POTENTIAL BARRIERS TOWARDS REPORTING OF SUSPECTED LASSA FEVER CASES BY HEALTHCARE WORKERS IN IBADAN

BY

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CERTIFICATION

I certify that this project was carried out under my supervision by MMADUIKE, Ebere Chika in the Department of Epidemiology and Medical statistics (EMS), Faculty of Public Health, College of Medicine, University of Ibadan.

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DEDICATION

To my darling husband; Mr. Mmaduike Uzochukwu and my sweetheart, my daughter, Divine who gave me consolation and supports during my study.

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ABSTRACT

Without knowledge of disease occurrence, health officials are limited in their ability to identify source of illness and prevent further disease in the community. There is need for healthcare workers to remain alert to endemic infectious diseases of this nature and to institute appropriate measures to promptly identify cases and report them, protect themselves and care-givers. Effective prevention and control will depend on accurate and prompt diagnosis with urgent reporting to appropriate authorities and institution of appropriate control guidelines to abort this trend. This study is designed to assess the potential barriers towards reporting of suspected Lassa fever cases by doctors and nurses in public health facilities in Ibadan.

A descriptive cross-sectional study design was employed. Stratified simple random sampling was used to select a total of 238 doctors and nurses who work at the public primary (70), secondary (36) and tertiary (132) levels of public health facilities in Ibadan. A self-administered, structured questionnaire and an observational checklist which contained items on socio demographic details, knowledge of Lassa fever and it's reporting through the integrated disease surveillance and response strategy, attitude to Lassa fever reporting, factors associated with reporting practice and availability of infrastructures for reporting of the suspected cases was used to collect the data. Knowledge of Lassa fever and its' reporting was scored based on 25 and 22 questions respectively from the knowledge sections. Participants with scores ≥12 and ≥9 respectively were categorized as having good knowledge of Lassa fever and its' reporting respectively.

A total of 255 questionnaires were distributed and 238 were returned completed giving a response rate of 93.0%. The mean age of the respondents was 36.5 ± 9.3years.Only 28.2% of the respondents reported an awareness of the integrated disease surveillance and response (IDSR) diagnostic criteria for Lassa fever. A little proportion (28.4% and 21.6%) of the participants had good knowledge of the disease and it's reporting through the IDSR strategy respectively. The potential barriers towards reporting of suspected Lassa fever cases identified in this study were knowledge of the disease(AOR 2.3,95% CI 1.1-4.8) , knowledge of its' reporting through the integrated disease surveillance and response (IDSR) strategy (AOR 2.2, 95% 1.0-4.8), involvement in outbreak investigations(AOR 0.2,

95% CI 0.1-0.5), availability of posters (AOR 3.3,95% C.I 1.4-7.9) and manuals in clinics (AOR 0.1, 95% CI 0.1-0.3).

Lack of knowledge of reporting requirement was identified as a major barrier affecting disease reporting among doctors and nurses at the three levels of health care facilities in Ibadan. The training and retraining of health workers responsible for data generation, collection and forwarding in health facilities on notifiable diseases, availability of posters and manual on these notifiable diseases in the facilities are recommended in order to improve the disease surveillance system.

Key Words: Healthcare Workers, Surveillance, Lassa fever, IDSR, Notification.

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IDSR	INTEGRATED DISEASE SURVEILLANCE AND RESPONSE
WHO	WORLD HEALTH ORGANIZATION
SPSS	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
CDC	CENTRE FOR DISEASE CONTROL
VHF	VIRAL HAEMORRHAGIC FEVER
DSN	DISEASE SURVEILLANCE AND NOTIFICATION
PPE	PERSONNEL PROTECTIVE EQUIPMENT
LGA	LOCAL GOVERNMENT AREA
ACDP	ADVISORY COMMITTEE ON DANGEROUS PATHOGENS
FMOH	FEDERAL MINISTRY OF HEALTH
SMOH	STATE MINISTRY OF HEALTH
ELISA	ENZYME-LINKED IMMUNOSORBENT ASSAY
PCR	POLYMERASE CHAIN REACTION
USAID	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
AFRO	WORLD HEALTH ORGANIZATION–AFRICAN REGION

CHAPTER ONE

1.1 BACKGROUND OF THE STUDY

Lassa fever is an acute viral zoonotic illness caused by Lassa virus, an arenavirus known to be responsible for a severe nosocomial haemorrhagic fever, which presents a great threat to public health (Fisher-Hoch, 2005). It is one of the Viral Haemorrhagic Fever (VHF) that is caused by geographically restricted viruses more commonly found in Africa, Central Asia and South America. Of the various types of organisms that cause VHF, Lassa, Ebola and Marburg are restricted to Sub-Saharan Africa (Hoogstral,1979) whereas Crimean-Congo Haemorrhagic Virus is widely distributed in Africa, Mediterranean, Middle East, Central Asia and China (Burney,1980).

Lassa fever was first described in Sierra Leone in thel950s but the virus responsible for the disease was not identified until 1969 when two missionary nurses died in Nigeria. The cause of their illness was found to be Lassa virus, It was named after the town of Lassa in northern Nigeria's Borno State where it was first identified in 1969 and the first cases were isolated. Since then, a number of outbreaks of Lassa virus infection have been reported in various parts of Nigeria (Fisher et al, 1995). Lassa fever is endemic in West Africa and has been reported from Sierra Leone, Guinea, Liberia, Mali, Senegal and Nigeria (Ogbu et al, 2007).

Lassa virus causes thousands of deaths annually in western Africa and is considered a potential biological weapon (CDC, 2004). Some studies indicate that 300,000 to 500,000 cases of Lassa fever and 5000 deaths occur yearly across West Africa. The overall case-fatality rate is 60.4% (WHO, 2012) Signs and symptoms of Lassa fever typically occur 1-3 weeks after the patient comes into contact with the virus. These include fever, retrosternal pain (pain behind the chest wall), sore throat, back pain, cough, abdominal pain, vomiting, diarrhea, conjunctivitis, facial swelling, proteinuria (protein in the urine), and mucosal bleeding. Neurological problems have also been described, including hearing loss, tremors, and encephalitis. Because the symptoms of Lassa fever are so varied and nonspecific, clinical diagnosis is often difficult (CDC, 2012).

The reservoir, or host, of Lassa virus is a rodent known as the "multimammate rat" of the genus *Mastomys*. Transmission from the multimammate rat to humans occurs via aerosols; or by direct contact with rat excretions, or with food and water contaminated with excretions (Public Health Agency of Canada, 2010). Because the symptoms of Lassa fever are so varied and non-specific,

clinical diagnosis is often difficult, especially early in the course of the disease. Lassa fever is difficult to distinguish from many other diseases which cause fever, including malaria, shigellosis, typhoid fever, yellow fever and other viral haemorrhagic fevers. Definitive diagnosis requires testing that is available only in highly specialized laboratories (Ogbu et al, 2007).

The antiviral drug ribavirin is effective treatment for Lassa fever if given early on in the course of clinical illness. No vaccine is currently available (Tarique et al, 2010).Prevention of Lassa fever in the community centers on promoting good community hygiene to discourage rodents from entering homes. Effective measures include storing grain and other foodstuffs in rodent-proof containers, disposing of garbage far from the home and maintaining clean households (CDC, 2012). An emphasis on prevention and control is therefore important in view of the epidemic potential and fatal outcomes observed with the disease. Family members and health care workers should always be careful to avoid contact with blood and body fluids while caring for sick persons. Routine barrier nursing precautions probably protect against transmission of Lassa virus in most circumstances (WHO, 2012).

Disease surveillance, notification and reporting have been defined as the continuous scrutiny of the occurrence of diseases and health related events to enable intervention for the control of diseases. The Disease Surveillance and Notification (DSN) system was introduced in Nigeria in 1988, sequel to the grave yellow fever outbreak of 1986/87 and Cerebro- spinal meningitis outbreak of 1986-89 (WHO, 1999).

Notifiable diseases are categorized into two- Immediate (Emergency) notifiable and routine notifiable diseases. Immediate notifiable diseases are those diseases that have high case fatality rate and have the potential of occurring in epidemics and include Human anthrax, cerebrospinal meningitis, cholera, plaque, human rabies, typhoid, paratyphoid, yellow fever and Lassa fever. (FMOH, 1991).The routine notifiable diseases are selected based on their public health significance and are mostly addressed by control programmes. They are forty in number and also include the immediate, notifiable disease (WHO, 1997). Levels of surveillance can be individual, local, national and international. Most surveillance systems depend on the information on the occurrence of diseases obtained from health care providers, hospitals, clinics, diagnostic laboratories and research laboratories. The generation of data through disease surveillance and notification system is critical to appropriate planning and implementation of disease control programmes, outbreak investigation, emergency preparedness and response.

1.2 STATEMENT OF THE PROBLEM

Since Lassa fever was first discovered thirty-nine years ago in Sierra Leone, it has remained a major public health problem in Nigeria; due to the endemic circulation of the virus and to a number of other prevailing factors. Its clinical manifestations are indistinguishable from many other febrile illnesses. This coupled with lack of appropriate diagnostic facilities directly reflect in poor recognition and mismanagement of disease. There are 300,000 to 500,000 cases of Lassa fever and 5000 deaths yearly across West Africa. Findings indicate that Lassa fever is still widespread in Nigeria but remains a neglected and unrecognized cause of most human fevers (Ehichioya et al, 2010). And ubiquitous nature of the vector suggests an outbreak in the study setting is not improbable. (CDC, 2003).

Primary health care workers including private hospital/ clinic workers are often the first set of personnel to handle suspected cases of Lassa fever. When these workers are not adequately equipped with requisite knowledge and materials to handle such cases, transmission of the infection is favoured with avoidable consequences. Also, health workers who work in rural facilities without experienced physicians and laboratories and are far from referral centres may wrongly manage suspected Lassa fever cases till irreversible complications develop.

Often times, patients with febrile illness report first at a primary care centre where treatment may be commenced for the common febrile illnesses such as malaria, upper airway infections and typhoid long before the diagnosis is confirmed. In fact, in some facilities, more than one regimen may be completed before more investigations are ordered and other professional opinions sought to determine the cause of a persisting illness. By this time, a lot of contact between the patient and their relatives. other patients and healthcare workers have occurred with epidemiological consequences particularly if it is a viral haemorrhagic fever like Lassa fever.

The public health importance of Lassa fever cannot be over emphasized if one considers the high infectivity and mortality rates associated with the disease (AbdulRaheem, 2002). These outbreaks have resulted in panic among affected communities and a strain on manpower in health facilities where these patients are first managed or subsequently referred. Nosocomial transmission of Lassa fever is not uncommon and has resulted in the painful loss of manpower across many cadres in the health workforce (Fisher-Hoch et al, 1995).

The Nigerian Federal Ministry of Health records indicated 174 cases with 60 deaths and case fatality rates ranging from 12.5 to 66.7% between 2003-2007 (FMOH, 2001).

Also an outbreak of Lassa fever, according to WHO Global Alert and Response, has occurred in Nigeria, 623 suspected cases, including 70 deaths have been recorded from 19 of the 36 States since the beginning of the year. The Lassa virus has been laboratory-confirmed in 108 patients as of month of April. This number may change as more laboratory results are received. Among the fatalities, include three doctors and four nurses (CDC, 2012). The affected states include Edo, Nasarawa, Plateau, Ebonyi, Taraba, etc (Folashade , 2012).

The DSN system is inadequate in Nigeria. Among other things, lack of awareness of the usefulness of the system is some of the reasons for its weakness. The challenges of the surveillance system in developing countries like Nigeria include lack of awareness, lack of feedback, ignorance of current regulations and the list of notifiable diseases by the health personnel (Bawa et al., 2003 and Ofili et al.,2003). Findings have also shown that most of the training of personnel on DSN was only conducted at the national and regional levels without it's cascading to the LGA and facility levels. The training of health personnel at district and health facility levels have been shown to improve the reporting notifiable conditions and response to epidemics

Rapid notification of infectious diseases is essential for prompt public health action and for monitoring of disease trends at the local, state and national levels. Despite its importance, notification suffers from some setbacks, as shown by several studies (Tan et al., 2007)

An assessment of potential barriers to healthcare workers's knowledge of the disease and its reporting are therefore important preparedness steps in avoiding potentially fatal outbreaks

1.2 JUSTIFICATION

The emergence of this highly virulent and contagious Lassa virus in many more districts and states in endemic countries of the West African sub-region and the increasing sporadic cases of Lassa fever outside the endemic regions within and outside Africa as a result of huge inter-border traffic and international travels, necessitates that health care providers should have comprehensive information about the virus and the disease it causes (Ogbu et al, 2007)

Similar studies documenting potential barriers towards reporting of suspected Lassa fever cases by healthcare workers include: Knowledge and practice regarding Lassa fever among primary care

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health workers in Esan west and central local government areas in Edo state, a study carried out by Aigbiremolen et al (2011), it was conducted among primary care health workers only and did not include disease reporting. Also Lassa fever awareness and practices was carried out on Nigerian rural community dwellers only (Asogun, 2010). Popoola, (2008) limited his study: the Potential for Clinical Diagnosis and Notification of Lassa Fever: to residents doctors in UCH alone.

There is need for clinicians and public health officials to remain alert to endemic infectious diseases of this nature and to institute appropriate measures to promptly identify cases and report them, protect healthcare workers and care-givers. Effective prevention and control will depend on accurate and prompt diagnosis with urgent reporting to appropriate authorities and institution of appropriate control guidelines to abort this trend (ACDP, 1996) Therefore, the key issues here are having a high index of suspicion and ability to decide on quick referral. These two clements are hinged on knowledge and experience. The results of this study will be useful for planning health care interventions on Lassa fever prevention and control, promoting active surveillance and notification of diseases and for investigating of trends in interventions over time.

1.4 RESEARCH QUESTIONS

1. What is the level of knowledge of Lassa fever by healthcare workers?
2. What is the level of the knowledge of healthcare workers on Lassa fever reporting through the IDSR strategy?
3. What is the attitude of healthcare workers towards Lassa fever reporting?
4. Are the infrastructures for disease reporting adequate at the health facilities in Ibadan?
5. Is there an association between knowledge of the disease, it's reporting through the IDSR strategy and attitude towards it's reporting?

1.5 OBJECTIVES

1.5.1 Broad Objective

To assess the potential barriers towards reporting of suspected Lassa fever cases by doctors and nurses in Ibadan.

1.5.2 Specific Objectives

1. To determine the knowledge of Lassa fever among healthcare workers in Ibadan.
2. To measure the knowledge of healthcare workers on Lassa fever reporting through the IDSR system.
3. To evaluate the attitude towards Lassa fever reporting among healthcare workers in Ibadan.
4. To ascertain the adequacy of infrastructure for disease reporting at the healthcare facilities in Ibadan.

CHAPTER TWO

LITERATURE REVIEW

2.1 Historical Background

The history of Lassa fever began in 1969 with the mysterious death of two missionary nurses and a near fatal illness of a third. The virus isolated from two of these patients was named "Lassa" after the town Lassa of Borno state in Nigeria where the disease was first recognized. An American nurse working at a Mission station in Lassa, Nigeria became ill after caring for two other nurses who died of the disease. When she too, developed a 103-degree fever and severe ulcers in her mouth, she was flown to a Hospital in New York. A doctor and scientist at Columbia University caring for the nurse, sent blood samples to the Yale Arbovirus Research Unit (Frame et al ,1970).

