

Assessment of the Measures in Place to Forestall Aviation Aided Spread of Pandemic in Nigeria

M.S. Stephens¹, I. Njoku^{2*}, O.S. Adebimpe³

^{1,2,3}Logistics and Transport Technology Department, Federal University of Technology Akure, Nigeria

*Corresponding Author: injoku@futa.edu.ng, Tel.: +2348036645117

Available online at: www.isroset.org

Received: 04/Jan/2022, Accepted: 26/Feb/2022, Online: 31/Mar/2022

Abstract— The study assessed the measures that have been put in place by the aviation industry of Nigeria to forestall future occurrence of the outbreak of infectious diseases; and evaluate the adequacy of these measures to forestall future outbreaks and spread. The research work majors on the measures in place at Murtala Muhammed International Airport before 2020 outbreak and how adequate those measures are in forestalling future outbreaks and spread of infectious diseases. The research employed the use of primary data obtained from the administration of a well-structured questionnaires. The data collected were analyzed using Likert scale (5 scales). The study shows that, the measures in place are neither adequate or inadequate to curtail future outbreaks of any infectious diseases in Nigeria. This is shown in Table 4.2, which indicates that 0.99% of passengers chose undecided, 16.8% Strongly Agreed, 32.7% went with Agreed, 35.6% Disagreed while 13.9% went for Strongly Disagreed. We then observed from the Likert scale table there was aggregate of 3 (Agrees 49.5%, Disagree 49.5%).

Keywords— Influenza, Transmission, Geographical Information System, World Health Organization

I. INTRODUCTION

Aviation could be defined as the design, manufacture, use or operation of aircraft in which the term aircraft refers to any vehicle capable of flight [1].

Aviation industry has played a significant role in developing economies around the globe. It has been reported that there are over two thousand (2,000) airlines operating more than twenty-three thousand (23,000) aircrafts that serve about three thousand seven hundred (3,700) airports around the world [2]. This makes the industry the gateway to any economy aspiring to develop, enabling globalization, trade facilitation and tourism development. It is very critical in the promotion of foreign direct investment (FDI) [3].

One can therefore say that the industry is crucial to the growth of the economy and national development of any nation. The commercial aviation industry has supported more than 80 million jobs worldwide and has contributed up to 8% of the gross domestic product and more than 30% of all international trade by value is carried by air and approximately 60% of international tourists travel by air [4].

Reference [1] posits that there are five major players in the aviation industry which are the Airport, the Airline, Passengers, Government and her Agencies and the Community. An airport is the physical site at which a modal transfer of transport is made from the air mode to

the land mode. It is, also, an industrial enterprise which acts as a forum wherein elements and activities are brought together to facilitate both passenger and freight interchange between air and surface mode. Increase in global travel is occurring simultaneously with many other processes that favour the emergence of disease [1].

Travel is a potent force in disease emergence and spread, whether it is aircraft moving human-incubated pathogens or insect vectors, great distances in short times or ships transporting used tyres containing mosquito eggs.

The speed and complexity of modern transport make both geographical space and the traditional 'drawbridge' strategy of disease control and quarantine increasingly irrelevant [5].

Although the transport sector has brought about a glut of positive effects on the socioeconomic spheres of diverse communities, the correlation between the transport of people and goods and the propagation of disease has long been established [6].

Communicable diseases pose an ever-present danger to human societies. Despite great advances in medical care, roughly one quarter of worldwide human deaths are attributed to infectious and parasitic disease. The plague bacillus, *Yersinia pestis*, was transmitted from infected rodents, often rats, by flea bites [7].

A Canadian study found that 15% of travelers had potential exposure to blood and body fluids through vehicles such as new sexual partner (9%); sharing instruments, such as razor or toothbrush (5%); receiving injection for medical treatment (3.2%); having acupuncture or other percutaneous nontraditional treatment (1%); tattooing or body piercing (0.5%); and abrasive injury (0.5%). Other investigators found that 5.6% of tourists departing from Cuzco engaged in sexual activity with a new partner during their stay. Although most reported having sex with other travelers (54.3%), some had sex with local partners (40.7%) or commercial sex workers (2.15%). Sexually transmitted infections (including hepatitis B, HIV, and HTLV-1) acquired during travel can further spread during the journey and after travelers return home [8].

