	9(1.9)
8	Am willing to undergo Ebola virus screening when travelling	209(43.5)	210(43.8)	37(7.7)	15(3.1)	9(1.9)
9	Am always afraid anytime I get screened	25(5.2)	59(12.3)	66(13.8)	171(35.6)	159(33.1)
10	I don't get scared when screened	191(39.8)	176(36.7)	45(9.4)	39(8.1)	29(6.0)
11	I am satisfied with the screening	156(32.5)	204(42.5)	89(18.5)	19(4.0)	12(2.5)

4.5 Acceptability of the Ebola virus screening by air travellers

Majority of the participants 432 (90.0%) said they are comfortable being screened for the Ebola virus via the use of infrared thermometer while 48 (10.0%) didn't feel comfortable with it. Of the four hundred and eighty participants, 426 (88.8%) also believed being screened with the infrared thermometer is purely for their safety while 6.3% also believed they had no choice, 4.4% mentioned the government made it compulsory, 0.4% said they saw others doing it.

Table 4.5: Acceptability of Ebola Virus Screening by Travellers

Variables	Frequency (n)	Percent (%)
Do you feel comfortable being screened with the infrared thermometer?		
Yes	432	90.0
No	48	10.0
Why did you allow yourself to be screened?		
You believe it is for your safety	426	88.8
The government made it compulsory	21	4.4
You saw others doing it	2	0.4
You had no choice	30	6.3
Others	1	0.2

4.6 Knowledge, perception and attitude mean score towards the Ebola virus screening

For scoring knowledge, every correct answer was assigned 1 mark and wrong answer as 0, after which total was taken and expressed in 50 percentile. Nine marks correspond to 50 percentile. Therefore, the reference standard for good knowledge score was ≥ 9 marks while ≤ 8 represented poor knowledge of the Ebola virus disease/screening.

Perception score was done by assigning 1 mark to correct answer and wrong answer 0, later expressed in 50 percentile. Six marks correspond to 50 percentile. Therefore the reference standard for good perception score was ≥ 6 marks while ≤ 5 represented poor perception towards the Ebola virus screening.

For attitude score, options were strongly agreed (SA), agreed (A), undecided (U), disagreed (D), and strongly disagreed (SD). The correct answer was assigned 5 marks all through to 1 mark, and was expressed in 50 percentile. 50% percentile corresponds to 43 score. Therefore, the reference standard for good attitude score was ≥ 43 marks while ≤ 42 marks was indicative of poor attitude towards the Ebola virus screening.

Table 4.6: Mean score of knowledge, perception, and attitude

Knowledge, perception and attitude towards screening	MEAN SCORE± SD	PERCENTILE(50)
Knowledge of Ebola virus disease/screening	8.7±1.8	9.0
Perception of Ebola virus screening	5.4±1.0	6.0
Attitude towards Ebola virus screening	43.4±5.5	43.0

4.7 Frequency of knowledge, perception and attitude of participants towards Ebola virus screening

Of the 480 study participants, 294 (61.3%) had good knowledge while 186 (38.8%) had poor knowledge of the disease/screening.

Two hundred and sixty four (55.0%) have good perception towards the screening while 216 (45.0%) have poor perception towards the screening.

The participants with good attitude were 264 (55.0%) while those with bad attitude accounts for 216 (45.0%).

Table 4.7: Frequency of Knowledge, Perception and Attitude grouping of Respondents towards Ebola Virus Screening/Disease

Knowledge, perception and attitude grouping towards Ebola virus screening	Frequency (%)
Knowledge of Ebola virus disease/screening	
Poor knowledge	186(38.8%)
Good knowledge	294(61.3%)
TOTAL	480(100.0%)
Perception towards Ebola virus screening	
Poor perception	216(45.0%)
Good perception	264(55.0%)
TOTAL	480(100.0%)
Attitude towards Ebola virus screening	
Bad attitude	216(45.0%)
Good attitude	264(55.0%)
TOTAL	480(100.0%)

