

Lassa fever: A recurring decimal in Plateau state, Nigeria

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Abstract

Background: Since the first reported case of Lassa fever (LF) in Jos, Plateau state Nigeria in the early 70's, the state has been plagued with increasing number of cases. This could be due to poor environmental practices, food and personal hygiene. By the end of August 2017 there were 42 reported cases with 15 confirmed cases. Sadly, over the years there have been challenges with reporting and investigation of cases. This could be due to weak health systems commonly seen in developing countries.

Methods and Materials: We reviewed 2012-2016 surveillance data from the State Ministry of Health (SMoH) using Microsoft Excel. Descriptive analysis was conducted on the reported LF cases in the state.

Results: Between the years 2012 – 2016 there were 109 reported LF cases, with 57 (52.3%) males and 52 (47.7%) females. The mean age of the reported cases was 27.9± 13.6 years. Out of these, 23 (21.1%) were confirmed cases: 1 (4.5%) in 2012, none in 2013, 2014 and 2015, and 21 (91.3%) in 2016. The male: female ratio was 10 (43.5%): 13 (56.5%). Six (26.1%) of the confirmed cases were health workers. The case fatality rate of the confirmed cases was 52.2%. Even though there is significant association between LF and death (P-value = 0.003) the odds ratio, 0.215 (95% CI) is low. The reporting years show consistent increasing trend from 2012 to 2016, except for 2015 where there was a decline in the number of reported cases. In 2016 there were 74 (67.9%) cases, 5 (4.6%) in 2015, 15 (13.7%) in 2014, 12 (11.0%) in 2013 and 3 (2.6%) in 2012.

Conclusion: Even though reported cases are increasing, there are still gaps observed in the surveillance system of the SMoH. The annual recurrence of LF outbreak in the state without reciprocal preventive efforts on ground to combating it has exposed the populace and health workers to ill-health and death.

Keywords: Lassa fever, recurring decimal, Plateau state.

1. Introduction

Lassa fever (LF) is an acute viral haemorrhagic fever illness that is known to be endemic in various West African countries including Nigeria.[1] The illness was discovered in 1969 when two missionary nurses died in Nigeria. The virus is named after Lassa town in Nigeria where the first cases occurred, although investigations in the 1970s and 1980s pointed to the existence of 3 disease-endemic zones within Nigeria: the north-eastern region around Lassa, the central region around Jos, and the southern region around Onitsha.[2,3] The virus, a member of the Arenaviridae family, is a single-stranded RNA virus and is zoonotic, or animal-borne.[4] The multimammate rats (*Mastomys natalensis*), which breed mostly during the dry season (January to March) and distributed widely throughout west, central, and east Africa are culprits in the

human infection.[5] The rat feeds and excretes the viruses on human foods either on the farmland or at home when it has been transported to the house. Nosocomial infection has been seen to occur. Although LF presents like malaria, the most useful clinical predictors are fever, pharyngitis, retrosternal pain, and proteinuria for diagnosis; and fever, sore throat, and vomiting for outcome. [6] By June 2017, a total of 501 cases including 104 deaths have been reported since the onset of the current LF outbreaks season in December 2016 in Nigeria. Of the reported cases, 189 have been further classified, 175 laboratory-confirmed including 59 deaths and 14 probable cases (all dead).[1] During the current LF outbreak, 17 Nigerian states (Anambra, Bauchi, Borno, Cross-River, Ebonyi, Edo, Enugu, Gombe, Kaduna, Kano, Kogi, Nasarawa, Ogun, Ondo, Plateau, Rivers, and Taraba) have reported at least one confirmed case. As of

June 2017, the outbreak is still active in nine states (Anambra, Bauchi, Cross-River, Edo, Taraba, Nasarawa, Ondo, Plateau, and Kano).[1] Over the years, prevalence of LF in Plateau state has continued to be high compared to other states of the federation, with the poor hygienic lifestyle of the farming population, environmental practices, food and personal hygiene and weak health system being the possible reasons for the continuous outbreak of the disease. The possibility that LF virus could be used as a biological weapon has raised the profile of the need for greater understanding of LF and for more effective control and treatment programmes, hence attempts are being made to produce a vaccine using the yellow fever virus as a vehicle.[7] This study was carried out to assess the trend of the reoccurrence of reported LF cases in Plateau state from 2012 – 2016.