Meanwhile, a research team at Yale University began studying the blood samples of these three missionaries. A few months after this work began; the head of the team came down with the disease. Both him and the nurse survived their illnesses. Unfortunately however, a laboratory technician at Yale with no known contact with the virus contracted the disease and died in December 1969. . But it was apparent early on that this was not a typical nosocomial outbreak and only a small fraction of the cases could be traced to infection acquired in the hospital itself. In fact, most of the patients became infected in their own village (Monath, 1972)

Doctors, with other scientists from the Centers for Disease Control and Prevention and Yale University and the Ministry of Health of Sierra Leone, began a systematic study of animals from patients' homes to determine the carrier of the disease. Hundreds of animals, particularly rodents, were collected from the village and surrounding areas. Several strains of Lassa virus were isolated from a small gray rodent found living in the houses, implicating it as the reservoir host (McCormick, 1987).

Since this discovery, several other studies have been carried out in West African village settings confirming the transmission of Lassa virus to man from this common village rodent, scientifically called *Mastomys natalensis* (Fisher-Hoch et al,1995)

In 1976, one of doctors in the CDC in Atlanta Georgia sent his colleague and a medical team to West Africa to begin extensive research to answer the critical questions surrounding Lassa fever. Though

the combined efforts of the CDC, the Ministry of Health in Freetown, Sierra Leone, and the Nixon Memorial Hospital in Segbwema with a very capable Sierra Leone medical staff, a research unit specifically aimed at studying and developing a treatment to Lassa fever began to unravel its mysteries (CDC, 2004).The virus was discovered as part of a plan to identify unknown viruses from Africa by collecting serum specimens from patients with fevers of unknown origin (Frame et al, 1970).

Epidemics of Lassa fever have also been documented in other West African countries including Liberia, Sierra Leone, Guinea, Mali and Senegal (Monath et al, 1972).Since its initial discovery, nosocomial outbreaks of Lassa fever have occurred repeatedly in Sierra Leone: Panguma, Kenema, 1971–83, 1997,(Carey et al,1972) Liberia: Zorzor, 1972; Phebe 1972, 1977, 1982;(Bowen et al, 1975) Ganta 1977, 1982 (Frame et al ,1984) and Nigeria: Jos, 1970, 1993(Fisher et al,1995); Onitsha, 1974(Bajani et al, 1997); Zonkwa, 1975; Vom, 1975–77, Imo, 1989 (McCormick, 2002); Lafia, 1993; and Irrua, 2004(Omilabu et al, 2005).

Investigations in the 1970s and 1980s pointed to the existence of 3 disease-endemic zones within Nigeria: the northeastern region around Lassa (Fichet et al, 2009), the central region around Jos, and the southern region around Onitsha (Bowen et al, 2000).The full extent of Lassa's endemicity is unknown due to poor means of contact and communication with the rural villages where Lassa is surely seen. a factor that prevents both reporting and treatment of infection.

A few cases of the importation of Lassa virus into other parts of the world for example by travellers have been documented (Holmes et al ,1990). There have been 10 confirmed cases of Lassa fever in the UK since 1970 (Cooke et al, 2009).

2.2 EPIDEMIOLOGY OF LASSA FEVER

2.2.1 Distribution

Lassa fever is endemic in West Africa. However the world is now a global village and the previous geographical gap between the tropics and the developed world has been bridged by international travel. The 6–21 days incubation period indicates that a person who contacts Lassa fever in an endemic area in West Africa may travel to a developed country within the incubation period and cause an epidemic (Inegbenebor, 2007). The most severely affected countries are in the region known

as the Manu River Union (Liberia, Sierra Leone and Guinea) and Nigeria (Khan et al, 2008). Outbreaks are common in these countries. According to the risk maps, the LF risk area covers approximately 80% of the area of each of Sierra Leone and Liberia, 50% of Guinea, 40% of Nigeria, 30% of each of Côte d'Ivoire, Togo and Benin and 10% of Ghana (Calvet and Rogers, 2009). A recent study describes detection of Lassa virus in rodents in southern Mali (Health protection Agency, 2012). Another study by Fichet et al (2009), has used spatial analysis of data from human cases and infected rodents, together with environmental and metereological conditions, to better understand the distribution of Lassa fever in West Africa. New insights have been gained in the pathogenesis and molecular epidemiology of Lassa fever, and state-of the-art technologies for diagnosing this life-threatening disease have been developed (Gunther et al, 2004).

2.2.2 Imported cases

Eight cases have been imported into the UK since 1980. A 68-year-old man who returned from Sierra Leone to Germany has been diagnosed with Lassa fever (Cooke and shapirol, 2006) most cases have been derived from either Sierra Leone or Nigeria, except for a single case in February 2009 which had been acquired in Mali. Cases of Lassa fever imported to Europe indicate that the virus also circulates in Ivory Coast and Mali (Atkin , 2009 and Gunther et al, 2000). World-wide, imported cases are very rare and occur almost exclusively in persons with high risk occupations such as medical or other aid workers. The risk to tourists is considered to be very low.

2.2.3 Prevalence

The prevalence of Lassa fever has been assesed by determining the prevalence of antibodies to Lassa fever in communities. The prevalence of Lassa fever in Nigeria, Guinea and Sierra Leone are 21%, 55% and 52% respectively (Inegbenebor, 2007). Surveillance figures for Lassa fever in West Africa are of limited quality, but it is estimated that 100 – 500 thousand cases occur annually with about 5,000 deaths. The Nigerian Federal Ministry of Health records indicated 174 cases with 60 deaths and case fatality rates ranging from 12.5 to 66.7% between 2003-2007 (FMOH, 2001). These figures are however based on facility based reporting and may under represent the magnitude of the problem. Studies in Lassa village following the initial outbreak found community sero positivity for Lassa

antibodies of 5.8% in 434 serum samples tested, follow up studies showed 31% of compounds had at least one family member positive for Lassa antibodies (Arnold, 1977).

Eze et al (2010) in their study of high Lassa Fever activity in Northern part of Edo State, Nigeria: In the year 2004, 12,000 persons presented with febrile illness at Irrua Specialist Teaching Hospital (ISTH), Irrua; 832 (6.5%) had lassa fever confirmed by reverse transcriptase-polymerase chain reaction (RT-PCR). 4,096 (32.26%) of those with febrile illness had acute infection as they tested positive for lgM antibody. 333 (33.33%) of about 1000 staff of the hospital had sub-clinical infection as they tested positive for IgG and negative for IgM antibody.. It was recommended that further seroepidemiological survey involving large population sample in the area should be carried out to establish more accurate seroepidemiological data on lassa fever. Also now in early 2012, Nigeria recorded 623 suspected cases, 108 confirmed cases and 70 deaths in 19 states of the nation

2.2.4 Reservoir

In 1972, the Natal multimammate Mouse, *mastomys natalensis* was found to be the natural host of the deadly Lassa fever virus. Infected rodents remain carriers throughout their life and do not show clinical symptoms (Ogbu et al, 2007). In a study by Okoror et al,(2005) titled - Lassa virus: seroepidemiological survey of rodents caught in Ekpoma and environs , Of the 876 rodents caught in different parts of Ekpoma, Nigeria, and environs, 218 were *Mastomys natalensis*, while 658 were other rodents. Of the 218 *M. natalensis caught*, 102 (46.79%) were positive for complement fixing antibody to Lassa virus.

2.2.5 Transmission

The outstanding difference between Lassa fever and the other arenaviruses is its transmibility from person to person (Monath et al, 1974).Lassa fever is transmitted to humans when they ingest food contaminated by the feces and urine of *mastomys natalensis*. Once humans are infected, transmission also occurs from human to human through contact with fluid and aerosol secretions in the form of sneezing, sputum, seminal fluid, stool, urine and blood (McCormick, 1987). There is no evidence of Lassa virus transmission during the incubation period or after recovery, with the exception of sexual transmission, in which transmission rarely occurs because of delayed clearance (≤3 months after acute infection) of Lassa virus from the gonads(McCormick and Fisher-Hoch,2002). Person-to-

person transmission occurs in both community and healthcare settings, where the virus may be spread by contaminated medical equipment, such as re-used needles (Monath, 1975). Infected persons represent serious threat to the environment (Ogbu et al, 2007). Vertical transmission through breast milk has also been observed (Inegbenebor, 2007).

2.3 Clinical Features

The symptomatology of Lassa fever is often nonspecific, especially early in the disease, and consequently the diagnosis may be difficult until multiple similar cases appear in the setting of an epidemic or until the consummate and severe clinical syndrome becomes apparent in an individual patient (Monath et al, 1975). Signs and symptoms typically occur after an incubation period of 6 –21 days. The onset of illness is insidious, with fever and shivering accompanied by malaise, headache and generalized aching. Sore throat is a common early symptom. In some cases the tonsils and pharynx may be inflamed with patches of white or yellowish exudate and occasionally small vesicles or shallow ulcers. As the illness progresses the body temperature may rise to 41°C with daily fluctuations of 2-3°C. The duration and severity of fever is very variable. The average duration is 16 days but extremes of 6-30 days have been reported. A feature of severe attacks is lethargy or prostration is proportionate to the fever. During the second week of illness there may be edema of the head and neck, encephalopathy, pleural effusion and ascites. Vomiting and diarrhea may aggravate the effects of renal and circulatory failure (Gunther and Lenz, 2004). Severe cases develop significant hemorrhage and multi-organ failure with widespread edema and bleeding into the skin, mucosae and deeper tissues. In non-fatal cases, the fever subsides and the patient's condition improves rapidly although tiredness may persist for several weeks. Clinically, a Lassa fever infection is difficult to distinguish from other viral hemorrhagic fevers, such as Ebola and Marburg, and from more common febrile illnesses such as malaria and typhoid (Fisher-Hoch et al, 1995).

2.3.1 Complications of Lassa fever

Various complications may occur in the course of Lassa fever. These complications vary with duration of illness and sex of the victim.

1. **Hypovolemic shock**

   Lassa fever viremia causes endothelial and platelet dysfunction with consequent leaky

capillary syndrome. Bleeding occurs in all organs and from all mucosae leading to hypovolemic shock (Harper ,2004)

2. **Electrolyte imbalance**

   Most Lassa fever victims lose fluid through vomiting and diarrhea and therefore develop electrolyte imbalance (Bausch et al, 2001)

3. **Renal failure**

   Renal tubular damage may also occur on Lassa fever and in conjunction with the hypovolemic shock predispose to renal failure (Inegbenebor, 2007).

4. **Complications of Lassa fever in pregnancy**

   Lassa fever is especially dangerous in pregnant women. The occurrence of breast pain and tenderness, preterm contractions and bleeding may be distinctive features of LF in pregnancy. The clinical finding of a viable fetus may be predictive of improved maternal and fetal outcome (Okogbenin et al, 2010).Abortion is common in early pregnancy and intrauterine fetal death is common in later pregnancies. Abortion reduces the mortality rate in affected pregnant women. Prognosis is very poor in pregnant women as mortality rate may be up to 80%.

5. **Sensorineural deafness**

   This is the commonest complication of Lassa fever. It is not related to the severity of disease as it may occur with the same frequency in both mild and severe forms of the disease. Okokhere et al, in 2009 demonstrated from their study that sensorineural hearing loss from Lassa fever infections can occur in both acute and convalescent stages and is probably induced by an immune response.

2.4 Diagnosis

Because the symptoms of Lassa fever are so varied and non-specific, clinical diagnosis is often difficult, especially early in the course of the disease. Lassa fever is difficult to distinguish from many other diseases which cause fever, including malaria, shigellosis, typhoid fever, yellow fever and other viral haemorrhagic fevers. Definitive diagnosis requires testing that is available only in highly specialized laboratories. Laboratory specimens may be hazardous and must be handled with extreme care. Lassa fever is diagnosed by detection of Lassa antigen, anti-Lassa antibodies, or virus isolation techniques (WHO, 2005). Hence, to make accurate diagnosis of Lassa fever, clinical manifestation,

epidemiological data, and result of laboratory findings should be taken into consideration (Ogbu et al, 2007). Bausch et al (2000) during their study in Sierra Leone and Guinea in West Africa did a thorough evaluation of the Lassa virus ELISA on field-collected samples to assess its true sensitivity and specificity. The virus can also be detected by reverse transcription PCR (RT-PCR) in all patients by the third day of illness, immunofluorescence identifies only 52% of the patients but the reagents and assays are not widely available and do not detect infection during the incubation period (Drosten et al, 2003).

2.5 Treatment

Ribavirin, an antiviral drug, is the current treatment of Lassa fever. The drug is to be administered in a volume of 50-100 ml of normal saline to be infused over 30-40 minutes.

Loading dose: 33 mg/kg (maximum dose 2.64 g)

Followed by a dose of 16 mg/kg (max dose 1.28 g) every 6 hours for the first 4 days

Followed by a dose of 8 mg/kg (maximum dose 0.64 g) every 8 hours for the subsequent 6 days.

Total treatment period is ten days, a treatment chart should be completed for individual patient clearly laying out correct amount to give for each dose (AbdulRameed, 2002).

Supportive treatment is usually carried out with intravenous fluids, and treatment of complications such as renal failure and infections may be necessary Monath (1975) observed that administration of plasma containing antibodies to Lassa virus being tried in a number of acutely ill patients. Five are well documented; a favourable response was observed in 4 and an adverse effect was suspected in 1 case.

Ribavirin has been associated with a number of adverse effects, although most of them are mild, and all are reversible with cessation or dose reduction of the drug (Crowcroft et al, 2004). Although Lassa fever can be treated with ribavirin, early diagnosis and treatment is essential in all cases of Lassa fever. Ribavirin is most effective when given within 6 days of illness. Self-diagnosis and treatment is common in the tropics because of ignorance and poverty. It is only when there is no remission of fever that the patient seeks treatment in a health-care facility (Crowcroft, 2002). Relative contraindications to ribavirin PEP (postexposure prophylaxis) include severe anemia or hemoglobinopathy in pregnancy and breast-feeding, coronary artery disease, renal insufficiency, decompensated liver disease, and known hypersensitivity (Russmann et al, 2006). McCormick et al

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(1989) in their study concluded that Ribavirin should be used at any point in the illness, as well as for postexposure prophylaxis.

2.6: Prevention and Control

Prevention of primary transmission of the Lassa virus from its host to humans can be achieved by avoiding contact with *Mastomys* rodents, especially in the geographic regions where outbreaks occur. Putting food away in rodent-proof containers and keeping the home clean help to discourage rodents from entering homes. Using these rodents as a food source is not recommended. Trapping in and around homes can help reduce rodent populations. However, the wide distribution of *Mastomys* in Africa makes complete control of this rodent reservoir impractical (Granjon et al, 1997). Lassa haemorrhagic fever is a highly virulent and contagious viral infection. Therefore, when caring for patients with Lassa fever, further transmission of the disease through person-to-person contact or nosocomial routes can be avoided by taking preventive precautions against contact with patient secretions by instituting strict barrier nursing (Fisher-Hoch et al, 1995). Such precautions include wearing protective clothing, such as masks, gloves, gowns and goggles; using infection control measures, such as complete equipment sterilization and isolating infected patients from contact with unprotected persons until the disease has run its course (McCormick et al, 1987). Absolute precautionary measures must be taken while carrying out bacteriological and biochemical investigations in the blood and urine samples of suspected cases and such manipulations must be done in biosafety chambers. All those who had contact directly with suspected Lassa haemorrhagic fever patients have to be traced, monitored and specimens should be collected for laboratory diagnosis. Those who test positive have to be isolated and treated as soon as possible with ribavirin. (WHO, 2005). Africa (2009) recommends that All HCWs should be: educated to understand the mechanisms of blood-borne pathogen transmission, shown methods to prevent transmission, and how to use those methods in all circumstances.