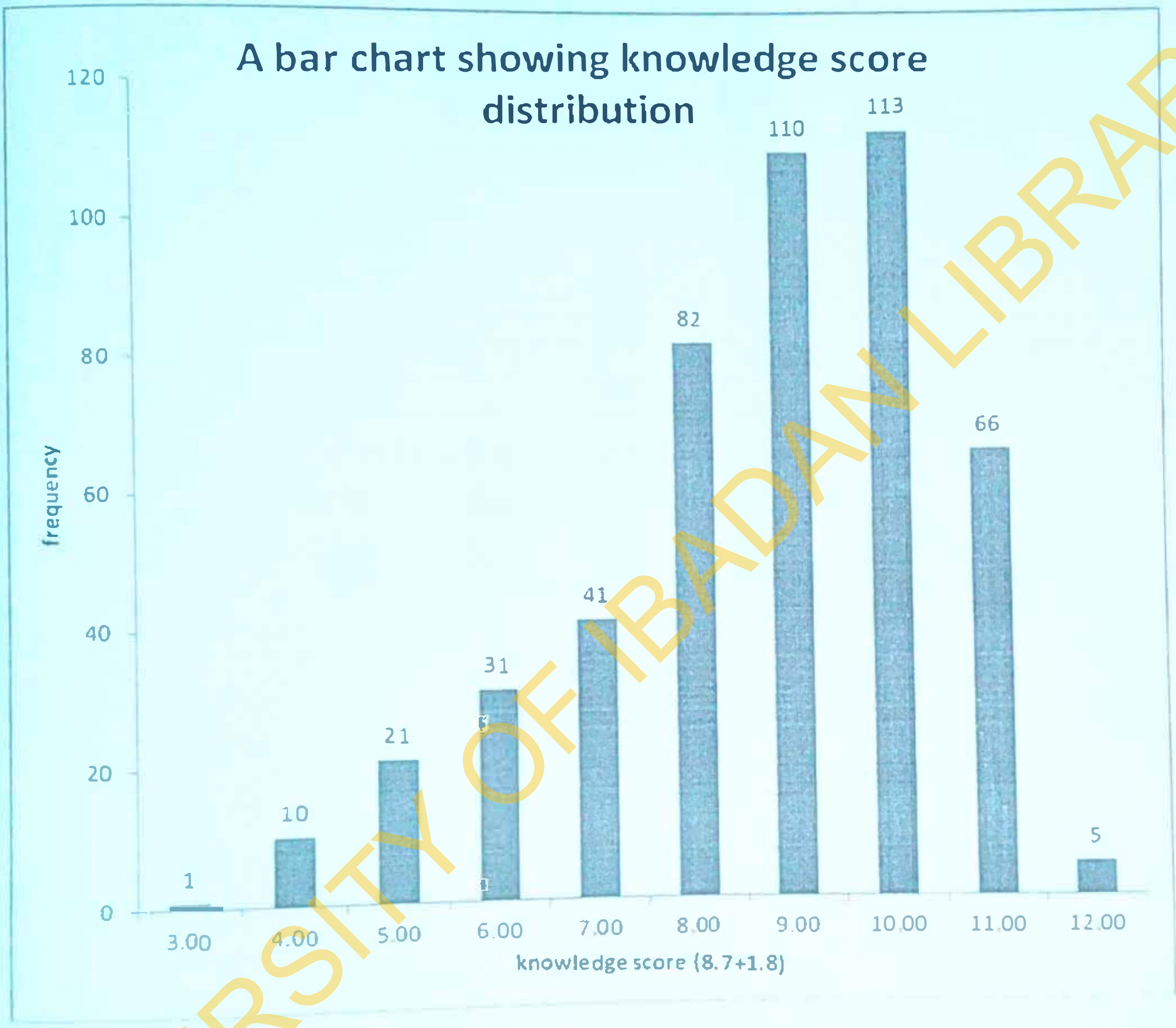

Figure 4.7.1 Mean knowledge score = 8.7±1.8

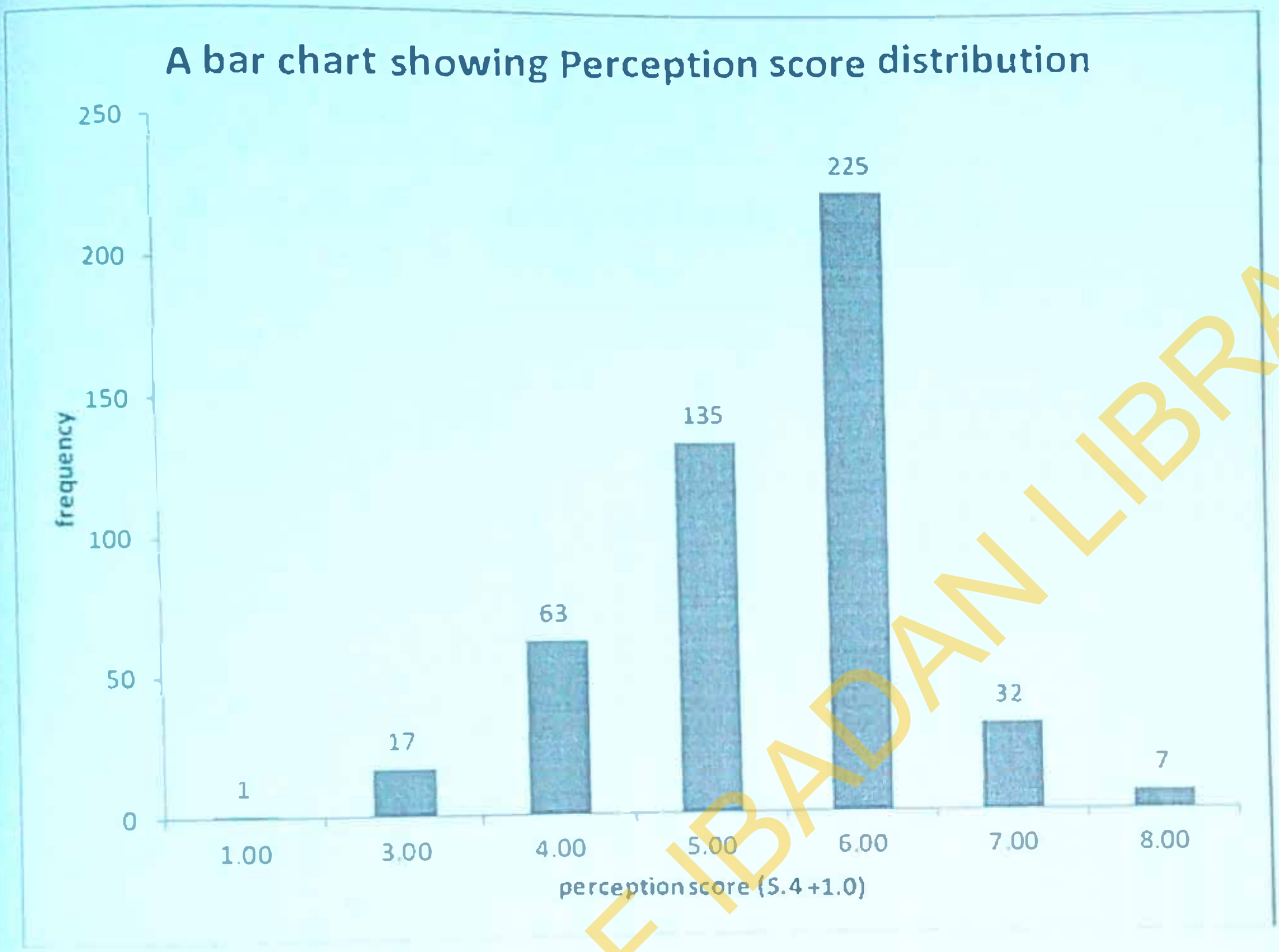

Figure 4.7.2 Mean perception score = 5.4±1.0

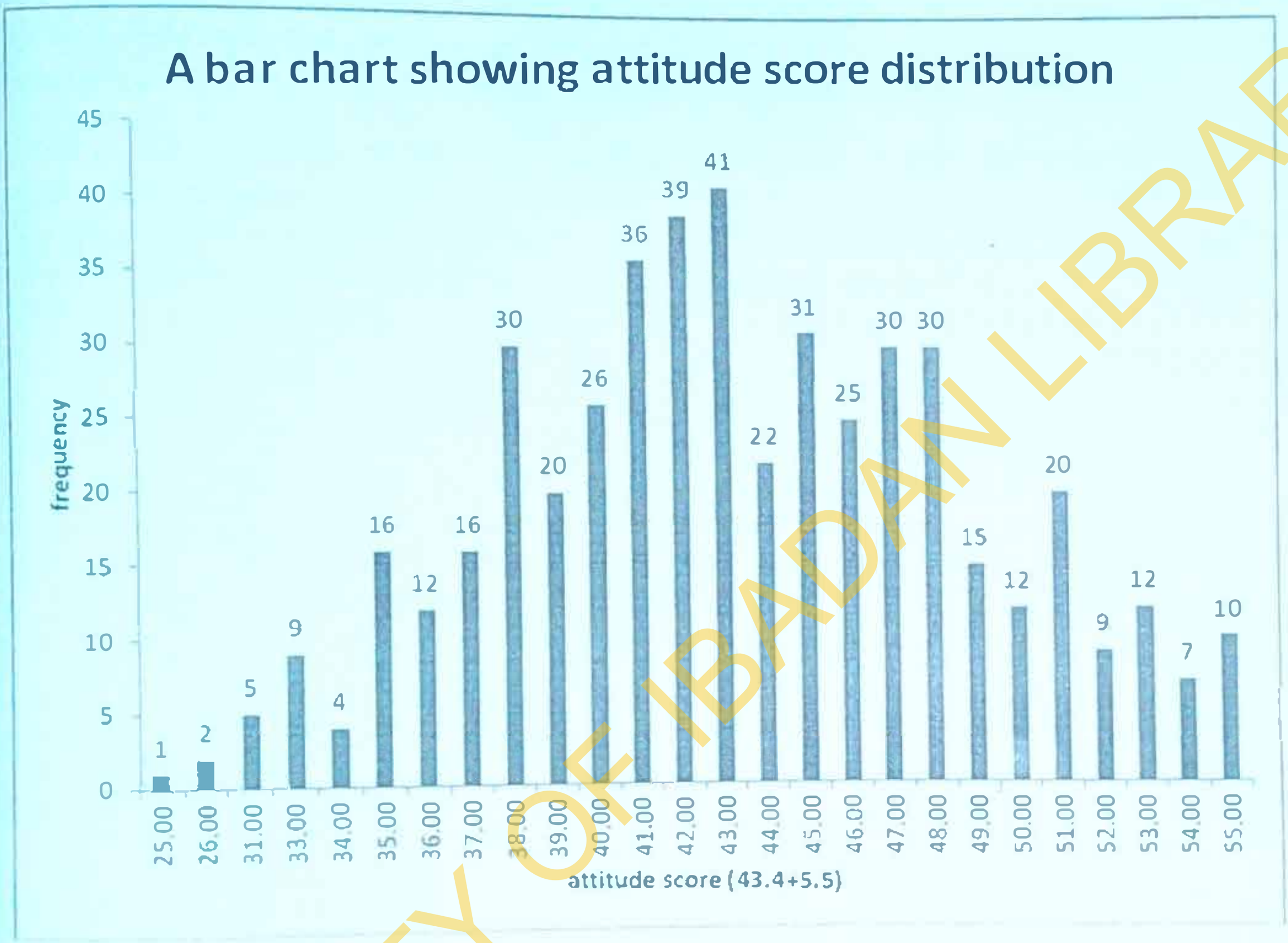

Figure 4.7.3 Mean attitude score = 43.4±5.5

4.8 Relationship between arriving-departing passengers and good perception towards the Ebola virus screening

Incoming passengers who had poor perception towards the Ebola virus screening were 89 (50.6%) while those with good perception were 87 (49.4%). Outgoing passengers who had poor perception were 127 (41.8%) while those with good perception were 177 (58.2%).

However, the proportion of departing passengers with good perception towards the Ebola virus screening was 36.9% while the proportion of those with poor perception was 26.5%. The proportion of arriving passengers with good perception towards the Ebola virus screening was 18.1% while the proportion of those with poor perception was 18.5%.

Table 4.8 : Association between arriving-departing passengers and good perception towards the Ebola virus screening.

Outcome Variable	Travelling Mode			
	Arriving	Departing	Pearson Chi square X^2	p-value
	n(%)	n.(%)	3.481	0.062
Bad perception	89(50.6%)	127(41.8%)		
Good perception	87(49.4%)	177(58.2%)		
TOTAL	176(100.0%)	304(100.0%)		

4.8.1: Association between socio-demographic characteristics, other related factors and the perception of the Ebola virus screening

Gender, marital status, and submitting to the Ebola virus screening were found to be associated with both good and bad perception.