2. Materials and Methods

2.1 Study area

Plateau State is located in Nigeria's middle belt. It has an area of 26,899 square kilometres, an estimated population of about three million people. It is located between latitude 8°24'N and longitude 8°32' and 10°38' east. The state is named after the picturesque Jos Plateau, the state capita, a mountainous area in the north of the state with captivating rock formations. Bare rocks are scattered across the grasslands, which cover the plateau. The altitude ranges from around 1,200 meters (about 4000 feet) to a peak of 1,829 metres above sea level in the Shere Hills range near Jos. Years of tin mining have also left the area strewn with deep gorges and lakes. The state is surrounded by Bauchi State – to the north east, Kaduna State – to the North West, Nasarawa State – to the South West and Taraba State – to the South East. It has a yearly temperature of between 18 and 22°C. The people are predominantly farmers and have similar cultural and traditional ways of life. Tribes like Berom, Taroh, Ngas and others make up about forty languages with people from other parts of the country have come to settle in Plateau State.[8]

2.2 Study Design/Data source:

The study employed a retrospective review of LF records of the Epidemiology Unit of the State Ministry of Health (SMoH) in Plateau State between 2012 and 2016. The dataset comprised of clinically suspected and laboratory confirmed cases of LF during the 5 years reporting period, between January 1, 2012 and December 31, 2016 state-wide. The residential addresses of LF cases and health facility of presentation were available in most occurrences.

An LF case was established based on the Nigeria Centre for Disease Control (NCDC) definition.[9]

2.3 Suspected case of LF:

Illness with gradual onset with one or more of the following: malaise, fever, headache, sore throat, cough,

nausea, vomiting, diarrhoea, myalgia, chest pain hearing loss and a history of contact with excreta of rodents or with a case of LF.

2.4 Confirmed case of LF

A suspected case that is laboratory confirmed (positive IgM antibody, PCR or virus isolation) or epidemiologically linked to a laboratory confirmed case.

2.5 Alert threshold

A single suspected case of Lassa fever. The outbreak threshold is a single confirmed case of Lassa fever.

2.6 Ethical consideration

Ethical approval was granted by the Health Research Committee, Jos University Teaching Hospital and Plateau SMOH, Nigeria for the study to be carried out.

2.7 Sample collection and serological testing:

Samples collected by the Diseases Surveillance and Notification Officers (DSNOs) from each of the 17 Local Government Areas (LGA) are in collaboration with the state DSNO, Epidemiologists and World Health Organization (WHO) sent to either the National Reference laboratory, Yaba, Lagos, Nigeria or the Central Public Health Laboratory in Gaduwa, Abuja, Nigeria both owned by the NCDC for confirmation and a third referral laboratory at the Irrua Specialist Teaching Hospital (ISTH) Edo State, Nigeria. The type of tests done in these centers is the Reverse Transcription Polymerase Chain Reaction (RT-PCR) for early diagnosis.[10,11]

2.8 Statistical analysis:

The trend analysis of LF prevalence focused on relevant independent variables such as age, sex and years, where the generated data were analysed using descriptive statistic. Chi-square and Fisher's Exact Correction Tests were used to show contrast of proportions and define any substantial associations within gender and age of reported and confirmed cases. To associate the number of LF infected persons; a chi-square test was used at 95% confidence level. The statistical analysis was completed after recording the data in a Microsoft Excel worksheet on a window 2010 platform and analysed using the IBM Statistical Package for the Social Sciences (SPSS) version 23.0

3. Results

There were a total of 109 suspected cases of LF who presented to different health facilities in the state within the period under assessment (2012-2016). Twenty-three (21.1%) were confirmed to be positive for LF, with a mean age of 31.9±10.8 for the confirmed cases and females made up majority of the case at 56.5%. The odds of having LF among females are 1.56 (0.95-2.56) as presented in table 1.