2.7 Public health challenges

In Nigeria, Inspite of government's re-assureance, there are indications that only two laboratories in the country have the capacity to screen blood for Lassa fever and these are the Irrua Specialist

Hospital in Irrua, Edo State and the Central Medical Laboratory at the Lagos University Teaching Hospital (LUTH) (Folashade, 2012).

Problems include weak capacity of public health laboratories, particularly their inability to confirm VHF requiring a bio-safety level 3 or 4 laboratories, in addition to the problem of securing the necessary reagents and trained laboratory staff. Intersectoral and cross-border collaboration, coordination of activities and the limited availability of trained human resources in the area of surveillance and response are also important issues (WHO, 2007).

2.8: Lassa fever Epidemic response in Nigeria

The Minister of State for Health in Nigeria inaugurated the Lassa Fever Rapid Response committee aimed at preventing and controlling the further outbreak of the disease. The Minister stated that government would continue to support the treatment of all reported Lassa fever cases with prompt provision of drugs and personal protective equipment. This year (2012), 500,000 vials of the Ribavirin drugs were procured and distributed to the affected states. As reported cases increase around the country, the National Emergency Management Agency (NEMA) organised sensitisation programmes geared towards raising the alarm over the outbreak (Folashade, 2012). WHO Global Alert and Response have also been actively involved in the outbreak (CDC, 2012).

2.9 Integrated Disease Surveillance and Response (IDSR).

Disease surveillance has been described by as:

> Systematic data collection on the occurrence of diseases, disability and deaths; data organization [in a] meaningful way; basic data analysis in order to extract useful information; and timely and complete reporting.(WHO/AFRO, 2003).

The existing surveillance system in Nigeria was insensitive as it was incapable of detecting early warning signs of outbreaks. The resultant effect of the poor surveillance system is high mortality, morbidity and disability, with attendant suffering of our people. In recognition of the defect in the disease surveillance and notification situation, Nigeria and other member States in the WHO African Region endorsed Integrated Disease Surveillance and Response strategy at the 48th Regional Committee meeting held in Harare, Zimbabwe, in September, 1998. Nigeria has embraced the new IDSR strategy and has also introduced it in all the States of the Federation and Federal Capital

Territory (FCT) (FMOH, 2010).The adoption of the Integrated Disease Surveillance and Response (IDSR) in Nigeria commenced in January 2001. The old Disease Surveillance and Notification (DSN) system was assessed to identify its strengths and weaknesses. National programme managers on IDSR were sensitized in June 2001. The national policy on service IDSR was approved in 2006 for use in all levels of health service delivery in the country (FMOH, 2007). A reportable condition is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease. On the basis of the unique disease control priorities within each state, the state determines which conditions are reportable within its jurisdiction (Doyle, 2000).

The IDSR concept is straightforward and calls for countries to strengthen surveillance of priority infectious diseases through: the use of simplified tools for data collection and analysis; integration of various channels for reporting and feedback; providing timely surveillance information for decision making and public health action throughout the system; and strengthening district level capacity to generate and transform surveillance data into information that can inform public health action. (USAID, 2006).

Objectives of the WHO/AFRO IDSR Strategy

- strengthen the capacity of countries to conduct effective surveillance activities.
- integrate multiple surveillance systems so that forms, personnel and resources can be used more efficiently and effectively.
- improve the use of information for decision-making.
- improve the flow of surveillance information between and within levels of the health system.
- improve laboratory capacity in identification of pathogens and monitoring of drug sensitivity.
- increase the involvement of clinicians in the surveillance system.
- emphasize community participation in detection and response to public health problems.
- strengthen the involvement of laboratory personnel in epidemiological surveillance.

(CDC/WHO/AFRO, 2001).

Seven functions of effective surveillance systems

1. Identify cases of priority diseases/conditions
2. Report priority diseases/conditions
3. Analyze data

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Seven functions of effective surveillance systems

1. Identify cases of priority diseases/conditions
2. Report priority diseases/conditions
3. Analyze data

4. Investigate suspected outbreaks/other public health problems
5. Respond to outbreaks/other public health problems
6. Provide feedback
7. Evaluate and improve surveillance and response

(CDC/WHO/AFRO, 2001).

WHO/AFRO named twenty-one (later increased to twenty-two with the addition of highly pathogenic avian influenza (HPAI) – Human) notifiable diseases which were classified into three categories:

- Epidemic prone disease – Cholera, measles, cerebro-spinal meningitis, viral haemorrhagic fever (e.g. Lassa fever), yellow fever, highly pathogenic avian influenza (HPAI) – human.
- Diseases targeted for eradication and elimination – poliomyelitis, dracunculiasis, leprosy, neonatal tetanus, and lymphatic filariasis.
- Other diseases of public health importance - Pneumonia in children less than five years of age, diarrhoea in children less than five years of age, HIV/AIDS, malaria, onchocerciasis, sexually transmitted infections (STIs), severe acute respiratory disease (SARD), tuberculosis, diarrhoea with blood (shigella), pertussis, hepatitis B, plague (FMOH, 2002).

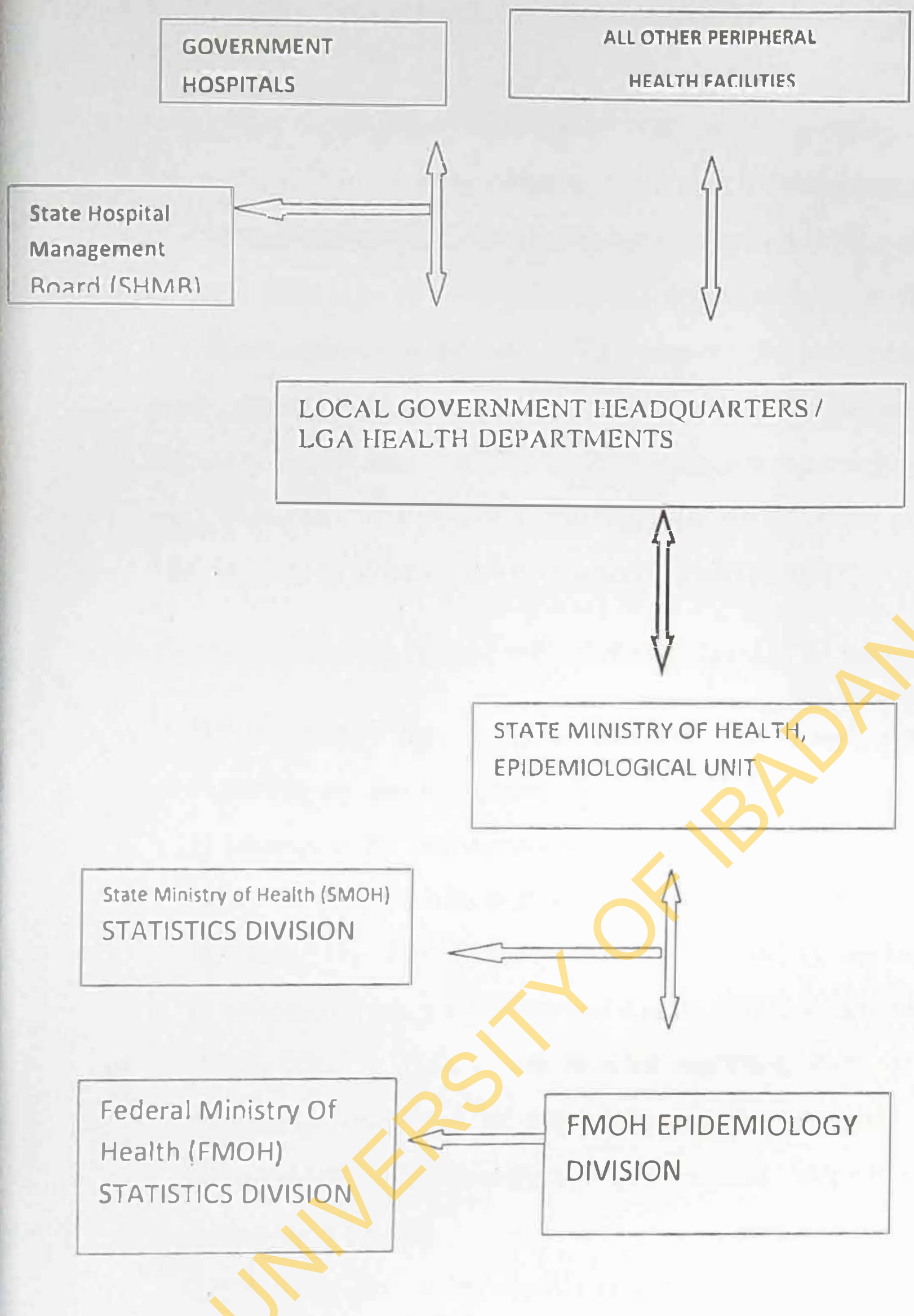
These notifiable diseases are meant to be reported through respective channels to the appropriate health authorities for action:

i. Health facility: Information about the twenty-two diseases is to be collected by all hospitals (both public and private health institutions) based on the case definition of the diseases. The sources of the data from the hospital are the out-patient and in-patient registers. These registers are expected to contain as a minimum – date, name, patient number, sex, age, address, problem diagnosed, treatment and outcome. Information on these priority diseases is to be sent to the LGA from the hospitals. Simple analyses are expected to be carried out at this level to keep trend lines of priority diseases and also to know when thresholds are reached for action.

ii. LGA: The completed forms for the health facilities are collated periodically as applicable and sent to the state level. Analyses are carried out at this level and logs of outbreaks reported by the health facilities are maintained including the intervention activities. Also feedback information on the notifiable diseases is sent to the health facilities from here.

iii. State: Data from various LGAs are collected and complied by the state DSN officer and forwarded to the federal epidemiology division. Detailed analysis is expected to be carried out at this level. Feedback is also to be given to the lower level.

iv. Federal: Data from all the states are forwarded to the federal level for compilation, analyses, interpretation of the information generated to be used for action. Also data are to be disseminated to all the vertical programmes, partners, and other stakeholders. Feedback is also to be given to the lower levels from here regularly (FMOH, 2007).



DUTIES

i. Compile data on standard forms

ii. Appreciate the importance of data collection

i. Receive and collect form from 1st tier.
ii. Collate and forward to SMOH (Epid Unit).
iii. Analyse and feed-back to 1st tier and public

i. Collate data and forward to FMOH (Epid. Unit) with copy to SMOH (Stat Div).
ii. Analyse and feed-back 2nd tier and public
iii. Plan appropriate operation and strategies for disease control

AT FMOH (Epid. Div)

i. Collate and forward to FMOH (statistics div).
ii. Collate data from other sources.
iii. Analyse and feedback 3rd tier and public.
iv. Plan for appropriate intervention.

Figure 2.1: The Structure and Flow of Information for Disease Surveillance and Notification in Nigeria. ((Adapted from National Technical Guidelines for Integrated Disease Surveillance and Response .2007)

These notifiable diseases are expected to be reported immediately or routinely depending on the particular disease involved:

a) Immediate reporting – Also called case-based reporting. Suspected or confirmed individual cases of epidemic –prone diseases are meant to be reported immediately. Case-based reporting of diseases targeted for elimination or eradication is also required when the action threshold is crossed. This is to be reported with the fastest means possible and within forty-eight hours.
b) Routine Summary Reporting – This reports the total number of cases and deaths seen in a given period either weekly or monthly. The routine weekly reporting is for only the six epidemic-prone diseases. The weekly summary reporting is to be reported even when no cases were detected. The monthly summary reporting is for all the twenty-two priority diseases. Also leprosy is to be reported quarterly (FMOH, 2002).

The different reporting is done with different forms. The forms used for the reporting are:

i. IDSR 001A – this is the immediate / case-based reporting form. The form is used for reporting epidemic – prone diseases and diseases targeted for eradication and elimination. It provides the demographic characteristics of the patient and vaccination history and likely sources of infection for the individual patient.
ii. IDSR 001B – This is the lab form. It is filled by the health facility if laboratory specimen is collected from the patient and a copy of it is sent to the laboratory with the specimen.
iii. IDSR 001C – This is the line-list reporting form. It is for use during epidemics and outbreaks (usually 5 or more cases of the epidemic – prone diseases). It contains the demographic characteristics and personal identifiers of the various patients in a spreadsheet format.
iv. IDSR 002 – This is the weekly reporting form for the six epidemic-prone diseases. It is for routine reporting even if no case of any of the epidemic–prone disease was detected within the week being reported.
v. IDSR 003 – This is the monthly notification form. It is used for monthly summary reporting of all the twenty-two notifiable diseases (FMOH, 2002).

2.10 Detection of Lassa fever

This severe acute viral infection has the potential to produce epidemics and as such surveillance mechanisms to detect outbreaks and to monitor control measures are critical in affected countries.

Recommended case definition

An illness of gradual onset with one or more of the following: malaise, fever, headache, sore throat, cough, nausea, vomiting, diarrhoea, myalgia, chest pain, hearing loss, and A history of contact with excreta of rodents or with a probable or confirmed case of Lassa fever.

Laboratory criteria for diagnosis

-Isolation of virus from blood, urine or throat washings or

-Positive IgM serology or seroconversion (IgG antibody) in paired serum specimens or

-Demonstration of Lassa virus antigen in autopsy tissues by immunohistochemistry or in serum by ELISA or

-Positive PCR from serum or autopsy tissues (WHO, 2011).

Case classification

Suspected: A case compatible with the clinical description.

Probable: A suspected case that is epidemiologically linked to a confirmed case.

Confirmed: A suspected case that is laboratory-confirmed.

Contact: A person having close personal contact with the patient (living with, caring for) or a person testing the laboratory specimens of a patient in the 3 weeks after the onset of the illness.

Recommended types of surveillance

Endemic situation:

Immediate reporting of case-based data of suspected, probable or confirmed cases from peripheral level to intermediate and central levels. All cases must be investigated, and contact tracing undertaken. Routine monthly reporting of aggregated data from intermediate to central level.

Outbreak situation:

All suspected outbreaks must be reported centrally. Surveillance must be intensified with active case finding and contact tracing. Aggregated data on a daily / weekly basis to be submitted to intermediate and central level by investigation team. The disease is endemic in Sierra Leone, Liberia, Guinea and regions of Nigeria. Outside these areas, compatible symptoms, with a history of travel to or arrival from one of these countries, should prompt investigation and reporting.

Case-based data for reporting and investigation

-Case classification (suspected / probable / confirmed)

-Unique identifier, age, sex, place of residence for the three weeks before onset of illness

-Date of onset

-Hospitalization

-Outcome

Protective measures include:

- a protective gown;
- a waterproof protective apron;
- latex gloves:
- face mask:
- eye protection;

Specimen for Lassa fever sample collection and transport

- Clean test tubes (vacutainers).
- vaccine carriers
- Refrigerator
- plastic bag
- Ice packs

2.11 Review of Some Literature on knowledge of Lassa fever

Below is a review of some of the works of some authors on Lassa fever awareness and knowledge.

Popoola (2008) studied Potential for Clinical Diagnosis and Notification of Lassa Fever: An assessment among UCH Resident Doctors. His findings were as follows: the response rate in the study was 60.5%. Respondents had a mean knowledge score of 10.4 on a scale of 25 indicating a poor knowledge of Lassa fever among the study population, knowledge of reporting of Lassa fever through the IDSR was found to be poorer than disease knowledge especially as regarding knowledge of forms used for IDSR reporting where less than 12% of the study population correctly identified the use of any of the forms stated. Only 67 respondents were aware of Lassa IDSR diagnostic criteria.

knowledge of disease and IDS reporting knowledge (ρ 0.51), Disease knowledge and attitude (ρ 0.18), and IDS knowledge and attitude (ρ 0.15) were positively correlated. Membership in a medical department, attendance of a workshop and non training of respondents were predictors of better disease knowledge scores. Reporting knowledge was associated with disease knowledge and respondents being from medical departments as significant predictors. Recommendation for establishment of surveillance unit for priority diseases reporting and response in the health facility was made.

