COMPLIANCE WITH EPIDEMIC-PRONE DISEASE SUREVEILLANCE AND RESPONSE GUIDELINES AMONG SURVEILLANCE UNITS IN SELECTED LOCAL GOVERMENT AREAS OF OYO STATE

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CERTIFICATION

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DEDICATION

This research work is dedicated to the Almighty God for His abundant blessings and for seeing me through this programme, and to my parents, Mr. and Mrs. Afolayan for their support financially and spiritually during the programme.

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ABSTRACT

The prevention, control and reduction of mortality from epidemics are dependent on an effective surveillance system. Epidemic-prone diseases continue to occur with increased frequency in epidemic proportions and produce the highest case fatality rate in Nigeria. Surveillance has been recognized to be weak in Nigeria. This study is aimed at assessing compliance with the surveillance and response guidelines for epidemic-prone diseases among surveillance units in Oyo state.

A cross-sectional study was conducted assessing the performance of the core surveillance activities for epidemic-prone diseases as stipulated by the National Technical Guideline for Integrated Disease Surveillance and Response. Data was obtained by records review, checklists and questionnaires that sought information on socio-demographics, knowledge on disease surveillance, core surveillance activities and support functions from all surveillance units. Data was analyzed using descriptive statistics, chi-square and multiple logistic regression at p=0.05 on SPSS version 20.

Majority of the surveillance units (82.4%) had a reporting practice. However, 6 months and 1 year compliance with the monthly reporting guideline were 77.4% and 65.8% respectively. At the health facility level, utilization of standard case definition was 25.9%, laboratory case confirmation was 85.7%, accurate case records was 95.2%, and analysis of surveillance data was 2.6%. At the local government level, analysis of surveillance data was 77.78%, epidemic preparedness was weak while surveillance support were adequate. In a multiple logistic regression model, predictors for compliance with monthly reporting guideline for 6 months were training (OR=7.917; CI=1.653 – 37.919), knowledge on surveillance data flow pathway (OR=4.804; CI=1.636 – 14.104), adequacy of funds (OR=27.805; CI=7.683 – 100.6) and 21-30 years of service (OR=6.412; CI=1.357 – 30.309). Predictors for 1 year reporting compliance were training (OR=5.668; CI=2.040 – 15.753) and adequacy of funds (OR=3.932; CI=1.820 – 8.497).

Local and State governments need to ensure the provision of continuous training and resources to surveillance workers to achieve effective disease control.

Key words: Compliance, Surveillance, guideline, Epidemic, Oyo

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ACRONYMS

AAP - American Academy of Paediatrics

AFRO - African Regional Office

CDC - Centre for Disease Control

EPD - Epidemic prone diseases

DSN - Disease Surveillance and Notification

DSNO - Disease Surveillance and Notification Officer

FMOH - Federal Ministry of Health

GOARN - Global Outbreak Alert & Response Network

HMIS - Health Management Information System

HPAI - Highly Pathogenic Avian Influenza

HIV/AIDS - Human Immunodeficiency Virus/Acquired Immune deficiency syndrome

IDSR - Integrated Disease Surveillance & Response

ILI - Influenza-Like Illness

LGA - Local Government Area

NIAID - National Institute of Allergy & Infectious Diseases

SARD - Severe Acute Respiratory Disease

UNICEF- United Nations International Children's Emergency Fund

WHO - World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Disease surveillance is the continuous scrutiny of the occurrence of diseases and health related events to enable intervention for the control of diseases (CDC, 2009). An effective control of communicable diseases relies on effective response systems, which also depends on effective disease surveillance (Abubakar et. al, 2013; WHO, 2000). According to WHO, (2006), a communicable disease surveillance system serves two key functions which includes; the early warning of potential threats to public health and programme monitoring functions which may be disease specific or multi-disease in nature. It provides the needed information for public health planning, implementation of those plans and monitoring and evaluation of programs alongside generating hypothesis that would stimulate public health research (Weber, 2007). The global pandemic of avian influenza within the first decade of the 21st century further led to the recognition of the need for effective disease surveillance and response (Minh, 2010; Franco et. al, 2006). Also, it was recognized that the widespread epidemics of yellow fever and cerebrospinal meningitis across the African sub region in the 1990s was largely attributed to poor surveillance systems which were neither able to detect communicable diseases on time nor mount an effective response (Abubakar et. al, 2013). Furthermore, the occurrence of Ebola virus disease within the year 2014 in Nigeria has also shown the importance of an effective disease surveillance and response system.

Prior to 1998, most African countries used a variety of vertical disease control programs for disease surveillance of which some of these programs were well funded, while some others were in a bad state (Abubakar et. al, 2013). Surveillance data were collected by programs under different authorities which led to disjointed and inefficient systems in which health workers utilized multiple complicated reporting formats with different terminologies and reporting mechanisms resulting in health workers becoming overloaded and demotivated (WHO, 2000). After the 48th World Health Organization Regional Committee for Africa meeting in 1998, Member States adopted the Integrated

Disease Surveillance and Response (IDSR) as the regional surveillance guideline for early detection and efficacious response to priority communicable diseases for the African region (WHO, 2010). In Nigeria, among the communicable diseases included in the Integrated Disease Surveillance and Response, 7 diseases are labeled as epidemic-prone. They include cholera, cerebrospinal meningitis, diarrhoea with blood (shigella), measles, yellow fever, viral hemorrhagic fevers and highly Pathogenic Avian influenza (FMOH, 2009).

The National Technical Guideline for Integrated Disease Surveillance and Response (IDSR) prepared by the World Health Organization office for Africa and the Centers for Disease Control and Prevention (CDC), USA, adopted by the Federal Ministry of health (Nigeria) seek to ensure that effective and functional surveillance systems are available at all surveillance units at all levels (i.e. health facilities, local government health departments, states and the national epidemiology unit). It specifies the performance of core surveillance functions such as the use of standard case definitions to identify priority diseases, laboratory confirmation of cases, registration of cases in registers at health facilities; collection and reporting of surveillance data to surveillance units at higher levels of health who also are to provide feedback to the reporting surveillance units; analysis of surveillance data at all surveillance units; epidemic preparedness and response to outbreaks; and also evaluate the performance of surveillance and response systems (Abubakar et. al, 2013; FMOH, 2006). It also specifies the need for surveillance support functions such as funding, training, supervision, availability logistic resources and standard guidelines for effective surveillance system at all surveillance units which are health units that can provide information on health related states and events (WHO 2010).

The disease surveillance and notification (DSN) system in Nigeria has been shown to be weak, thus, its inability to promptly detect and control epidemics (Dairo et. al. 2010). According to WHO (2000), it was reported that the poorly functioning surveillance systems in some parts of the world (particularly in Africa) contribute to the underreporting of cases and thus, not only are there many more cases than the number reported, but also the completeness of the reporting varies considerably by country.

1.2 Statement of problem

Epidemic-prone diseases (EPD) continue to occur with increased frequency in epidemic proportion and produce highest case fatality rate in Nigeria (FMOH, 2006). During the past decade, except for the recent Haitian outbreak, (Hendriksen et. al, 2011; Piarroux et. al, 2010), most cholera epidemics, cases, and deaths have been reported in sub-Saharan Africa (W.H.O, 2010; Griffith et. al, 2006; Gaffga 2007). Since the first appearance of epidemic cholera in 1972 in Nigeria, intermittent outbreaks have been occurring. The later part of 2010 was marked with severe outbreak which started from the northern part of Nigeria, spreading to the other parts and involving approximately 3,000 cases and 781 deaths (Adagbada et. al., 2012). Diarrhoea with blood (Shigella) is still a major public health problem in developing countries as ninety nine percent of 200 million cases and more than 650,000 deaths per year result from shigella infections. (Khatun et. al, 2011; Reda et. al, 2011). The mortality rates of cerebrospinal meningitis continue to be high, ranging between 2% and 30% globally (Chavez-Bueno and McCracken, 2005; Perez et. al, 2010; Beck et. al, 2004), of which the estimated annual meningitis cases is 1.2 million cases and deaths of 170,000 (WHO, 2011). In middle and low-income countries, acute bacterial meningitis remains the fourth leading cause of disability (Edmond, 2010) with repeated large scale epidemics of cerebrospinal meningitis for the past 4 decades in Nigeria (Mado et. al, 2013). Measles still remains a serious medical concern in Africa, Latin America, Europe, south-east Asia and eastern Mediterranean (WHO, 2011); being the fifth leading cause of under-five child mortality in Nigeria (WHO, 2006). In 2010, there were a reported 327,305 measles cases and estimated 139,300 measles deaths in Nigeria (Simmons et. al, 2012; WHO, 2013).

Viral hemorrhagic fevers such as Lassa fever is endemic in West Africa (Kelly et. al, 2013) with estimates of up to 300,000 persons infected and 5,000 deaths annually across the region and a population. In the first quarter of 2012, 623 suspected cases, including 70 deaths was reported from 19 of the 36 States of Nigeria (Olowokere et. al, 2014). Another viral hemorrhagic fever, Ebola, occurs in epidemics majorly in Africa and South America (CDC, 2010) with recent cases in West African countries such as Guinea, Sierrea leone, Liberia, and Nigeria claiming lives. WHO estimated 200,000 cases of

yellow fever and 30,000 deaths attributable to yellow fever occur annually worldwide (Barnett. 2007). The case-fatality rate of which is highly variable but approximately 20% in Africa and approximately 50% in South America (Monath et, al, 2008). From the estimated 200, 000 cases and 30, 000 deaths annually, most of these cases and deaths occur in 12 countries including Nigeria.

The highly pathogenic Avian Influenza H5N1 subtype is great concern because in late 2003, a highly pathogenic Avian Influenza H5N1 poultry epidemic spread throughout Asia (Li et al. 2004). In Nigeria, Since January 2006, H5N1 avian influenza has affected Nigeria's poultry population causing enormous loss of resource as millions of poultry were destroyed and one human death occurred (Joannis et. al, 2008). The highly pathogenic avian influenza (HPAI) virus of the H5N1 subtype was detected in chickens in Kaduna state of northern Nigeria, making Nigeria the first African country reporting a confirmed highly pathogenic avian influenza (H5N1) outbreak.

Globally, there is an inadequate laboratory and epidemiological surveillance on cholera (Ali et. al, 2012). This has also been reported in African countries such as Nigeria (Adagbada et. al 2012), Uganda (Bwire et. al, 2013); Kenya (Mutonga et. al, 2013); Cameroon (Djomassi 2013) and Togo (Landoh et. al, 2013). Such weaknesses included incomplete reporting, inconsistency in applying the standard case definition and limited utilization of laboratory for diagnosis. Research reports by Onoja et. al, (2013) showed that the death toll of measles epidemics in Nigeria has either been under-reported or over-blown by different media accounts. According to Fatiregun et. al, (2010). the surveillance for yellow fever is weak in the Nigeria with many suspected cases not reported and when reported they are not investigated because of lack of laboratory facility for confirmation. Furthermore, Bawa et. al, (2003) and Ofili (2003) reported that the challenges of the surveillance system in developing countries include lack of awareness, lack of feedback, ignorance of current regulations and the list of notifiable diseases by the health personnel.

1.3 Justification for the study

This study would contribute to research on disease surveillance in Nigeria and Africa in general by filling the gap of knowledge on the compliance with disease surveillance guidelines as specified by the Integrated Disease Surveillance & Response. The study

findings would reveal aspects of the surveillance system needing strengthening so that appropriate steps could be taken to improve and achieve an effective surveillance system. It would help in identifying the gaps and opportunities in the performing of the core and support surveillance functions in Oyo state.

Oyo state has been faced with epidemics yearly from time, experiencing cholera yearly from 2011 to 2013, (Ogunniyi et. al, 2014) with an outbreak in Ibadan North-west Local Government Area in 2011 (Daily Sun, 2011), Akinyele Local government in 2012 (Gbolahan et. al, 2012) and Egbeda Local government in 2013 (Gbolahan et. al, 2013); measles infection and mortality occurring year round (Onoja et. al, 2013); lassa fever outbreaks in 2012 (Adedire et. al, 2014) and in 2014 (Nigerian Tribune, 2014); cerebrospinal meningitis outbreak in 2009 (Falade et. al, 2009) and of which Oyo state is among states in the cerebrospinal meningitis belt in Nigeria. Thus, this stresses the need that the surveillance of these epidemic-prone diseases in the State is taken with utmost diligence because effective communicable disease control relies on effective response systems, which in turn depend on effective disease surveillance (Abubakar et. al, 2013; WHO. 2000).

There are limited research publications assessing compliance to surveillance guidelines in Nigeria. The few similar past works in other states of the country either assessed few surveillance units in a state; didn't determine the association between the factors that could predict the compliance with surveillance and response guidelines nor assess all the core surveillance activities. The past works has shown that the proportions of surveillance units at all health levels complying with surveillance guidelines has been unsatisfactory despite the fact that epidemiologic surveillance constitutes an important component of the public health response in Nigeria.

It is therefore in the light of all the above that a study on the compliance to epidemic-prone disease surveillance guideline in Oyo state is important.

1.4 General objective

To assess the compliance with epidemic-prone disease surveillance and response guidelines among surveillance units in Oyo state

1.5 Specific objectives

1. To assess the knowledge of surveillance workers on epidemic-prone disease surveillance in Oyo state.
2. To assess the compliance with the epidemic-prone disease core surveillance guidelines among surveillance units in Oyo state
3. To determine the availability of surveillance support functions at surveillance units in Oyo state
4. To determine the predictors for disease reporting compliance among surveillance units in Oyo state.

1.6 Research questions

In the course of this study, the following questions would be answered:

1. What do surveillance workers in Oyo state know about epidemic-prone disease surveillance?
2. To what extent does the surveillance for epidemic-prone disease in Oyo State meet the desirable standard for core surveillance activities?
3. To what extent are the surveillance support functions available at the health facilities, Local government areas (LGA) and state epidemiological unit?
4. What are the predictors for disease reporting compliance among surveillance units in Oyo state?

1.7 Operational definition of term

1) **Compliance** - Compliance is the state of conforming to official requirements, such as standards, guidelines, policies or law (Merriam-Webster, 2005). A surveillance unit that carries out its surveillance activity in accordance with a particular surveillance guideline is ascertained to be complying with that particular surveillance guideline e.g. guidelines on case registration, disease reporting, surveillance data analysis etc

CHAPTER TWO

LITERATURE REVIEW

2.1 Disease surveillance

Disease surveillance is the ongoing systematic collection, analysis, and interpretation of data, closely integrated with the timely dissemination of these data to those responsible for preventing and controlling disease and injury (Nsubuga et. al, 2006). Surveillance has been recognized as an effective strategy in the control and prevention of diseases most especially communicable diseases (Abubakar et. al, 2014). An effective surveillance system allows early intervention for the prevention and reduction of the mortality and morbidity that may result from epidemics of communicable diseases (Dairo et. al, 2010). Surveillance is a watchful, vigilant approach to information gathering that serves to improve or maintain the health of the population and a functional disease surveillance system is essential for defining problems and taking action (WHO, 2001). A functional disease surveillance guideline system will equip health workers to set priorities, plan interventions, mobilize and allocate resources and provide early detection and response to disease outbreaks (FMOH, 2005).

The major types of surveillance include active surveillance in which there is a targeted search for cases of a disease in the community; passive surveillance in which there is routine reporting of the cases of diseases reaching health care facilities for treatment or service with no special efforts to find unsuspected cases of diseases. Sentinel surveillance is a surveillance system usually based on selected institutions or individuals that provide regular, complete reports on diseases, interventions or adverse events (Lucas and Gilles, 2003). Syndromic surveillance relies on the detection of diseases based on clinical case features, which are noticeable before confirmed diagnoses are made (Sahal, 2011).

Core functions of a surveillance system include disease case identification, registration, case confirmation, reporting and feedback, data analysis, epidemic preparedness and response to epidemics. The support functions of a surveillance system include the

availability of standards and guidelines, training, supervision, logistic resources and funding (WHO, 2006).

Review of literature showed that despite the established system, surveillance of diseases breaks down in Nigeria leading to avoidable morbidity and mortality while various reasons factors are thought responsible, studies have not yet documented the extant reasons that may be responsible for the breakdown in surveillance activities (Dairo et. al, 2010). According to Nnebue et. al, (2013), disease surveillance and notification (DSN) has been shown to be weak in Nigeria, thus, its inability to promptly detect and control epidemics. Karimuribo et. al, (2012) reported that most developing countries have limited disease surveillance capacity and so need to ensure optimal use of available resources.

2.1.1 History of surveillance in Nigeria

The disease surveillance system in Nigeria was introduced in 1988 following a major outbreak of yellow fever in 1986/87, which affected ten out of the then nineteen States of the Federation. The magnitude of the outbreak was attributed to weak or non-existent disease surveillance and notification system in most States. (FMOH, 2005) Between 1988 and 1989, a disease surveillance and notification system for the country was developed of which forty diseases of public health importance in the country were identified and designated for routine (monthly) notification. Forty diseases of public health importance in the country were identified and designated for routine (monthly) notification out of which ten epidemic-prone diseases were selected for immediate reporting. Standard reporting forms (DSN 001) for immediate reporting, and DSN 002 for monthly routine reporting) were also introduced. The methodology for information flow between the various levels was also prescribed. In 1989, the National Council on Health approved the adoption of Disease Surveillance and Notification (DSN) in the country. Varying degrees of success have been recorded in the implementation of the disease surveillance system but however, the effectiveness and efficiency has been a cause for concern over the years as it has not been able to produce the required information needed for timely response. (FMOH, 2005) Before 1998, most African countries used a variety of vertical disease control programs for disease surveillance some of which were well funded, while others were in a state of collapse (Abubakar et. al, 2013). This unsatisfactory situation was more or less the same in other countries in the African Region (FMOH, 2005). In September

1998, the 48th Regional Committee for Africa met in Harare. Through resolution AFRO/RC48/R2, Member States adopted Integrated Disease Surveillance and Response as a regional guideline for early detection and efficacious response to priority communicable diseases for the African region. The vision of the Integrated Disease Surveillance and Response is to establish an effective national surveillance system that will generate information for timely action. (WHO, 2003) In Nigeria the IDSR implementation process started in June 2000 (Abubakar et. al, 2013)

2.1.2 Integrated Disease Surveillance and Response (IDSR)

The surveillance guideline adopted in Nigeria is the Integrated Disease Surveillance and Response, a form of passive surveillance. The long term goal of the Integrated Disease Surveillance and Response policy is to ensure good and quality health for all Nigerians by contributing to the reduction of the burden of these communicable diseases, which is one of the health millennium development goals. (FMOH, 2005) There are 22 priority in Nigeria including the epidemic-prone diseases consisting of cerebrospinal meningitis, cholera, diarrhoea with blood, measles, lassa fever, yellow fever, highly pathogenic avian influenza; diseases targeted for elimination and eradication consisting of neonatal tetanus, leprosy, lymphatic filariasis, guinea worm and poliomyelitis; and other diseases of public health importance consisting of diarrhoea without blood, malaria, plague, tuberculosis, pertussis, onchocerciasis, pneumonia, HIV/AIDS, sexually transmitted Infections, hepatitis B (FMOH, 2009). Epidemic-prone diseases and diseases targeted for eradication and elimination are to be reported immediately they occur. Epidemic-prone diseases are to also be reported weekly while the whole 22 diseases are to be reported monthly. The Integrated Disease Surveillance and Response (IDSR) guideline has also been adopted by other World Health Organization regions such as the South-East Asian region (SEAR) and the Eastern Mediterranean region (EMR) (CDC, 2013). The surveillance system adopted in Europe is The European Surveillance System (TESSY) (ECDC, 2013) while that of the United States is The National Notifiable Disease Surveillance Systems (NNDSS) (Doyle, 2005).