Table 1: Demographic data of Lassa fever patients in Plateau state, 2012-2016

Category .n (%)	All patients tested 109 (100)	Unknown 28 (25.7)	PCR negative 58 (53.2)	PCR-positive 23 (21.1)	χ^2	OR (95% CI)
Percentage (%)						
Age (years)						
Mean	27.9±13.6	24.4±15.3	28.0±13.5	31.9±10.8		
Gender, n (%)						
Male	57 (52.3)	10 (35.7)	37 (63.8)	10 (43.5)	2.79	0.68 (0.41-1.12)
Female	52 (47.7)	18 (64.3)	21 (36.2)	13 (56.5)		
State of resident						
Plateau	100 (91.7)			21 (91.3)		
Others*	9 (8.3)			2 (8.7)		
Location (LGA)						
Jos North	39 (35.8)	12 (42.9)	21 (36.2)	6 (26.1)		
Jos South	17 (15.6)	6 (21.4)	10 (17.2)	1 (4.3)		
Others**	53 (48.6)	10 (35.7)	27 (46.6)	16 (69.6)		

*Bauchi, Nassarawa and Taraba states. **Barkin Ladi, Bassa, Bokkos, Kanam, Kanke, Langtang North, Langtang South, Mangu, Mikang, Pankshin, Qwaanpan, Riyom, Shendam, Wase, Other states.

While 21 (91.3%) of the confirmed case were resident in Plateau state, 8.7% are from other states like Bauchi, Nassarawa and Taraba states. Six (26%) health

workers were among the confirmed cases with LF within the period under review (Figure 1).

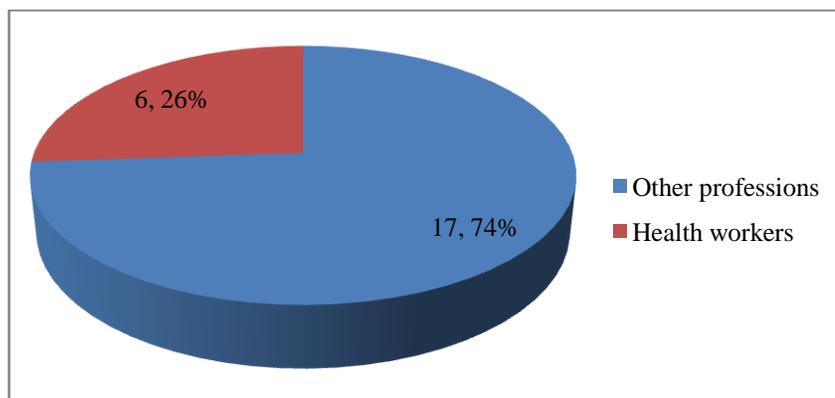


Figure 1: Pie chart showing percentage of health workers infected with LF in Plateau state, 2012-2016

In 2012 there was only one (33.3%) confirmed case of LF, 8.3% in 2013, none in 2014 and 2015 while 21 (28.4%) in 2016 compared to the PCR-negative and

unknown cases (Table 2). The trend plot in figure 2 shows 11 and 12 cases in 2013 and 2014 respectively and 21 (28.4%) positive cases in 2016.