Knowledge and practices regarding Lassa fever among primary care health workers in Esan west and central local government areas in Edo state, a study carried out by Aigbiremolen et al (2012) was conducted among primary care health workers only. 55.8% of health workers received awareness about Lassa fever from the media. Over 70% of participants had good knowledge about Lassa fever, 50% of respondents had participated in Lassa fever campaigns which may have reinforced their knowledge about the disease. 13% and 16.9% identified barrier-nursing and hand washing respectively as measures to prevent nosocomial transmission of Lassa fever. There was no significant association between type of health facility or designation of health worker and level of knowledge about Lassa fever.

A study on Lassa fever awareness and practices on Nigerian rural Community dwellers (Asogun, 2010) revealed that thirty-six percent (36%) of the respondents have heard about the disease, mainly through the electronic media. Fifty-one percent (51%) identified rats as the main source of infection of Lassa fever, while 14% of respondents said that the disease can be spread from person to person. The study revealed that only 31% of the people had a correct knowledge of Lassa fever, and 32% had poor attitude and engage in practices that favor transmission of the disease. Most (72%) of the respondents do not use any means to control rats in their households. Forty-three percent (43%) of respondents encouraged bush-burning. There was a significant relationship between the level of education of respondents and knowledge of Lassa fever ($X=3.4$, $P < 0.05$). However, the relationship between the occupation of respondents and practices was not significant ($x = 3.2$, $P > 0.05$).

2.12: Studies on Other Viral Haemorragic Fever

A knowledge and attitude survey Congo Crimean Haemorrhagic fever among health workers in a tertiary care referral centre in Balochistan Pakistan revealed that 80% of doctors knew the most common signs and symptoms of Congo Crimean Haemorrhagic fever but less than 20% had good knowledge of other clinical signs and symptoms and only 32% suggested patients should be isolated (Sheikh et al., 2004).

A survey of Iranian health care workers occupationally at risk for Congo Haemorrhagic fever revealed a positive correlation between knowledge and attitude. Senior physicians obtained higher mean knowledge scores than junior physicians and the most correct responses were for percutaneous transmission and protective role of universal precautions. The highest attitude scores were for preventing nosocomial transmission through the use of universal precautions and active participation in hospital infection control programmes and senior doctors had better attitude scores than junior doctors (Rahnavardi et al., 2008).

2.13: Review Of Existing Studies on potential barriers towards reporting of notifiable diseases.

AbdoolKanim and Dilraj (1996) studied the reasons for under reporting of notifiable conditions by doctors in a tertiary hospital in Durban, South Africa. The overall mean in the assessment of the knowledge of notifiable conditions was 5.7(SD 2.6) .Only 23.4% of the doctors read Epidemiological Comments and 28.6% read the table of notification in the South African Medical Journal. The notification was considered too complicated by 13% of the doctors and too laborious by 55.8%. 19.5% of the doctors did not know the location of a book for notification or did not know if one existed. Factors influencing under-reporting of notifiable conditions and under-reporting were listed as accessibility and complexity of the notification form, lack of motivation because of poor feedback on reported cases. and a perception that it is useless to report notifiable conditions.

A study carried out by Ofili et al (2002) on the knowledge of disease notification among doctors of government hospitals in Benin City, Edo state Nigeria showed that only 11.9% of the doctors had a good knowledge of disease notification, 31(23.1%) knew where to obtain notification forms, and

32(23.9%) knew how to complete the forms. Thus the knowledge of disease notification among doctors in these major institutions is poor.

Bawa et al., (2003) studied the knowledge, attitude, and practises of the reporting of notifiable diseases among health workers in Yobe state. The result showed that only 38.2% of respondents were aware of the national disease surveillance system, 70.9% have ever reported a disease while 29.1% have never reported any notifiable condition. Only 21.8%claimed to have ever received feedback on reports sent to higher authorities. 92% of the health facilities lacked the reporting forms. 85.5% of the respondents listed lack of training on disease surveillance as one of the factors affecting disease reporting.

Prato et al.,(2004) in their own study to evaluate the mandatory notification activities of communicable diseases by general practitioners (GPs) and family paediatricians (FPs) in a local health unit in South Italy in 1999-2000, found that only 39% and 28% of notifiable disease were reported in 1999 and 2000 respectively. The majority of the doctor never notified any case of infectious disease within the period.

A study carried out by Bawa and Olumide (2005) on the effects of training on the reporting of notifiable diseases among health workers in Yobe state, Nigeria showed an increase in the personal awareness of the surveillance system increased from 35.6% to 91.95%, and an increase in the mean knowledge score from 0.85 ± 1.38 SD to 6.15 ± 2.64 SD post intervention in the experimental group. The percentage completeness increased to 52.0% from 2.3%, while the percentage timeliness was 0.0% and 42.9% before and after intervention respectively in the experimental group.

Brabazon et al., (2008) studied the level of under-reporting of hospitalization for notifiable diseases for a 6-year period in a health board region in Ireland. 9 out of the 22 notifiable diseases were under-reported resulting in 18% of the notification being missed due to hospital clinician under-reporting.

A cross sectional survey carried out by Bawa and Umar (2009) on the functional status of disease surveillance and notification system at the Local Government Level in Yobe state, Nigeria showed that out of 144 health personnel's; only 55(38.2%) of the respondents were aware of the disease surveillance notification system, 58(65.9%) and 7(8.0%) of the facilities had a up-to-date registers and DSN forms respectively.

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Study by Dairo et al, (2010) on disease surveillance and reporting in two Southwestern states in Nigeria; Logistic Challenges and prospects showed that; Out of 42 DSN officers surveyed, 38 (90.5%) were medical records officers, 32(76.2%) had appropriate training in disease surveillance and notification. Most had received training from the WHO. Over 90% knew the process of reporting. 45.8% reported that there were penalties for defaulting officers. Logistic support was inadequate in more than half of the local governments surveyed. Inadequate funds and lack of surveillance forms were significantly associated with reporting of outbreaks by the officers. Only 13 of the officers had ever recorded episodes of epidemics in their LGAs. Majority of DSN officers had appropriate training on disease surveillance, reporting and notification.

Assessment of the impact of a special notification nurse and ward notification register on the rate of notification from a general medical unit, the knowledge and attitudes of intern medical officers regarding notification, and the community outcome of notification in a Sri Lankan setting, by Seneviratne et al (1997) revealed that overall, appointment of a special nurse improved notification rates from 9·7% to 62·1%, and the addition of a special ward notification register further improved the rate to 95·1% The results also indicated that, although a majority of intern medical officers were aware of notifiable diseases and the importance of notification, only a few of them always notified notifiable diseases. One of the main reasons given for this was that the majority of them felt that no useful action was taken on notifications by the preventive health authorities, a view that was held because there was no feedback information regarding the notifications. However, during the period of this study nearly 80% of all notifications were successfully investigated by the relevant medical officer of health office. The appointment of a nurse dedicated to notification and introduction of a ward notification register could greatly improve notification rate.

Figueiras et al, (2003) study on Influence of physicians' attitudes on under-notifying infectious diseases shows that the following: beliefs, knowledge and attitudes were statistically associated with a smaller probability of reporting any given MRD (mandatory-reporting diseases). Under-reporting was not associated with specialization (general or paediatric) or the type of contract (fixed or temporary), but was associated with gender. Some physicians' beliefs, knowledge and attitudes regarding MRDs are associated with under-reporting. This suggests that modification of certain attitudes and knowledge in physicians could greatly reduce the under-reporting of MRDs.

Schramm et al, (1991) in his work the surveillance of communicable disease in Vermont: who reports? Found out that 2,035 reports of selected notifiable diseases received from January 1, 1986, through December 31, 1987 reviewed by the Vermont Department of Health, Laboratories provided 1,160, or 71 percent, of the initial reports on 1,636 confirmed cases. This demonstrates that laboratories, when required by law and when part of active surveillance, can make a significant contribution to surveillance of infectious disease. A survey of primary care physicians indicated that 18 percent always reported notifiable diseases. The most frequently mentioned reason for lack of reporting was an assumption that the laboratory would report the cases.

A study by Konowitz et al,(1984), The Underreporting Of Disease And Physicians' Knowledge Of Reporting Requirements. Most of the respondents knew that reporting is required, but their knowledge in specific areas, such as which diseases are reportable, varied greatly. The number of physicians who knew which diseases they are required to report ranged from a low of 63 physicians (37 percent) for trachoma to 163 (96 percent) for syphilis. Of the 169 physicians, only 50 believed they knew how to report reportable diseases and only 40 of them knew the correct procedures. Thirty-six percent of the 169 physicians indicated that they had not reported any cases at all during 1978-81. On the average, physicians recalled reporting 28 percent of their reportable cases. When they indicated why they had not complied with reporting requirements, the physicians chose reasons that reflected a lack of knowledge of the reporting system. The most common reasons were "did not know how to report" and "did not know it was a reportable disease." The results suggest that a major factor in physician underreporting is a lack of knowledge of the morbidity reporting system.

Al-Jawadi and Al-Neami (2008) in their study of Assessment Of Infectious Diseases Surveillance System In Mosul, Iraq, found out that there is an acceptable registration, reporting activities and passable supervisory visits for the disease specific surveillance systems at health facilities level, while all poor for monthly passive surveillance. Obvious lack of standardized case definitions with limited ability for laboratory diagnosis at health facilities surveyed. Feedback activities were the weakest issue in the surveillance at all levels. Nonexistence of essential activities required for the system to act as an early warning system for epidemic detection at health facilities and sectors levels. There is poor reporting facilities, although 76.5% of health facilities have computers, none of them use this equipment for compiling and reporting surveillance data. They concluded that special attention is

required for the improvement in supervision, standardized case definitions and quality of reporting, analysis and feedback of monthly passive surveillance, with a continuous support for the disease specific surveillance systems activities.

Simon Voss (1992): How much do doctors know about the notification of infectious diseases? Of all doctors who responded, 115 (87%) knew that there is a statutory duty to notify certain infectious diseases. More than 65% of doctors were aware that those who diagnose, confirm diagnosis, or are the consultant in charge have a duty to notify. However, only 37 (46%) general practitioners and 15 (29%) hospital doctors knew that a doctor who suspects the diagnosis may have a duty to notify, and 29 (36%) general practitioners and 24 (47%) hospital doctors incorrectly thought that the microbiology laboratory has a duty to notify. Both groups of doctors thought notification to be most important to the consultant for communicable disease control and national surveillance and least important to the general practitioner and individual patient. Only 40% of responding doctors (53) were aware of where completed notification forms should be sent. Although the address is on the form, which folds into a self contained letter, anecdotal reports suggest that the forms are often put in an envelope before posting.

Allen and Ferson (2000) Notification of infectious diseases by general practitioners: A Focus groups showed that at least some GPs have poor understanding of the process of notification, most felt uncomfortable notifying an unconfirmed case, many preferred to leave notification to the laboratory because of concerns about damaging the doctor-patient relationship, and that there is need for financial or other incentives. There are deficiencies in the completeness and timeliness of notification by GPs which may adversely affect the timing of prophylaxis and outbreak control. Notification by GPs may be improved by such strategies as better notification forms and better feedback to doctors on the outcomes.

Bek et al, (1994) studied notification of infectious diseases by general practitioners in New South Wales. Survey before and after the introduction of the Public Health Act 1991 (NSW) The percentage of doctors who considered notification to be very important increased (57% "before" v. 67% "after";P=0.02), as did the percentage who believed that notification usually leads to preventive action (41% v. 54%; P = 0.04). There was no increase in self-reported notification (50% v. 54% who reported notifying cases of notifiable diseases "always, or almost always"; P = 0.42). Notification of

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infectious disease by doctors remains suboptimal, but may improve over time as the impact of the new Act is felt. Feedback to doctors showing that preventive action is taken as a result of their notifications may be the most effective way to improve notification practices.

Tan et al (2009) study- Private doctors' practices, knowledge, and attitude to reporting of communicable diseases: a national survey in Taiwan. The most common reasons for not reporting were "do not want to violate the patient's privacy", "reporting procedure is troublesome", and "not sure whether the diagnosed disease is reportable". Significantly higher proportions of the non-reporting doctors considered the reporting system inconvenient or were not familiar with the system. The highest percentage (65.2%) of the non-reporting doctors considered that a simplified reporting procedure, among all measures, would increase their willingness to report. In addition, a significantly higher proportion of the non-reporting doctors would increase their willingness to report if there has been a good reward for reporting or a penalty for not reporting. The most effective way to improve reporting rate may be to modify doctor's attitude to disease reporting. The development of a convenient and widely-accepted reporting system and the establishment of a reward/penalty system may be essential in improving disease reporting compliance in private doctors.

Spedding et al (1998) Notification of infectious diseases by junior doctors in accident and emergency department Ireland.81 (91%) of the senior house officers participated in the study; 23 (29%) realised that the doctor diagnosing the notifiable disease had a statutory duty to notify that disease; nine (11%) were aware there were three statutory lists in the United Kingdom. Knowledge about which infectious diseases require notification varied from 79/81 (98%) for meningococcal disease to 15/91 (19%) for methicillin resistant S aureus. Seventy nine (98%) of the doctors thought that a poster displayed in the A&E department would be helpful. There was no significant difference between duration of qualification and performance on the questionnaire (p=0.2).In Conclusion despite varying experience, junior doctors in A&E do not know which infectious diseases are notifiable by statute. They felt that it would be helpful to have a poster in the A&E department listing the notifiable diseases of that region. To encourage accurate reporting, interregional variation between the statutory lists should be abolished and replaced by one nationally agreed list.

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CHAPTER THREE

METHODOLOGY

3.1 Study design

This was a descriptive cross sectional study among doctors and nurses in public healthcare facilities in Ibadan.

3.2 Study area

This study was carried out in a tertiary, two secondary and 52 primary healthcare facilities in Ibadan. Ibadan is located in south-western Nigeria, 128 km northeast of Lagos and 530 km southwest of Abuja, the federal capital. It is the capital of Oyo State and the third largest metropolitan city in Nigeria, with a population of 1,338,659 according to the 2006 census. There are five urban local government areas (LGAs) with their headquarters within the city. The public health care delivery system in Nigeria is structured into three levels, namely the primary, secondary and tertiary levels of care. There is one public tertiary health care facility (The University College Hospital) in Ibadan, two public secondary health care facilities (Adeoyo Maternity and the Ring Road State Hospitals) and 52 primary health care (PHC) centres distributed in the LGAs within the city. The tertiary hospital, UCH has 380 resident Doctors and 1,131 nurses and serves as a referral Centre for general hospitals and clinics in Oyo state and its environs. It is located in Ibadan North local government area. Adeoyo Maternity Hospital, Yemetu is located in Ibadan North local government area has 18 medical Doctors and 217 Nurses. Ring road state hospital is located in Ibadan southwest local government area of Oyo state. It has 14 doctors and 173 nurses. There are 52 primary healthcare centers in the 5 LGA in Ibadan and there are 70 healthcare workers in them: Ibadan North (8), Ibadan Northwest (8), Ibadan Northeast (8), Ibadan Southwest (21) and Ibadan Southeast (7) (SMOH, 2012)

3.3 Sampling technique

A cluster of the tertiary, secondary and primary healthcare levels of the public facilities in Ibadan were selected. Probability proportional to size was used to select number of doctors and nurses thatl participated in the study for the tertiary and secondary hospitals. Due to the relatively low number of eligible participants from the PHC centres and to ensure that all centres were well represented, all 70

participants in these centres were selected. The departments in the tertiary and secondary hospitals was further stratified into medical and non-medical units, after which simple random sampling was used to select the number of persons that participated in each cluster.