The broad objective of the Integrated Disease Surveillance and Response according to (FMOH, 2005) is to contribute to reduction of mortality, morbidity and disability from

diseases through accurate, complete and timely information with respect to data gathering and transmission for effective control and prevention of communicable diseases in the country.

In the Integrated Disease Surveillance and Response system, all surveillance activities are coordinated and streamlined. Instead of using scarce resources to maintain separate vertical activities, resources are combined to collect information from a single focal point at each level. Several activities are combined into one integrated activity and take advantage of similar surveillance functions, skills, resources and target populations. (WHO, 2010)

The Integrated Disease and Surveillance strategy requires the use of standard case definitions; laboratory confirmation of disease; reporting surveillance data from the health facility to the Local Government Area health department, to the State Ministry of Health, down to the Federal Ministry of Health who then reports to the World Health Organization and response to the epidemic. At each level, analysis of the data collected is done to enable intervention such as instituting control and preventive measures for epidemics and also provide feedback to the level that reported the surveillance data.

Reporting tools (Forms) used in reporting (FMOH, 2009) include:

IDSR 001A - This is used for immediately reporting case based information about individual cases of epidemic-prone diseases, diseases targeted for eradication and elimination, and any other disease recommended by the national policy for case based surveillance from health facilities to the Local government health department. The Local government health department notify the information to the State level for a joint and sharp response and from State to Federal level.

IDSR 001B - This is used for immediately reporting laboratory based information about individual cases of epidemic-prone diseases, diseases targeted for eradication and elimination, and any other disease recommended by the national policy for case based surveillance from health facilities to the

Local Government level. The Local government health team is to notify the information to the State level and from State to the Federal level.

IDSR 001C - This is used for immediately reporting the line list of cases of epidemic-prone diseases, diseases targeted for eradication and elimination, and any other disease recommended by the national policy for case based surveillance from health facilities to the Local Government health team and for use during outbreaks. The Local Government health team is to notify the information to the State level and from State to the Federal level.

IDSR 002 - This is used for reporting weekly information about epidemic-prone diseases from the health facility to the Local government level to the State level and then to the Federal level. Weekly reports from health facilities should reach the LGA by the first working day (Monday) of the following week. The LGAs are to collate same and forward to the State by the third working day (Wednesday) of the following week. Weekly data from the State should be forwarded to the Federal epidemiology division by the first working day of the second week after the reporting week.

IDSR 003 - This is used for reporting monthly information about the whole 22 priority diseases from the health facility to the Local government level, to the State level and finally to the Federal level. The health facility should report all the totals for the month by the first week after the reporting month. At the LGA data coming from the various health facilities should be complied and forwarded to the state by the end of the second week of the succeeding month. Data from various LGAs should be compiled and forwarded to the Federal epidemiology division by the third week of the succeeding month

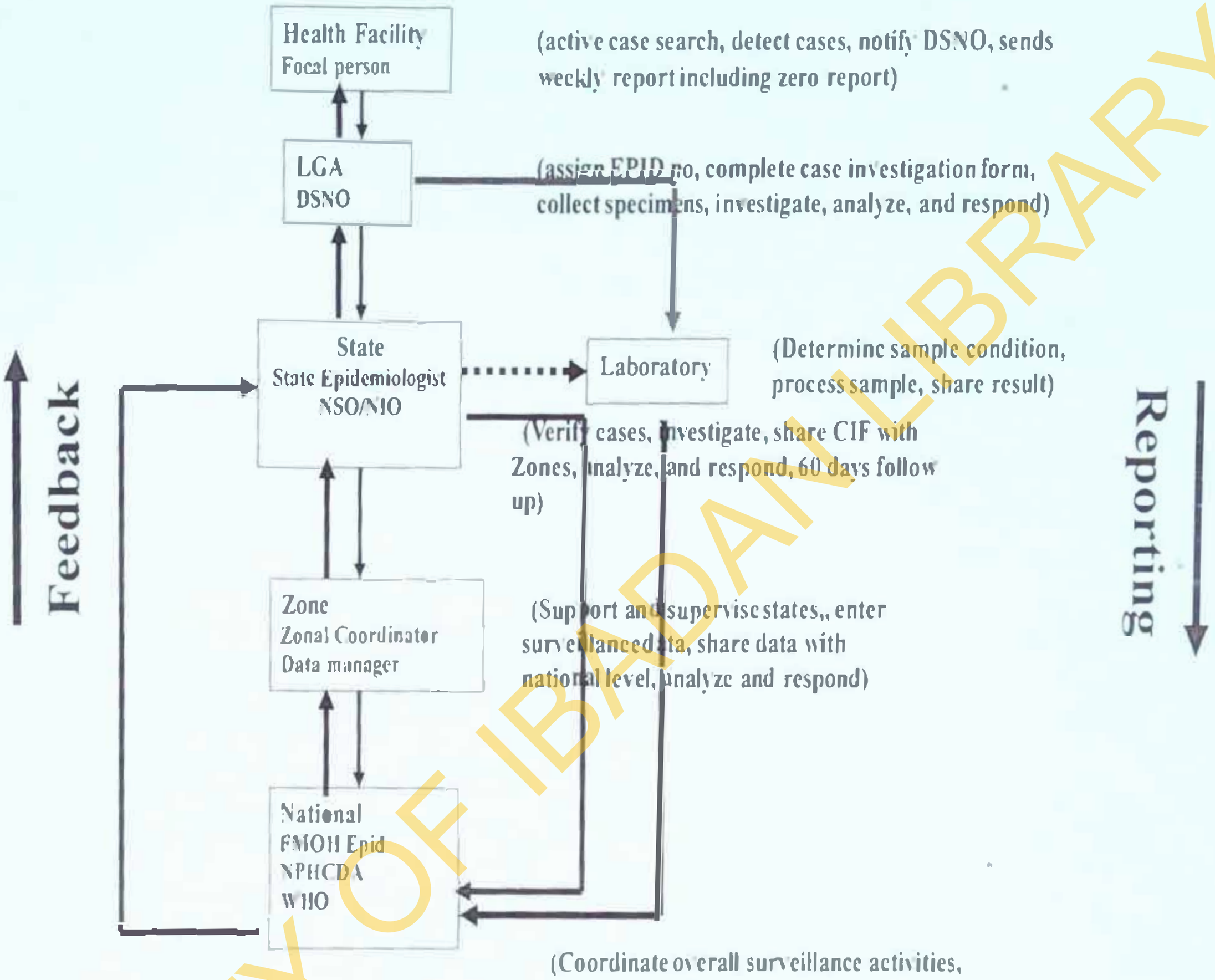

Figure 2.1.2: Surveillance Data flow and roles at various health level in Nigeria (FMOH, 2009)

In a study carried out in Kaduna state of Nigeria, it was concluded that there is a poor implementation of the Integrated Disease Surveillance and Response strategy (Abubakar et. al, 2013). According to Sahal (2011), the communicable disease surveillance system was poor in Sudan, a country in the Eastern Mediterranean region that adopted the Integrated Disease surveillance and response strategy. Meanwhile, a study carried out in India by Phalkey et. al, (2013) reported that the implementation of the Integrated Disease

Surveillance system is partially satisfactory due to the encouraging results from the study, Coker et. al, (2011), reported that there is a general short fall in the South East Asia regional disease surveillance.

2.1.3 Epidemic-prone disease surveillance and response guidelines

According to the National Technical Guideline for the Integrated Disease Surveillance and Response adopted by the Federal Ministry of Health (Nigeria), the guidelines for the surveillance of epidemic-prone diseases includes the detection of cases using standard case definition; laboratory confirmation of cases; case registration; weekly and monthly reporting of all epidemic-prone disease cases timely; zero reporting (sending zero reports in cases where there were no case of Epidemic prone diseases for the week); respond to the epidemics within 48 hours; analyze surveillance data and provide feedback to the reporting surveillance unit. (FMOH, 2009)

2.2 Knowledge on disease surveillance among health workers

The knowledge of the pathway of disease notification directs the Disease Surveillance and Notification (DSN) officers and indirectly predicts his level of awareness of his duty. This was evident as majority of DSN officers (97.6%) that had a correct knowledge of the pathway appeared to be active in their surveillance duties with 85.8% sending timely reports to the state level (Dairo et. al 2010). Sow et. al, (2010) had also reported that district health personnel knowledge about both the national priority diseases is essential for timely detection of priority reporting.

Research findings by Nnebue et. al, (2012) showed that health workers in Anambra state have a low knowledge on the use of the various Integrated Disease Surveillance and Response (IDSR) forms. From the study, although 89.8% of the health-care workers were aware of the Disease surveillance notification system, of which only 33.3, 31.1, and 33.7% of them knew the specific uses of forms IDSR 001, IDSR 002, and IDSR 003 respectively. This was different from the finding from a study in Benin City by Otih et. al, (2003) that revealed that only 11.9% of doctors studied were aware of the national disease surveillance system of which 23.1% of doctors knew wherein to obtain notification forms and 23.9% knew how to complete the forms, and another study in

Yobe state by Bawa et. al, (2003)that showed that only 38.2% of health workers being aware of national disease surveillance system.

In Africa, research finding showed that the knowledge of health personnel for Epidemic prone diseases ranged between 52 and 78% (Sow et. al, 2010). Studies in Germany revealed that 47.9% of physicians felt sufficiently informed about the new infectious disease law (Krause et. al, 2005). Meanwhile, studies in Australia have also found that the list of notifiable diseases is not well known by physicians thereby underscoring the need to repeatedly inform physicians about the notifiable disease surveillance system (Allen and Ferson, 2000)

Conclusively, knowledge on disease surveillance among surveillance workers at the health facility level is low meanwhile the knowledge is high among the Disease surveillance and Notification Officers at the Local government level which is probably explained by the training they had received (Dairo et. al, 2010).

2.3 Core surveillance activities at surveillance units

Case definition, confirmation and registration

Case definition utilization and case confirmation provides uniform criteria for reporting notifiable diseases (Doyle et al, 2005). Case definition is vital for the communicable diseases case detection (Sahal 2011). Abubakar et. al, (2013) reported that in Kaduna state, 62% of health facilities had standard case definition for the priority diseases which was similar to the report of a study in India by Phalkey et. al. (2013), which revealed that standard case definitions were regularly used by 67% of health facilities but was higher than the 35% reported in Tanzania (Nsubuga et. al, 2002). Another study in Tanzania by Mghamba, *et al.* (2004) found case definitions to be insufficient in the health facilities which were similar to the reports of Gueye et. al, (2005) in Tanzania and the assessment of surveillance in Nigeria in 2001 where no health facility had any case definition for any of the priority diseases (FMOH, 2001) but different from the 2009 assessment of IDSR in Nigeria where only 32% of health facilities did had case definitions for any of the priority diseases (FMOH, 2009). However, a study in Uganda by the Centre for Disease Control had shown in year 2000 that 35% health facilities had standard case definition (CDC, 2000). Case confirmation by laboratory test helps to further ensure the reliability of cases

identified (WHO 2006). Sahal (2011) reported that almost all health facilities in Khartoum state of Sudan had a functioning laboratory.

Case registration in registers helps in ensuring an accurate reporting of cases (FMOH, 2007). Phalkey et. al. (2013), reported that there were no Integrated Disease Surveillance Program registers at sub centers but records of patients attended were maintained in a daily diary meanwhile all health facilities maintained registers in India which was similar to the discovery of Sahal (2011) in Sudan which had reported that all health facilities in Khartoum state in Sudan had an outpatient register, and hospitals had an inpatient register for recording of the cases. Another similar report by CDC (2000) revealed that 92% of health facilities in Uganda had outpatient clinic registers. Sow et. al, (2010) revealed that clinical registers where available in more than 95% of health facilities surveyed in Cape Verde, while the proportion is 83% and 74% of health facilities in Malawi and The Gambia, respectively (MMOH & WHO, 2006; GDOH & WHO, 2004)

In conclusion, the availability and thus, utilization of standard case definition at health facilities in Nigeria is poor as its far below the WHO and CDC benchmark of 80% meanwhile case confirmation and case registration are above the 80% benchmark and thus acceptable.

Disease reporting and feedback

The Integrated Disease Surveillance and Response reporting in Africa has been poor, often due to slow data flow from the facilities (Pascoe et. al. 2012), and has also been associated with times when key Integrated Disease Surveillance and Response (IDSR) staffs responsible for submitting reports were away from their work stations (Karimuribo et. al. 2012). This had also been reported previously by Rumisha *et al.* (2007) when poor disease reporting under Integrated Disease Surveillance and Response (IDSR) was attributed to staff being on annual leave.

Abubakar et. al, (2013) reported that in Kaduna state, 57% of health facilities have a reporting system to the Local government in place while all Local government areas reported sending reports to the state level of which 67% send their reports by hand delivery while 33% of Local government areas reported sending monthly reports by mobile phone while the state reported regularly to the national level through email. The

identified (WHO 2006). Sahal (2011) reported that almost all health facilities in Khartoum state of Sudan had a functioning laboratory.

Case registration in registers helps in ensuring an accurate reporting of cases (FMOH, 2007). Phalkey et. al. (2013), reported that there were no Integrated Disease Surveillance Program registers at sub centers but records of patients attended were maintained in a daily diary meanwhile all health facilities maintained registers in India which was similar to the discovery of Sahal (2011) in Sudan which had reported that all health facilities in Khartoum state in Sudan had an outpatient register, and hospitals had an inpatient register for recording of the cases. Another similar report by CDC (2000) revealed that 92% of health facilities in Uganda had outpatient clinic registers. Sow et. al, (2010) revealed that clinical registers where available in more than 95% of health facilities surveyed in Cape Verde, while the proportion is 83% and 74% of health facilities in Malawi and The Gambia, respectively (MMOH & WHO, 2006; GDOH & WHO, 2004)

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study also revealed that a clear reporting system was available at all levels compared to findings by Mghamba in Tanzania (Mghamba, *et al.* 2004) where districts had no clear reporting mechanism.

Another study carried out in Yobe state showed that 70.9% health facilities reported any of the notifiable conditions to the Local government (Bawa et. al, 2003). Meanwhile, for disease notification at the Local government level, Dairo et. al, (2010) reported that surveillance workers were active in their surveillance duties as 85.8% reported that they sent timely reports to the state level, 88.1% conducted regular weekly visits to peripheral health centre and 97.6% reported visiting all health facilities, (government and private) in their weekly visits which supports the findings from the previous study in Nigeria on effect of training on disease notification (Bawa et al., 2003).

Reporting completeness is the proportion of expected reports received. It is only when a district has received reports from all facilities on the expected date can it be confident about knowing the true disease situation and make decisions accordingly. (Gueye et. al, 2005) Sow et. al, 2010 had reported that The mean proportion of districts with evidence of completeness in data reporting was 92% which was higher than the IDSR recommended threshold of 80% for completeness of reporting. In Cape Verde the proportion of districts that had evidence of completeness in weekly reporting was found to be high at 95% (Sow et. al, 2010). In Uganda, the proportion of districts with completeness in reporting was 95% which shows an increase by 98% in Uganda between 2001 and 2004 (UGMOH et. al, 2004).

Another key indicator of reporting compliance, reporting timeliness, is defined as the proportion of expected reports received on time. Reports are considered late if they had not been received by the established deadline (Gueye et. al, 2005). In a study carried out by Sow et. al, (2010) in Africa, the mean proportion of districts with evidence of timeliness in reporting was 85% which was slightly higher than the IDSR recommended 80% threshold for timeliness of reporting. The proportion of districts that reported on time in the Gambia increased by 47% between 2003 and 2004 (GDOH & WHO, 2004); in Cape Verde was an increase of 100% compared with the baseline survey conducted in 2002 (Sow et. al, 2010) while in Uganda, the proportion of districts with timely reporting

had increased by 75% since 2001 (UGMOH et. al, 2004). In Eritrea, where 83% of districts had trained health personnel, both the evidence of actual timeliness of reporting at district level was 100% (MOHE & WHO, 2004). Timeliness among districts in Tanzania was reported to be 47% for weekly reports and 60% for monthly reports by Gueye et. al, 2005.

Bawa et. al, (2003) reported that only 21.8% of the health facilities claimed to have ever received feedback on the reports they forward to the Local governments in Yobe state. According to Abubakar et. al, (2013), there were no feedback from the Kaduna state to the Local Governments, similar to findings from a peer review assessment (WHO, 2009) and differed from findings in Mozambique and Tanzania where 50% of districts received feedback from the provincial level (GM and WHO, 2006; Rumisha et. al, 2004). The study also reported that thirteen percent of LGAs reported receiving feedback from the state which was lower than that reported from Uganda and Tanzania (CDC, 2000; Rumisha et. al, 2007) while the state reported not receiving any feedback from the national level which differed from findings in Nigeria in 2001 where 50% of states reported receiving feedback reports from the national level (FMOH, 2001) and in 2009 where 67% of states reported receiving feedback from the national level (WHO, 2009). Sow et. al, (2010) reported that feedback was not provided on a regular basis in Africa while in India, feedback at district level 65% was better than at facility level 15% (Phalkey et. al, 2013). Krause et. al, (2005) reported the 59.3% doctors in Germany claimed not to have received any feedback on infectious disease surveillance after reporting.

In summary, the reporting compliance at the health facilities level in Nigeria is poor as it doesn't meet the WHO/CDC benchmark of 80% unlike the reporting compliance at the Local government level which is above the 80% benchmark. Timeline of reporting is acceptable in African countries as the mean timeliness proportion is slightly above the 80% benchmark.

Surveillance data analysis

Abubakar et. al, (2013) reported that 81% of health facilities in Kaduna state had no form of data analysis available which was higher than the 10% and 17% reported in Uganda and Nigeria respectively, (FMOH, 2001; CDC, 2000) but lower than the 32% reported by Mghamba in Tanzania, (Mghamba, *et al.* 2004) and much lower than the 41-78% reported in Ghana from 2004 to 2005 (Franco et. al, 2006) and the 20% reported in Nigeria and Kenya (FMOH, 2009; Rumisha et. al, 2007). However, Gueye et. al. (2005) reported that 33% of health facilities in Tanzania reported doing any type of trend analysis for priority diseases, and 28 percent stated that they did trend analysis for malaria. Abubakar et. al, (2013) also revealed that all the Local government areas in the study had data analysis available on the priority diseases by age & sex distribution and spot maps available for at least one priority disease and just a single Local government area having a line graph available in Kaduna state. At the Kaduna state level, analysis of data on priority diseases was plotted by time (line graphs) as well as place (spot maps).