From the review of literature, it has been revealed that little work has been done on the measures put in place at airports to prevent the importation or exportation of infectious diseases in Nigeria. Hence, the focus of this research is to assess the degree of measures in place to prevent the future spread of infectious diseases in Nigeria.

Research Questions

- a. What are the measures that have been put in place by the global aviation industry to prevent the future occurrence of the outbreak of infectious diseases?
- b. Are these measures adequate to forestall future outbreaks and spread?

Aim and Objectives of the study

The aim of this study is to assess air transport as a medium for the transmission of communicable diseases while the specific objectives are as follows:

- a. assess the measures that have been put in place by the local and global aviation industry to prevent the future occurrence of the outbreak of infectious diseases; and
- b. evaluate the adequacy of these measures to forestall future outbreaks and spread.

Significance of the Study

The study provides the researchers with the necessary information on the measures available to all the airports users; be it passengers, airliners, management and government agencies to safeguard them from the spread of infectious diseases that might breakout, which will in turn help the stakeholders in aviation industry to aim at improving on facilities that can prevent future spread of any infectious diseases in all the air hubs across the world.

The rest of the paper is organized as follows, Section I contains the introduction of the research, Section II reviews some of the past related works while Section III explains the methodology with some equations. Section VI presented and discussed the results with some tables whereas Section V concludes the research with some recommendations.

II. RELATED WORK

An outbreak of Ebola virus disease in West Africa, with onset in early February 2014, had evolved in Guinea, Liberia, Nigeria and Sierra Leone. This was the first such outbreak in the area. The first cases were reported from the forested region of south-eastern Guinea. As of 7 April 2014, the Ministry of Health in Guinea reported 151 clinically compatible cases of Ebola, 54 of which were laboratory-confirmed. Ninety-five of these patients died and the death toll expectedly went much higher in the ensuing months [9]. Liberia had reported 21 cases clinically compatible with Ebola, including 10 deaths. In Mali, the Ministry of Health had reported six suspected cases as at 7 April 2014, two of which had tested negative for Ebola virus infection. Samples from the four remaining suspected cases were sent to CDC and the Institute Pasteur in Dakar for testing [9].

Contact information in one large investigation into in-flight tuberculosis transmission was inaccurate for 15% of passengers. Although air carriers are under no obligation to archive passenger manifests, most have internal policies to do so for up to 3 months.

The outbreaks of chikungunya virus infection that originated in Kenya in 2004, and major outbreaks followed in the Indian Ocean Island countries like Reunion, Mauritius, Comoros, Seychelles and Madagascar in 2005 to 2006 [10]. Outbreaks ensued in India and Indonesia, and the virus was carried by travelers to Europe, [11] and [12].

A viremia traveler from India visiting the Ravenna province of Italy became the index case of an outbreak that infected 205 local residents, which was transmitted through local *Aedes albopictus*, a mosquito species introduced into Italy by ship in 1990 [13]. The overall results were the same, negatively affecting travel and tourism [14].

The outbreak became visible to the world community when an infected physical from Guangdong, who stayed for a day in Hotel Metro pole in Hong Kong, was the source of infection for multiple hotel guests, who then disseminated the virus in many other countries upon their return home. By May 2002, more than 8000 SARS infections had been reported by [15]. By July 2002, 29 countries and territories across five continents reported outbreaks and attributed 774 fatalities to SARS [15]. Transmission of SARS on aircraft occurred at rates of 0% to 18.3% and occurred as far as seven rows from the source passenger [16]. One particular SARS case showed the potential for rapid international dispersion of a pathogen that is spread from person to person [17].

A businessman flew from Hong Kong to Frankfurt, Germany on March 30, 2003. He travelled on seven flights throughout Europe during a 5-day period, including stops in Barcelona, London, Munich and Hong Kong. He was hospitalized in Hong Kong on April 8 for suspected

SARS, subsequently confirmed on April 10, [17]. Responding to SARS outbreak, the Centre for Disease Control (CDC) issued advisories to avoid travel to the SARS-affected countries, thus negatively affecting tourism.