3.4 Sample size determination

Using single proportion

$$n = \frac{Z^2 \alpha\, pq}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.119 \times (1-0.119)}{0.0025} = 161$$

n = minimum sample size

P = Prevalence of good knowledge of notification among medical doctors in Edo state (11.9%) (Ofili , 2003)

d = precision for the study which is set at 0.05

z = Standard Normal Deviate at 95% confidence interval = 1.96

Since the population is a finite one (i.e 1933 healthcare workers in UCH, Adeoyo maternity hospital, Ring road hospital) then the sample size for a finite population was further determined using this formula;

$$nf = \frac{n}{(1 + n/N)}$$

nf = desired sample size for finite population

n = desired sample size for infinite population

N = the estimate of the population size

nf = 161/ (1+ (161/1933)

= 148 respondents

Non response rate

Using a non-response rate of 10%

100/90 = 1.11 × 148 = 165

To get the number of participants in the tertiary and secondary level, probability proportional to size was used to estimate participants in each hospital.

Total sample frame = 1933

Sample size = 165

UCH = 1511 doctors and nurses

1511 × 165 =132

1933

Adeoyo Maternity Hospital = 235 doctors and nurses

235 × 165 = 20

1933

Ring Road State Hospital = 187 doctors and nurses

187 × 165 = 16

1933

Total number of healthcare workers in the primary health care centres was 70.

Therefore 132, 36 and 70 doctors and nurses from the tertiary, secondary and primary levels of health care facilities in Ibadan were recruited for this study using multistage random sampling.

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3.5 Selection criteria

Inclusion criteria

Healthcare workers who were present during the study period at the specified facilities and gave their consent.

Exclusion criteria

All Healthcare workers who were on leave or otherwise unavailable during the study period and those who were present but did not give their consent.

3.6 Data collection method

Data was collected using an observational checklist and a semi-structured pre-tested questionnaire containing open and close ended questions which was designed based on the Integrated Disease Surveillance technical guidelines by WHO and CDC Lassa fever fact sheets that elicits the required information based on the study's objectives which was administered to respondent in their facilities by trained research assistant.

The questionnaire comprise 5 sections:

Section A: Socio demographic and educational details.

Section B: Knowledge of Lassa fever including signs and symptoms, clinical diagnosis, transmission and treatment.

Section C: Knowledge of IDSR criteria for Lassa fever reporting, reporting sequence and forms utilized.

Section D: Attitude to Lassa fever reporting and prior management of probable cases.

Section E: Factors associated with reporting practice

The adequacy of infrastructure for disease reporting was assessed at the health facility level using an observational checklist. This checklist was used in obtaining information from the health facilities on the availability of infrastructures like designated person, functional laboratory tools for collecting specimen, reporting tools, materials, information dissemination and feedback.

3.7 Data management

Data collected was checked for completeness, cleaned, edited and entered into Statistical Software Package for Social Sciences (SPSS) version 15.0.

3.8 Data Analysis

Frequencies, percentages, mean and standard deviations were used to summarise the data. Knowledge of Lassa fever was scored based on 25 questions from the knowledge section. Each correct answer was awarded one point while a wrong answer was given no points. Participants with scores <12 were categorised as having poor knowledge, and those with scores ≥12 were categorized as having good knowledge. Knowledge of IDSR was scored based on 22 questions from the knowledge section. Each correct answer was awarded one point while a wrong answer was given no points. Participants with scores <9 were categorized as having poor knowledge, and those with scores ≥9 were categorised as having good knowledge scored. Based on 5 questions from the attitude section graded on a likert scale the maximum score is 25. Each correct perception was awarded 5 points while the wrong answer was awarded 1 point. Participants with scores < 15 were categorised as having negative attitude towards reporting of suspected Lassa fever case and those with scores ≥15 were categorised as having positive attitude.

The chi-square test statistics was used to evaluate the associations between knowledge, attitude and demographic characteristics of respondents at p-value 0.05. A binary logistic regression analysis was then used to build a model between the outcome variable and the explanatory variables with p-value set at 0.20. The outcome variables were knowledge of Lassa fever, knowledge of IDSR diagnostic criteria for the disease and attitude towards its reporting. The explanatory variables that were included in the model are socio-demographic characteristics of respondents, type of facility, source of information and other factors affecting reporting. The adjusted odds ratios (AORs) and 95% CIs were used as measures of association.

3.9 Limitations

Time considerations necessitated the limitation of the study to doctors and nurses and not all populations relevant in the diagnosis, treatment, reporting and nosocomial prevention of Lassa fever which involves all cadres of health workers. Only healthcare workers in the public facilities participated in the study.

3.10 Ethical considerations

The Proposal was submitted to the UI/UCH ethical review committee for ethical approval. Written informed consent was obtained from all participants who were informed of what the study entailed and time required to complete the research instrument. Participation was voluntary, sessions were interrupted at any time at respondents' desire .Confidentiality of responses was maintained as participants were not required to input their names or any personal identifier.

CHAPTER FOUR

RESULTS

4.1: Socio-demographic characteristics of the respondents

A total of 255 questionnaires were distributed and 238 were returned completed giving a response rate of 93.0% .In table 4.1 below, the demographic characteristics of the respondents are presented. Majority of the respondents were nurses 155 (65.1%). There were 85(35.7%) males .The ages of the respondents ranged from 22 to 58years with a mean age of 36.5years (STD± 9.3). Majority of the respondents were married 154(64.7%), with only two widows (0.8%) and 82(34.5%) singles. The highest level of education for most respondents was the university education with 60.3 % (143) and others tertiary education 35.1% (84). Their years of experience ranged from 2 to 35years with a mean of 9.8 years(STD± 9.3).The ethnic composition of the group was such that 186(78.2%) were Yoruba, 46 (19.3%) Ibo, 4 (1.7%) Hausa and 2(0.8%) from other tribes.

Table 4.1: Frequency distribution of respondents by socio-demographic characteristics

Variables	Health Facilities			
	Primary	Secondary	Tertiary	Total (%)
	N = 70	N =36	132	N= 238
Age group in years				
20-29	19 (27.1%)	17 (47.2%)	28 (21.2%)	64(26.9)
30-39	35 (50.0%)	13 (36.1%)	49 (37.1%)	97(40.8)
40-49	10 (14.3%)	5 (13.9%)	35 (26.5%)	50(21.0)
50-59	6 (8.6%)	1 (2.8%)	20 (15.2%)	27(11.3)
Sex				
Male	30 (42.9%)	7 (19.4%)	48 (36.4%)	85(35.7)
Female	40 (57.1%)	29 (80.6%)	84 (63.6%)	153(64.3)
Marital Status				
Single	27(38.6%)	16(44.4%)	39(29.5%)	82(34.5)
Married	42(60.0%)	20(55.6%)	92(69.7%)	154(64.7)
widow	1(1.4%)	0 (0%)	1 (0.8%)	2(0.8)
Designation				
Doctors	17(24.3%)	6 (16.7%)	60 (45.5%)	83(34.9)
Nurses	53 (75.7%)	30 (83.3%)	72 (54.5%)	155(65.1)
Education				
University/ Postgraduate Schoolof	41 (58.6%)	15 (41.7%)	98 (74.2%)	154(64.7)
Hygiene/Technology	18 (25.7%)	12 (33.3%)	26 (19.7%)	56(23.5)
School of nursing/midwifery	11 (15.7%)	9 (25.0%)	8 (6.1%)	28(11.8)
Ethnic group				
Yoruba	53 (75.7%)	25 (69.4%)	108 (81.8%)	186(78.2)
Igbo	15 (21.4%)	11 (30.6%)	20 (15.2%)	46(19.3)
Hausa	1 (1.4%)	0 (0.0%)	3 (2.3%)	4(1.7)
Others	1 (1.4%)	0 (0.0%)	1 (0.8%)	2(0.8)
Years of service				
<10	51 (72.9%)	24(66.7%)	75 (56.8%)	150(63.0)
10-19	12 (17.1%)	9 (25.0%)	26 (19.7%)	47(19.7)
20-29	5(7.1%)	3 (8.3%)	20 (15.2%)	28(11.8)
≥30	2 (2.9%)	0 (0.0%)	11 (8.3%)	13(5.5)

4.2: Knowledge of the respondents on Lassa fever signs and symptoms, transmission, diagnosis and treatment.

Table 4.2 and 4.3 below highlights knowledge of the respondents on Lassa fever signs and symptoms, transmission,. diagnosis and treatment and their scores. A high proportion of the respondents 219 (92.0%) knew that the reservoir is rat, 154 (64.7%) knew that Lassa fever is a viral infection, while 167 (70.2%) knew that the incubation period ranges from about one to three weeks.

Very little of the study participants 76(32.0%) knew the correct signs and symptoms of Lassa fever and also 69(29.0%) of the respondents could identify the right channel of. transmission for Lassa fever virus.

In Lassa lever treatment, a high percentage of the respondents 130 (54.6%) knew that patients are nursed in isolated wards while very few 72 (30.3%) knew that Ribavirin is the drug of choice and 22(9.2%) the correct dose.

Table 4.2: Knowledge score of healthcare workers **N= 238**

Knowledge score	Frequency	(%)
Good (≥12)	67	28.4
Poor (<12)	169	71.6

Table 4.3: Knowledge of the respondents on Lassa fever signs and symptoms, transmission and diagnosis

Variable	No of respondents = 238		
	Response		
	Yes	No	Not Sure
Lassa is a viral disease	*154 (64.7%)	23(9.7%)	61(25.6%)
Reservoir in Rats	*219 (92.0%)	8(3.4%)	11 (4.6%)
Infection is usually fatal	*179 (75.2%)	40(16.8%)	19 (8.0%)
Transmission by rat bite	79 (33.2%)	*124(52.1%)	35 (14.7%)
Incubation 1-3 weeks	*167 (70.2%)	22(9.2%)	49 (20.6%)
Features include			
Fever > 38°C	*135(56.7%)	32 (13.4%)	35(14.7%)
Mucosal bleeding	*125 (52.5)	21 (8.8%)	92 (38.7%)
Facial Oedema	*83 (34.9%)	19 (8.0%)	136 (57.1%)
Retrosternal pain	*82 (34.5%)	28(11.8%)	128 (53.8%)
Jaundice	88 (37.0%)	*41(17.2%)	109 (45.8%)
Diagnosis			
Children not affected	23(9.7%)	*120 (50.4%)	95 (39.9%)
Suspect in fever + bleeding	*108(45.6%)	41 (17.2%)	88 (37.0%)
Abnormal bleed excludes	37 (15.5%)	*116 (48.7%)	84 (35.3%)
Confirmed without lab	44 (18.5%)	*112 (47.1%)	82(34.5%)
Distinct case presentations	63 (26.5%)	*58 (24.4%)	117(49.2%)
Transmission			
Dead bodies may transmit	*190(79.8%)	19 (8.0%)	29 (12.2%)
Active skin penetration	116 (48.7%)	*76 (31.9%)	46 (19.3%)
By aerosol	*117 (49.2%)	57 (23.9%)	64 (26.9%)
Only infectious in acute phase	151 (63.4%)	*35 (14.7%)	52 (21.8%)
Semen may transmit	113 (47.5%)	*21 (8.8%)	10 (43.7%)
Treatment			
Nurse patient on open wards	39 (16.4%)	*130 (54.6%)	69 (29.0%)
Bleeding poor prognostic sign	*45 (18.9%)	79 (33.2%)	114 (47.9%)
Ribavirin	*72 (30.3%)	86 (21.0%)	116 (48.7)
Use Steroids	34(14.3%)	*84 (35.3%)	120 (50.4%)
Dose for 10 days	*22 (9.2%)	42 (17.7%)	174 (73.1%)

* Indicates the right response

4.3: Knowledge of the respondents on IDSR, diagnostic criteria for Lassa fever and its reporting.

Table 4.4 and 4.5 below summarizes IDSR knowledge of respondents and their scores with respect to Lassa fever reporting. Only 67 (28.2%) of the respondents reported an awareness of the IDSR diagnostic criteria for Lassa fever. The most frequent source was journals 87(36.6%) followed by other health workers 47 (19.7%), conferences 37(15.5%), books 29(12.2%), postgraduate teaching/lectures 17(7.1%), undergraduate teachings/lectures 11 (4.6%), and internet 9 (3.8%), while 1(0.4%) respondent obtained his knowledge elsewhere.

The most correctly known Lassa fever criterion was epidemiological linked to a confirmed case of Lassa by 177(74.4%) respondents, followed by laboratory confirmed IgM Lassa antibodies 175(73.5%), and subconjuctival bleeding being considered diagnostic criteria by only 114(47.9%) respondents.

It was found that 50(21.6%) of the respondents were in the good knowledge category while 181(78.4%) of the respondents were in the poor category.

Table 4.4: Knowledge score of healthcare workers N= 238

Knowledge score	Frequency	(%)
Good (≥9)	50	21.6
Poor (<9)	181	78.4

Table 4.5: Knowledge of IDSR diagnostic criteria for Lassa fever. No of respondents = 328

Variable	Response		
	Yes	No	Not Sure
Included in IDSR Lassa criteria			
Link to Lassa case	*177 (74.4%)	14 (5.9%)	47 (19.7%)
Lassa IgM antibodies	*175 (73.5%)	12 (5.0%)	51 (21.4%)
Fever unresponsive to Rx	*126 (52.9%)	16 (6.7%)	96 (40.3%)
Lassa virus isolation	*116 (48.7%)	23(9.7%)	99 (41.6%)
Subconjuctival bleeding	*114 (47.9%)	41(17.2%)	83(34.9%)
Haematuria	*128 (53.8%)	18 (7.6%)	92 (38.7%)
IDSR Reporting Requirments			
Report suspected cases	*184(77.3%)	16 (6.7%)	38 (16.0%)
Report only confirmed cases	174 (73.1%)	*18 (7.6%)	46 (19.3%)
Critical number of cases needed to report	154 (64.7%)	*41 (17.2%)	43 (18.1%)
Notify State Ministry	148(62.2%)	*19 (8.0%)	71 (29.8%)
Notify Local Government	*135(56.7%)	46 (19.3%)	57 (23.9%)
Report cases weekly	164 (68.9%)	*29 (12.2%)	45 (18.9%)
Notify Federal Ministry	155 (65.1%)	*15 (6.3%)	68 (28.6%)
Reporting Forms			
Only 001B used for only Lassa fever	23(9.7%)	*16 (6.7%)	198(83.2%)
001C used for line listing	*28(11.8%)	14(5.9%)	196(82.4%)
All IDS forms useful for Lassa	*31(13.0%)	13(5.5%)	194(81.5%)
001A for Lab reporting	35(14.7%)	*15 (6.3%)	188(79.0%)
001B for Facility reporting	30(12.6%)	*23 (9.7%)	185(77.7%)

* Indicates the right response

4.4: Attitude to Lassa fever reporting and control

Table 4.6 and 4.7 below shows summary of responses to attitude questions and their scores.