According to Sow et. al, (2010), it showed that the mean proportion of districts performing data analysis in Lesotho, Eritrea, the Guinea Bissau, Uganda, Ethiopia and Malawi was 63%. In The Gambia and Cape Verde, the evidence of data analysis at the district level was 68% (ranging from 50% to 86%), similar to findings in Uganda which showed that 70% of districts analyzed data and reports in Guinea Bissau which showed evidence of data analysis among 75% of districts meanwhile the evidence of data analysis (trend analysis) was found in all districts in Eritrea. In Tanzania, Gueye et. al (2005) reported that only 42% of districts reported doing any type of trend analysis for IDSR priority diseases. Research in India by (Phalkey et. al. 2013) showed that although the facility registers recorded the date, age, location, and gender of the patient. Integrated Disease Surveillance program (IDSP) reporting formats and portal entry system did not include these attributes in regular data and Line graphs were frequently available at the district levels for some diseases than others with 88% districts citing the lack of time as the main reason for not performing disease trends for regular data.

Epidemic preparedness and response

Abubakar et. al, (2010) reported that the response system in a local government in Kaduna state was poor based on the selected criteria from the National Technical Guidelines for IDSR. Less than 50% of the criteria were met thereby reflecting the need that the local government to fully adopt the National Technical Guidelines on IDSR to be better positioned to prepare for and identify outbreaks. There was no prepositioned stock of drugs and vaccines available; there was a budget line available for emergency response; and the local government relied on reports from health facilities and communities to identify outbreaks with no threshold or markers being used. Also from the study, there was a local government Epidemic Management Committee (EMC) with an adequate number of members only from the public sector and community meeting about thrice a year which doesn't meet the requirements of monthly meetings; and a well constituted epidemic rapid response team.

Other studies on IDSR in Uganda, Tanzania and Nigeria showed that less than half of local governments had a written plan for epidemic response. (FMOH, 2009; Rumisha et. al, 2007; CDC 2000) The assessment of IDSR in Nigeria showed that 74% of local government had action thresholds for priority disease (FMOH, 2009). It is recommended that all local governments assess the current situation in their areas and prepare a plan based on the assessment results. The plan is meant to review the existing resources and determine additional requirements in terms of human resources, funds, emergency stocks of drugs and supplies, laboratory support and logistics.

Phalkey et. al. (2013) reported that 71% districts had a clearly defined Epidemic Management Committee (EMC); 79% had a written plan for response although few 23% had evaluated it; and 41% had a method in place to forecast an outbreak of diseases based on institutional learning and analysis of previous data. Significant number of districts 88% had access to emergency stocks of drugs and supplies at all times in past year with only a few districts 18% experiencing shortage of drugs, vaccines or supplies during the most recent outbreak. 71% districts had a clearly defined budget line or access to funds for outbreak response and half of them rated the amount as adequate with 65% of districts stating that administrative delays made the funds less accessible despite availability. 91%

of districts reported a suspected outbreak in the last 6 months of which 24 responded within 48 hrs and all looked for risk factors. All districts reported the use of outbreak data for action in the past year which included additional rounds of water purification, container surveys, health promotion and population awareness, stockpiling medications.

2.4 Surveillance support functions at surveillance units

Abubakar et. al, (2013) reported that 38% of health facilities did not have standard case definitions for identifying diseases in Kaduna state which was similar to another study in Anambra state by Nnebue et. al (2012) which reported that 37% of health facilities did not have copies of the standard case definitions for notifiable diseases. Report in India showed that, Case definitions were rarely used as surveillance manuals on the Integrated Disease Surveillance program (IDSP) portal were not up-to date, difficult to understand and available only in English language and Medical officer's manual developed under the Integrated Disease Surveillance program (IDSP) was available in six (15%) of the 30 facilities of which half of them were able to produce a physical copy for review and also that there was limited laboratory capacity at all levels compromised case and outbreak confirmation (Phalkey et. al, 2013). Abubakar et. al, (2013) reported that sixty two percent of health facilities had at least one standard IDSR case definition available which was higher than the 8% of the health facilities had the Disease surveillance and notification 001 and 002 forms in Yobe state (Bawa et. al, 2003), while Nnebue et. al, (2013) reported that there was only 43.9% regular supply of the Integrated Disease Surveillance and Response forms to health facilities with most 81.5% of the facilities returning completed forms monthly. Dairo et. al, (2010) shows that specifically, standardized and designated surveillance forms were available and adequate in only 20 (47.8%) of the local government area surveillance units. 35% was reported in Tanzania (Nsubuga et. al, 2002) which was similar to findings by Rumisha in Tanzania, where case definitions were not used for recording diagnosis in registers (WHO, 2001). Another study in Tanzania by Mghamba, *et al.* (2004) found case definitions to be insufficient in the health facilities. In Ghana, standard case definition pamphlets are distributed to health facilities for diagnosis and this increased the availability and use of case definitions at health facilities (Franco et. al, 2006) which however, differed from the assessment of surveillance in Nigeria in 2001, where no health facility had any case definition for any

of the priority diseases (FMOH, 2001) and the 2009 assessment of IDSR where 68% of health facilities did not have case definitions for any of the priority diseases (FMOH, 2009).

Research by Nnebue et. al, (2012) had shown that there were no training in disease surveillance for the health workers in Anambra state while Sow et. al, (2010) revealed that the overall proportion of health facilities with one or two personnel trained in Africa varied from 52% to 89%. Dairo et. al, (2010) revealed that 76% of the DSNO from Osun and Ekiti states had received further training from WHO while others 24% had training in computer management but not in integrated disease surveillance. Phalkey et. al. (2013) study in India had reported that training was significantly higher at the district level compared to the facility levels with the Integrated Disease Surveillance program (IDSP) focal person at 50% districts having a degree in public health. In nearly half of the districts, none of the subordinate staff was trained in integrated disease surveillance except the Disease surveillance officer and the epidemiologist who were trained in the two-week Field Epidemiology Training Program (FETP) course and the data entry operators for two days. Training has been documented to positively impact the disease notification habits of health personnel as reported in an interventional study conducted in Northern Nigeria in which percentage completeness of reporting of notifiable diseases increased from 2.3 - 52.0% and percentage of timely reports increased from 0.0 - 42.9% post training (Bawa and Olumide, 2005).

In assessing the logistic, communication and data management resources, Abubakar et al, (2013) revealed that about 71% had standby generators out of which 67% were functional, 29% had motorcycles and cars available, 62% had calculators available for data management, while 29% had computers and printers. Health facilities were discovered to more likely have calculators available 67% than any other data management tool which was similar to findings in Tanzania (Nsubuga et. al. 2002) and more than the figures of the 2001 assessment of surveillance in Nigeria, where 47% of health facilities had calculators available (FMOH, 2001) while findings were less than in Uganda, where 78% of health facilities had calculators (CDC, 2000). From Abubakar et al, (2013), 67% Local government areas had had standby generators available which were all functional, 67%, all Local government areas had computers which was similar to

other studies in Mozambique and Tanzania where all districts and provincial directorates studied had computers available (Mghamba, et. al, 2004; GM and WHO, 2006) and showing an improvement over the 2009 IDSR assessment in Nigeria where 25% of LGAs had computers; 67% had stationery, a printer and calculators which was less than the findings in Tanzania (Nsubuga et. al, 2002). Dairo et. al, (2010) revealed that transport was available for only a quarter of the surveillance officers in Osun and Ekiti while stationery supplies were available for less than one third of them. A similar assessment in India by Phalkey et. al, (2013) showed that the availability of logistic and communication resources were better at facilities than at district surveillance units and availability of vehicles was a major issue in over 90% of the districts. Despite availability of vehicles, guidelines for their use and persons eligible for using them were unclear while fuel charges had to be first borne by the Disease surveillance officer and epidemiologist and it took months for reimbursement. Dairo et. al, (2010) showed that Funding for surveillance activities was adequate in 19.1% of the local government areas in Osun and Ekiti state while 21.4% provided no funding at all.

Research findings by Dairo et. al, (2010) revealed that majority of the surveillance units lacked offices (57.1%), only 10 (23.8%) had adequate transport and 8(19%) had adequate finance for their daily activities. The inadequacy of finance (funding) was significantly associated with poor performance of surveillance activities. The inadequacy of reporting forms and stationeries (52.4%) were found to be significantly associated with non-reporting of outbreaks which was similar to what had been reported in previous studies which reported lack of reporting forms as a reason for not reporting notifiable diseases (Bawa et al., 2003; CDC, 2009). According to Dairo et. al, (2010), the effect of poor logistic support can be demonstrated in the proportion of the surveillance units who were able to promptly report outbreaks of epidemic-prone diseases in their local government areas. However, the relationship between the availability of logistic resources and reporting of epidemics was reported to be not clear. It also couldn't be clearly concluded whether outbreaks occurred and were not reported due to late detection emanating from logistic hindrances to surveillance or whether the officers lack the requisite knowledge to detect outbreaks.

In a bivariate analysis, Dairo et. al (2010) report showed that only inadequate funding and lack of adequate surveillance forms were statistically significant factors associated with the reporting of outbreaks in the local government areas. Other surveillance support factors such as training, qualification of DSNOs, availability of transport and penalty for not reporting were not statistically significant. This backs the reports in Sow et. al (2010) that showed that despite Lesotho having a high proportion (89%) of districts with trained health personnel, the IDSR performance was found to be poor in that the reporting was not done regularly according to the recommended national reporting schedule in any of the districts. In contrast, training has been documented to positively impact the disease notification habits of health personnel as reported in an interventional study conducted in Northern Nigeria (Bawa and Olumide, 2005). Dairo et. al (2010) also backs the report in a previous study which had reported that the lack of reporting forms was a reason for not reporting notifiable diseases (Bawa et al., 2003; CDC, 2009).

Conclusively, the availability of surveillance support factors in Nigeria is poor, thereby limiting and discouraging the compliance to the core surveillance guidelines as a result of unavailability of tools and support functions that would aid the compliance to the guidelines. It is needful for the government to ensure adequate provision of the necessary resources and facilities to enhance the effectiveness of the officers.

2.5 Epidemic prone diseases

An epidemic can be defined as the unusual occurrence in a community or region, of specific health behaviour or events clearly in excess of expected occurrence (Park, 2009). According to the National Technical Guidelines on Integrated Disease Surveillance and Response adopted by the Federal Ministry of Health (Nigeria), the epidemic-prone diseases include Cholera, Measles, Cerebrospinal meningitis, diarrhoea with blood (shigella), Viral hemorrhagic fevers, Yellow fever and highly pathogenic avian Influenza (FMOH, 2009).

2.5.1 Cholera

Cholera was the first disease for which modern public health surveillance and reporting was carried out in an organized way (WHO, 2000). The case fatality may be as high as 30

to 40 per cent. (Park, 2009) There is an outbreak of cholera when when there is doubling of cases over a period (FMOH, 2002).

Epidemiological Determinants:

Cholera is caused by Vibrio Cholerae; a curved Gram-negative bacillus belongs to the family, *Vibrionaceae* and shares some characteristics with the family, *Enterobacteriaceae* (Adagbada et. al, 2012; Farmer 2006). Vibrio cholera O1 and O139 are the only serotypes responsible for the disease defined clinically and epidemiologically as cholera (Tamang et. al, 2005; López-Gigosos, 2005). Vibrio cholera O1 is divided into classical and El Tor biotypes, and into three serosubtypes - Ogawa, Inaba, and Hikojima. Cholera cases are confirmed through the isolation of Vibrio cholera O1 or O139 from stools in any patient with diarrhea (WHO 2004). Vibrio cholerae 01 Eltor is the commonest strain in Nigeria (Opajobi 2004; Usman, 2005). The incubation period is from a few hours up to 5 days but commonly 1-2 days. (UNICEF, 2013)

Human beings are the only known reservoir of cholera infection with the predominant route for cholera transmission is faecal-oral (UNICEF, 2013). The transmission occurs from man to man via faecally contaminated water, contaminated foods and drinks (Berthoud, 2010) and in developing countries, a considerable proportion of cases may result from person to person transmission through contaminated fingers while carelessly handling excreta and vomit of patient (UNICEF, 2013).

Cholera affects all ages and both sexes with the attack rate being highest for children. Cholera infection rate, sex and age distribution and seasonality are not constant (Agbadagba et. al, 2012).

Signs and Symptoms:

People infected with cholera may have no symptoms or have only mild symptoms. A small number of infected people may have very serious symptoms such as: Severe watery diarrhea, vomiting, cramps. (NIAID, 2010) Within hours, dehydration can become severe, causing intense thirst, muscle cramps, weakness with very little urine being produced and if dehydration is not treated, loss of water and salts can lead to kidney failure, shock, coma, and death.

Recommended Case Definition (FMOH, 2006)

Suspected case:

In a patient age 5 years or more severe dehydration or death from acute watery diarrhoea. If there is a cholera epidemic, a suspected case is any person age 2 years or more with acute watery diarrhoea, with or without vomiting.

Confirmed case:

A suspected case in which *Vibrio cholerae* O1 or O139 has been isolated in the stool.

Distribution:

Epidemics of cholera-like diseases have been described in India since early sixteenth century and continuing through the nineteenth century. It spread periodically to other parts of the world, in pandemic waves, retreating to its endemic area in South-East Asia between pandemics. (WHO, 2000) The current seventh pandemic was caused by caused by the El Tor biotype of *V. cholerae* serogroup O1 began in 1961 in Sulawesi, Indonesia and spread rapidly to other countries in Asia, Europe, Africa in 1970 and finally to Latin America in 1991, after almost a century without cholera (CHP, 2011; NTHNC, 2010).

Most cases of cholera occur in Africa and Asia (NIAID, 2010). Nevertheless, cholera is on the rise with an estimated 1.4 billion people at risk in endemic countries and an estimated 3 million to 5 million cases and 100,000-120,000 deaths per year worldwide (Berthoud, 2012). Cholera has remained endemic in some Asian countries for centuries and has become endemic in an increasing number of African countries with epidemic peaks throughout the years. Recently in 2010, it returned to the Americas with transmission in Haiti and the Dominican Republic (Bliss and Fisher, 2013).

Prevention:

Effective surveillance and response system is essential for the prevention and control of cholera (Mint and Tauxe, 2013). It is important to have monitoring of cholera in the health facilities with immediate notification to higher levels of the health system and thus is paramount, that the health workers particularly those close to the community are trained to identify and notify immediately to the local health authorities (Park 2009) to facilitate epidemiological detection and outbreak investigation (CHP, 2011).

All steps must be taken to provide safe water to the community for all purposes and there should be provision of effective excreta disposal system. Oral Rehydration Therapy could be used as a treatment for dehydration (Park, 2009). Also, oral cholera vaccines (OCV), namely Dukoral and Shanchol are effective against the *V. cholerae* O1 strain (CHP, 2011). Lastly, the awareness of general public about the risks of cholera infection through various channels and promoting the importance of good personal and food hygiene are greatly important (CHP, 2011).

2.5.2 Measles

Measles, also known as "Rubeola", is a highly infectious disease which has a major impact on child survival (affects all ages), particularly in developing countries (Park, 2009). There is an outbreak of measles when 5 or more cases are suspected in one month (FMOH, 2002).

Epidemiological determinants:

Measles is caused by a negative sense RNA paramyxovirus of the genus Morbillivirus within the family Paramyxovirus (Kutty et. al, 2013). There is only one serotype of the virus i.e. an antigenically monotypic virus. The only known reservoir is human (Perry and Halsey 2004; Moss, 2009) while carriers are not known to occur (Park 2009).

Measles can be spread directly from person to person mainly by respiratory droplets and by direct contact with secretions from nose and throat of an infected person (CDC 2009; Engel, 2006) from 4 days before onset of rash until 4 days thereafter (Kutty et. al, 2013). Direct contact is the primary mode of transmission; airborne droplet and indirect contact are less common modes of transmission (Park, 2009). Measles is a highly communicable disease (Signore 2001). Patients are infectious from the onset of prodromal symptoms until 2-4 days after rash development, but communicability is higher before rash appearance. Communicability declines rapidly after the appearance of the rash. The average incubation period for measles is 14 days, with a range of 7–21 days (Park, 2009; AAP, 2009).

Measles can affect almost everyone in infancy or childhood between 6 months and 3 years of age in developing countries where environmental conditions are generally poor,

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and older children usually over 5 years in developed countries. Following the use of measles vaccine, the disease is now seen in somewhat older age-groups. (Park, 2009) No age is immune if there was no previous immunity. One attack of measles generally confers life-long immunity. (Lucas and Gilles, 2003) Measles tends to be a severe killing disease in malnourished children (Lucas and Gilles, 2003). Given a chance, the virus can spread in any season (Jawetz, et.al. 2007).

Distribution:

Before the introduction of measles vaccine in 1963 in United States, 130 million cases and 7-8 million deaths were estimated to be due to measles and 95-98% of children were infected (Perry and Halsey2004; Moss 2009). In the 1960's, vaccine introduction allowed substantial reduction of both incidence and mortality due to measles.

Between 2009 and 2010, measles outbreaks were reported in Europe, Africa and Asia. (Schoub 2011; Grais 2011; Siegfried et. al, 2010; Zarocastas, 2009; Wairagkar et. al. 2011; Minetti et. al, 2013; Stefens et. al, 2010). Also, between 2010 and 2011, Western Europe saw a rise in measles cases with at least 33 countries reporting more than 68,743 measles cases, resulting in importations into the Americas (CDC, 2011; Cottrell and Roberts, 2011; Muscat 2011; Vainio et. al, 2011; Jankovic, 2012; Antona et. al, 2013). The Region of the Americas is in the process of verifying elimination of measles or maintenance of elimination in every country in the Region (CDC, 2012). Important measures are underway to achieve measles elimination in Europe, the Eastern Mediterranean, and the Western Pacific regions by 2015, and the African region by 2020. In Africa, about 13 million cases and 650,000 deaths occur annually, with sub-Saharan Africa having the highest morbidity and mortality (Onoja et al., 2013). Nigeria has the largest population in Africa with over 140 million people (Nigerian Medecins Sans Frontieres (NMSF), 2006) with measles being the fifth leading cause of under-five child mortality (WHO, 2006).