Table 4.8.1: Socio-demographic and other related factors associated with perception of screening

Variables	PERCEPTION				
N=480	Poor	Good	Total N=480	X^2	p-value
Age	n(%)	n(%)			
≤ 24years	76 (51.0%)	73 (49.0%)	149	7.8	0.099
25-34years	60 (48.4%)	64 (51.6%)	124		
35-44years	42 (38.5%)	67 (61.5%)	109		
45-54years	23 (34.3%)	44 (65.7%)	67		
55+ years	15(48.4%)	16 (51.6%)	31		
Gender					
Male	115 (39.7%)	175 (60.3%)	290	8.5	0.004*
Female	101 (53.2%)	89 (46.8%)	190		
Marital Status					
Not currently married	130 (49.2%)	134 (50.8%)	264	4.3	0.039*
Married	86 (39.8%)	130 (60.2%)	216		
Highest level of education					
< Tertiary	37 (51.4%)	35 (48.6%)	72	1.4	0.237
Tertiary	179 (43.9%)	229 (56.1%)	408		
Occupation					
Civil servant	35 (49.3%)	36 (50.7%)	77	8.7	0.070
Farming/ Artisans/ others	18 (54.5%)	15 (45.5%)	33		
Trading/ Business	41 (36.6%)	71 (63.4%)	112		
Unemployed/ Student	85 (50.6%)	83 (49.4%)	168		
Professionals	37 (38.5%)	59 (61.5%)	96		
Religion					
Christianity	182 (45.7%)	216 (54.3%)	398	4.8	0.092
Islam	29 (48.3%)	31 (51.7%)	60		
Traditional/Others	5 (22.7%)	17 (77.3%)	22		
Nationality					
Nigerian	182 (46.4%)	210 (53.6%)	392	1.8	0.184
Non-Nigerian	34 (38.6%)	54 (61.4%)	88		
Are you arriving or departing.					
Arriving	89 (50.6%)	87 (49.4%)	176	3.5	0.062
Departing	127 (41.8%)	177 (58.2%)	304		
Do you feel comfortable being screened with the infrared thermometer?					
Yes	190 (44.0%)	242 (56.0%)	432	1.8	0.178
No	26 (54.2%)	22 (45.8%)	48		
Why did you allowed yourself to be screened					
You believe it is for your safety	184 (43.2%)	242 (56.8%)	426	7.0	0.020*
The government made it compulsory	15 (71.4%)	6 (28.6%)	21		
You saw others doing it	17 (51.5%)	16 (48.5%)	33		

4.9 Association between arriving-departing passengers and good attitude towards the Ebola virus screening

Arriving passengers who had poor and good attitude towards the Ebola virus screening were 94 (53.4%) and 82 (46.6%), respectively while passengers departing who had poor and good attitude were 122 (40.1%) and 182 (59.9%), respectively. Among those arriving, the proportion with poor attitude towards screening were higher than those with good attitude with a percentage difference 6.8% while those who had good attitude were higher than those with poor attitude among departing passengers with a difference of 19.8 %.

The proportion of arriving passengers with good attitude towards Ebola screening was 17.0% while for departing counterpart was 37.92%.

Differences in attitude between arriving and departing were significant. A higher proportion of departing passengers had good attitude compared with those arriving. $X^2=7.9$; $p=0.005$.

Table 4.9: Association between arriving-departing passengers and good attitude towards Ebola virus screening

Outcome Variable	Travelling Mode			
	Arriving N=480	Departing N=480	Pearson Chi square X^2	p-value
	n(%)	n.(%)	7.940	0.005
Poor attitude	94(53.4)	122(40.1)		
Good attitude	82(46.6)	182(59.9)		
TOTAL	176(100.0%)	304(100.0%)		

4.9.1 Association between socio-demographic characteristics, other related factors and attitude of participants towards screening

All the variables in the table below were found to be associated with attitude at 5% level of significance except education and religion.

Table 4.9.1: Association between socio-demographic characteristics, other related factors and attitude of participants towards screening

Variables	Attitude				
	Poor	Good	Total	X^2	p-value
Age group	n(%)	n(%)		14.0	0.007*
≤ 24years	85 (57.0)	64 (43.0)	149		
25-34years	53 (42.7)	71(57.3)	124		
35-44years	42 (38.5)	67 (61.5)	109		
45-54years	23 (34.3)	44 (65.7)	67		
55+ years	13 (41.9)	18 (58.1)	31		
Gender				9.6	0.002*
Male	114 (39.3)	176 (60.7)	290		
Female	102 (53.7)	88 (46.3)	190		
Marital Status				7.9	0.005*
Not currently married	134 (50.8)	130 (49.2)	264		
Married	82 (38.0)	134 (62.0)	216		
Highest level of education				0.024	0.877
< Tertiary	33 (45.8)	39 (54.2)	72		
Tertiary	183 (44.9)	225 (55.1)	408		
Occupation				11.4	0.022*
Civil servant	27 (38.0)	44 (62.0)	71		
Farming Artisans/ others	12 (36.4)	21 (63.6)	33		
Trading/Business	42 (37.5)	70 (62.5)	112		
Unemployed/Student	92 (54.8)	76 (45.2)	168		
Professionals	43 (44.8)	53 (55.2)	96		
Religion				5.3	0.072
Christianity	177 (44.5)	221 (55.5)	398		
Islam	33 (55.0)	27 (45.0)	60		
Traditional/Others	6 (27.3)	16 (72.7)	22		
Nationality				7.6	0.006*
Nigerian	188 (48.0%)	204 (52.0)	392		
Non-Nigerian	28 (31.8)	60 (68.2)	88		
Are you arriving or departing.				7.9	0.005*
Arriving	94 (53.4)	82 (46.6)	176		
Departing	122 (40.1)	182 (59.9)	304		
Do you feel comfortable being screened with the infrared thermometer?				14.4	0.000*
Yes	182 (42.1)	250 (57.9)	432		
No	34 (70.8)	14 (29.2)	48		
Why did you allowed yourself to be screened				12.8	0.002*
You believe it is for your safety	180 (42.3)	246 (57.7)	426		
The government made it compulsory	12 (57.1)	9 (42.9)	21		
You saw others doing it	24 (72.7)	9 (27.3)	33		

Significant at 5%

4.10 : Socio-demographic factors influencing the acceptability of Ebola virus screening

The cross tab result of the association between socio-demographic factors and acceptability of the Ebola virus screening shows that not a single socio-demographic factor was associated with the acceptability of the Ebola virus screening as all p values obtained were greater than 5% ($p > 0.05$) and this was not statistically significant.