The highest attitude score was expressed for the issue of Lassa fever being uncommon source of morbidity and the least for the healthcare workers being vulnerable group in Lassa fever outbreaks. It was found that 200(84.0%) of the respondents were in the good attitude category while 38(16.0%) of the respondents were in the poor category.

Table 4.6: Attitude score of healthcare workers N = 238

Attitude score	Frequency	(%)
Good (≥15)	200	84.0
Poor (<15)	38	16.0

Table 4.7: Responses to attitude questions

Number of respondents = 238

Variable	Number of Responses (%)				
	Agree strongly	Agree	Undecided	Disagree	Disagree strongly
Healthcare workers should maintain clinic registers for commu. disease diagnosis	60 (25.2%)	26 (10.9%)	22 (9.2%)	43 (18.1%)	87 (36.6%)
Reporting requirements not an unnecess. burden on busy clinicians	109 (45.8%)	44 (18.5%)	43 (18.1%)	21 (8.8%)	21 (8.8%)
Health workers especially are vulnerable during Lassa outbreaks	75 (31.5%)	37 (15.5%)	17 (7.1%)	38 (16.0%)	71 (29.8%)
Emphasis on Lassa fever prevention and control is important and necessary	111 (46.6%)	69 (29.0%)	24 (10.1%)	27 (11.3%)	7 (2.9%)
Universal precautions of benefit in limiting nosocomial infection	102 (42.9%)	53 (22.3%)	25 (10.5%)	38 (16.0%)	20 (8.4%)

4.5: Treatment and Reporting of Probable Cases.

Table 4.8 below summarises the responses to the questions on treatment and reporting of probable cases by respondents .Only 8 healthcare workers had in the month preceding the study singularly or in conjunction with a team, treated a patient with fever refractory to treatment and unexplained mucosal bleeding. The number of patients ranged from 1 to 3 per respondent. Three healthcare workers reported Lassa fever was considered a differential and one respondent reported an investigation was done to exclude it as a diagnosis, only one physician was certain a case in question was reported to the local government.

Table 4.8: Treatment and Reporting of Probable Cases.

Number of respondents = 238

Variable	Yes (%)	No (%)
Managed a patient with fever refractory to treatment + mucosal bleeding in the last one month .	8 (3.4)	228(95.8)
Lassa fever considered a differential in the patient.	3(1.3)	5(2.1)
Laboratory investigation done to exclude Lassa fever.	1(0.4)	7(2.9)
Case reported.	3(1.3)	4(1.7)

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Laboratory investigation done to exclude Lassa fever.	1(0.4)	7(2.9)
Case reported.	3(1.3)	4(1.7)

4.6: Other variables associated with Lassa fever reporting

Table 4.9 below summarizes the healthcare workers responses to factors that can affect Lassa fever reporting. A high proportion of the respondents 159(66.8%) and 166(69.7%) reported that their clinics, ward or other practice areas contain a manual and posters of case definitions for communicable diseases respectively. Less than half of the respondents 95(39.9%) have attended a training or workshop which included communicable disease reporting and surveillance while 42(17.6%) have been involved directly or indirectly with investigation of an outbreak. Only 45 (18.9%) of the respondents have ever received feedback on any communicable disease reported.

Table 4.9: Other variables associated with Lassa fever reporting

Number of respondents = 238

Variable	Responses	
	Yes (%)	No (%)
Presence of a manual of case definitions for comm.diseases	159(66.8)	79(33.2)
Presence of a poster of case definitions for comm.diseases	166(69.7)	72(30.3)
Training or workshop on comm. disease reporting and surveillance	95(39.9)	143(60.1)
Involvement in investigation of any outbreaks.	42(17.6)	96(82.4)
Ever received feedback on any communicable disease reported.	45 (18.9)	193(81.1)

4.7: Assessment of infrastructure affecting disease reporting at the health facilities.

The table 4.10 below contains the results of the observational checklist used to assess the adequacy of the infrastructure for reporting of notifiable diseases.

Majority 46(83.6%) out of the 55 health facilities that were visited had designated people who collect information of notifiable diseases in the facilities. Forty–six (83.6%) of the health facilities had clinic registers for recording the diagnosed disease. Thirty-four (61.8%)of them also have copies of the standard case definition pasted around the hospital. 46(83.6%) of the health facilities have vaccine carriers for packaging and transporting specimens, 46(83.6%) had clean test tubes for collection of specimen. Most of the facilities 29(52.7%) had refrigerator for handling specimen. Also 34(61.8%) of the health facilities plotted graph of priority diseases diagnosed in the health facility, plotted the distribution of priority disease in a map of their catchment areas and displaying maps for people to see at a glance in the health facility. Most of the health facilities 46(83.6%) have the monthly reporting forms, immediate/case based reporting form, and reported having enough forms that will last for more than 3 months. Nine (16.4%) of the health facility reported not having any of the reporting form at the time of the study. Only 12(26.1%) of the health facilities submit their forms to the LGA while in 34(61.8) the LGA DSNO collects the forms during visit to the health facility. Also 43(78.2%)and 3(5.5%) received information from state or LGA on monthly and quarterly basis while none of the health facilities reported receiving information weekly and 9(16.4%) said they never received any information.

Table 4.10 Assessment of infrastructure affecting disease reporting at the health facilities.

Variable N= 55	Yes (%)	No (%)
Presence of a surveillance officer or designated person who collects information on notifiable diseases in the community.	46(83.6)	9(16.4)
Presence of a register for recording diseases diagnosed	46(83.6)	9(16.4)
Standard case definition of the notifiable diseases posters on display.	34(61.8)	21(38.2)
Availability of the following forms		
1-Immediate /case base reporting	46(83.6)	9(16.4)
2-Line list form	46(83.6)	9(16.4)
3-Weekly reporting	46(83.6)	9(16.4)
4-Monthly	46(83.6)	9(16.4)
Quantity of the forms available in the hospital now.		
1-None	9(16.4)	46(83.6)
2-Enough for one week	46(83.6)	9(16.4)
3-Enough for one month	46(83.6)	9(16.4)
4-Enough for 3 months	46(83.6)	9(16.4)
5-Enough for more than 3 months	46(83.6)	9(16.4)
Transportation or logistics supports available		
1- availability of Vehicles	34(61.8)	21(38.2)
2- availability of Motor cycles	34(61.8)	21(38.2)
Availability of instrument for handling, packaging and transporting specimen for suspected Lassa fever cases		
1- Clean test tubes	46(83.6)	9(16.4)
2- vaccine carriers	46(83.6)	9(16.4)
3- Refrigerator	29(52.7)	26(47.3)
4- plastic bag	34(61.8)	21(38.2)
5- Generator	29(52.7)	26(47.3)
6- Ice packs	46(83.6)	9(16.4)

Availability of materials for carrying out data management		
1. Availability of Computers	34(61.8)	21(38.2)
2. Availability of Statistical programs/packages	34(61.8)	21(38.2)
3. Availability of Calculator and papers	21(38.2)	34(61.8)
Presence of plotted number of cases for each of the priority disease on a graph.	34(61.8)	21(38.2)
Presence of appropriate supplies for collecting specimen.	21(38.2)	34(61.8)
Presence of plotted distribution of diseases on a map for the hospital catchment area.	34(61.8)	21(38.2)
Presence of displayed maps and graphs of diseases plotted in the hospital for everybody to see	34(61.8)	21(38.2)
Suspected Lassa fever case had ever been seen	0(0)	55(100)
If yes to 14 above, what was the reaction		
1-Report to the LGA	----	-----
2-Go to investigate in the community		
3-Order for drug supplies		
Adequate funds in the facility for transportion of specimen to laboratory.	34(61.8)	21(38.2)
How diseases are reported		
1-Submission of forms to the LGA office	12(26.1)	43(73.9)
2-Collection from the hospitals by LGA DSNO officer during visit	34(61.8)	21(38.2)
Ever received feedback from the LGA or state on disease reported.		
1. Never	9(16.4)	46(83.6)
2. Weekly	0(0)	55(100)
3. Monthly	43(78.2)	12(21.8)
4. Quarterly	3(5.5)	52(94.5)

4.8: Relationship between socio demographic factors and respondents knowledge of Lassa fever.

The associations of the socio-demographic variables with respondents knowledge of Lassa fever are presented in table 4.11 below. Only gender was found to have a significant association with respondents knowledge of Lassa fever.

Table 4.11: Relationship between socio-demographic factors and respondents knowledge of Lassa fever

Socio-demographic variables	Knowledge in frequency (%)		
	Good	Poor	P-value
Age group in years			
20-29	17(27.0)	46(73.0)	
30-39	29(30.2)	67(69.8)	0.853
40-49	15(30.0)	35(70.0)	
50-59	6(22.2)	21(77.8)	
Gender			
Male	14(16.5)	71(83.5)	
Female	53(35.3)	98(64.7)	0.002
Marital Status			
Single	18(22.2)	63(77.8)	
Married	49(30.7)	106(69.3)	0.129
Designation			
Doctors	21(25.6)	61(74.4)	
Nurses	46(29.9)	108(70.1)	0.489
Education			
University/ Postgraduate	43(28.3)	109(71.7)	
School of hygiene/Technology	19(33.9)	37(66.1)	0.305
School of nursing/midwifery	5(17.9)	23(82.1)	
Ethnic group			
Yoruba	51(27.6)	134(72.4)	
Igbo	14(31.1)	31(68.9)	
Hausa	0(0.0)	4(100)	0.077
Others	2(100)	0(0.0)	
Years of service			
<10	46(30.9)	103(69.1)	
10-19	7(14.9)	40(85.1)	
20-29	10(37.0)	17(63.0)	0.128
≥30	4(30.8)	9(69.2)	
Healthcare facility level			
Primary Healthcare	20(28.6)	50(71.4)	
Secondary Healthcare	13(36.1)	23(63.9)	0.502
Tertiary Healthcare	34(26.2)	96(73.8)	

4.9: Relationship between respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting and socio-demographic factors

The associations of the socio-demographic variables with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting are presented in table 4.12 below. None of the variables was found to have a significant association with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting.

4.9: Relationship between respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting and socio-demographic factors

The associations of the socio-demographic variables with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting are presented in table 4.12 below. None of the variables was found to have a significant association with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting.

4.9: Relationship between respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting and socio-demographic factors

The associations of the socio-demographic variables with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting are presented in table 4.12 below. None of the variables was found to have a significant association with respondent's knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting.

Table 4.12: Relationship between respondents knowledge of EBVD, diagnostic criteria for Lassa fever and socio-demographic factors. Knowledge in frequency (%) N= 198

Variables	YES	NO	P-value
Age group in years			
20-29	14(21.8)	47(78.8)	
30-39	14(16.9)	70(83.2)	0.100
40-49	14(30.4)	32(69.6)	
50-59	8(16.0)	21(84.0)	
Gender			
Male	13(13.8)	71(86.2)	0.083
Female	37(25.2)	110(74.8)	
Marital Status			
Single	14(17.3)	67(82.7)	0.021
Married	36(24.3)	114(75.7)	
Designation			
Doctors	13(14.8)	47(85.2)	0.150
Nurses	37(25.9)	106(74.1)	
Education			
University/ Postgraduate	34(25.9)	97(74.1)	
School of hygiene/Technologist	10(19.2)	42(80.8)	0.884
School of nursing/midwifery	6(21.4)	22(78.6)	
Ethnic group			
Yoruba	40(24.8)	121(75.2)	
Igbo	4(9.5)	38(90.5)	
Hausa	2(50.0)	2(50.0)	0.082
Others	4(33.3)	8(66.7)	
Years of service			
<5	28(25.0)	84(75.0)	
5-10	10(25.0)	30(75.0)	0.268
11-15	4(33.3)	8(66.7)	
>15	4(30.8)	9(69.2)	
Healthcare facility level			
Primary Healthcare	10(14.7)	58(85.3)	0.243
Secondary Healthcare	8(20.5)	31(79.5)	
Tertiary Healthcare	32(29.6)	76(70.4)	

Table 4.12: Relationship between respondents knowledge of IDSR, diagnostic criteria for Lassa fever and socio-demographic factors. Knowledge in frequency (%) N= 238

Variables	YES	NO	P-value
Age group in years			
20-29	16(25.4)	47(74.6)	
30-39	16(16.8)	79(83.2)	0.199
40-49	14(30.4)	32(69.6)	
50-59	4(14.8)	23(85.2)	
Gender			
Male	13(15.5)	71(84.5)	0.085
Female	37(25.3)	110(74.7)	
Marital Status			
Single	14(17.3)	67(82.7)	0.237
Married	36(24.3)	114(75.7)	
Designation			
Doctors	15(18.3)	67(81.7)	0.359
Nurses	35(23.5)	114(76.5)	
Education			
University/ Postgraduate	34(22.5)	117(77.5)	
School of hygiene/Technology	10(19.2)	42(80.8)	0.884
School of nursing/midwifery	6(21.4)	22(78.6)	
Ethnic group			
Yoruba	44(24.0)	139(76.0)	
Igbo	4(9.5)	38(90.5)	
Hausa	2(50.0)	2(50.0)	0.082
Others	0(0.0)	2(100)	
Years of service			
<10	28(19.0)	119(81.0)	
10-19	10(21.3)	37(78.7)	0.368
20-29	8(33.3)	16(66.7)	
>=30	4(30.8)	9(69.2)	
Healthcare facility level	10(14.7)	58(85.3)	
Primary Healthcare	9(26.5)	25(73.5)	0.243
Secondary Healthcare	31(24.0)	98(76.0)	
Tertiary Healthcare			

4.10: Relationship between socio demographic factors and respondents attitude to Lassa fever reporting and control

The associations of the socio-demographic variables with respondent's attitude to Lassa fever reporting and control are presented in table 4.13 below.

Ethnicity was found to have a significant association with respondent's attitude to Lassa fever reporting and control.

Table 4.13: Relationship between socio-demographic factors and respondents attitude to Lassa fever reporting and control

Socio-demographic variables	Attitude in frequency (%) Good	Poor	P-value	N= 238
Age group in years				
20-29	50(78.1)	14(21.9)		
30-39	84(86.6)	13(13.4)	0.288	
40-49	41(82.0)	9(18.0)		
50-59	25(92.6)	2(7.4)		
Gender				
Male	70(82.4)	15(17.6)		
Female	130(84.9)	23(15.1)	0.598	
Marital Status				
Single	69(84.1)	13(15.9)		
Married	131(85.1)	25(14.9)	0.973	
Designation				
Doctors	68(81.9)	15(18.1)		
Nurses	132(85.2)	23(14.8)	0.516	
Education				
University/ Postgraduate	130(84.4)	24(15.6)		
School of hygiene/Technology	46(82.1)	10(17.9)	0.894	
School of nursing/midwifery	24(85.7)	4(14.3)		
Ethnic group				
Yoruba	162(87.1)	24(12.9)		
Ibo	34(73.9)	12(26.1)	0.001	
Hausa	4(100)	0(0.0)		
Others	0(0.0)	2(100)		
Years of service				
<10	128(85.3)	22(14.7)		
10-19	36(76.6)	11(23.4)		
20-29	23(82.1)	5(17.9)	0.198	
>=30	13(100)	0(0.0)		
Healthcare facility level				
Primary Healthcare	62(88.6)	8(11.4)		
Secondary Healthcare	29(80.6)	7(19.4)	0.448	
Tertiary Healthcare	109(82.6)	23(17.4)		

4.11: Relationship between respondent's knowledge of Lassa fever and other variables

Table 4.14 below summarizes the result of respondent's knowledge of Lassa fever.
Knowledge of Lassa fever was associated with other related variables such as source of information, presence of manual and posters in the clinic, involvement in outbreak investigation and training and receiving of feedback. Availability of manuals and posters were significantly associated with respondents knowledge of Lassa fever.