Table 2: Retrospective time-trend of Lassa fever in Plateau state, 2012-2016

Year	PCR-positive, n (%)	PCR negative, n (%)	Unknown, n (%)	Total
2012	1 (33.3)	2 (66.7.3)	0 (0.0)	3 (100.0)
2013	1 (8.3)	0 (0.0)	11 (91.7)	12 (100.0)
2014	0 (0.0)	3 (20.0)	12 (80.0)	15 (100.0)
2015	0 (0.0)	0 (0.0)	5 (100.0)	5 (100.0)
2016	21 (28.4)	53 (71.6)	0 (0.0)	74 (100.0)

Table 3: Contingency table showing the outcome and results of patients, 2012-2016

Result	Outcome			χ^2	P-value	OR (95% CI)
	Alive	Death	Total			
Positive	11(47.8)	12 (52.2)	23	8.9	0.003	0.215 (0.750-0.612)
Negative	47 (81.0)	11 (19.0)	58			
Total	58	23				

Among the confirmed cases twelve (52.2%) died, while even among the negative cases 11 (19.0%) died with a Chi-square (χ^2) of 8.9, P-value of 0.003 and OR of 0.215

(0.750-0.612) at 95% CI during the years under review (2012-2016).

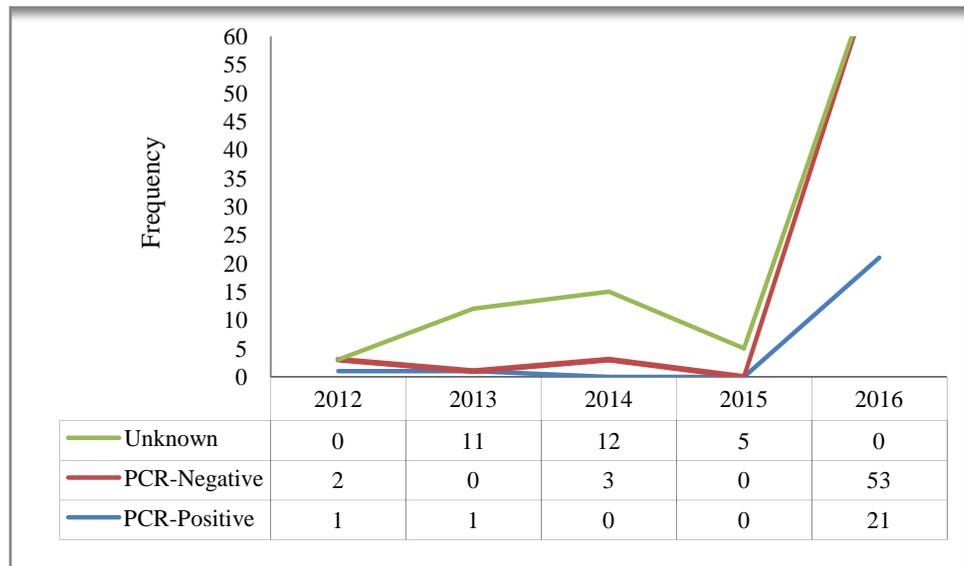


Figure 2: Trend plot of confirmed, negative and suspected LF in Plateau state, 2012-2016

4. Discussion

To our knowledge this is one of the few attempts at giving a trend to this interesting disease that has become endemic to one of the central states in Nigeria, Plateau state. The data used is primarily the total of what was reported to the State Ministry of Health (SMOH) by 2012 – 2016. Although the reported cases of LF may represent only a very small proportion of what actually occurred within the period under review. Even though the findings were seen to be in keeping with previous studies there were some obvious inadequacies in data management, for example the total number of confirmed cases was found to be 23 for the period under review, a previous study conducted using data from various health facilities in the state for 2012-2014 gave a result of up to 20 confirmed cases.[12] The 21.1% seropositive prevalence found in this study conforms to what a study that reviewed different documents came up with at 21 % for Nigeria.[13,14] Although LF PCR-positive cases were mostly individuals with mean age 31.9 ± 10.8 , people of all ages are said to be susceptible, with no sex predilection.[14]

The case of health workers becoming infected is in keeping with the findings in 2005 and 2008 at the Ebonyi State University Teaching Hospital (EBSUTH) in Abakaliki where up to eight (8) health care workers were infected either from the hospital environment (nosocomial) or from their homes when they take care and stay with other infected individuals.[15] It is disturbing, that healthcare-workers are still at high risk of contracting and dying from the disease as they were 20 years ago.[16] This has shown the need for continuous reorientation of health workers on high index of suspicious and treating each patient presenting with fever as a case until definitive diagnosis, and also the need for hospitals in endemic areas such as Plateau SMOH to continue to provide health workers with and encourage the use of personal protective equipment.