Table 4.10: Relationship between the socio-demographic factors influencing the acceptability of Ebola virus screening

Independent Variable:	Do you feel comfortable being screened with the infrared thermometer?				
(N=480)	YES	NO	Total (N=480)	X^2	p-value
	n (%)	n (%)			
Age group				3.560	0.469
≤24years	132(88.6)	17(11.4)	149		
25-34years	108(87.1)	16(12.9)	124		
35-44years	101(92.7)	8(7.3)	109		
45-54yeasr	63(94.0)	4(6.0)	67		
55+years	28(90.3)	3(9.7)	31		
Gender				0.871	0.351
Male	264(91.0)	26(9.0)	290		
Female	168(88.4)	22(11.6)	190		
Marital status				0.239	0.652
Not currently married	236(89.4)	28(10.6)	264		
Married	196(90.7)	20(9.3)	216		
Level of education				1.432	0.233
< Tertiary	62(86.1)	10(13.9)	72		
Tertiary	370(90.7)	38(9.3)	408		
Occupation				6.351	1.174
Civil servant	65(91.5)	6(8.5)	71		
Farming /Artisans/Others	33(100.0)	0(0.0)	33		
Trading/Business	103(92.0)	9(8.0)	112		
Unemployed/Student	146(86.9)	22(13.1)	168		
Professionals	85(88.5)	11(11.5)	96		
Religion				3.909	0.142
Christianity	361(90.7)	37(9.3)	398		
Islam	50(83.3)	10(16.7)	60		
Traditional/Others	21(95.5)	1(4.5)	22		
Nationality				0.748	0.387
Nigerian	355(90.6)	37(9.4)	392		
Non-Nigerian	77(87.5)	11(12.5)	88		
Are you Arriving or departing?					
Arriving	155(88.1)	21(11.9)	176	1.152	0.283
Departing	277(91.1)	27(8.9)	304		

4.11 Multivariate Analysis to determine predictors of perception

Variables found to be statistically significant or associated with perception at chi square analysis were further subjected to multiple logistic regression. Gender was the only variable found to be independent predictor of perception. Men are 1.6 times more likely to perceive Ebola screening as good than women (OR=1.6 ; 95%CI=1.1-2.3).

Table 4.11: Multivariate analysis/ logistic regression of variables associated with perception

Variables	Odds Ratio	95% CI	P-value
Gender			
Female	1 (Reference)	-	-
Male	1.6	1.1- 2.3	0.017*
Marital status			
Not married	1(Reference)	-	-
Married	1.3	0.9-1.9	0.166
Why did you allow yourself to be screened?			
You saw others doing it	1(Reference)	-	-
The government made it compulsory	0.5	0.1-1.5	0.205
You believe it is for your safety	1.4	0.7-2.8	0.391

Significant at 5% level of significance

4.12 Multivariate analysis to determine independent predictors of attitude of participants towards the Ebola screening.

Variables found associated with attitude of participants towards the Ebola virus screening at Chi square analysis were further subjected to multiple logistic regression.

Being comfortable with screening and believe that screening is for personal safety were independent predictors of attitude towards screening.

Those who were comfortable with screening were 3 times more likely to have good attitude towards screening compared with those not comfortable (OR = 2.9 ; 95%CI =1.4-5.8)

The odds of having good attitude among those who allowed themselves screened because government made it compulsory and because it is for their safety were 3 times more for those who allowed themselves to be screened because they saw others doing it. (OR = 2.3 ; 95%CI=0.7-7.8) for those who allowed self to be screened because the government made it compulsory, and (OR = 2.7 ; 95%CI =1.2-6.3) for those who believe it was for their safety, respectively.

Table 4.12: Factors influencing the attitude of participant to Ebola virus screening

Variables	Odds ratio	95% CI	P-value
Age category			
25-34	1(Reference)	-	-
35-44	1.4	0.6-3.4	0.467
45-54	1.8	0.7-4.5	0.216
55+	1.4	0.5-4.4	0.546
Gender			
Female	1(Reference)	-	-
Male	1.5	1.0-2.2	0.074
Marital Status			
Not married	1(Reference)	-	-
Married	1.2	0.7-2.1	0.463
Occupation			
Farming/ Artisan/Others	1(Reference)	-	-
Trading/Business	0.8	0.4-1.6	0.582
Unemployed/students	1.0	0.4-2.2	0.908
Professional	0.7	3.8-1.4	0.369
Nationality			
Nigerian	1(Reference)	-	-
Non-Nigerian	1.6	0.9-2.8	0.080
Are you departing or arriving			
Arriving	1(Reference)	-	-
Departing	1.6	1.0-2.2	0.068
Do you feel comfortable when screened with the infrared thermometer?			
Not comfortable	1(Reference)	-	-
Comfortable	2.9	1.4-5.8	0.004*
Why did you allow yourself to be screened?			
You saw others doing it	1(Reference)	-	-
The government made it compulsory	2.3	0.7-7.8	0.1 99
You believe it is for your safety	2.7	1.2-6.3	0.020*

Significant at 5%

4.13 Exploring screeners' experience as touching travelers attitude towards the Ebola virus screening (A KEY INFORMANT INTERVIEW REPORT)

Captured Stakeholders' Statements-*Ebola was a global phenomenon. A lot of air travelers really appreciated the Ebola virus screening. Some believed it was waste of resource while some said its continued existence is useless and should be scrapped.*

A lot of passengers were aware of the Ebola virus disease/screening especially regular travelers. The knowledge of the disease and the screening was equally good except that many do not know the causes and the predisposing factors to the Ebola virus disease, hence a need for increased sensitization since the disease is re-emerging and has no known cure

The Ebola virus screening occurred at two levels, namely the primary level of screening and the secondary level screening. All travelers went through the primary screening as a conventional practice while only those referred from primary screening went through the secondary screening. At the primary level of screening, temperature of the passenger was taken via the use of the infrared thermometer after which the passenger must have filled Ebola questionnaire. Any passenger who measured temperature above 37.5^{0}C or precise temperature 38.6^{0}C which was indicative of fever was referred for secondary screening.