Table 4.14: Relationship between respondent's knowledge of Lassa fever and other variables.

Variables	Knowledge in Frequency (%) Good	Poor	N=238 P-value
Sources of information			
Lectures/colleagues	16(28.6)	40(71.4)	
Books	43(28.7)	107(71.3)	0.993
Conference	8(27.6)	21(72.4)	
Availability of manual			
Yes	27(17.0)	132(83.0)	0.001
No	40(51.9)	37(48.1)	
Availability of posters			
Yes	37(22.3)	129(77.7)	0.001
No	30(42.9)	40(57.1)	
Attendance training/workshop			
Yes	28(29.8)	66(70.2)	0.698
No	39(27.5)	103(72.5)	
Involvement in outbreak investigation			
Yes	13(31.7)	28(68.3)	0.604
No	54(27.7)	141(72.3)	
Ever received feedback			
Yes	13(28.9)	32(71.1)	0.934
No	54(28.3)	137(71.7)	

4.12: Relationship between knowledge of IDSR, diagnostic criteria for Lassa fever and other variables

Respondents knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting are presented in table 4.15 below, it was associated with other related variables such as source of information ,presence of manual and posters in the clinic, involvement in outbreak investigation and training and receiving of feedback. Availability of posters, involvement in outbreak investigation and receiving of feedback were significantly associated with respondent s knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting.

Table 4.15: Relationship between respondent's knowledge of IDSR diagnostic criteria for Lassa fever and other variables

Variables	Knowledge in Frequency (%) Good	Poor	N=238 P-value
Sources of information			
Lectures/colleagues	11(20.4)	43(79.6)	
Books	35(23.5)	114(76.5)	
Conference	4(14.8)	23(85.2)	0.580
Availability of manual			
Yes	34(21.8)	122(78.2)	
No	16(21.3)	59(78.7)	0.936
Availability of posters			
Yes	41(25.3)	121(74.7)	
No	9(13.0)	60(87.0)	0.038
Attendance training/workshop			
Yes	24(26.7)	66 (73.3)	
No	26(18.4)	115 (81.6)	0.139
Involvement in outbreak investigation			
Yes	17(42.5)	23(57.5)	
No	33(17.3)	158(82.7)	0.001
Ever received feedback			
Yes	18(40.0)	27(60.0)	
No	32(17.2)	154(82.8)	0.001

4.13: Relationship between respondent's attitude to Lassa fever reporting and control and other variables

Table 4.16 below summarises the result of respondents knowledge of Lassa fever .it was associated with other related variables such as source of information, presence of manual and posters in the clinic, involvement in outbreak investigation and training and receiving of feedback. Involvement in outbreak investigation and receiving of feedback were significantly associated with respondent's attitude to Lassa fever reporting and control.

Table 4.16: Relationship between respondent's attitude to Lassa fever reporting and control and other variables.

Variables	Attitude in Frequency (%) Good	Poor	N=238 p-value
Sources of information			
Lectures/colleagues	48(84.2)	9(15.8)	
Books	127(84.1)	24(15.9)	0.982
Conference	24(82.8)	5(17.2)	
Availability of manual			
Yes	136(85.5)	23(14.5)	
No	64(81.0)	15(19.0)	0.370
Availability of posters			
Yes	143(86.1)	23(13.9)	0.177
No	57(79.2)	15(20.8)	
Attendance training/workshop			
Yes	80(84.2)	15(15.8)	0.952
No	120(83.9)	23(16.1)	
Involvement in outbreak investigation			
Yes	23(54.8)	19(45.2)	0.001
No	177(90.3)	19(9.7)	
Ever received feedback			0.001
Yes	29(64.4)	16(35.6)	
No	171(88.6)	22(11.4)	

4.14: Relationship between respondent's attitude to Lassa fever reporting, knowledge of IDSR and knowledge of Lassa fever

Table 4.17 below highlights the relationship between respondents attitude to Lassa fever reporting, knowledge of IDSR and knowledge of Lassa fever .They were found to be statistically significant with attitude to Lassa fever reporting.

Table 4.17: Association between respondent's attitude to Lassa fever reporting, knowledge of IDSR and knowledge of Lassa fever

	Attitude in Frequency (%)		N=238
Variables	Good	Poor	p-value
Lassa fever knowledge			
Good	50 (74.6)	17(25.4)	0.010
Poor	149 (88.2)	20 (11.8)	
IDSR knowledge			
Good	36 (72.0)	14 (28.0)	0.013
Poor	157(86.7)	24 (13.3)	

4.15: Binary logistic regression of variables associated with knowledge of Lassa fever

Table 4.18 below shows different variables that were put into a logistic regression model to adjust for confounding variables and show the strength of association between dependent and independent variables.

Gender, marital status, ethnic group, years of service, availability of manual and posters in the clinic are factors that were significantly associated with knowledge of the respondents on Lassa fever in the bivariate analysis.

Male respondents were 1/0.416 times less likely than female to have good knowledge of Lassa fever, however the difference was statistically significant.(95% C.I= 0.200 – 0.866)

Healthcare workers that had a manual of case definitions for communicable diseases in their clinics were 1/0.141 times less likely to have good knowledge of Lassa fever than those that did not have manuals in their clinics, there was however significant association between them.
(95% C.I= 0.058 – 0.342)

The following variables were adjusted for at $p < 0.2$: marital status, ethnic group and years of service.

4.15: Binary logistic regression of variables associated with knowledge of Lassa fever

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Healthcare workers that had a manual of case definitions for communicable diseases in their clinics were 1/0.141 times less likely to have good knowledge of Lassa fever than those that did not have manuals in their clinics, there was however significant association between them.
(95% C.I= 0.058 – 0.342)

The following variables were adjusted for at $p < 0.2$: marital status, ethnic group and years of service.

Table 4.18 Binary logistic regression of variables associated with knowledge of Lassa fever

Factors	AOR	95% CI	P -value
Gender			
Male	0.365	0.188- 0.708	0.003
Female(ref)	1		
Marital status			
Single	0.0.762	0.341- 1.704	0.508
Married(ref)	1		
Ethnicity			
Yoruba	0.729	0.340- 1.562	0.416
Ibo/Hausa/Others(ref)	1		
Years of service			
<20	1.683	0.803- 3.530	0.168
>= 20(ref)	1		
Availability of posters in clinic.			
Yes	1.861	0.727 –4.765	0.195
No(ref)	1		
Availability of manuals of in clinic			
Yes	0.141	0.058 –0.342	0.001
No(ref)	1		

4.16: Binary logistic regression of variables associated with knowledge of IDSR diagnostic criteria for Lassa fever

Table 4.19 below shows different variables that were put into a logistic regression model to adjust for confounding variables and show the strength of association between dependent and independent variables.

Age, gender, ethnicity, availability of posters in clinics, attendance of training or workshop, involvement in outbreak investigation and receiving of feedback were factors that were significantly associated with knowledge of IDSR diagnostic criteria for Lassa fever in the bivariate analysis.

Male respondents were 1/0.317 times less likely than female respondents to have good knowledge of IDSR diagnostic criteria for Lassa fever however the difference was statistically significant.

(95% C.I 0.14 – 0.72)

Healthcare workers who were yoruba were 2.903 times more likely than those who were Ibos, Hausas and other tribes to have good knowledge of IDSR diagnostic criteria for Lassa fever, however the difference was statistically significant (95% C.I=1.060 – 7.951)

Respondents that had a poster of case definitions for communicable diseases in their clinics were 3.339 times more likely to have good knowledge of IDSR, diagnostic criteria for Lassa fever and its reporting than those that did not have posters in their clinics, there was however significant association between them (95% C.I=1.414 –7.888).

Healthcare workers that had been involved in training/workshop were 1.772 times more likely to have good knowledge of IDSR diagnostic criteria for Lassa fever and its reporting than those that have not been involved in training/workshop, there was however significant association between them. (95% C.I=1.093 –6.752).

Healthcare workers that have been involved in investigation of outbreaks were 3.987 times more likely to have good knowledge of IDSR diagnostic criteria for Lassa fever and its reporting than those that have not been involved in investigation, there was however significant association between them. (95% C.I=1.473–10.796). The following variables were adjusted for at $p < 0.2$: Age, gender, ethnicity and attendance of training or workshop.

Table 4.19: Binary logistic regression analysis variables associated with knowledge of IDSR diagnostic criteria for Lassa fever.

Factors	AOR	95% CI	P -value
Age group in years			
20-39	0.721	0.350-1.486	0.375
40-59	1		
Gender			
Male	0.317	0.140-0.717	0.006
Female (ref)	1		
Ethnicity			
Yoruba	2.903	1.060-7.951	0.038
Ibo/Hausa/Others (ref)	1		
Availability of posters in clinic			
Yes	3.339	1.414- 7.888	0.006
No(ref)	1		
Attendance of training / workshop			
Yes	1.772	0.848-3.701	0.128
No(ref)	1	1.093-6.752	
Involvement in outbreak investigation			
Yes	3.987	1.473 –10.796	0.006
No(ref)	1		
Receiving of feedback			
Yes	1.476	0.593 –3.672	0.403
No(ref)	1		

4.17: Binary logistic regression of variables associated with respondent's attitude to Lassa fever reporting and control

Table 4.20 below shows different variables that were put into a logistic regression model to adjust for confounding variables and show the strength of association between dependent and independent variables.

Ethnicity, years of service, availability of posters, involvement in outbreak investigation, receiving of feedback, knowledge of Lassa fever and IDSR were factors that were significantly associated with respondent's attitude to Lassa fever reporting and control in the bivariate analysis.

Healthcare workers who were Yoruba are 2.487 more likely than Ibo, Hausa and other tribes to have good attitude towards reporting of Lassa fever, there was however significant association between them (95% C.I= 1.177 –5.253).

Healthcare workers who have been involved in outbreak investigations were 1/0.187 times less likely to have good attitude towards reporting of Lassa fever than those who have never been involved, there was however significant association between them. (95% C.I= 0.065 –0.544).

Respondents who have good knowledge of Lassa fever were 2.250 times more likely than those who have poor knowledge to have good attitude towards reporting of Lassa fever, there was however significant association between them. (95% C.I= 1.064 –4.756).

Respondents who have good knowledge of IDSR diagnostic criteria for Lassa fever were 2.208 times more likely than those who have poor knowledge to have good attitude towards reporting of Lassa fever, there was however significant association between them. (95% C.I= 1.010 –4.830).

The following variables were adjusted for at $p < 0.2$: Years of service and availability of posters.

Table 4.20 Binary logistic regression of variables associated with respondent's attitude to Lassa fever reporting and control.

Factors	AOR	95% CI	P-value
Ethnicity			
Yoruba	2.629	1.082- 6.389	0.017
Ibo/Hausa/Others(ref)	1		
Years of service			
<20	1.309	0.581- 2.948	0.516
>= 20(ref)	1		
Availability of posters in clinic			
Yes	1.270	0.535-3.017	0.588
No(ref)			
Involvement in outbreak investigation			
Yes	0.187	0.065 – 0.544	0.002
No(ref)	1		
Receiving of feedback			
Yes	0.690	0.237 – 2.015	0.498
No(ref)	1		
Knowledge of Lassa fever			
Good	2.250	1.064 – 4.756	0.034
Poor(ref)	1		
Knowledge of IDSR			
Good	2.208	1.010 - 4.830	0.047
Poor(ref)	1		

CHAPTER FIVE

DISCUSSION

5.1: Socio demographic characteristics of the respondents

The response rate in this study was 93.0%.This proportion is higher than 60.5% reported in a study on notification of Lassa Fever among resident doctors in the same institution by Popoola (2008).A response rate of 53.2% was reported for a similar study among doctors at the Central Hospital Benin (Ofili et al, 2003).This may be as a result of demonstration of the willingness of healthcare workers to report this notifiable disease. The majority of respondents in this study were form the tertiary healthcare facility 132 (55.5%) and is similar to the result of a study: willingness to receive pandemic influenza A (H1N1) vaccine among doctors and nurses in the same institution (Fatiregun et al, 2011) The majority of respondents in the present study are nurses (65.1%), this is in keeping with the participants in a study: knowledge and practices regarding Lassa fever among primary care health workers in Esan west and central local government areas in Edo state (Aigbiremolen et al, 2011) in which nurses made up 52.8% of the study population. Majority of the respondents were female (64.3%) this is similar to the results of Aigbiremolen et al (2011) but different from the participants in Popoola's study in which participants were mainly male.

5.2: Knowledge of Lassa fever

In this study, there was poor knowledge of Lassa fever among the study population and is similar to Popoola's result (mean score of 10 on a scale of 25), but different from Aigbiremolen et al (2011) study where over 70% of participants had good knowledge about Lassa fever. These differences may be attributed to the fact that the latter study focused on health care workers in an area where the frequency of occurrence of the disease is high, hence participants most likely have had previous contact with patients with the infection, as opposed to this present study which was carried out among a heterogeneous group of healthcare workers in an area where the frequency of occurrence is low. Fever was the most frequent correctly indicated feature of the disease (56.7%) followed by mucosal bleeding (52.5%).These findings are in keeping with the results of Popoola (2008), in which fever and mucosal bleeding were the most frequently identified features of Lassa fever. There was no

significant association between type of health facility or designation of health worker and level of knowledge about Lassa fever. This is probably due to the many similarities between training curriculum and job description of this cadre of workers. Knowledge of disease and IDSR reporting knowledge, disease knowledge and attitude towards reporting were statistically significant. These results are similar to the findings by Rahnavardi et al (2008) in the knowledge study on Congo Crimean haemorrhagic fever among at risk Iranian doctors which found a correlation between knowledge and attitude especially for the higher scores for Iranian hospital workers.

5.3: Knowledge of disease reporting through IDSR

Only few of the respondents (28.2%) reported an awareness of the IDSR diagnostic criteria for Lassa fever and is similar to Popoola's study and Bawa et al (2003) study of the knowledge, attitude, and practices of the reporting of notifiable diseases among health workers in Yobe state where 38.2% of the respondents were aware of the national disease surveillance system. Healthcare workers should be involved and made to be more effective in the surveillance of infectious diseases. This was found to be useful in the primary healthcare facilities where nurses were used for notification of diseases and it improved the performance of the system. For the purpose of emergency case based reporting the IDSR guidelines state that every case of suspected Lassa fever should be notified to the appropriate authorities by any means possible within 24 hours. It was encouraging to know that over 73% of the study population knew suspected cases should be reported. It is also instructive to note that there was no statistical significant association between knowledge and age or years of practice. This is understandable in the context of the fact that Lassa haemorrhagic fever is not endemic in the catchment area of the health facilities. IDSR knowledge and attitude were statistically significant. These results are similar with the findings by Rahnavardi et al (2008) which found a correlation between IDSR knowledge and attitude especially for the higher scores for Iranian hospital workers

5.4: Attitude to Lassa fever Reporting

Respondents in this study demonstrated good attitude towards Lassa fever reporting and can be as a result of the awareness campaigns done as a result of the recent outbreak.Ethnicity was found to have a significant association with respondent's attitude to Lassa fever reporting and control. Figueira's et

al (2003) study on influence of physicians' attitudes on under-notifying infectious diseases shows that the following: beliefs, knowledge and attitudes were statistically associated with a smaller probability of reporting any given MRD (mandatory-reporting diseases). This suggests that cultural beliefs of people influence their attitudes in life to a great extent so that modification of certain attitudes in healthcare workers could greatly reduce the under-reporting of notifiable diseases.