There should also be strict isolation of cases and procedures for handling body fluids and excreta must be maintained.[14] As it was observed in previous studies in Plateau state, more of the cases were from Jos North (Capital city) of the state with 6 (26.1%) in this study which together with Jos South both of Plateau North senatorial district make up majority of the cases just as shown by a Jos study in 2015.[12] With annual positive data reporting, except for 2014 and 2015, LF has been described as a recurring annual epidemic or endemic disease with high burden since 1969 with media pronouncement of its outbreak almost every year in different parts of Nigeria including Plateau state.[17] Just as compared a previous study conducted in health facilities in Plateau state, positive cases were observed each year with the peak seen in 2016 (28.4%) in the study under review.[12]

In this study records that have to do with the most useful clinical predictors of LF are fever, pharyngitis, retrosternal pain, and proteinuria for diagnosis; and fever, sore throat, and vomiting for outcome were not recorded as part of routine data of patients.[6] A case fatality rate of 52.2% was observed in this study as against a declining rate observed in a previous study conducted in health facilities from 70% - 18.5% in 2012-2014.[12] It appears to be higher than the values suggested by CDC that approximately 15%-20% of patients hospitalized for Lassa fever die from the illness. However, only 1% of all Lassa virus infections result in death.[18]

The death rates for women in the third trimester of pregnancy are particularly high. Spontaneous abortion is a serious complication of infection with an estimated 95% mortality in foetuses of infected pregnant mothers, although the data did not capture these other variables. Because the symptoms of LF are so varied and nonspecific clinical diagnosis is often difficult. LF is also associated with occasional epidemics, during which the case-fatality rate

can reach 50% in hospitalized patients.[18] Even though there is significant association between LF and death (P-value = 0.003) the odds ratio, 0.215 (95%CI) is low in this study. There is every possibility of expecting that LF will continue to spread in Plateau state due to constant inflow of people from different parts of the country especially from the northern part either in search of jobs or due to fleeing from civil unrest or in urgency. It would be a welcomed idea if the Plateau state government would put in place strategies that will ensure adequate and prompt reporting of cases that resemble LF by the different health facilities in the state.

Although disease surveillance and notification is on-going, there will be the need to institute newer technological trends to help foster enabling environment for improved Disease Surveillance, such as: Rapid cell/smart phone penetration (even in rural areas); wide availability of surveillance monitoring system (SMS) applications; availability of the Internet (including mobile-internet); implementation of wireless data technologies. Collectively these have enabled simple yet sophisticated applications such as mobile email and web browsing. These developments have heralded the advent of m Health. m Health refers to the incorporation of wireless devices such as mobile phones, tablets, personal diagnostic assistants (PDAs), patient monitoring devices and other wireless devices into medical and public health practice to improve health or ensure better delivery of healthcare.[19]

Public health physicians should be mobilised to different parts of the state to sensitise members of the community and educate them on LF and how to control infection.

5. Conclusion

Establishing a reliable trend of LF outbreaks in Plateau state will require prompt reporting and proper record keeping of the cases as they occur, with indices that will match best international standards. Cases seen to be increasing though the years may be a sign of improved data collection. These can only be determined in subsequent studies, but the gap currently hardly gives reliable information observed in the surveillance system of the SMOH. The annual recurrence of LF outbreak in the state without reciprocal preventive efforts on ground to combating it has exposed the populace and health workers to ill-health and death.

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Competing interests

Authors have declared that no competing interests exist.

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