At the secondary level screening, details such as flight name, destination of departing passengers, and country of arrival for incoming passenger were taken. The temperature was then taken again via the use of a digital thermometer. if it was found to be 38.6^0 C, further questions like any history of travelling to epidemic zones, history of participation in a funeral rite in the last four weeks, history of contact with someone who had any symptoms of Ebola such fever, diarrhoea, headache, joint pain, muscular pain, body weakness, vomiting, sore throat and coughing were asked. Most passengers deny ever being through all these, even when they had obvious clinical symptoms

At this stage, experience showed that majority of the passengers displayed un-necessary tension, fears and sometimes violent behavior which could be described as psychotic Experience equally showed that this negative attitude was always borne out of the fear of being quarantined and subsequent cancellation of flight schedules. Also, passengers equally believed that whenever they were referred for secondary screening, it then automatically

translated to having the Ebola virus disease. Travellers slogan at this stage was 'do I have Ebola virus disease' 'Am I okay' 'is everything wrong with me' 'is anything the problem', 'will I be quarantined', 'am dead', 'can I still travel'. These statements connoted fear and ignorance.

At this point, we educated them on the various differential diagnoses for Ebola disease, risk factors and what quarantine actually meant, after which we assessed passengers level of understanding and comprehension. During the course of doing this, experience showed that, most times a lot of passengers have hidden health issues such as chronic malaria unknown to them, which could have triggered the fever in the first place not necessarily the Ebola virus This action was always accompanied with relieved tension in most air travelers

This was found to be opposite of what we discovered in few educated ones when referred for secondary screening. A good example was a man from Maryland in the United States, he had fever as high as 40^0c, diarrhoea and he is a Nurse. Meaning he had two symptoms of Ebola disease namely diarrhoea and fever and two predisposing factor- he is a practicing nurse and definitely works in an health care facility and he had being to the United States where they experienced Ebola epidemic. We were able to attend to the man because he submitted himself willingly, no coercion. We took him to the hospital, got him a cab home, and followed him up, perhaps he may come up with secondary symptoms of the Ebola virus disease. This positive attitude could have been due to the fact that he is a Nurse and well educated

Inference from the key informant interview revealed that a lot of air travelers at the Murtala Muhammed International Airport have negative attitude towards the Ebola virus screening. especially at the secondary level screening where most air travelers referred always display obvious tension, un-necessary fears and non-compliance to screening protocols despite the high level of awareness and the virulent nature of the Ebola virus.

The experience of the health personnel revealed that this negative attitude fueled by wrong perception was borne out of the fear of being quarantined and low level of knowledge on the causes and risk factors for Ebola disease. Sensitization was always carried out to re-orientate passengers in order to change their perception and eventually attitude to screening. Passengers was always advised to go for periodic medical checkups, in order to know the state of their

health. Also the fact that Nigeria had been declared free from the virus by the World Health Organisation isn't a call to slumber but to sit tight as a nation and strengthen our health system and preparedness towards handling emergency outbreak of such magnitude in the future.

CHAPTER FIVE

5.0 Discussion, Conclusion and Recommendation

In this study, the mean age of the study subjects was found to be 33.5±12.3 with the minimum age of 18 and maximum age of 81. The age distribution shows that mostly younger people participated in the study. The relationship between the number of study participants and the age groups was found to be inversely proportional.

83.3% had heard about the Ebola virus disease via the internet (83.3%) which accounted for the major source of information. This was not found consistent with one of the few studies conducted where television was the main source of information (CPPA, 2014)

Findings revealed men participated more in the study 60.4%. More than half of the participants were single 52.7%. 85.0% had university education. 94.6% had heard about the screening.

82.9% of the participants were Nigerians not willing to participate compare to non-nationals. 63.3% participants were Christians. 63.3% participants were departing.

93.8% agreed they could be infected via contact with bodily fluids of an infected individual and this was found consistent with other findings where 92% agreed to this fact as well (Centre for Public Policy Alternative CPPA, 2014). 76.9% through eating infected bush meat.

21.3% of the participants believe Ebola is airborne. Other findings said 15% think Ebola is airborne (Lagos State Survey, 2014). 89.6% believe fever is a sign of the disease. 90.2% believed they would seek medical treatment should they are infected with Ebola which also agrees with the findings 89% from the Centre for Public Policy Alternative. 90.0% said they were comfortable with the screening. 61.3% had good knowledge. 55.0% good perception while more than half of the participants have good attitude.

The proportion of arriving air travelers with good perception towards the Ebola virus screening was estimated to be 18.13% while the proportion of departing air travelers with good perception towards the screening was 36.88%. Deductively, departing passengers have better perception towards the Ebola virus screening than their arriving counterpart. This could

have been due to the better understanding of benefits of the screening, and the high level of awareness.

Other socio-demographic characteristics found to be associated with perception of passengers towards screening was gender. The logistic regression analysis proved it further, showing that men were found to be 1.6 times more likely to have good perception towards the Ebola virus screening.

Marital status was also found to be associated with the perception of air travelers towards the Ebola virus screening. Married people were found to be 1.3 times more likely to have good perception towards the Ebola virus screening than unmarried individuals.

Another outcome variable—safety was also found to be statistically associated with perception of air travelers towards the Ebola virus screening. This was because passengers have strong understanding that the screening procedure was engendered towards safe guarding health and that the screening was purely a preventive practice.

The level of awareness and knowledge of the Ebola virus disease/screening among air travellers is considerably good and this cannot be unconnected from the quick cessation of the further transmission of the disease from persons to persons and states to states especially in Nigeria which eventually led to Nigeria being declared officially free from the virus on October 20th, 2014 by the World Health Organisation. A feat which attracted global community leading to the United State sending public health experts to Nigeria to learn about contact tracing when they experienced the epidemic, action appearing incredible but the truth

Attitude was found to be associated with the Ebola virus screening. This shows that passengers with good attitude will show positive disposition towards the Ebola virus screening while those with bad attitude will have wrong disposition towards the screening.