III. METHODOLOGY

Study Area

The study was carried out in Nigeria. A country that has been classified as a mixed economy and emerging market. It has reached lower-middle income status according to the World Bank, with its abundant supply of natural resources, well-developed financial, legal, communications, transport sectors and stock exchange, which is the second-largest in Africa. Nigeria was ranked 21st in the world in terms of GDP (PPP) in 2015. Aviation is in its growing stage in Nigeria when compared with the operation of the industry in a developed world.

The industry has been a means of generating income for the government of the nation. According to the list provided by NCAA of Nigeria, there are 13 airlines that operates as a domestic carrier in Nigeria. These airlines have Nigeria as their home state. These airlines include; Air Peace, Allied Air, Arik Air, Aero Contractors, Azman Air, Dana Air, Dornier Aviation Nigeria, Green Africa Airways, Ibom Air, Kabo Air, Max Air, Overland Airways and TAT Nigeria.

Research Population

The population for this study is the totality of all the air travelers at Murtala Muhammed International Airport Lagos, which is said to be estimated according to 2016 passenger flow to be 7,564,321, all these were targeted population for the administration of well-structured questionnaires. And 50 medical practitioners are the targeted population for the Focus Group Discussion for this study and the 50 medical experts were chosen due to the fact that we have no definite figure of medical experts.

Sample Size

Using the Taro Yamane formulae of 1973, to derived at a reasonable sample size from the research population for the primary data gathering, a total of 400 copies of questionnaire were administered to the respondents but only 385 copies were recovered after administration due to the busy schedule of the respondents and incomplete filling of the questionnaires. Moreso, 50 Medical practitioners were interviewed for the purpose of having a wider view on the adequacy of the measures in place to reduce future outbreak of other diseases.

$$n = \frac{N}{N(0.5)^2}$$

$$N = 7,564,321$$

$$n = \frac{7,564,321}{(7,564,321 \times 0.005)}$$

$$n = 400$$

Data Analytical Tools

To achieve the objectives of this research work, descriptive statistics was employed. The descriptive tools like Mean, Standard Deviation and Likert Scale (5 Scale).

Mean

$$N = \frac{\sum Fx}{F}$$

Standard Deviation

$$S = \left(\frac{\sum F(x - n)^2}{n - 1} \right)^2$$

IV. RESULTS AND DISCUSSION

Assessment of Preventive Measures Against Future Global Outbreaks:

Posting of Notice Information

The findings from the Focus Group Discussions (FGD), CDC, ensure that there is information about the prevention and control of outbreaks when they occur. There are notice post and banners on the walls of airport to keep passengers informed on the status of the country where they are flying to in term of disease outbreak. Also, passenger is sensitized on how to keep themselves safe on board aircraft and around the airport during their flight or transit. According to the doctors, these measures had proven to be one of the best ways to keep the passengers informed on how to protect themselves aboard aircraft and around the airport.

Administering an Exposure-and-Symptom Questionnaires

According to the findings from the FGD, during this outbreak of 2009, for Influenza, and 2014-2016 of Ebola, there was a questionnaire developed to elicit the opinion of passengers (respondents) to know the health state of each passenger before allowing them to fly to any nations of the world. These questionnaires were administered to passengers at the counter so as to ensure truthfulness and accuracy of passenger's response. These questionnaires are now used by experts to know how to handle each passenger based on their response on the questionnaire. This is a little but effective tool that has been proven to be efficient in discouraging travel transmission of these infectious diseases to new territories.

Non-Contact Thermometer.

It was also discovered that, this instrument was introduced during the outbreak of Ebola Virus in 2014 since the disease was contracted through close proximity to an infected person or touch among others. The CDC provided these thermometers at the airport to measure the body temperature of passengers without having to touch them. The thermometers measures passengers' temperature with the aim of disallowing passenger with high temperature from leaving the origin's location. According to the doctors' view, this instrument is a good tool used during

the out-break to prevent infected person from leaving the origin since the machine would have given the accurate temperature of the passenger and high temperature is associated with Ebola Virus Symptoms.

Denial of pass to travel

According to the findings from the FGD, this measure is taken when there is a fear of pandemic of a dangerous disease. Many countries disallow airlines from the infected countries from coming to their country on a revenue travel bases. In the outbreak of Ebola of 2014, many powerful countries of the world like America and European countries deny airlines of West Africa from coming to their nations. Also, some countries allow airlines to come but screen each passenger thoroughly and disallow any passenger with unusual symptoms or high temperature from travelling by denying them passage.