Signs and symptoms (Stages)

There are three stages in the natural history of measles, viz the prodromal or pre-eruptive stage, eruptive stage and post measles stage. Prodromal stage begins 10 days after

infection, and last until day 14. It is characterized by fever, coryza with sneezing and nasal discharge, cough, and redness of the eyes, lacrimation and often photophobia. There may be vomiting or diarhoea (Park 2009). The Eruptive phase is characterized by a typical, dusky-red, macular or maculo-papular rash which begins behind the ears and spreads rapidly in a few hours over the face and neck, and extends down the body taking 2 to 3 days to progress to the lower extremetics. In the post-measles stage, therc may be growth retardation and diarrhoea, cancrumoris, pyogenic infections, candidosis, reactivation of pulmonary tuberculosis.

Recommended case definition (FMOH, 2006)

Suspected case:

Any person with fever and maculopapular (non-vesicular) generalised rash and cough, runny nose or conjunctivitis (red eyes) or any person in whom a clinician suspects measles.

Confirmed case:

A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an outbreak.

Prevention:

Only live attenuated vaccines are recommended for use; they are both safe and effective of which a combined vaccine against measles, mumps, rubella (MMRV) is used to protect children against measles (Park, 2011). Also, measles may be prevented by administration of immunoglobulin (human) early in the incubation period (Park 2009).

Control measures:

A child with measles needs to be kept away from other children for at least 7 days after onset of rash to prevent spread of the infection to other children. Also, immunization of contact within 2 days of exposure and the prompt immunization at the beginning of an epidemic are essential to limit the spread (Park 2009).

2.5.3 Cerebrospinal meningitis

Cerebrospinal meningitis also known as meningococcal meningitis is an acute communicable disease (Park, 2009). Meningitis outbreak occurs when the alert threshold is crossed which 5 cases per 100,000 populations are for alert threshold: 15 more /100,000 population for two weeks in row for action (FMOH, 2006).

Epidemiological determinants:

Cerebrospinal meningitis is caused by a number of agents but the most common causes of bacterial meningitis beyond the newborn period are *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenza*. Haemophilus influenzae type b (Hib) used to be a common cause of bacterial meningitis worldwide before the Hib vaccines (Martin M. 2004). However more recently, Streptococcus pneumoniae and *Neisseria* meningitidis have become the major organisms causing meningitis.

Neisseria. Meningitidis is classified into 12 serogroups of which six of these serogroups cause the great majority of infections in people: A, B, C, W135, X, and Y (Jafri et. al, 2013; Leimkugel et. al, 2005). *H. influenzae*, like *Neisseria meningitidis*, is either unencapsulated or encapsulated with a polysaccharide capsule which allows encapsulated *Haemophilus influenzae* isolates to be classified into six serotypes (a, b, c, d, e, and f) with the most common cause of invasive disease being *Haemophilus influenzae* type b (Hib) (Watt et. al, 2009). *Streptococcus pneumoniae*, like *Neisseria meningitidis* and *Haemophilus influenzae*, is an encapsulated bacterium.

Humans are the reservoir of the infection (Lucas and Gilles, 2003). Carriers are the most important source of infection as clinical cases present only a negligible source of infection. The disease spread mainly by droplet infection with the portal of entry being the nasopharynx (Park, 2009). The incubation period is usually 3-4 days, but may be 2-10 days (Lucas and Gilles, 2003).

Cerebrospinal meningitis is majorly a disease of children and young adults of both sexes (Park, 2009). In many countries with epidemiological data, particularly in Europe and North America, the age distribution of meningococcal disease demonstrates two peaks (Harrison et. al, 2011; AMSP, 2010). The highest incidence is in infants less than one

year of age, and a secondary rise in incidence occurs in adolescents and young adults (Jafri et. al, 2013).

The seasonal variation of the disease is well established; outbreaks occur more frequently in the dry and cold months of the year (Park, 2009).

Signs and symptoms:

It has characterized by a sudden onset of intense headache, fever, nausea, vomiting, stiff neck and various neurological signs (Park, 2009). Without treatment, the case-fatality rate can be as high as 70 percent, and one in five survivors of bacterial meningitis may be left with permanent sequelae including hearing loss, neurologic disability, or loss of a limb (Rosenstein et. al, 2001).

Recommended Case definition (FMOH, 2006)

Suspected case:

Any person with sudden onset of fever (>38.5°C rectal or 38.0°C axillary) and one of the following signs: neck stiffness, altered consciousness or other meningeal sign.

Confirmed case:

A suspected case confirmed by isolation of *N. meningitidis* from Cerebrospinal Fluid or blood.

Distribution:

Apart from epidemics, at least 1.2 million cases of meningitis are estimated to occur with estimated annual deaths of 170,000 (WHO, 2011). In countries with high endemicity, the disease burden places an immense strain on the public health system (Jafri et. al, 2013) while in middle and low-income countries, acute bacterial meningitis remains the fourth leading cause of disability (Edmond, 2010). The prevalence of bacterial meningitis in these countries is higher compared to developed countries (Owusu et. al, 2012). The Worldwide, the incidence of meningitis is highest in a region of sub-Saharan African known as the "meningitis belt". Across the meningitis belt, at least 350 million people are at risk for meningitis during these annual epidemics. The highly endemic African Meningitis Belt, originally characterized by Lapeysonnie in 1963 (Jafri et. al, 2013) and

modified in 1987, extends from Senegal to Ethiopia, and is characterized by seasonal epidemics that constitute a major public health burden. In the Eastern Mediterranean region Sudan and Saudi Arabia have high endemic rates of serogroup A disease, and have also experienced outbreaks in recent years during the hajj season with serogroup W-135 while in South-East Asia Region, Korea and Thailand are the only countries from this region with published population-based estimates, which demonstrate low endemic rates (Jafri et. al, 2013).

In many African countries including Nigeria which lie within the meningitis belt, epidemic cases of acute bacterial meningitis are usually reported (Greenwood, 2006). In Nigeria, there have been repeated large scale epidemics of cerebrospinal meningitis for the past 4 decades (Mado et. al, 2013). According to research findings by Mado et. al (2013), showed the highest incidence to be between 6-10 years followed by the age group 1-5

Prevention and control

Treatment of cases with antibiotics can save the lives of 95% of patients provided that it is started during the first 2 days of illness with penicillin being the drug of choice (Park, 20109) while carriers are to be treated with more powerful antibiotics such as rifampicin to eradicate the carrier state (Brooks et. al, 2007). The risk of secondary cases of meningococcal disease among close contacts of someone with meningococcal disease (i.e., household members, day-care center contacts, or anyone directly exposed to the patient's oral secretions) is high with chemoprophylaxis using rifampicin being recommended for them (Park, 2009). Surveillance and environmental measures to reduce air borne infections are also important in the prevention and controls of the disease (Lucas and Gilles, 2003) while vaccines are the cornerstone of prevention and control of bacterial meningitis (WHO, 2006).

2.5.4 Diarrhoea with blood (shigella)

Shigellosis still remains a public-health problem in most developing countries where communities are ravaged by poverty, war, poor sanitation, personal hygiene, and water supplies. (Iwalokun et.al, 2001)

Epidemiological determinants

Shigella are Gram-negative, non-motile bacilli belonging to the family *Enterobacteriacae*. The genus *Shigella* includes four species: *S. dysenteriae, S. flexneri, S. boydii* and *S. sonnei*, also designated groups A, B, C and D, respectively. The first three species include multiple serotypes. S. *sonnei* and *S. boydii* usually cause relatively mild illness in which diarrhoea may be watery or bloody. *S. flexneri* is the chief cause of endemic shigellosis in developing countries. *Shigella* are spread by direct contact with an infected person, or by eating contaminated food or drinking contaminated water. Flies may also transmit the organism. However, humans and a few primates are the only reservoir of *Shigella*. (W.H.O 2005)

Risk factors for the disease include overcrowding in areas with unsafe water and poor sanitation. The incubation period is from 1 to 4 days (FMOH, 2009)

Distribution:

Shigellosis is endemic in most developing countries and is the most important cause of bloody diarrhoea worldwide Ninety-nine percent of infections caused by *Shigella* occur in developing countries, and the majority of cases and deaths, occur among children less than five years of age. (Reda et. al, 2009)

Signs and symptoms:

Clinical illness is characterised by acute fever, bloody diarrhoea, abdominal cramps and can also present with systemic symptoms and signs as well as dehydration especially in young children. (Park, 2009)

Recommended Case Definition (FMOH, 2009)

Suspected case:

A person with diarrhoea with visible blood in stool

Confirmed case:

Suspected case with stool culture positive for *Shigella dysentariae 1*

Prevention:

Prevention relies primarily on measures that prevent spread of the organism within the community and from person to person such as hand-washing with soap, ensuring the availability of safe drinking water, safely disposing of human waste, safe handling and processing of food, and control of flies. (WHO, 2005) Environmental sanitation requires educational support, to ensure their proper use and maintenance of such facilities thus making health education a key prevention measure while immunization against measles is a potential preventive intervention (Park, 2009).

Control:

All cases of bloody diarrhoea should be treated promptly with an antimicrobial that is known to be effective against *Shigella*. This lessens the risk of serious complications and death, shortens the duration of symptoms, and hastens the elimination of *Shigella* from the stool. Other supportive measures used to treat acute diarrhoea, such as rehydration, feeding and zinc supplementation, should also be provided. Symptomatic treatment should be given for fever and pain. (WHO, 2005)

2.5.5 Viral haemorrhagic fevers

Viral hemorrhagic fevers (VHFs) are a group of illnesses that are caused by several distinct families of viruses. Characteristically, the overall vascular system is damaged, and the body's ability to regulate itself is impaired. These symptoms are often accompanied by hemorrhage (bleeding); however, the bleeding is itself rarely life-threatening while some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease. (CDC, 2004)

Viral haemorhagic fevers (VHF) are caused by five distinct families of viruses which includes Arenaviridae consisting of Lassa fever, Argentine hemorrhagic fever, Brazilian hemorrhagic fever, Bolivian hemorrhagic fever, Venezuela hemorrhagic fever,

Bunyaviridae consisting of Crimean-Congo hemorrhagic fever, rift valley hemorrhagic fever; Filoviridae consisting of Ebola and Marburg; Flaviviridae consisting of dengue type 1-4, yellow fever, Kyasanur Forest hemorrhagic fever, Omsk hemorrhagic fever and Togaviridae consisting of Chikunguya. Each of these families share a number of common features which includes: they all being RNA viruses with a lipid envelope, their survival is dependent on an animal or insect host and their geographical restriction to the areas where their host species live. (ENIVID, 2001) In Nigeria, Lassa fever is the hemorrhagic fever usually being reported because it's the one usually occurs in the country (FMOH, 2002) but with the presence of Ebola in the country, Ebola would also be reported.

2.5.5.1 Lassa fever

Lassa fever is an acute arena viral hemorrhagic fever that was first identified in Lassa village, Borno State in the northeastern region of Nigeria in 1969 (Okokhere, 2009) when two nuns died as a result of complications of a hemorrhagic fever (Inegbenebor, 2012). Since then it has become endemic in many parts of West Africa. A single case of Lassa fever is an outbreak (FMOH, 2002).

Epidemiological determinants

Lassa fever is an acute hemorrhagic fever caused by Lassa virus (LAV), a biscgmented ambisense single-stranded RNA virus that belongs to the family old world Arenaviridisae spp (Rojek and Kunz, 2012).

The reservoir of infection is mastomys natalensis (Okokhere, 2009). In 1972, the Natal multimammate mouse was found to be the natural host of the deadly Lassa fever virus (Inegbenebor, 2012). Lassa fever is transmitted to humans when they ingest food contaminated by the feces and urine of mastomys natalensis (Okokhere, 2009; Lucas and Gilles, 2003). Multimainmate rats are also reservoirs of the causative agents of leptospirosis, plague, and leishmaniasis (Katakweba et. al. 2012; Mgode et. al. 2005). Once humans are infected, transmission also occurs from human to human through contact with fluid and acrosol secretions in the form of sneezing, sputum, seminal fluid, stool, urine and blood (Inegbenebor, 2012). The incubation period is between 6-21 days (Dzotsi et. al, 2012).

Men are more commonly affected than women; however, the case fatality rate is nearly two times higher in women. (Inegbenebor, 2012) Poor quality housing increases the risk of Lassa fever spread by rodents (Kelly et. al, 2013).

Distribution:

Lassa fever is endemic in West Africa (Kelly et. al, 2013) with an estimate of about 300,000 persons infected and 5,000 deaths annually across the region (Richmond and Baglole, 2003; Fichet-Calvet and Rogers, 2009; Ehichioya et. al, 2010). It is recognized in Guinea, Liberia, Sierra Leone, as well as Nigeria. However, because the rodent species which carry the virus are found throughout West Africa, the actual geographic range of the disease may extend to other countries in the region (CDC, 2004). Recent importation of Lassa fever into Germany, the Netherlands, the United Kingdom, and the United States by travelers on commercial airlines (CDC, 2004; Haas et. al, 2003; Veldkamp and Schippers, 2002; CDSC, 2000) illustrates the potential for the spread of this highly dangerous and contagious pathogen.

The prevalence of Lassa fever in Nigeria, Guinea and Sierra Leone can be as much as 21%, 55% and 52% respectively (Inegbenebor, 2012). In Nigeria, outbreaks of the infection have been reported in Edo, Ebonyi, Ondo, Taraba, Plateau, Anambra, Nasarawa, Yobe and recently Rivers (Ogbu et al, 2007).

Signs and symptoms:

Signs and symptoms typically occur after an incubation period of 6 –21 days (Inegbenebor, 2012) The onset of Lassa fever illness is gradual, with non-specific signs and symptoms starting with fever, general weakness and malaise and after a few days, headache, sore throat, muscle pain, chest pain, vomiting, diarrhoea and abdominal pain may follow (Dzotsi et. al, 2012) Severe cases may progress to show facial swelling, bleeding from mouth, nose, vagina or gastrointestinal tract, and low blood pressure. Shock, seizures, disorientation, and coma may be seen in the late stages. Deafness occurs in 25% of patients but half recover some function after 1-3 months (Dzotsi et. al, 2012)

Recommended Case Definition (FMOH, 2006)

Suspected case:

Illness with onset of fever and no response to usual causes of fever in the area, and at least one of the following signs: bloody diarrhoea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine.

Confirmed case:

A suspected case with laboratory confirmation (positive IgM antibody or viral isolation), or epidemiological link to confirmed cases or outbreak

Prevention and control:

Awareness (campaigns) and advocacy on clean and safe environment to promote prevention especially within the endemic areas are necessary. Abrogation of practices that might enhance contact with the Lassa virus should be encouraged. (Ibekwe, 2012) Patients suspected of Lassa fever should be isolated while high risk contacts should be identified and kept under surveillance. Post exposure prophylaxis with ribavirin in recommended. (Lucas and Gilles, 2003) Also, setting up serviceable diagnostic and treatment centers for Lassa fever within the region would enhance prompt therapy and containment of the illness while the ultimate aim should be towards producing a functional and safe anti Lassa-fever-vaccine (Ibekwe, 2012)

2.5.5.2 Ebola

Ebola haemorrhagic fever is a severe disease caused by infection with Ebola virus, named after a river in the Democratic Republic of the Congo (formerly Zaire) in Africa, where it was first recognized in 1976. The disease neither has cure nor vaccine. (CDC, 2010) The case-fatality rate for Zaire Ebola virus (EBOV) infections is estimated to be between 50% and 90% (ECDC, 2014).

Epidemiological determinants:

Ebola is caused by Ebola virus which is one of two members of a family of RNA viruses called the Filoviridae. There are five identified subtypes of Ebola virus. Four of the five

have caused disease in humans: Ebola-Zaire, Ebola-Sudan, Ebola-Ivory Coast and Ebola-Bundibugyo. The fifth, Ebola-Reston, has caused disease in nonhuman primates, but not in humans. (CDC, 2010)

The exact origin, locations, and natural habitat (known as the "natural reservoir") of Ebola virus remain unknown. However, on the basis of available evidence and the nature of similar viruses, researchers believe that the virus is zoonotic (animal-borne) with four of the five subtypes occurring in an animal host native to Africa. A similar host, most likely in the Philippines, is probably associated with the Ebola-Reston subtype, which was isolated from infected cynomolgous monkeys. (ECDC, 2014; CDC, 2010; ENIVID 2001)

Ebola viruses are highly transmissible by direct contact with infected blood, secretions, tissues, organs or other bodily fluids of dead or living infected persons (GOARN, 2014). Burial ceremonies are known to play a role in transmission (WHO, 2012). Bats remain the most likely, but still unconfirmed, reservoir host for Ebola viruses (Wood, 2012; Hayman et. al, 2012). The incubation period is between 2-21 days (ECDC, 2014, GOARN, 2014).

Distribution:

Ebola, occurs in epidemics majorly in Africa and South America (CDC, 2010) with an ongoing spread in West African countries such as Guinea, Sierrea leone, Liberia, and Nigeria. This spread of the disease in West Africa has from 33rd December to 23rd July of 2014, produced about 1275 cases and 704 deaths (GOARN, 2014).

Historically, the first case was known in Zaire (now Democratic Republic of the Congo) in 1976. Since then, confirmed cases of Ebola have been reported in the Gabon, Sudan, the Ivory Coast, and Uganda while also, the Ebola-Reston subtype was isolated from infected cynomolgous monkeys in the Philippines. (ENIVID, 2001)

Signs and symptoms:

The onset of Ebola is sudden and its early symptoms include flu-like illness, fever, muscle pain (myalgia), fatigue (weakness), headache and sore throat. The next stage of the disease is characterised by symptoms and clinical manifestations from several organ systems. Its symptoms can be gastrointestinal (vomiting, diarrhoea, anorexia and

have caused disease in humans: Ebola-Zaire, Ebola-Sudan, Ebola-Ivory Coast and Ebola-Bundibugyo. The fifth, Ebola-Reston, has caused disease in nonhuman primates, but not in humans. (CDC, 2010)

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abdominal pain), neurological (headaches, confusion), vascular (conjunctival/pharyngeal injections), cutaneous (maculopapular rash), and respiratory (cough, chest pain, shortness of breath), and can include complete exhaustion (prostration).

Case Definition (GOARN, 2014)

Suspected (clinical) case:

Any person ill or deceased with fever and hemorrhage. Documented prior contact with an Ebola case is not required.

Probable case (with or without bleeding):

Any person (living or dead) with contact with a clinical case of Ebola and a history of acute fever

OR

Any person (living or dead) with a history of acute fever and three or more of the following

- headache/ vomiting/nausea/ loss of appetite/ diarrhea/ intense fatigue/ abdominal pain/ general muscular or articular pain/ difficulty in swallowing/ difficulty in breathing/ hiccoughs

Prevention and control:

Avoiding contact with symptomatic patients and/or their bodily fluids, corpses and/or bodily fluids from deceased patients (CDC, 2010); timely contact-tracing, early identification, systematic quarantine or isolation of cases (surveillance); Health-care providers must protective clothing (PPE) such as masks, gloves, gowns, and goggles; complete equipment sterilization; (ECDC, 2014) and avoiding any form of close contact with wild animals (including monkeys, forest antelopes, rodents and bats), both alive and dead, and consumption of any type of 'bushmeat'.