The proportion of arriving passengers with good attitude towards Ebola screening was 17.0% while their departing counterpart was 37.92% with a difference of 20.92%. This equally shows passengers departing show better disposition to the screening than their arriving counterpart.

Other variables found to be associated with attitude was age. Gender was also found to be associated with attitude. Men were 1.5 times more like to show good attitude towards the screening than their female counterpart.

Marital status was also found to be related to attitude. Married individuals were 1.2 times more likely to show good disposition towards the Ebola virus screening than unmarried people. Occupation was found statistically significant or associated with attitude towards screening. Passengers' occupation will influence their attitude towards screening.

Nationality was found to be associated with attitude. Non-Nigerians were found 1.6 times more like to show good attitude towards the Ebola virus screening than Nigerians. This was also found to be true in the recent Ebola outbreak in Liberia. The epidemic linger for long in Liberia not because they were not able to halt its transmission but because the citizenry had serious misconceptions even with obvious mortality rate, case fatality rates, and the high level of awareness (CDC, 2014). This was nothing but total display of wrong attitude fuelled by ignorance. The concept of attitude in public health intervention is very salient and cannot be overemphasized. A need to change our minds and make a paradigm shift in our attitude towards public health interventions.

Arriving - departing passengers was equally found associated with attitude. Departing passengers were found to be 1.6 times more likely to show good attitude towards the Ebola virus screening intervention programme than their arriving counterpart.

Being comfortable with the Ebola virus screening was found to be associated with attitude. Air travellers comfortable with the screening were found to be 2.9 times more likely to show good attitude towards screening than air travellers not comfortable. Submission for screening was equally found associated with attitude. This was because the air travellers believe it was for their safety.

Passengers who subjected themselves to the Ebola virus screening because they believe the screening was for their safety were found to be 2.7 times more likely to show good attitude towards the screening compared to those who saw others doing it while. Result shows that there was no association between the socio-demographic factors and the acceptability of Ebola virus screening by travelers. In other words socio demographic factors cannot influence

acceptability of the Ebola virus screening by travelers. This was not consistent with the findings that the education of travelers regarding pandemic influenza and public health measures, including airport health screening, increased acceptance of such measures (Leegat, 2009).

Key Informant Interview revealed a lot of air travelers showed negative attitude towards the screening, especially at the secondary level screening. Some feel it is not cost effective and should have been scrapped, since Nigeria had been declared free from the dreaded virus.

A lot of passengers are aware of the Ebola virus disease and screening especially regular travelers. But not too many know the cause and the various factors that can predispose one to the disease. This however attracts regular intervention aimed at sensitizing passengers and later assess their level of understanding. During the course of doing this, experience shows that most passengers have latent health issues unknown to them such as chronic malaria which could have triggered the fever in the first place—a differential diagnosis for Ebola.
This interview also revealed that attitude towards screening especially the secondary level screening was quiet negative, except for few educated ones who complied well to a degree.

Also the health personnel must choose their language of communication when talking to referred passengers as this also affect passengers disposition to screening.

5.1 Study Limitation

Travellers not willing to participate in the study could constitute a major limitation to realizing the needed sample size needed quality study outcome. Language barrier could also pose a major limitation but provision for translation would be ensured.

5.2 Conclusion

Findings from this study revealed that majority of the travellers have good to average knowledge of the Ebola virus disease/screening, the mode of transmission and current method of screening. A lot of people also know that their first point of call for medical service would be the hospital if suspected to have Ebola signs. Despite, this level of awareness of Ebola virus disease and its screening among travelers at the Murtala Muhammed Airport, many still do not have good perception towards the Ebola virus screening.

Passengers at the airport have good attitude to the Ebola virus screening especially at the primary level screening where the infrared thermometer was used for temperature reading. This may be due to passengers believe that it is for their safety. However, some may be hostile when referred for secondary screening because they feel being referred for secondary screening, automatically translate to having the Ebola virus disease.

The Ebola virus screening had much acceptability at the airport. This level of acceptability towards the screening by the air travelers could be due to safety consciousness. The findings in this study further shows that socio-demographic characteristics cannot influence the acceptability of the Ebola virus screening. People will simply accept an intervention when they are aware of the benefit especially when it comes to health.

5.3 Recommendations

1. The level of awareness and sensitization should be increased as the study results reflect poor perception and attitude towards the Ebola virus screening especially among the arriving passengers.
2. Health personnel must choose their language when attending to air travelers at the secondary level screening as this was found to interfere with good disposition of travelers to screening.
3. Passengers should always go for periodic medical check up to discover latent health issues. Also education on risk factors for Ebola virus disease should be a priority. Passengers should know that being quarantined isn't a death sentence and does not translate to having the Ebola disease.
4. Air travellers who are Nigerians should inculcate a willing attitude towards accepting public health interventions readily without being coerced or without the screening being made compulsory by the government, no matter their flight schedules.

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APPENDIX I

QUESTIONNAIRE

PERCEPTION, ATTITUDE AND ACCEPTABILITY OF EBOLA VIRUS SCREENING BY INCOMING AND OUTGOING TRAVELLERS AT THE MURTALA MUHAMMED AIRPORT, LAGOS.

INFORMED CONSENT FORM

My name is Fadumila Johnson Abiodun, a postgraduate student at the Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

I am carrying out a research on '**the Perception, Attitude, and Acceptability of Ebola Virus Screening by intending travellers at Murtala Muhammed International Airport, Lagos State**'. The research will involve asking some questions, in which some may be quite private. Your participation in this study is absolutely voluntarily. All elicited piece of information will be kept confidential. The information provided will be used to further the planning of appropriate control measures towards Ebola virus disease.