5.5: Adequacy of infrastructure for Lassa fever reporting at the health facilities.

There is adequacy of reporting infrastructure with respect to availability of personnel as majority of the facilities 46 (83.6%) have designated persons who collects information on notifiable diseases.The LGA DSNO collects information from majority of the health facilities. There are available reporting forms at the health facilities,reasons for under reporting from these facilities may be as a result of complexity of the notification form, lack of motivation because of poor feedback on reported cases, and a perception that it is useless to report notifiable conditions as seen in a study by AbdoolKanim and Dilraj (1996) titled: the reasons for under reporting of notifiable conditions by doctors in a tertiary hospital in Durban, South Africa.

The facilities were adequate in terms of availability of vaccine carriers, test tubes, ice packs and refrigerator. There was also adequate funds and availability of transportation to the LGA.
Out of the 55 health facilities visited, 34(61.8%) of the health facilities plotted graph of diagnosed priority disease and displayed the maps and graphs for easy glance respectively. All of the health facilities visited claimed that no suspected case of Lassa fever had ever been seen in the health facilities. Despite these explanations; it is very impotent to keep trends, have action plan and threshold because it will enhance policy making and public health action.

5.6: Factors associated with disease knowledge, knowledge of reporting through IDSR and attitude towards Reporting.

Majority of the healthcare workers have manual (66.8%) of case definition and posters (69.7%) in their clinics and only few healthcare workers (39.9%) have been involved in training, investigation (17.6%) or ever received feedback on diseases reported (18.9%). These findings are similar to Bawa

et al (2003) result where only 21.8% claimed to have ever received feedback on reports sent to higher authorities and 85.5% of the respondents listed lack of training on disease surveillance as one of the factors affecting disease reporting.

Lassa fever knowledge was significantly associated with gender, availability of manuals and posters in the facilities. Logistic model for disease knowledge identified that gender and availability of manuals in facilities have an effect on disease practice. This finding is in line with a study on assessment of the impact of a ward notification register on the rate of notification from a general medical unit, the knowledge and attitudes of intern medical officers regarding notification, in a Sri Lankan setting, by Seneviratne et al (1997) which revealed that introduction of a ward notification register could greatly improve notification rate. So there is a great need to have manuals and posters of diseases in each health facility.

IDSR knowledge of disease was significantly associated with availability of posters, involvement in outbreak investigation and receiving of feedback. Spedding et al (1998) study: notification of infectious diseases by junior doctors in accident and emergency department Ireland discovered that it would be helpful to have a poster in the A&E department listing the notifiable diseases of that region. But for an epidemic- prone disease like Lassa fever, health workers cannot afford to rely only on posters and manuals for awareness and basic knowledge relevant to its control, health campaigns and awareness programmes are important means of communicating health information, reminding and thus reinforcing existing knowledge. Aigbiremolen et al (2011) study where over 70% of participants had good knowledge about Lassa fever shows that almost 50% of respondents had participated in Lassa fever campaigns which may have reinforced their knowledge about the disease.

The variables associated with attitude towards reporting include ethnicity, years of service, availability of posters, involvement in outbreak investigation, receiving of feedback, knowledge of Lassa fever and IDSR knowledge. Logistic model for attitude towards reporting found that ethnicity, involvement in outbreak, knowledge of Lassa fever and IDSR knowledge influences attitude towards reporting positively. Bek et al, (1994) study on notification of infectious diseases by general practitioners in New South Wales, concluded that feedback to doctors showing that preventive action is taken as a result of their notifications may be the most effective way to improve notification practices. Also health education activities encourage behaviour change and are particularly important in the control of infectious diseases.

CHAPTER SIX

CONCLUSION

Knowledge of Lassa fever and it's reporting through the IDSR strategy was found to be poor among healthcare workers in Ibadan, and there was no significant association between type of health facility or designation of health worker and level of knowledge.

Potential barriers towards reporting of suspected Lassa fever cases identified in this study were knowledge of the disease, knowledge of its' reporting through the integrated disease surveillance and response (IDSR) strategy, involvement in outbreak investigations, availability of posters and manuals in clinics. It is important for healthcare workers to be grounded in the basics of knowledge and control of Lassa fever to mitigate the often avoidable transmission of the disease.

Attitude to Lassa fever reporting and control was good in the study population with healthcare workers willing to meet IDSR requirements of keeping clinic registers and notifying diseases despite busy schedules and heavy workloads.

It is standard practice to isolate VHF pateints whether they are suspected or confirmed, and to take extra care in ensuring universal precautions of using PPEs and regular hand washing. A very low proportion of respondents recognised the importance of these in the control of Lassa fever.

5.8 Recommendations

- In endemic zones for Lassa fever, a high index of suspicion is important in the management of febrile illnesses.
- There is the need for continous and consistent training and retraining of health care personnel on emerging and remerging diseases of public health importance
- Healthcare workers in facilities should be involved in outbreaks investigations not only public health officials.
- Health authorities should on a regular basis, organise training programmes for health workers on infectious disease control.

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- There is the need for continous and consistent training and retraining of health care personnel on emerging and remerging diseases of public health importance
- Healthcare workers in facilities should be involved in outbreaks investigations not only public health officials.
- Health authorities should on a regular basis, organise training programmes for health workers on infectious disease control.

- Hospital departments should institute workshops/seminars for healthcare workers on importance of disease reporting and institute departmental measure for reporting and evaluating disease reporting.
- Creating networking opportunities like meetings, conferences, and other professional interactions between public health professionals, where practices and plans for surveillance are discussed. This way, those attending these meetings gain knowledge and strengthen professional interactions. These functions can help establish strong, professional links between public health professionals and private healthcare providers
- Hospital management in conjunction with the Public health department at all levels should develop case definition posters and make them available in all the consultant clinics and wards for easy glance by healthcare workers.
- There should be establishment of surveillance unit for priority diseases reporting and responses especially in the secondary and tertiary facilities.

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QUESTIONNAIRE ON POTENTIAL BARRIERS TOWARDS REPORTING OF SUSPECTED LASSA FEVER CASES BY HEALTHCARE WORKERS IN IBADAN

Dear Respondents,

I, MMADUIKE EBERE C., a postgraduate student in the Faculty of Public Health, University of Ibadan, am conducting a research on the above topic among Doctors and Nurses in Ibadan North in partial fulfilment of the requirements for an M.Sc in Epidemiology. please kindly complete this research instrument as truthfully and completely as you are able based on your knowledge and opinions at the time of receiving this questionnaire without researching the topic or discussing it with a colleague.

Please be aware that participation is not compulsory and you may decide to interrupt this session at any time you choose. Responses will be kept confidential and there are no possible penalties for non participation. Thank you for your kind cooperation. Kindly answer all questions by inserting the relevant number code in the box for yes or no questions and ticking appropriate box for true or false options kindly answer all questions as incomplete responses may be unsuitable for analysis.

Serial No.....

Section A. Socio-demographic and educational details

1. Age at last birthday.....
2. Gender 1. Male 2. Female
3. Marital Status 1.Single 2. Married 3. Others Please specify
4. Ethnic Group 1.Yoruba 2.Ibo 3. Hausa 4.Others please specify
5. Designation 1.Doctor 2.Nurse 3.Others please specify
6. Department .....
7. Years of service .....
8. School attended last .....
9. Indicate level of health care you are practicing at

Health Care Delivery Level	Place a tick (√) against any level you are practicing at
Primary Health Care	
Secondary Health Care	
Tertiary Health Care	

Section B: Knowledge of Lassa fever

Kindly tick appropriate answers to the following questions

Statement	True	False	Not Sure
12. Lassa fever is a viral disease			
13. Infection with the organism is usually fatal			
14. The reservoir of infection is rats			
15. The incubation period ranges from about one week to three weeks			
16. Rats transmit the disease by biting humans			

Which of the following is/are signs and symptoms of Lassa Fever?

Statement	True	False	Not Sure
17. Fever > 38 °C			
18. Jaundice			
19. Retrosternal pain			
20. Mucosal bleeding			
21. Facial oedema			

In the diagnosis of Lassa fever

Statement	True	False	Not Sure
22. Fever refractory to treatment and unexplained mucosal bleeding is enough to suspect a case			
23. The absence of profuse mucosal bleeding excludes the diagnosis			
24. Paediatric clients are excluded from diagnosis			
25. Cases can be confirmed without laboratory assistance			
26. Cases present in similar and easily recognisable fashion			

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Concerning Lassa fever transmission

Statement	True	False	Not Sure
27. Lassa fever is transmitted by aerosol			
28. Causative organism penetrates unbroken skin			
29. Bodies of dead cases constitute a potential hazard			
30. Cases cease to be infectious after the acute phase of the disease			
31. Semen of cases is capable of transmitting the infection			

Lassa Fever Treatment: (Kindly indicate number code of selected option in the accompanying text box)

32. Which of the following drug agents is effective in treating Lassa fever?

1. Ostelamivir
2. Rifampicin
3. Acyclovir
4. Rivabirin
5. Famiclovir
6. Not Sure

33. Therapeutic agent is administered as stated below (indicate the appropriate option in the box)

1. IV loading dose at 33mg/kg then oral medication for one week
2. IV loading dose at 33mg/kg, then iv 16mg/kg 6 hourly for one week
3. IV loading dose at 33mg/kg then iv 16 mg/kg 6 hourly for 4 days and iv 8 hourly for 6 days
4. Not Sure

34. Patients are nursed on open wards? 1. Yes 2. No 3. Not Sure

35. Corticosteroids play a prominent role in managing the disease?

1. Yes 2. No 3. Not Sure

36. Presence of bleeding is a poor prognostic sign?

1. Yes 2. No 3. Not Sure

Section C: Knowledge of IDSR

37. Are you aware of IDSR (Integrated Disease Surveillance and Response) diagnostic criteria for Lassa fever?

1. Yes 2. No ☐

11. What is the source of your information about IDSR diagnostic criteria for Lassa fever?

1. Undergraduate teaching / lectures
2. Postgraduate teaching / lectures
3. Journal
4. Newspaper
5. Conference ☐
6. Colleagues
7. IDSR technical guidelines
8. Others. Please Specify .....

38. Have you ever seen any forms for Integrated Disease Surveillance and Response?

1. Yes 2. No ☐

39. Have you ever filled any IDSR forms?

1. Yes 2. No ☐

40. Who would you notify as stated in IDSR guideline on suspicion of a priority disease?

1. Unit Consultant
2. Head of Department
3. Chief Medical Director
4. Local Government Disease surveillance unit ☐
5. State Disease Surveillance unit
6. Federal Ministry of Health Epidemiology unit
7. Others. Please Specify .....
8. Not Sure.

Statement	True	False	Not Sure
40. A critical minimum number of cases must be observed before reporting can occur			
41. Suspected cases qualify for reporting			
42. Cases can be reported only when confirmed			

43. Cases should be reported weekly for administrative efficiency			
44. Tertiary health facilities should notify directly to the Federal Ministry of Health			
45.Tertiary health facilities should notify directly to the State Ministry of Health			
46. Tertiary health facilities should notify directly to the Local Government.			

Which of the following criterion is (criteria are) included in the diagnostic criteria for Lassa fever?

Criterion	True	False	Not Sure
47. Illness with fever and no response to common treatments for fever in the area			
48. Subconjuctival haemorrhage			
49. Haematuria			
50. Epidemiological link to confirmed cases of Lassa fever			
51. Laboratory confirmed Lassa IgM antibodies			
52. Lassa virus isolation			

Regarding Lassa fever reporting

Statement	True	False	Not Sure
53. IDSR form 001 A is used for facility reporting to laboratory			
54. IDSR form 001 B is used for immediate case based reporting to the local government			
55. IDSR form 001 C is used for line listing of cases			
56. All IDSR forms are utilized in the reporting of Lassa fever			
57. IDSR 001 B is used only for Lassa fever			

Section D. Attitude towards Lassa fever reporting

Indicate with an (x) your opinion about each of the under listed statements

Statement	Strongly Agree	Agree	Undecided	Disagree	Stro Disa
58. Lassa fever is an uncommon source of morbidity and mortality so emphasis on its control is unnecessary					
59. Reporting requirements are an unnecessary burden to busy Doctors and nurses					
60. Health workers should keep clinic registers of patient diagnosis					
61. Health workers are an especially vulnerable group in Lassa outbreaks					
62. Universal precautions are of limited use in preventing hospital acquired infections					

63. Have you singularly or in conjunction with a team of other doctors or nurses managed any patient with fever refractory to treatment and unexplained mucosal bleeding in the last 1 month? ☐

1. Yes 2. No

If no skip to Q72

64. How many patients met these criteria during this period? .....

65. What was the final treatment diagnosis of the (last) patient? .....

66. Was Lassa fever considered a differential in this (last) patient? ☐

1. Yes 2. No

67. Was any laboratory investigation done to exclude Lassa fever? ☐

1. Yes 2. No

68. If yes, what investigation(s) was done? ..... ☐

69. Was this case reported? 1. Yes 2. No 3. Not Sure

70. What was the outcome of this patient's management? .....

Section D: Factors affecting reporting of Lassa fever

71. Does any of your clinics, ward or other practice areas contain a manual of case definitions for communicable diseases? ☐
    1. Yes 2. No

72. Does any of your clinics, ward or other practice areas contain posters on case definitions of any communicable disease? ☐
    1. Yes 2. No

73. Have you attended any training or workshop which included communicable disease reporting and surveillance? ☐
    1. Yes 2. No

74. Have you been involved directly or indirectly with investigation of any outbreaks? ☐
    1. Yes 2. No

75. Have you ever received feedback on any communicable disease reporting your clinical work may have generated? ☐
    1. Yes 2. No

Thank you for your patience and cooperation.

OBSERVATIONAL CHECKLIST FOR HEALTH FACILITIES

Name of Health Facility .....

	VARIABLES	YES	NO
1	Presence of a surveillance officer or designated person who collects information on notifiable diseases in the community.		
2	Presence of a register for recording diseases diagnosed		
3	Standard case definition of the notifiable diseases posters on display.		
4	Availability of the following forms 1-Immediate /case base reporting 2-Line list form 3-Weekly reporting 4-Monthly		
5	Quantity of the forms available in the hospital now. 1-None 2-Enough for one week 3-Enough for one month 4-Enough for 3 months 5-Enough for more than 3 months		
6	Transportation or logistics supports available 1-availability of Vehicles 2-availability of Motor cycles		
7	Availability of instrument for handling, packaging and transporting specimen for suspected Lassa fever cases 7- Clean test tubes 8- vaccine carriers 9- Refrigerator 10- plastic bag 11- Generator 12- Ice packs		
8	Presence of plotted number of cases for each of the priority disease on a graph.		

9	Availability of materials for carrying out data management 1. Availability of Computers 2. Availability of Statistical programs/packages 3. Availability of Calculator and papers		
10	Presence of appropriate supplies for collecting specimen.		
11	Presence of plotted distribution of diseases on a map for the hospital catchment area.		
12	Presence of displayed maps and graphs of diseases plotted in the hospital for everybody to see		
13	Suspected Lassa fever case had ever been seen		
14	If yes to 14 above, what was the reaction 1-Report to the LGA 2-Go to investigate in the community 3-Order for drug supplies		
15	Adequate funds in the facility for transportion of specimen to laboratory.		
16	How diseases are reported 1-Submission of forms to the LGA office 2-Collection from the hospitals by LGA DSNO officer during visit		
17	Ever received feedback from the LGA or state on disease reported. 5. Never 6. Weekly 7. Monthly 8. Quarterly		