2.5.6 Yellow fever

Yellow fever is a disease that has caused severe morbidity and mortality in Africa and South American regions despite the available effective vaccine for more than 70 years (Fatiregun et. al. 2010; Wiysonge, et. al. 2008; Barnett, 2007). The "yellow" in the name is explained by the jaundice that affects some patients. A single case of yellow fever is an outbreak. (FMOH, 2006) Case fatality rates for reported cases are in the order of 15 to 50% (WHO, 2000).

Epidemiological determinants:

The causative agent, Flavivirus fibricus formerly classified as a group B arbovirus, is a member of the togavirus family. The yellow fever virus is constantly present in mosquitoes and non-human primates in some tropical areas of Africa and the Americas (WHO, 2000). In forest areas, the reservoir of the infection is mainly monkeys and forest mosquitoes while in the urban areas, the reservoir is man (subclinical and clinical cases) besides Aedes aegypti mosquitoes (Park, 2009). The incubation period is usually 3-6 days (Lucas and Gilles, 2003).

Yellow fever virus is transmitted to humans primarily through the bite of an infected *Aedes* or *Haemagogus* species mosquito (Staples et. al, 2010). Mosquitoes acquire the virus by feeding on infected nonhuman or human primates and then can transmit the virus to naïve nonhuman or human primates. These mosquitoes are domestic (i.e. they breed around houses), wild (they breeding the jungle) or semi-domestic species (they display a mixture of habits). Any region populated with these mosquitoes can potentially harbour the disease (WHO, 2000). Yellow fever virus has three transmission cycles: jungle (sylvatic), intermediate (savannah), and urban (Barrett and Monath, 2003). Depending on the transmission cycle and location, different mosquito species are involved, and humans or nonhuman primates serve as the primary reservoir of the virus.

All ages and both sexes are susceptible to yellow fever in the absence of immunity (Park, 2009). In general, increased temperature, humidity, and rainfall lead to higher mosquito abundance and consequently an increase in viral circulation (Vasconcellos, 2001).

Distribution:

Yellow fever virus occurs in sub-Saharan Africa and tropical South America, where it is endemic and intermittently epidemic (Lucas and Gilles, 2003). Most Yellow fever disease in these areas is attributable to sylvatic or intermediate transmission cycles (Staples et. al, 2010). However, urban transmission of Yellow fever does occur periodically in Africa and sporadically in South America (PAHO 2008; Tomori, 2004).

In Africa, the majority of outbreaks have been reported from West Africa; fewer outbreaks have been reported from Central and East Africa (Ellis and Barrett, 2008). During West African outbreaks, up to 30% of the population is infected with Yellow fever virus and 3%--4% develop clinical disease (Staples et. al, 2010). Although urban outbreaks of Yellow fever occurred in North America and Europe until the early 1900s, autochthonous transmission has not been reported over the past several decades. (Staples et. al, 2010)

Signs and symptoms:

The presentation of yellow fever disease ranges from subclinical infection to systemic disease including fever, jaundice, hemorrhage, and renal failure. Viremia peaks 2–3 days after infection, and patients with fatal cases have a longer duration of viremia than do survivors (Barnett, 2007).

Recommended Case definition (FMOH, 2006)

Suspected case:

A person with acute onset of fever followed by jaundice within two weeks of onset of first symptoms Hemorrhagic manifestations and renal failure may occur

Confirmed case:

A suspected case with laboratory confirmation (positive IgM antibody or viral isolation) or epidemiological link to confirmed cases or outbreaks.

Control measures:

A suspected case must first be isolated while domestic contacts should also be isolated under screened condition for 6 days (Lucas and Gilles, 2003). Urban yellow fever is best controlled by rapid immunization of the population at risk with 17D vaccine being the internationally approved vaccine while other methods includes intensive vector control and an effective surveillance system wherever the disease is endemic (Park, 2009).

2.5.7 Highly pathogenic avian influenza (H5N1)

Highly Pathogenic Avian Influenza H5N1 has attracted substantial public attention since its emergence in late 2003. The virus has shown to cause disease in both animals and humans (OIE 2009a, WHO 2010).

Avian Influenza viruses in poultry are classified as being either high pathogenic (HPAI) or low pathogenic (LPAI) (OIE 2006). High Pathogenic Avian Influenza viruses are defined as those that kill 75% or more of 4- to 8-week-old chickens within ten days of inoculation (Alexander 2000). Only H5 and H7 subtypes viruses can cause High Pathogenic Avian Influenza, although not all viruses of these subtypes are virulent (Alexander 2007). Low Pathogenic Avian Influenza viruses (defined as those that kill less than 75% of 4- to 8-week-old chickens within ten days of inoculation) can include any of the 16 HA and 9 NA subtypes. A single case of avian influenza is an outbreak (FMOH, 2002).

Epidemiological determinants:

Avian influenza (AI) is caused by type A strains of influenza virus. All Avian Influenza viruses are members of the Orthomyxoviridae family. There are three sub types, namely influenza type A, type B, type C (Park, 2009).

Wild waterfowl are a natural reservoir of avian influenza A viruses, and these viruses are usually non-pathogenic in these species (Swayne 2008). Avian Influenza viruses can be transmitted directly or indirectly by contact with infectious aerosols and other virus-contaminated materials. Thus, the main path of transmission may have shifted from an oral-faecal route to more oral-oral route or even airborne route or both (Stuim-Ramirez et al. 2005). Cross-species transmission of Avian Influenza viruses can potentially cause

infection in mammals including humans, hamsters, mice, pigs, ferrets, stone martens, dogs, domestic cats, tigers, leopards, civets, and macaques (Choi et al. 2005; Thiry et al. 2007; Lipatov et al. 2008).

Influenza affects all ages and both sexes. In general, the attack rate is lower among adults. The immunity to influenza is sub type-specific (Park, 2009). Epidemics usually occur in winter months in the Northern Hemisphere and in the winter or rainy season in the Southern Hemisphere. Overcrowding enhances transmission (Park, 2009).

Distribution:

In early 2004, Highly Pathogenic Avian Influenza outbreaks were simultaneously reported in nine Asian countries: South Korea, Vietnam, Japan, Thailand, Cambodia, Laos, Indonesia, China, and Malaysia (Li et al. 2004). Between 2003 and 2010, Highly Pathogenic Avian Influenza H5N1 outbreaks were reported in Asia, Africa, Europe, and the Middle East, affecting wild birds, domestic poultry, human and other mammals. In February 2006, highly pathogenic avian influenza (HPAI) virus of the H5N1 subtype was detected in chickens in Kaduna state in northern Nigeria, the first African country reporting a confirmed HPAI (H5N1) outbreak. The infection later spread to 25 of the 36 Nigerian states and to the Federal Capital Territory and persisted for 21 months. (Fusaro et. al, 2009)

Signs and symptoms:

Symptoms include fever, chills, aches and pains, coughing and generalized weakness. Fever lasts from 1-5 days averaging 3 days in adults. The most dreaded complication is pneumonia, which should be suspected if fever persists beyond 4 or 5 days or recurs abruptly after convalescence. (Park, 2009)

Recommended Case Definition (FMOH, 2006)

Clinically, patient may present with either Influenza-like illness (ILI) or Severe acute respiratory disease (SARD)

ILI: Adult or child seeking care for an acute illness consisting of fever ≥ 38.0 C AND either cough or sore throat

SARD, ≥ 5 years: Moderate-to-severe unexplained acute lower respiratory tract illness (temperature > 38 C AND cough or sore throat AND shortness of breath, difficulty in breathing or severity requiring hospitalization), with or without evidence (clinical or radiological) of pneumonia.

For children age 2 months to 5 years, SARD will be defined using the severe pneumonia definition from IMCI:

A child presenting with cough or difficulty in breathing and any general danger sign, or chest in drawing or stridor in a calm child. General danger signs for children 2 months to 5 years are: unable to drink or breast feed, vomits everything, convulsions, lethargy, or unconsciousness.

Suspected case: ILI or SARD case-patient with history of exposure within 7 days of onset of symptoms

Exposure could be through:

- Close contact (within 1 meter) with a probable/confirmed case of influenza A/H5N1
- Close contact with infected birds (handling, slaughtering, defeathering, butchering, preparation for consumption) or with environments contaminated by their faeces, or consumption of raw poultry products where H5N1 infections are confirmed
- Close contact with a confirmed case of H5N1 infection in an animal
- Worked in laboratory processing samples suspected of containing A/H5N1 virus
- Reside or visit area where A(H5N1) is suspected or confirmed in birds

Probable case: Ssuspected case Plus Limited laboratory evidence of A/H5N1 (e.g. single serum antibodies)

Confirmed case: A (H5N1) confirmed case

Any individual for whom laboratory testing demonstrates:

- Positive PCR for A (H5N1)
- Positive viral culture A (H5N1)

- 4 fold rise in influenza A (H5N1) specific antibody titre

IF A positive test using A (H5N1) monoclonal antibodies

Prevention/Control measures:

Early detection of infection and rapid response to that infection are essential components of the effective control of a High pathogenic avian influenza outbreak. Surveillance programs contribute to early detection of Highly pathogenic avian influenza (HPAI) infection and risk factors, monitoring of vaccination programs, understanding of disease patterns, allowing authorities to adjust disease prevention and control measures. Recently, the terms 'scanning' and 'targeted' surveillance have been used in veterinary surveillance (Scudamore 2002). In countries where the veterinary infrastructure is weak or unable to enforce laws related to disease control, a modified approach should be applied to control rather than to eradicate High pathogenic Avian H5N1 virus (Sims 2007). When the disease is endemic, vaccination strategies can be applied simultaneously with other control measures to reduce HPAI incidence and minimize the risk of human exposure to infection (FAO 2007b).

2.6 Conceptual framework

Public health surveillance is the ongoing systematic collection, analysis, interpretation of outcome- specific data for use in the planning, implementation, and evaluation of public health practice (WHO, 2001). A surveillance system involves the ability to collect data, analyze the data as well as the timely dissemination of these data to people who can take effective prevention and control activities. The core of any surveillance system involves the collection, analysis, dissemination of data and taking of action (response).

For the assessment of Epidemic prone diseases in Oyo state, the conceptual framework of surveillance and response systems for Infectious diseases (as shown in Figure 2.6 below) is used. The two important components of the system i.e. public health surveillance & action (core surveillance functions) and the surveillance support function are under focus, and thus the assessment will cover the major dimensions of Epidemic prone disease surveillance.

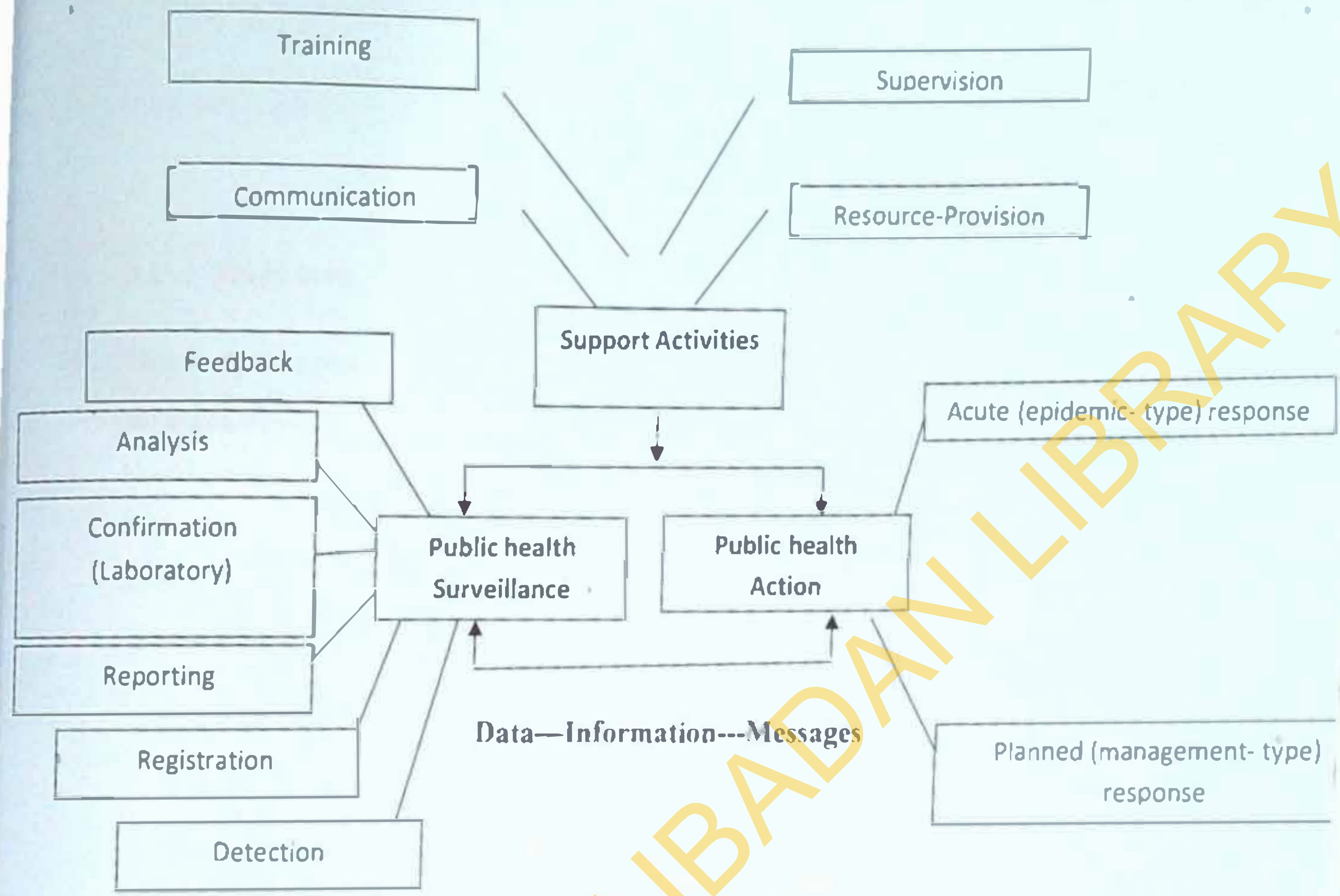

Figure 2.6: Conceptual framework of health surveillance and action (McNabb et. al, 2002)

CHAPTER THREE

METHODOLOGY

3.1 Study area

This study was conducted in Oyo state, located in South-western Nigeria. The state has a landmass of 27, 247 square kilometers and is one of the states in Nigeria. It is bounded by Kwara state in the North, Ogun state in the South, Osun state in the East and the Republic of Benin in the West. (OYI, 2012) Oyo state has a population of approximately 5,580,894 based on the 2006 National population census (NPC, 2006). The state is divided into three senatorial districts and a total of 33 Local government areas for administrative purpose. The state has a total of 12 federal institutions including two teaching hospitals, 54 State owned health institutions, 607 Local government area health institutions as well as numerous private health facilities.

Figure 3.1: Map of Oyo state (www.nigeriamuse.com)

The randomly selected Local governments per senatorial districts for the study were:

Oyo North - Kajola, Ogbomosho south, and Surulere Local Government

Oyo Central - Afijio, Akinyele, and Egbeda Local Government

Oyo South - Ibadan South-East, Ibadan North, and Ibarapa East Local Government

3.2 Study design

The study design is a cross-sectional study.

3.3 Study population

The study population is the epidemic-prone disease surveillance workers in Oyo state at the health facility, local government and state government levels.

3.3.1 Inclusion criteria

All consenting surveillance workers in charge of epidemic-prone disease core surveillance activities at the health facility, local government and state government levels

3.3.2 Exclusion criteria

1. Disease monitoring and evaluation officers
2. Health Management Information System Unit officers

3.4 Sample size determination

The minimum sample size for the study would be derived from the formula;

$$N = \frac{Z_{\alpha}^2 \times pq}{d^2}$$

Where N= minimum estimated sample size

P= 0.858 (proportion of local government health departments that report regularly to the state epidemiology unit) (Dairo et. al, 2010)

q = 0.142 (proportion of local government health departments that don't report regularly to the state epidemiology unit)

d = 0.05 (precision level of 5%)

Z = 1.96 (standard normal deviation at 95% confidence interval)

$$N = \frac{1.96^2 \times 0.858 \times 0.142}{0.05^2} = 188 \text{ surveillance units}$$

Adding a non response rate of 5%, the minimum sample size estimated will be approximately 198 surveillance units.

3.5 Sampling technique

A multi-stage sampling technique was used.

Stage 1:

From the sample frame of Local governments in each of the three senatorial districts in Oyo state, three local government areas were randomly sampled by balloting from each senatorial district.

Stage 2:

From each local government area sampled, 7 wards were randomly selected.

Stage 3:

From each ward, 3 health facilities were randomly selected.

Stage 4

From each health facility, the surveillance focal officer was selected for the study.

3.6 Study variables

Dependent variables assessed are:

1) Short term reporting compliance (6 months)
2) Mid-term reporting compliance (1 year)

Independent variables assessed are:

1) Socio-demographic factors (gender, occupation, length of service, religion, marital status)
2) Knowledge of surveillance dataflow
3) Surveillance support functions (reporting forms, training, supervision, feedback, logistic resources and funding)

3.7 Variable definition/Indicators

1) Reporting compliance:

For determining the predictors for monthly disease reporting compliance, the levels of compliance assessed in this study are the short term and mid-term reporting compliance. However, there are three levels of compliance which are:

a) **Short term reporting compliance** – This refers to the regular and consistent reporting of monthly surveillance data for a period of 6 months without missing any by a surveillance unit. Therefore, only those that reported regularly for the period of 6 months where regarded as short term "Compliant" while surveillance units that reported irregularly (missed at least a monthly report) and surveillance units that don't have a surveillance reporting system at all where both regarded as short term "Non Complaint".

b) **Mid- term reporting compliance** – This refers to the regular and consistent reporting of monthly surveillance data for a period of 1 year without missing any by a surveillance unit. Only those that reported regularly for the period of 1 year where regarded as mid-term "compliant" while surveillance units that reported irregularly (missed at least a monthly report) and surveillance units that don't have a surveillance reporting system at all where both regarded as short term "Non Complaint".

c) **Long term reporting compliance:** This refers to the regular and consistent reporting of monthly surveillance data for a period of over and above 1 year without missing any by a surveillance unit. However, due to the cross sectional nature of this research study, long term reporting compliance cannot be assessed.