Please kindly try to give precise and accurate answers to all the questions. Thank you.

Willing to participate: Yes [ ] or No[ ]

Study Subject Signature _____ Date _____

For official use only

Serial no _____

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Please kindly try to give precise and accurate answers to all the questions. Thank you.

Willing to participate: Yes [ ] or No[ ]

Study Subject Signature _____ Date _____

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Serial no _____

SECTION A

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1.) Age as at last birthday(years) _____

2.) Gender: 1.Male [ ] 2.Female [ ]

3.) MaritalStatus:1.Single[ ] 2.Married[ ] 3.Divorced[ ] 4.Widowed [ ]

4.) Highest level of education:1 .Did not attend school[ ] 2.Primary[ ] 3.Secondary[ ]
4 Tertiary[ ]

5.) Occupation: 1.Civil servant [ ] 2.Farming[ ] 3.Trading/Business[ ]
4.Unemployed/Student[ ] 5.Professionals[ ] 6.Artisans[ ]
7.Others, specify_____

6.) Religion: 1.Christianity[ ] 2.Islam[ ] 3.Traditional[ ] 4.Others,please specify_____

7.) Nationality: 1.Nigerian [ ] 2.Non-Nigerian[ ]

8.) If non Nigerian, please indicate country_____

9.) What is the name of the airline you are boarding?_____

10.) Are you departing or arriving?_____

11.) If you are departing, where is your destination? _____

12.) If you are arriving, which country are you coming from?_____

SECTION B

QUESTIONS ON AWARENESS AND KNOWLEDGE

13.) Have you heard about Ebola virus disease: 1.Yes [ ] 2. No [ ]

14.) If yes,what are your sources of information on Ebola virus disease? Please tick as applicable

	Internet	Radio	Newspaper	Friends	Health facility	Posters	Campaign	Others (specify).
YES								
NO								

15.) Which of the following ways can one be infected with Ebola virus disease?

	Handshake	Sex	Eating infected bush meat.	Inhalation	Contact with bodily fluids of infected person	Others (specify)
YES						
NO						

16.) Which of the following signs/symptoms can be used to recognise someone with Ebola virus disease? Please tick the appropriate ones.

	Vomiting	Sore throat	Fever	Diarrhoea	Skin rashes	Bleeding	Others (specify)
YES							
NO							

17.) When does Ebola virus disease begins to show signs in victims?

1. 2-21days after contact with an infected person [ ]
2. 10-31days after contact with an infected person [ ]
3. 18-41days after contact with an infected person [ ]
4. 26-51days after contact with an infected person [ ]
5. Others (specify)_____

18.) Have you heard about Ebola virus screening: 1.Yes [ ] 2.No [ ]

19.) If yes, who or what are your sources of information: 1.Health worker[ ] 2.Magazine[ ] 3.Media[ ] 4.Religious organisation[ ] 5.Friends [ ] 6.Posters [ ] 7.Campaign[ ] 8.Others, specify_____

QUESTIONS ON PERCEPTION

20.) What would you do, if you feel you have been exposed to the Ebola virus?

_____

21.) Do you think the use of infrared thermometer for Ebola virus screening is necessary at the airport? 1.Yes[ ] 2.No[ ]

22.) What are your preferred means of being screened for Ebola virus? 1.Use of infrared thermometer[ ] 2.Checking for travel history[ ] 3.Checking for signs/symptoms[ ] 4.Laboratory test[ ] 5.Others specify_____

23.) Do you think the use of the infrared thermometer poses any side effect? 1.Yes[ ] 2.No[ ]

24.) Do you think the screening affects your travelling schedule in any way? 1.Yes[ ] 2.No[ ].

SECTION C

QUESTIONS ON ATTITUDE

25.) Please tick the one that is applicable to you. **SA**-Strongly Agreed, **A**-Agreed, **U**-Undecided, **D**-Disagreed, **SD**-Strongly Disagreed

STATEMENTS.	SA	A	U	D	SD
I undergo Ebola virus screening quite often.					
The Ebola virus screening is time wasting.					
The advantages of Ebola virus screening outweighs its disadvantages					
Ebola virus screening has enabled me to know that fever is a sign of the disease.					
The use of infrared thermometer for Ebola virus screening is dangerous to health.					
Ebola virus screening is for the protection of passengers.					
The medical personnel who engage in Ebola virus screening are competent.					
Am willing to undergo Ebola screening when travelling.					
Am always afraid anytime I get screened.					
I don't get scared when screened.					
Am satisfied with the screening method.					

SECTION D

QUESTIONS ON ACCEPTABILITY

26.) Do you feel comfortable being screened with the infrared thermometer: 1. Yes[ ] 2.No[]

27.) Why did you allow yourself to be screened?

1. You believe it is for your safety [ ]
2. The government made it compulsory [ ]
3. You saw others doing it [ ]
4. You had no choice
5. Others specify _____

SECTION C

QUESTIONS ON ATTITUDE

25.) Please tick the one that is applicable to you. **SA**-Strongly Agreed, **A**-Agreed, **U**-Undecided, **D**-Disagreed, **SD**-Strongly Disagreed

STATEMENTS.	SA	A	U	D	SD
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The medical personnel who engage in Ebola virus screening are competent.					
Am willing to undergo Ebola screening when travelling.					
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3. You saw others doing it [ ]
4. You had no choice [ ]
5. Others specify _____

APPENDIX II

KEY INFORMANT INTERVIEW GUIDE

The key informant interview involved selecting fours stakeholders (service providers) and respondents at the port health unit who were two environmental health officers at the primary level screening and two Doctors at the secondary level screening.

The purpose was to explore their experience as touching passengers' attitude towards the Ebola virus screening. The following questions were directed to each of them;

(1) Their experience as touching passenger' attitude towards the Ebola virus screening?

(2) Their experience as regards passengers' perception towards the screening?

(3) Their experience as touching passengers' acceptance of the Ebola virus screening?