These measures were said to have been the best measures by all Agencies like CDC, Airport and ICAO, since the time of Black spot. This measure happens to be the last resort when all other measures happen to be failing. It impaired movement both in and out of the place where the out-break happens to be more dodge.

Emailing of Health Update of Different Destination

The center for diseases control and prevention a branch of World Health Organization had been saddled with the responsibility of keeping air travelers informed about the health conditions of destinations around the world. This they do by reaching out to passengers through their emails provided by them from their previous journey. This has been in place since the outbreak of Influenza disease of 2009. Ever since, air travelers have been kept updated on the outbreak of any diseases across the world so as to help them to plan their trips.

Efficiency of the Measures to Prevent Future Outbreak of the Diseases

Passengers on transit were interviewed with the aid of questionnaires to get their view concerning the efficiency of the measures put in place by government and governing body of aviation industry to curtail the future pandemic spread of these diseases and also what they do to ensure their safety while on international journey.

Table 1 and Table 3 Show the demographic characteristics of the respondents 168 (43.6%) of them were Male while the remaining 217 (56.4%) were Females. The mean age of the respondent is 51.3, and the Standard Deviation is 10.33, this means that the Age data is around the mean value.

This shows that the females make more journey than their male counterparts. This shows their opinions concerning the safety measures in place and the ones taken by them to ensure their safety on international journey. The mean age also shows that the respondents that were sampled most are above 50 years, this also shows that their opinion can be valid.

Table 2 shows, the gender composition of the medical practitioners that was interviewed during this research work to know about the adequacy of the measures that was put in place to prevent and ensure safety of passengers in case of future occurrence of the disease. Table 4, shows that 22 males were sampled out of all the 50 doctors while the rest 28 were females. This implies that there are more females in the discussion on the adequacy of the measures in place to ensure safety of passengers in the case of future occurrence disease outbreak.

Table 1: Gender of the Selected Passengers

Gender	
Measures	F
Male	168
Female	217
Total	385

Source: Researchers Fieldwork, 2021

Table 2: Gender of Doctors

Gender for Doctors	
Measures	F
Male	22
Female	28
Total	50

Source: Researchers Fieldwork, 2021

Table 3: Descriptive Result of Respondents (International passengers) Socio-Economic Characteristics

Age	
Measures	Parameters
Mean	51.28713
Standard error	0.726932
Median	50
Mode	59
Standard deviation	10.33165
Confidence level (95.0%)	1.433392

Source: Researchers Fieldwork, 2021

Table 4, shows the years of experience of the doctors that was interviewed. The mean is 15.73, mode 16 and median is 16. We can then say that since the majority of the doctors have 16 years of experience of practice, they can give an accurate information on the adequacy of the measures based on the cases of infectious diseases victims they have encountered before given their long years of experience. This means that they have the professional experience to talk about the adequacy of an instrument or measures to prevent the wide spread of diseases.

The perception of doctors and passengers on the efficiency and effectiveness of the measures put in place to curtail the future occurrence of the disease outbreak on international scale. Using Likert scale, the average responses of the respondents gave 3 out of 5 which means that the measures are on the middle and line cannot be said to be sufficient, effective or ineffective. It is on the 50-50 level; it is on the boundary of efficient and inefficient. Then it is compulsory that the policy makers in the aviation industry

ensure that these measures are adequate enough to prevent future spread of infectious diseases.

Table 4: Descriptive Result of Respondents Socio-Economic Characteristics

Measures	Years of Experience
Mean	15.73267
Standard error	0.573746
Median	16
Mode	16
Standard deviation	8.154468

Source: Researchers Computation, 2021

Table 5: Availability of the Measures in Nigeria Airports

Questions	Passengers		Doctors	
	Frequency	Percentage	Frequency	Percentage
Are these measures available in Nigeria Airports?				
Yes	206	53.5	27	54
No	179	46.5	23	46
Total	385	100	50	100
Average	0.535			

Source: Researchers Computation, 2021.

Table 6: Opinion of Respondents of Adequacy of the Measures in place using Likert Scale

SA- Strongly Agree, A- Agree, U- Undecided, D- Disagree, SD- Strongly Disagree.