Eighty percent performance at all surveillance units was chosen as the standard bench mark for compliance to each surveillance guideline indicators based on the WHO CDC guide for Africa (WHO 1999; Sow et. al 2010; Sahal 2011) i.e. if 80% of surveillance units in a place comply to a particular surveillance guideline, there is said to be an acceptable level of compliance to that particular surveillance guideline in that place (city, state, or region etc)

2) **Surveillance support functions** - Surveillance support functions are those factors that facilitate compliance with the performance of the core surveillance guidelines. The availability of these surveillance support functions at surveillance units assist in ensuring compliance. Surveillance reporting support functions include:

a. **Reporting forms (IDSR 003)**: Availability of IDSR 003 reporting forms at surveillance units (Yes/No);

b. **Training:** Availability of training on disease surveillance for surveillance worker at surveillance units (Yes/No);

c. **Supervision:** Availability of supervisory visits from higher health authorities (Yes/No);

d. **Feedback:** Availability of feedback from higher health authorities to reporting surveillance unit on the outcomes of reports sent (Yes/No);

e. **Logistic resources:** Availability of logistic resources such as offices, motor vehicle and adequacy of stationeries at surveillance units (Yes/No);

f. **Funding:** Adequacy of finance imprest for surveillance activities at surveillance units (Yes/No)

3.8 Data collection instrument

There were two (2) research instruments used in this study. The first is a semi structured questionnaire that is divided into five sessions and was filled by every consenting study participant. The semi-structured questionnaire had five sections was used to collect relevant information on:

Section A: Socio-demographic data

Section B: Knowledge of surveillance workers

Section C: Reporting and feedback system

Section D: Epidemic response system

Section E: Surveillance support functions

The second instrument is a checklist used to record information relating to some of the core surveillance activities such as the utilization of standard case definition, case confirmation by laboratory test, case registration, disease reporting, data analysis, epidemic response and availability of logistic resources. It was used to assess the

compliance to the other surveillance guidelines by reviewing the health facility outpatient register, log books and copies of laboratory reports at health facilities; copies of reported IDSR 002 & 003 forms / evidence of reports (for a year), tables/charts showing analysis of epidemic-prone diseases, minutes of meetings of epidemic preparedness and Rapid response team, and also to ascertain the availability of standard case definition and logistic resources at the surveillance units.

3.9 Validity

Validity of the instrument was ensured through the development of a draft instrument by consulting relevant literatures, adopting questions from relevant questionnaires of researches related to the study with the help of my supervisor and subjecting the draft to independent, peer and expert reviews, particularly expert in public health.

3.10 Reliability

The instruments used to collect data for the study was pre-tested among surveillance units in Ibadan North-West Local government area. The both instruments were used to collect data from 20 (10% of the sample size) eligible surveillance units. Thereafter, the questionnaires were subjected to a measure of internal consistency using the Cronbach's Alpha model technique. The reliability value obtained for the study was 0.719. The reliability coefficient obtained from this analysis was used to ascertain the statistical reliability of the instrument.

3.11 Data collection procedure

Questionnaires were self-administered. The purpose of the study was explained to the respondent at each surveillance unit. The questionnaires were administered to only those who agree to participate. The maximum time allotted for return of questionnaire to the researcher was two days. Checklist was used to review the records and logistic resources at the surveillance units. The telephone contact of each consenting participant was collected (if allowed) so as to monitor and ensure the collection of the questionnaire. The questionnaires and checklists were collated per surveillance units and checked daily to ensure that all segments are appropriately filled.

Timelines and completeness of weekly reports for the state for the year 2014 (January – December) was obtained from the W.H.O Oyo state office.

3.12 Data analysis

Data was entered and analyzed on SPSS (Statistical Package for the Social Sciences) version 20. Descriptive statistics as mean with their standard deviation, frequency and percentage was used to describe the general characteristics of the respondents at the surveillance units. Association between categorical variables was examined using chi-square test (bivariate analysis). Multivariate logistic regression was performed to identify predictors for compliance with the monthly disease reporting guideline. Results of the logistic regression analysis were presented with a 95% confidence interval (CI). A probability level of $p < 0.05$ was accepted as being of statistical significance.

3.13 Ethical consideration

Ethical approval for the study was obtained from the Oyo State Ethical Review Committee.

The confidentiality of the respondents was ensured and protected as there was no request for names and personal addresses. The nature, purpose and processes involved in the study were well explained to the participants with emphasis on confidentiality, privacy and anonymity of information provided. In other to ensure anonymity of responses, code numbers was given to each participant and any form of identification was not included in the questionnaires and checklist. Information gathered from the respondents was stored in the computer package for analysis by the principal investigator and with no access to unauthorized persons.

Written informed consent was obtained from the respondents before administration of the questionnaires and checklist.

CHAPTER FOUR

RESULTS

4.0 Preamble

This chapter contains the results for this study aimed at determining the compliance with epidemic-prone disease surveillance and response guideline among surveillance units in Oyo state. Also, it contains the results for the knowledge of surveillance workers on epidemic-prone disease surveillance; the support functions at the surveillance units and finally shows associational results for the factors affecting disease reporting compliance among surveillance units in Oyo state.

The results from this section are obtained from the responses of 199 respondents (N=199) in this study; with 189 respondents (n=189) from health facilities, 9 Disease Surveillance and Notification officers (n=9) at the Local government level and the State epidemiologist (n=1) at the State government level.

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The results from this section are obtained from the responses of 199 respondents (N=199) in this study; with 189 respondents (n=189) from health facilities, 9 Disease Surveillance and Notification officers (n=9) at the Local government level and the State epidemiologist (n=1) at the State government level.

4.1 Socio demographic characteristics of the study respondents

The respondents were aged between 22 and 66 years with a mean age of 40.15 (SD = ± 10 years). **(Table 4.1)**

There were more females (65.3%) than males (34.7%). A sizeable proportion, (79.9%) of the respondents was married, while one (0.5%) was a widower. Majorities (80.9%) of the respondents were non-doctors. Majority (97%) were Yoruba's while others were either Igbo or Hausa. **(Table 4.1)**

The State epidemiologist is a Medical doctor and has been in service for between 11 – 20 years. He is a married male with MBBS and a postgraduate qualification of Master of Public Health in Community Medicine.

Table 4.1: Sociodemographic characteristics of study respondents at surveillance units

Characteristics	N=199	%
Age		
20-29 years	34	17
30-39 years	69	34.7
40-49 years	46	23.1
50 years and above	50	25.1
Gender		
Males	69	34.7
Females	130	65.3
Level of Education		
Primary	0	0.0
Secondary	7	3.5
Tertiary	192	96.5
No formal education	0	0.0
Education qualification		
Registered Nurse (RN)	69	34.7
CHEW/CHO	42	21.1
B.Sc/HND	39	19.6
MBBS	38	19.1
Others[a]	11	5.5
Occupation		
Nurse	109	54.8
Medical Records officer	41	20.6
Doctor	38	19.1
Others[b]	11	5.5
Length of Service		
1-5 years	26	13.1
6-10 years	55	27.6
11-20 years	55	27.6
21-30 years	63	31.7
Religion		
Christianity	117	59.3
Islam	82	41.2
Ethnicity		
Yoruba	193	97.0
Igbo	4	2.0
Hausa	2	1.0
Marital status		
Married	159	79.9
Single Others	40	20.1
Level of function		
State	1	0.5
Local govt. area	9	4.5
Health facility	189	95

[a] = WASSCE/OND

[b] = DSNO/Laboratory scientist

*Mean age ± SD = 40.15 years ± 10

4.2 Knowledge of the study respondents on Epidemic prone disease surveillance

4.2.1 Pathway of dataflow

The knowledge on the pathway of surveillance data flow was higher among the Disease Surveillance and Notification Officers at the Local government level (100%) than among respondents at the health facility level (52%). **(Table 4.2a)**

4.2.2 Use of IDSR forms

Knowledge on the use of IDSR forms was generally low at the health facility level; with the highest knowledge (49.7%) being on the use of IDSR 003 form and the lowest knowledge (8.5%) being on the use of IDSR 001C form. In contrast, the knowledge on the use of the IDSR forms was high at the Local government level with the lowest knowledge (77.8%) being on the uses of IDSR 001B form. **(Table 4.2a)**

Table 4.2a: Knowledge on surveillance dataflow pathway and use of IDSR forms among surveillance units

VARIABLES	Health facility		Local Government	
	(n=189)	%	(n=9)	%
Surveillance data pathway				
Pathway of data flow	100	52.9	9	100
Use of IDSR forms				
Use of IDSR 001A	36	19.0	9	100
Use of IDSR 001B	22	11.6	7	77.78
Use of IDSR 001C	16	8.5	8	88.89
Use of IDSR 002	51	27.0	9	100
Use of IDSR 003	94	49.7	9	100

4.2.3 Use of Disease surveillance & Notification records

Knowledge on the use of DSN records was generally low at the health facility level; with the highest knowledge (20.10%) of the use of DSN records being on the reporting of diseases to health authorities next to the use of the records for health planning (11.64%) while the least was its use for the monitoring and evaluation of health care system and disease control (6.88%%). Meanwhile at the local government level, the Knowledge on the use of DSN records was generally high and followed the same pattern of knowledge on the uses of the DSN records. **(Table 4.2b)**

Table 4.2b: Knowledge on the use of Disease Surveillance and Notification (DSN) records among surveillance units

VARIABLE	Health facility		Local Government	
	(n=189)	%	(n=9)	%
Uses of DSN Records				
Health planning	22	11.64	6	66.67
For research purpose	11	5.82	-	-
For statistics purpose	16	8.47	4	44.44
Reporting to health authorities	38	20.10	7	77.78
Detect outbreak	20	10.58	5	55.55
Others[a]	13	6.88	5	55.56

[a]=Monitor & evaluate health care system / disease control

4.2.4 List of epidemic-prone diseases

Knowledge on listing the epidemic-prone disease at the health facility level showed that the knowledge of diarrhoea with blood (shigella) and highly pathogenic avian influenza (HPAI) being epidemic-prone disease were lowest (5.8% and 9.5% respectively) and was highest with measles (77.2%). However, at the local government level, the knowledge on listing the seven epidemic-prone diseases was high. **(Table 4.2c)**

4.2.5 Incubation period of Epidemic prone diseases

Generally, the knowledge on the incubation periods of the epidemic-prone disease was poor at both the health facility and local government level even though it was better at the local government level. None of the Disease Surveillance and Notification officers knew the incubation period of highly pathogenic avian influenza. **(Table 4.2c)**

At the state level, the knowledge of the State epidemiologist on epidemic-prone disease surveillance was perfect as he knew all that was asked of him on epidemic-prone disease surveillance.

Table 4.2c: Knowledge on epidemic-prone disease among surveillance units

VARIABLES	Health facility		Local Government	
	(n=189)	%	(n=9)	%
Listing of Epidemic prone disease				
Cholera	116	61.4	9	100
Cerebrospinal Meningitis	100	52.9	9	100
Diarrhoea with blood (Shigella)	11	5.8	7	77.78
Highly Pathogenic Avian Influenza	18	9.5	7	77.78
Measles	146	77.2	9	100
Viral hemorrhagic fevers	103	54.5	9	100
Yellow fever	63	33.3	8	100
Incubation Periods				
Cholera (Few hours – 5 days)	40	21.2	4	44.44
Cerebrospinal Meningitis (2-10 days)	10	5.3	3	33.33
Diarrhoea with blood (1-4 days)	3	1.6	2	22.22
Highly Pathogenic Avian Influenza (2-8 days)	9	4.8	0	0.0.
Measles (7-18 days)	29	15.3	4	44.44
Viral hemorrhagic fevers (3-21 days)	37	19.6	4	44.44
Yellow fever (3-6 days)	15	7.9	3	33.33

4.3 Compliance with epidemic-prone disease surveillance and response guideline among surveillance units

Compliance with the utilization of standard case definition in identifying cases of epidemic-prone diseases at all health facilities is 25.7% while only 2.6% of health facilities analyze epidemic-prone disease data. Meanwhile, only 56 focal health facilities (focal sites) from the randomly selected local governments are designated to report cases of weekly epidemic-prone diseases. **(Table 4.3a)**

At the local government level, the compliance with surveillance data analysis guideline (77.78%) and epidemic preparedness were not up to standard while the reporting compliance was above the 80% WHO/CDC recommended standard. **(Table 4.3b)**

Despite a reporting practice existing in 82.4% of the surveillance units, only 77.4% of all 199 surveillance units were found to report regularly over a period of 6 months and only 65.8% of all surveillance units reported regularly over a period of 1 year. **(Table 4.3c)**

Timeliness and completeness of weekly reports ranged from 81% to 100% for both. The timeliness was 94.44% while the completeness was 94.89%. **(Table 4.3d)**

Table 4.3a: Compliance with epidemic-prone disease surveillance and response guidelines at health facilities

GUIDELINES	Health Facilities (N=189)	%	Standard W.H.O benchmark %
Case Identification			
Utilize Standard case definition	49	25.9	80
Case confirmation			
Utilize laboratory confirmation	162	85.7	80
Case registration			
Register cases	180	95.2	80
Disease Reporting			
Regular monthly report (6 months)	144	76.2	-
Regular monthly report (1 year)	121	64.02	-
Have a reporting practice	154	81.48	80
Analyze EPD[a] data			
Analyze data	5	2.6	80

	Focal Health Facilities[b] (n=56)	%	Standard W.H.O benchmark %
Regular weekly report (6 months)	47	83.9	-
Presence of Zero reporting practice	56	100	80

[a]= Epidemic prone disease

[b]= Only the focal health facilities are expected to report weekly

Table 4.3b: Compliance with Epidemic prone disease surveillance and response guidelines at Local Government health departments

GUIDELINES	Local Government		Standard W.H.O Benchmark
	N=9	%	%
Disease Reporting			
Regular monthly report (6 months)	9	100	-
Regular monthly report (1 year)	9	100	-
Regular weekly report (6 months)	8	88.89	-
Have a reporting practice	9	100	80
Presence of Zero reporting practice	NI[a]	NI	80
Feedback			
Provide feedback	9	100	80
Analyze EPD data			
Analyze data	7	77.78	80
Epidemic preparedness & response			
Presence of EPRR[b] team	9	100	-
Presence of EMC[c]	0	0.0	-
Written EPRR plan	0	0.0	-
Respond to outbreaks (48 hours)	NI	NI	-
Stocks of drugs	0	0.0	-
Stocks of material supplies	9	100	-

[a] =NI – No Information
[b]= Epidemic Preparedness and Rapid Response
[c]= Epidemic Management Committee

Table 4.3c: Summary of compliance with epidemic-prone disease reporting guideline among all surveillance units

GUIDELINES	All Surveillance Units (N=199)	%
Disease Reporting		
Regular monthly report (6 months)	154	77.4
Regular monthly report (1 year)	131	65.8
Have a reporting practice	164	82.4
	Focal surveillance units (n=66)	**%**
Regular weekly report (6 months)	56	84.8

Table 4.3d: Timeliness and completeness of weekly reports reaching the State level per local governments (January – December 2014)

Local Governments	Timeliness (%)	Completeness (%)	Benchmark (For both indices) %
Afijio	100	100	80
Akinyele	100	100	80
Egbeda	94	94	80
Ibadan North	85	87	80
Ibadan South-East	81	81	80
Ibarapa East	100	100	80
Kajola	98	98	80
Ogbomosho South	94	96	80
Surulere	98	98	80
Mean	94.44	94.89	80

4.4 Surveillance support factors at surveillance units

4.4.1 Health facilities

Surveillance support functions such as standard case definition, IDSR forms, training received, supervision visits and feedback received were available at below 50% of the health facilities. However, the adequacy of funding for surveillance activities was reported at one hundred and fourteen (60.3%) health facilities.

Logistic resources such as the availability of office, calculator, telephone, generator and motor vehicle and adequacy of stationery were available to the surveillance workers at the health facilities while computers, printers were predominantly unavailable. **(Table 4.4.1)**

4.4.2 Local government and State Epidemiology unit

At the local government level, all Disease surveillance and Notification Officers reported that they had received training, feedback from the state epidemiology unit, availability of IDSR forms and adequacy of funds/imprest for surveillance activities. However, only two of the Disease surveillance and Notification Officers had received supervisory visits this year.

Logistic resources such as offices, calculators, telephones were available to all Disease surveillance and Notification Officers, meanwhile printers were not available to any of the Disease surveillance and Notification Officers. Meanwhile, all surveillance support functions were reported by the State epidemiologist be available to him **(Table 4.4.2)**

Table 4.4.1: Surveillance support functions available to the surveillance worker at health facilities

SUPPORT FUNCTIONS	Available	Inadequate	Not Available
Standard case definition	52 (27.5%)	-	137 (72.5%)
Training	88 (46.6%)	-	101 (53.4%)
Supervision visit	74 (37.2%)	-	125 (62.8%)
Feedback	81 (42.9%)	-	108 (57.1%)
IDSR Form (003)	59 (31.2%).	-	130 (68.8%)
Logistic resource			
Office	160 (84.66%)	-	29 (15.34%)
Computer	75 (39.7%)	-	114 (60.3%)
Printer	40 (21.2%)	-	149 (78.8%)
Stationery	161(85.2%)	25 (13.2%)	3 (1.6%)
Calculator	166 (87.8%)	-	23 (12.2%)
Motor car	109 (66.7%)	-	80 (33.3%)
Telephone	185 (97.9%)	-	4 (2.1%)
Generator	160 (84.7%)	-	29 (15.3%)
Funding	114 (60.3%)	37 (19.6%)	38 (20.10%)

Table 4.4.2: Surveillance support functions available to DSN Officers at Local government health departments

SUPPORT FUNCTIONS	Available	Inadequate	Not Available
Training	9 (100%)	-	-
Supervision visits	2 (22.22%)	-	7 (77.78%)
Feedback	9 (100%)	-	-
IDSR Forms	9 (100%)	-	-
Logistic resource			
Office	9 (100%)	-	-
Computer	6 (66.67%)	-	3 (33.33%)
Printer	0 (0%)	-	9 (100%)
Stationery	6 (66.67%)	3 (33.33%)	-
Calculator	9 (100)	-	-
Statistical package	6 (66.67%)	-	3 (33.33%)
Motor car	6 (100%)	-	3 (33.33%)
Telephone	9 (100%)	-	-
Generator	8 (88.89%)	-	1 (11.11%)
Funding	9 (1000%)	-	-

*At the State Epidemiology unit, all the surveillance support factors were available.

4.5 Factors associated with 6 months reporting compliance at surveillance units

Bivariate analysis was performed with "regular monthly reporting compliance for 6 months" as the dependent variable. The results are presented in **Table 4.5** below.

The statistically significant factors associated with monthly reporting compliance for a period of 6 months include marital status, length of service of the respondents, and knowledge on surveillance data flow. Other statistically significant factors were the availability of IDSR 003 reporting forms; training on disease surveillance; supervision, feedback and the availability of logistic resources such as motor vehicles, adequacy of stationeries and funding. **(Table 4.5)**

Factors that led to a higher compliance rate were availability of training (97.1%), supervision (91.5%), feedback (90.1%), funding (94.48%) and knowledge on surveillance dataflow (86.4%). Respondents with 21-30 years of service had the highest compliance rate (93.7%). Respondents that were married were more compliant (81.8%) than unmarried respondents (60%). **(Table 4.5)**

Table 4.5: Factors affecting 6 months reporting compliance at surveillance units

FACTORS	Reporting Compliant N= 154 (77.4%)	Reporting Non- Complaint N= 45 (22.6%)	X^2	P.value
SOCIO-DEMOGRAPHICS				
Gender				
Males	55 (79.7%)	14 (20.3%)	0.326	0.568
Females	99 (76.2%)	31 (23.8%)		
Religion				
Christianity	92 (78.6%)	25 (21.4%)	0.252	0.6116
Islam	62 (75.6%)	20 (24.4%)		
Marital status				
Married	130 (81.8%)	29 (18.2%)	8.642	0.003
Other[a]	24 (60%)	16 (40%)		
Occupational status				
Doctors	25 (65.8%)	13 (34.2%)	3.610	0.057
Non-doctors	129 (80.1%)	32 (19.9%)		
Length of Service				
1-10 years	49 (60.5%)	32 (39.5%)	23.959	<0.001
11-20 years	46 (83.6%)	9 (16.4%)		
21-30 years	59 (93.7%)	4 (6.3%)		
KNOWLEDGE ON SURVEILLANCE				
Knowledge on data flow				
Yes	95 (86.4%)	15 (13.6%)	11.326	0.001
No	59 (66.3%)	30 (33.7%)		
SUPPORT FUNCTIONS				
Reporting forms				
Available	67 (97.1%)	2 (2.9%)	23.459	<0.001
Not available	87 (66.9%)	43(33.1%)		
Training				
Available	94 (95.9%)	4 (4.1%)	37.892	<0.001
Not available	60 (59.4%)	41 (40.6%)		

Table 4.5 (Cont'd): Factors affecting 6 months reporting compliance at surveillance units

Supervision				
Available	65 (91.5%)	6 (8.5%)	12.652	<0.001
Not available	89 (69.5%)	39 (30.5%)		
Feedback				
Available	82 (90.1%)	9 (9.9%)	15.51	<0.001
Not available	72 (66.7%)	36 (33.3%)		
Motor vehicle				
Available	96 (82.8%)	20 (17.2%)	4.586	0.032
Not available	58 (69.9%)	25 (30.1%)		
Stationery				
Adequate	135 (80.4%)	33 (19.6%)	5.437	0.020
Inadequate	19 (61.3%)	12 (38.7%)		
Funding				
Adequate	117 (94.48%)	7 (5.6%)	54.131	<0.001
Inadequate	37 (49.3%)	38 (50.7%)		

[a]=single/widower

4.6 Factors affecting 1 year reporting compliance at surveillance units

Bivariate analysis was performed with "regular monthly reporting compliance for 1 year" as the dependent variable. The results are presented in **Table 4.6** below.

The statistically significant factors associated with monthly reporting compliance for a period of 1 year include occupational status, length of service, and knowledge on surveillance dataflow. Other statistically significant factors were the availability of IDSR 003 reporting forms, training on disease surveillance, supervision, feedback and the adequacy of funding. **(Table 4.6)**

Factors leading to a higher compliance rate over a year include the availability of training (90.8%), supervision (84.5%), feedback (80.2%), adequacy of funding (81.5%) and knowledge on surveillance dataflow (86.4%). Respondents with 21-30 years of service had the highest compliance rate (82.5%). Non-doctors were more compliant (70.8%) than doctors (44.7%). **(Table 4.6)**

4.6 Factors affecting 1 year reporting compliance at surveillance units

Bivariate analysis was performed with "regular monthly reporting compliance for 1 year" as the dependent variable. The results are presented in **Table 4.6** below.

The statistically significant factors associated with monthly reporting compliance for a period of 1 year include occupational status, length of service, and knowledge on surveillance dataflow. Other statistically significant factors were the availability of IDSR 003 reporting forms, training on disease surveillance, supervision, feedback and the adequacy of funding. **(Table 4.6)**

Factors leading to a higher compliance rate over a year include the availability of training (90.8%), supervision (84.5%), feedback (80.2%), adequacy of funding (81.5%) and knowledge on surveillance dataflow (86.4%). Respondents with 21-30 years of service had the highest compliance rate (82.5%). Non-doctors were more compliant (70.8%) than doctors (44.7%). **(Table 4.6)**

Table 4.6: Factors affecting 1 year reporting compliance at surveillance units

FACTORS	Reporting Compliant N= 131 (65.8%)	Reporting Non- Complaint N= 68 (34.2%)	X^2	P value
SOCIO-DEMOGRAPHICS				
Gender				
Males	43 (62.3%)	26 (37.7%)	0.579	0.447
Females	88 (67.7%)	42 (32.3%)		
Religion				
Christianity	81 (69.2%)	36 (30.8%)	1.461	0.227
Islam	50 (61.0%)	32 (39.0%)		
Marital status				
Married	109 (68.6%)	50 (31.4%)	2.610	0.106
Other[a]	22 (55.0%)	18 (45.0%)		
Occupational status				
Doctor	17 (44.7%)	21 (55.3%)	9.289	0.002
Non-doctors	114 (70.8%)	47 (29.2%)		
Length of Service				
1-10 years	39 (48.1%)	42 (51.9%)	20.241	<0.001
11-20 years	40 (72.2%)	15 (27.3%)		
21-30 years	52 (82.5%)	11 (17.5%)		
KNOWLEDGE ON SURVEILLANCE				
Knowledge on data flow				
Yes	83 (75.5%)	27 (24.5%)	10.130	0.001
No	48 (53.9%)	41(46.1%)		
SUPPORT FUNCTIONS				
Reporting form (IDSR 003)				
Available	64 (92.8%)	5 (7.2%)	34.039	<0.001
Not available	67 (51.5%)	63 (48.5%)		
Training				
Available	89 (90.8%)	9 (9.2%)	53.594	<0.001
Not available	42 (41.6%)	59 (58.4%)		

Table 4.6 (Cont'd): Factors affecting 1 year reporting compliance at surveillance units

Supervision				
Available	60 (84.5%)	11 (15.5%)	17.119	<0.001
Not available	71 (55.5%)	57 (44.5%)		
Feedback				
Available	73 (80.2%)	18 (19.8%)	15.437	<0.001
Not available	58 (53.7%)	50 (46.3%)		
Motor vehicle				
Available	82 (70.7%)	34 (29.3%)	2.921	0.087
Not available	49 (59.0%)	34 (41%)		
Stationery				
Adequate	112 (66.7%)	56 (33.3%)	0.336	0.562
Inadequate	19 (61.3%)	12 (38.7%)		
Funding				
Adequate	101 (81.5%)	23 (18.5%)	35.698	<0.001
Inadequate	30 (40.0%)	45 (60.0%)		

[a]=single/widower

4.7 Predictors for 6 months reporting compliance at surveillance units

The statistically significant variables in the bivariate analysis were further analyzed using the multiple logistic regression model. The result of the multivariate analysis for 6 months compliance is presented in **Table 4.7** below.

Multivariate analysis shows that the predictors for compliance with monthly reporting guideline for 6 months were training of surveillance workers on disease surveillance (OR=7.917; CI=1.653–37.919), knowledge on surveillance data flow pathway among surveillance workers (OR=4.804; CI=1.636–14.104), adequacy of funds (OR=27.805; CI=7.683–100.6) and 21-30 years of service (OR=6.412; CI=1.357–30.309). **(Table 4.7)**

Table 4.7: Predictors for 6 months reporting compliance at surveillance units

Variable	Categories	OR	95% C.I	p-value
Marital status	Married (Ref)	1		
	Others[a]	0.529	0.101 – 2.774	0.452
Length of service	1-10 years (Ref)	1		
	11-20 years	1.185	0.333 –4.223	0.793
	21-30 years	6.412	1.357 – 30.309	0.019
Pathway knowledge	No (Ref)	1		
	Yes	4.804	1.636 – 14.104	0.004
Reporting form (IDSR 003)	Not available (Ref)	1		
	Available	0.826	0.118 – 5.799	0.847
Received Training	No (Ref)	1		
(on disease surveillance)	Yes	7.917	1.653 – 37.919	0.010
Receive Supervision from	No (Ref)	1		
(higher health authorities)	Yes	0.667	0.161 – 2.768	0.577
Receive Feedback from	No (Ref)	1		
(higher health authorities)	Yes	1.357	0.381 – 4.825	0.637
Motor vehicle	Not available (Ref)	1		
	Available	1.119	0.386 – 3.245	0.836
Stationery	Inadequate (Ref)	1		
	Adequate	5.325	0.952 – 29.777	0.057
Funds	Inadequate (Ref)	1		
	Adequate	27.805	7.683 – 100.6	<0.001

[a]=Single/Widower

4.8 Predictors for 1 year reporting compliance at surveillance units

The statistically significant variables in the bivariate analysis were further analyzed using the multiple logistic regression model. The result of the multivariate analysis for 12 months compliance is presented in **Table 4.8** below.

Multivariate analysis shows that the predictors for 1 year reporting compliance were training (OR=5.668; CI=2.040–15.753) and adequacy of funds (OR=3.932; CI=1.820 – 8.497).

(Table 4.8)

Table 4.8: Predictors for 1 year reporting compliance at surveillance units

Variable	Categories	OR	95% C.I	p-value
Occupation	Non Doctors (Ref)	1		
	Doctors	0.454	0.169 – 1.218	0.117
Length of service	1-10 years (Ref)	1		
	11-20 years	1.836	0.673 – 5.010	0.235
	21-30 years	2.521	0.883 – 7.198	0.084
Pathway knowledge	No (Ref)	1		
	Yes	2.004	0.938 – 4.283	0.073
Reporting form (IDSR 003)	Not available (Ref)	1		
	Available	1.731	0.482 – 6.210	0.400
Received Training on (Disease surveillance)	No (Ref)	1		
	Yes	5.668	2.040 – 15.753	0.001
Receive Supervision from (higher health authorities)	No (Ref)	1		
	Yes	1.116	0.394 – 3.116	0.836
Receive Feedback (higher health authorities)	No (Ref)	1		
	Yes	0.860	0.338 – 2.186	0.751
Funds	Inadequate (Ref)	1		
	Adequate	3.932	1.820 – 8.497	<0.001

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

In this study, compliance with the EPD surveillance and response guidelines was higher at the State and Local government level than at health facilities. This was similar to what was obtainable in other Nigerian states and countries in the WHO African region.

5.1.1 Knowledge of surveillance workers on EPD Surveillance

The knowledge on the surveillance of EPD was higher among the Disease Surveillance and Notification Officers and State epidemiologist than the surveillance workers at the health facilities. This distinction is probably explained by the training they had received as all the Disease Surveillance and Notification Officers and the State epidemiologist have been trained on disease surveillance. This is similar to what was reported by Dairo et. al, 2010 on the relationship between the knowledge of Disease Surveillance and Notification Officers and training. Another key explanation of this variance in knowledge is the experience the DSNOs and State epidemiologist have had as regards carrying out their daily duties as surveillance officers in their respective health authority cover.

The knowledge on data flow pathway among surveillance workers at the health facilities in this study was 52% which was far lower than the 100% among the Disease Surveillance and Notification Officers (DSN officers) at the Local government level. The knowledge among DSN officers was similar to what Dairo et. al, (2010) had reported. Dairo et. al, (2010) had stated that 97.6% of Disease Surveillance and Notification Officers could correctly describe the pathway of information for surveillance from the peripheral health facility to the State Ministry of Health. Knowledge on the use of the IDSR forms 001, 002 and 003 was poor among the surveillance workers at health facilities as that reported by Nnebue et. al, (2012) where only 33.3, 31.1, and 33.7% of health care workers knew the uses of the IDSR forms.

5.1.2 Case identification, confirmation and registration

Compliance with epidemic-prone disease surveillance guideline on the utilization of standard case definition to identify cases of EPD (25.0%) was found out to be far lower

than what was reported in Kaduna state by Abubakar et. al (2013) whereby 62% of health facilities had standard case definition for at least one of the priority diseases. It was also lower than the 2009 assessment report of IDSR in Nigeria where only 32% of health facilities had case definitions for any of the priority diseases (FMOH, 2009). This is as a result of the difference methodology and scope of study as both studies probably assessed the presence of posters containing the standard case definition of any of the 22 priority diseases in Nigeria and not the presence and utilization of the WHO AFRO standard case definition adopted in Nigeria. However, the 25.9% finding from this study was higher than what was reported by a study in Tanzania by Mghamba, *et al.* (2004) which revealed that standard case definitions were insufficient in the health facilities, the reports of Gueye et. al, (2005) in Tanzania, and the assessment report of surveillance in Nigeria in 2001 where no health facility had any case definition for any of the priority diseases (FMOH, 2001). The reason for the low availability of the WHO AFRO standard case definition in health facilities in Oyo state is probably due to the fact that the standard case definitions were not distributed to all the health facilities and probably a lack of care of the standard case definitions among health facilities given.

The compliance with the utilization of laboratory test report for confirming cases of EPD was found to 85.7% which is lower than what Sahal (2011) had reported which stated that almost all health facilities in Khartoum state of Sudan had a functioning laboratory. Compliance with the registration of cases in clinic registers in this study was similar to the findings of Sow et. al, (2010) which revealed that clinical registers were available in more than 95% of health facilities surveyed in Cape Verde and report by CDC (2000) which revealed that 92% of health facilities in Uganda had clinic registers. Also, it was slightly below the report by Sahal (2011), which revealed that all health facilities in Khartoum state in Sudan registered cases in clinic registers. These similarities are probably due to the fact that case confirmation and registration are routine practices in most health facilities.

Therefore, the availability and utilization of standard case definition at health facilities in Oyo state poor as its far below the WHO and CDC benchmark of 80% meanwhile case confirmation and case registration are above the 80% benchmark and thus deemed good

5.1.3 Disease reporting and feedback

Although a disease reporting practice is available in 81.5% of health facilities, only 76.2% complied regularly with the monthly reporting guideline over a period of 6 months and 64.02% over a period of one year. The 81.5% availability of a reporting practice among health facilities is higher than the 57% reported in Kaduna state by Abubakar et. al, (2013) and the 70.9% reported by Bawa et. al. (2003) in Yobe state. Meanwhile at the local government level, all the Disease Surveillance and Notification Officers had a reporting system available and complied regularly with the monthly reporting for the complete year which was similar with the report of Abubakar et. al. (2013) which showed that all the Disease Surveillance and Notification Officers reported regularly to Kaduna state. Regular weekly reporting of EPD among the focal health facilities was also sound while that of the Disease Surveillance and Notification Officers was 88.89% which was similar to the 85.8% regular weekly reporting in both Ekiti and Osun state that Dairo et. al (2010) had reported

The weekly reporting completeness of 95% in this study is similar to the findings of Sow et. al, (2010) who had reported that the mean proportion of districts in Africa with evidence of completeness in data reporting was 92% and the report by UGMOH et. al. (2004) that reported that the proportion of districts in Uganda with completeness in reporting was 95%.

The weekly reporting timelines of 94.5% in this study is higher than the findings of Sow et. al, 2010 who had reported that the mean proportion of districts in Africa with evidence of timeliness in data reporting was 85%; far higher than the 47% timeliness among districts in Tanzania reported by Gueye et. al. (2005). It was similar to the report by UGMOH et. al. (2004) that showed that the proportion of districts in Uganda with completeness in reporting was 95%. The high timelines and completeness revealed in this study is due to the fact that weekly reporting among the focal surveillance units is funded by the W.H.O office in Oyo state and thus all focal records officers and DSNOs are motivated to comply with reporting timeliness and completeness

Feedback of 42.9% from the local government to health facilities was higher than the 21.8% Bawa et. al, (2003) had reported in Yobe State. Meanwhile there was evidence of

feedback from the State epidemiology unit to all the Disease Surveillance and Notification Officers which differed from the findings in Kaduna state by Abubakar et. al, (2013) where there was no feedback from the Kaduna state epidemiology unit to the Disease Surveillance and Notification Officers at the Local Governments. It also differed from the findings in Mozambique and Tanzania where only 13% of LGAs received feedback from the state (GM and WHO, 2006; Rumisha et. al, 2004).

In summary, the reporting compliance at the health facilities level in Oyo state is adequate as it slightly exceeds the WHO/CDC benchmark of 80%. Meanwhile the reporting compliance at the Local government level which is very good as it is far above the 80% benchmark. Timeliness and completeness in Oyo state is also deemed good.

5.1.4 Surveillance data analysis

The compliance among the health facilities with the surveillance data analysis guideline in this study is found to be very low (2.6%) for any of the epidemic-prone diseases and 23.1% for at least only malaria which is similar to the findings of Abubakar et. al, (2013) which had reported that only 19% of health facilities in Kaduna state had any form of data analysis available and was higher than the 10% and 17% reported in Uganda and Nigeria respectively, (FMOH, 2001; CDC, 2000) but lower than the 32% reported by Mghamba in Tanzania, (Mghamba, *et al.* 2004). However, the 23.1% compliance for any type of trend analysis in this study is lower than the reports of Gueye et. al. (2005) which showed that 33% of health facilities in Tanzania reported doing data analysis for any of the priority diseases, and 28 percent did analysis for malaria. The analysis of surveillance data is very poor as a result of the fact that health facilities felt they didn't see the need for analyzing surveillance data meanwhile some others claimed that data analysis of surveillance data was for the local government to do. Meanwhile, at the local government level, only 77.78% of the Disease surveillance and Notification officers did data analysis (trend or tables) for epidemic-prone diseases, thus evidencing that the compliance to surveillance data analysis guideline at the local government is below the 80% WHO/CDC standard.

5.1.5 Epidemic preparedness and response

Findings from this study showed that gaps existed in the compliance with epidemic preparedness and response guideline in Oyo state based on selected criteria from the

National Technical Guidelines for IDSR. The situation among the Local governments in Oyo state is similar to the finding by Abubakar et. al, (2010) who had reported that the response system in a local government in Kaduna state was poor as less than half of the criteria were met thereby reflecting the need that the local governments should fully adopt the National Technical Guidelines on IDSR to be better positioned to prepare for and identify outbreaks. Among all the local governments in this study, there were no prepositioned stock of drugs and vaccines available which was similar to findings by Abubakar et. al (2010). However, all the local governments had stocks of supplies for outbreak response such as sample bottles, needles and syringes. Also, funding was available for emergency response which was also similar to findings by Abubakar et. al (2010). This study showed there was an Epidemic preparedness and Rapid response (EPRR) team in all the local governments which was also a similar to findings by Abubakar et. al (2010). However, the local governments lacked an Epidemic management committee which was differed with what Abubakar et. al (2010) had reported in a local government in Kaduna state. All the IDSR criteria on epidemic preparedness and response where met by the State epidemiology unit. Thus, this study evidences the need for improvement in the epidemic preparedness and response at the local government level so as ensure adequate response in the control of epidemics.