S/N	Measures	SA	A	U	D	SD	Inference
1	Posting of Notice Information.	66	126	5	137	53	Significant
2	Administering an Exposure and Symptom Questionnaires.	66	126	5	137	53	Significant
3	Non-Contact Thermometer.	66	126	5	137	53	Significant
4	Denial of pass to travel.	66	126	5	137	53	Significant
5	Vaccine administration.	66	126	5	137	53	Significant
6	Emailing of health update of different destination.	66	126	5	137	53	Significant

Source: Researchers Computation, 2021

Also, the medical practitioners gave their opinion on the adequacy of the measures in place. Thus, Table 5 shows that 27 out of 50 persons that were sampled (54%) said Yes, that the measures that are in place at the airport are adequate to cater for the future outbreak of any disease while the remaining 23 of them said No, that these measures won't be adequate to curtail future spread of any outbreak of the future. This can then be seen in the spread of COVID-19 in the country and in the world at large.

At this point we can say that the measures need some improvement so as to be able to prevent future wide spread if it can't prevent their outbreak. Also from the table, it is seen that majority of all the passengers are not aware that there are measures in place to prevent them from being exposed to infectious diseases when entering or leaving

the country. This can be inferred from Table 6, which shows that 0.99% of passengers chose undecided, 16.8% Strongly Agreed, 32.7% went with Agreed, 35.6% Disagreed while 13.9% went for Strongly Disagreed. We can see that from the Likert scale table there was aggregate of (Mode) 3 (Agrees 49.5%, Disagree 49.5%) From this result, we can then conclude that the measures in place are neither adequate nor inadequate to curtail future outbreak of this diseases. Therefore, there is need for the governing body or concerned authorities of the aviation industry to improve on these measures so as to be adequate.

V. CONCLUSION

The findings of this work shows that there is no adequate preparation by all the stakeholders in aviation industry (Governments, Airlines and aircrafts designers and Passengers) should there is an outbreak of any infectious diseases in the future.

Of course, adequate preparation will help in prompt containment of contagious disease and prevent its transmission to other part of the world through air transport. The measure of preparedness to forestall the spread of diseases is not yet enough. This was evident in the case of Coronavirus in January 2020, that had infected 25 countries of the world in just 43 days of outbreak.

Recommendations

1. Passengers should make sure they have adequate information (Healthwise) about the place they are visiting, to avoid being infected if they visit such places.
2. The players in aviation industry should ensure that they work *in tandem* with both WHO and CDC for information about outbreak of infectious diseases for a prompt response to prevent spreading to other nation due to lack of information.
3. Government should encourage the use of manifest to make ensure that information of passengers is captured for ease tracking in case of emergency.

ACKNOWLEDGMENT

The authors appreciate the authorities of the Federal University of Technology, Akure, Ondo State, Nigeria, the Cabotage Department of Nigerian Maritime Administration and Safety Agency for their supports towards the accomplishment of this paper.

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AUTHORS' PROFILE

Dr. M. S. Stephens bagged Bachelor of Technology, Master of Science and Doctor of Philosophy degrees in Transport Management Technology from the Federal University of Technology, Owerri Nigeria (FUTO). He is a Lecturer at the Department of Logistics and Transport Technology, Federal University of Technology, Akure Nigeria. His area of specialization includes aviation transport and logistics. He has published widely in both national and international journals. He is a member of CILT, Nigeria.

Dr. I. Njoku pursued Bachelor of Technology, Master of Science and Doctor of Philosophy degrees in Maritime Transport Management from the Federal University of Technology, Owerri Nigeria (FUTO) in 2000, 2009 and 2015 respectively. He also obtained another Master's degree in Financial Management from FUTO in 2007. He is a Lecturer at the Department of Logistics and Transport Technology, Federal University of Technology, Akure Nigeria. His area of specialization includes maritime transport and shipping finance. He has published widely in both national and international journals. He is a member of CILT, Nigeria.

Mr. O. S. Adebimpe. obtained a Bachelor Degree in Transport Management from LAUTECH and an M.Tech. Degree in Transport Management Technology from Federal University of Technology, Akure, Nigeria. experience and 10 years of research experience.