5.1.6 Surveillance support functions

This study reveals that 72.5% of health facilities lacked copies of the standard case definition for notifiable diseases which is in similar to the report of the 2009 assessment of IDSR in Nigeria by FMOH. (2009) where 68% of health facilities did not have case definitions for any of the priority diseases. This also was higher than the situation in India where Phalkey et. al, 2013 had reported stating that standard case definitions were rarely used as surveillance manual and the findings of Mghamba, *et al.* (2004) in Tanzania which found case definitions to be insufficient in the health facilities. However, this is in contrast to the findings of Nnebuc et. al (2012) which reported that only 37% of health facilities did not have copies of the standard case definitions for notifiable diseases in Anambra state. Only 31.2% of health facilities had IDSR 003 form which was lower than the 43.9% which Nnebue et. al, (2013) had reported. Meanwhile at the local governments, all the local governments had IDSR forms which are in contrast to the

report of Dairo et. al, (2010) that showed that standardized and designated surveillance forms were available and adequate in only 20 (47.8%) of the local government area surveillance units in Osun and Ekiti state.

Training on disease surveillance in Oyo state was reported by 46.6% of surveillance workers at heath facilities which is in contrast to the report by Nnebue et. al, (2012) that had shown that there were no training in disease surveillance for the health workers in Anambra state while at the local government level, all the DSNO's had been trained on disease surveillance which was higher than what Dairo et. al, (2010) had revealed that 76% of the DSNO from Osun and Ekiti states had received further training on disease surveillance from W.H.O.

In assessing the logistic resources at surveillance units, results showed that the proportion of surveillance workers at health facilities that had computers and printers available to them were low while a sizeable proportion of them had a means of transportation (motor vehicle), calculators, telephones and generators. This is similar with the report of Abubakar et. al, (2013) which revealed that about 29% of health facilities had computers and printers while 71% had standby generators. 62% had calculators available for data management. At the local government level, all had adequate funding and a sizeable proportion of the logistic resources except for printers which is in contrast to what Dairo et. al, (2010) had reported of the local government areas in Osun and Ekiti state where there was low availability of logistic resources and funds were inadequate.

5.1.7 Predictors for compliance with reporting guideline

This study reveals that the knowledge on the pathway of surveillance data flow among surveillance workers is was a predictor for compliance with the EPD reporting guideline over a period of six months. This finding backs what Dairo et. al. (2010) had reported which stated that the knowledge of the pathway of disease notification directs surveillance workers and indirectly predicts the level of awareness of their duty and the report of Sow et. al, (2010) who had also stated that district health personnel knowledge about both the national priority diseases was essential for timely detection of priority reporting.

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Despite the adequacy of funds in slightly more than half of the surveillance units, the adequacy of funds was statistically significantly in ensuring compliance with EPD reporting guideline over a period of 6 months and 1 year. This backs the report of Dairo et. al (2010) which showed that adequate funding was a statistically significant factor associated with the reporting of outbreaks in the local government areas of Osun and Ekiti state.

This study also revealed that training of surveillance workers was a predictor for compliance with EPD reporting guideline over a period of 6 months and 1 year. This backs the report of Bawa and Olumide, (2005) that showed that training positively impacts the disease notification habits of health personnel.

Another statistically significant predictor for compliance with EPD reporting guideline was the length of service of the surveillance workers which showed that surveillance workers who had 21-30 years of service were more likely to comply over a period of 6 months than all other surveillance workers with lower length of service. This is probably due to the fact that these workers might have been exposed to training on disease surveillance during their long length of service.

The results of this study has further re-emphasized the importance of having training on disease surveillance, adequacy of funds for surveillance activities and the knowledge on the surveillance data flow pathway among the surveillance workers on compliance to disease reporting guideline.

5.2 Conclusion

Compliance with the core surveillance activities is functioning well at the state level; however, it has defects at the lower surveillance units (Local government health departments and health facilities) as gaps exist in the surveillance systems at these levels. These gaps in the performance of the core surveillance activities include the utilization of standard case definition in identifying cases of EPD, analysis of EPD surveillance data at health facilities as well as epidemic preparedness and response at the local government. Also, the Oyo state surveillance system lacked adequate surveillance support for the health facilities.

Thus, the existing EPD surveillance system in Oyo state needs to be strengthened at the Local government and health facility levels so it can function to its best capacity to achieve the aims of effective disease prevention and control.

5.3 Recommendation

Considering the results from this study, the following recommendations are hereby made:

1) The state government should ensure that more surveillance workers at the health facility level are trained.
2) The State government should supply the health facilities in Oyo state with the WHO AFRO standard case definition guideline so that the identification of cases of diseases is facilitated; and also the IDSR forms so as ensure an end to the practice of some health facilities photocopying IDSR forms whenever they wanted to report or using plane sheets of paper to report surveillance data.
3) The State government should put lots of efforts in making policies to ensure that health facilities analyze their surveillance data so as to facilitate quick detection of outbreaks.
4) Finally, it is needful for the government to always ensure the adequate provision of the fund and logistic resources for surveillance workers so to motivate and enhance the effectiveness of the surveillance workers.

5.4 Study limitations

1. Causation of compliance/non compliance could not be ascertained due to the cross sectional nature of the study.
2. Evidence of response to epidemics within 48 hours could not be ascertained as a result of the lack of supply of evidence of epidemic reports

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APPENDIX

QUESTIONNAIRE (HEATH FACILITIES)

COMPLIANCE WITH EPIDEMIC PRONE DISEASE SURVEILLANCE AND RESPONSE AMONG EPIDEMIOLOGICAL UNITS IN SELECTED LOCAL GOVERMINENT AREAS OF OYO STATE

Dear Respondent,

My name is **AFOLAYAN OLA DANIEL**, am currently a postgraduate student of Epidemiology and Medical Statistics of Faculty of Public Health, College of Medicine, University of Ibadan. I'm currently undertaking a study to investigate the "Compliance with Epidemic-Prone Disease Surveillance and Response guideline among Epidemiological units in selected Local Government Areas of Oyo state". The research is primarily in partial fulfillment for the award of the degree of Masters in Public Health in Epidemiology and Medical Statistics of the University of Ibadan.

Your sincere response is encouraged as participation in this study is voluntary, absolute anonymity and confidentiality shall be maintained and the information provided will only be used for the research purpose.

If you have accepted to paticipate in the study, please indicate your interest by signing.

Thanks

Respondent's Signature..... Serial Number .....

SECTION A: SOCIO-DEMOGRAPHIC DATA.

Note: Please tick as appropriate [√] or fill in the appropriate boxes

1. **Age in years (at last birthday)** .....
2. **Gender:** 1). Male [ ] 2). Female [ ]
3. **Level of education** 1). Primary Education [ ] 2). Secondary Education [ ]
   3). Tertiary Education [ ] 4). No Formal Education [ ]

4. **Education qualification:** 1). Registered Nurse [ ] 2). CHEW/CHO [ ]
3). HND/B.Sc [ ] 4). MBBS [ ] 5). M.Sc [ ] 5). Ph.D [ ]

5. **Length of service** 1). 1-5 years [ ] 2). 6-10 years [ ] 3). 11-20 years [ ] 4. 21-30 years [ ]

6. **Religion:** 1). Christianity [ ] 2). Islam [ ] 3). Traditional [ ] 4). Others (specify).....

7. **Ethnic Group:** 1). Yoruba [ ] 2). Igbo [ ] 3). Hausa [ ] 4). Others (specify) .....

8. **Marital status:** 1). Single [ ] 2). Married [ ] 3). Others (specify) .....

SECTION B: KNOWLEDGE ON EPIDEMIC PRONE DISEASE SURVEILLANCE

Note: Please indicate your responses to the following questions

9. Please describe the **pathway of surveillance data flow** for Epidemic prone disease? (Starting from health facilities)

.....

Note: Please fill in the uses of the following Integrated Disease Surveillance Response (IDSR) forms.

	FORMS	*USES*
10	IDSR form 001A	
11	IDSR form 001B	
12	IDSR form 001C	
13	IDSR form 002	
14	IDSR form 003	

15. Please list 4 uses of Disease Surveillance and Notification (DSN) records?

	USES
a.	
b.	
c.	

d.	

16. Please **name** the seven (7) epidemic-prone diseases in Nigeria as stated by the IDSR?

a) ..... b)..... .....

c) ..... d)..... .....

e) ..... f)..... .....

g) .....

17. Please name the **incubation periods** of the seven (7) epidemicprone diseases in Nigeria as stated by the IDSR?

a) ..... b)..... .....

c) ..... d)..... .....

d) ..... e)..... .....

g) .....

SECTION C: EPIDEMIC PRONE DISEASE REPORTING & FEEDBACK

18. Who prepares the surveillance reports to Local govt.? (Position) .....

19. Do you receive surveillance **feedback** from the Local govt.? 1. Yes [ ] 2. No [ ]

20. How many feedback reports have you received this year? .....

21. If yes, how often do you receive feedbacks? 1. Always [ ] 2. Sometimes [ ]

22. Do you distribute copies of surveillance feedback to staffs in your health facility?

1. Yes [ ] 2. No [ ]

SECTION D: SURVEILLANCE SUPPORT FACTORS

Note: Please indicate your responses to the following questions.

23. Do you have supervision visits from higher health authorities this year? 1. Yes [ ] 2.No [ ]

24. If yes, how often do receive visits? 1. Always [ ] 2. Sometimes [ ]

25. Have you been trained in disease surveillance & response? 1. Yes [ ] 2. No [ ]

26. If yes, specify when, where, by whom and how long .....

.....

.....

27. Have you lacked IDSR forms at any time during the year? 1. Yes [ ] 2. No [ ]

28. Is there funding for disease surveillance at your health facility? 1. Yes [ ] 2. No [ ]

29. What is the imprest for disease surveillance? .....

30. Is the funding adequate? 1. Yes [ ] 2. No [ ]

31. Please, which of the following do you experience shortage of?

	Resource	Do you experience shortages (Yes/No)
a.	Office	
b.	Computer	
c.	Printer	
d.	Statistical Package (Excel/SPSS/Epi info)	
e.	Stationery	
f.	Calculator	
g.	Telephone	
h.	Motor vehicle	
I	Generator	

THANK YOU

QUESTIONAIRES (STATE AND LGA LEVELS)

COMPLIANCE WITH EPIDEMIC PRONE DISEASE SURVEILLANCE AND RESPONSE AMONG EPIDEMIOLOGICAL UNITS IN SELECTED LOCAL GOVERMINENT AREAS OF OYO STATE

Dear Respondent,

My name is **AFOLAYAN OLA DANIEL**, am currently a postgraduate student of Epidemiology and Medical Statistics of Faculty of Public Health, College of Medicine, University of Ibadan. I'm currently undertaking a study titled "Compliance with Epidemic-Prone Disease Surveillance and Response guideline among Epidemiological units in selected Local Government Areas of Oyo state". The research is primarily in partial fulfillment for the award of the degree of Masters in Public Health in Epidemiology and Medical Statistics of the University of Ibadan.

Your sincere response is encouraged as participation in this study is voluntary, absolute anonymity and confidentiality shall be maintained and the information provided will only be used for the research purpose.

If you have accepted to participate in the study, please indicate your interest by signing.

Thanks

Respondent's Signature..... Serial Number .....

SECTION A: SOCIO-DEMOGRAPHIC DATA.

Note: Please tick as appropriate [√] or fill in the appropriate boxes

1. **Age in years** (at last birthday) .....
2. **Gender:** 1). Male [ ] 2). Female [ ]
3. **Level of education** 1). Primary Education [ ] 2). Secondary Education [ ]
   3). Tertiary Education [ ] 4). No Formal Education [ ]
4. **Education qualification:** 1). Registered Nurse [ ] 2). CHEW/CHO [ ] 3). HND/B.Sc [ ]
   4). MBBS [ ] 5). M.Sc [ ] 5). PhD [ ]
5. **Length of service** 1). 1-5 years [ ] 2). 6-10 years [ ] 3). 11-20 years [ ] 4. 21-30 years [ ]
6. **Religion** 1). Christianity [ ] 2). Islam [ ] 3). Traditional [ ] 4). Others (specify).....
7. **Ethnic Group** 1). Yoruba [ ] 2). Igbo [ ] 3). Hausa [ ] 4). Others (specify) .....
8. **Marital status:** 1). Single [ ] 2). Married [ ] 3). Others (specify) .....

SECTION B: KNOWLEDGE ON EPIDEMIC PRONE DISEASE SURVEILLANCE

9. Please describe the **pathway of surveillance data flow** for Epidemic prone disease? (Starting from health facilities)

.....

Note: Please fill in the uses of the following Integrated Disease Surveillance Response (IDSR) forms.

	FORMS	*USES*
10	IDSR form 001A	
11	IDSR form 001B	
12	IDSR form 001C	
13	IDSR form 002	
14	IDSR form 003	

15. Please list 4 uses of Disease Surveillance and Notification (DSN) records?

	USES
a.	
b.	
c.	
d.	

16. Please **name** the seven (7) Epidemic prone diseases in Nigeria as stated by the IDSR?

a) ..... b) .....

c) ..... d) .....

e) ..... f) .....

g) .....

17. Please name the **incubation period** of the seven (7) Epidemic prone diseases in Nigeria as stated by the IDSR?

a) ..... b) .....

c) ..... d) .....

e) ..... f) .....

g) .....

SECTION C: EPIDEMIC PRONE DISEASE REPORTING & FEEDBACK

18. Who prepares the surveillance reports to higher health authorities? **(Position)**.....

19. Do you receive surveillance **feedback** from the state? 1. Yes [ ] 2. No [ ]

20. How many feedback reports have you received this year? .....

21. Do you distribute copies of surveillance feedback to staffs in your health office?

1. Yes [ ] 2. No [ ]

SECTION D: EPIDEMIC RESPONSE

22. What is the number of reported outbreaks within your authority cover within the past 1 year? .....

23. If there is any, please list the diseases

.....

.....

.....

24. List the Designation/positions of the members of the Epidemic Preparedness and Rapid Response team in your Epidemiological unit?

.....

.....

.....

.....

25. What are the time intervals for the meetings of the Epidemic Preparedness and Rapid Response team? .....

26. How long does it take to respond to epidemics? .....

SECTION E: SURVEILLANCE SUPPORT FACTORS

27. Do you have supervision visits from higher health authorities this year? 1. Yes [ ] 2. No [ ]

28. Do you visit lower health units for regular supervision? 1. Yes [ ] 2. No [ ]

3. Not at all [ ]

29. How often do you visit health facilities? 1. Always [ ] 2. Sometimes [ ]

3. Not at all [ ]

30. What type of health facilities do you visit? 1. Govt. facilities only [ ] 2. Private facilities only [ ] 3. All facilities [ ]

31. Have you been trained in disease surveillance & response? 1. Yes [ ] 2. No [ ]

32. If yes, specify when, where, by whom and how long .....

.....

.....

33. Have you lacked IDSR forms at any time during the year? 1. Yes [ ] 2. No [ ]

34. What penalties are stipulated for failing to report surveillance data? 1. Query [ ]

2. Salary withholding [ ] 3. Incentive withholding [ ]

4. No penalty [ ]

35. Is there funding for disease surveillance at your Epidemiological unit? 1. Yes [ ] 2. No [ ]

36. What is the imprest for disease surveillance? .....

37. Is the imprest adequate? 1. Yes [ ] 2. No [ ]

38. Please, which of the following do you experience shortage of?

	Resource	Do you experience shortages (Yes/No)
a.	Office	
b.	Computer	
c.	Printer	
d.	Statistical Package (Excel/SPSS/epi info)	
e.	Stationery	
f.	Calculator	
g.	Telephone	
h.	Motor vehicle	
I	Generator	

THANK YOU

CHECKLIST (HEALTH FACILITIES) Serial no.....

	OBSERVATIONS	YES	NO
1	Standard case definition of priority diseases utilization?		
2	Standard case definition of priority diseases at health facility?		
2	***Registers*** cases at health facility?		
2	***Laboratory reports*** confirming priority disease?		
3	Copies of **monthly** ***reports*** on Epidemic prone diseases to higher health authorities (in the last 6 months)? **Regularity:**		
4	Copies of **weekly** ***reports*** on Epidemic prone diseases to higher health authorities (in the last 6 months)? **Regularity:**		
5	Copies of **monthly** ***reports*** on Epidemic prone diseases to higher health authorities (in the last 12 months)? **Regularity:**		
6	Copies of ***Zero report*** (where necessary)?		
7	Displays showing Analysis of data for priority diseases? **List:**		

RESOURCES AVAILABLE AT HEALTH FACILITY

	Resource	Available at site (Yes/No)
a.	Office	
b.	Computer	
c.	Printer	
d.	Statistical Package (Excel/SPSS/Epi info)	
e.	Stationery	
f.	Calculator	
g.	Telephone	
h.	Motor vehicle	
I	Generator	

CHECKLIST (STATE AND LGA LEVEL) Serial no.....

	OBSERVATIONS	YES	NO
1	Copies of **monthly** ***reports*** on Epidemic prone diseases to higher health authorities (in last 6 months)? **Regularity:**		
2	Copies of **monthly** ***reports*** on Epidemic prone diseases to higher health authorities (in last 1 year)? **Regularity:**		
2	Copies of **weekly** ***reports*** on Epidemic prone diseases to higher health authorities (in last 6 months)? **Regularity:**		
3	Copies of ***Zero reports*** (where necessary)?		
4	Copies of ***feedback reports*** to lower health levels?		
5	Displays showing ***Analysis*** data for priority diseases? **List:**		
4	Existence of a written ***EPRR plan*** for the Epidemic prone diseases? **List:**		
5	Copies of ***Epidemic response reports***?		
6	***Minutes of meetings*** of the EPRR team?		
7	***Stocks*** of drugs, supplies and materials for outbreak investigation? **List:**		

RESOURCES AVAILABLE at HEALTH UNIT

	Resource	Available at site (Yes/No)
a.	Office	
b.	Computer	
c.	Printer	
d.	Statistical Package(Excel/SPSS/Epi info)	
e.	Stationery	
f.	Calculator	
g.	Telephone	
h.	Motor vehicle	
I	Generator	

TELEGRAMS.....

TELEPHONE.....

OYO STATE: THE PACESETTER

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to

the Honorable Commissioner quoting

Our Ref. No. AD 13/ 479/____

December, 2014

The Principal Investigator,
Department of Epidemiology and Medical Statistics,
College of Medicine,
University of Ibadan,
Ibadan.

Attention: Afolayan Ola Daniel

Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled: "Compliance with Epidemic Prone Disease Sureveillance and Response Guidelines among Epidemiological Units in Selected Local Government Areas of Oyo State."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implemcntation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of thc findings as this will help in policy making in thc health sector.

4. Wishing you all the hest.

OYO STATE RESEARCH ETHICAL REVIEW COMMITTEE

Signature & Date

Sola Akande (Dr)
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee