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Analysis of Reported Cases of Lassa Fever in Plateau State and the Need for Strategic Action Plan

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Authors' contributions

This work was carried out in collaboration between all authors. Author SCC did the study design and wrote the protocol. Authors SO and AA proof-read the manuscript and provided technical support. Authors PL and DZE carried out data analysis and supervision while author IM provided technical support for designing tables and figures. All authors read and approved the final manuscript.

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ABSTRACT

Background: Lassa fever is a fatal haemorrhagic disease endemic in West Africa. Following the index case in Lassa, Nigeria in 1969, outbreaks of Lassa fever have become common in Nigeria. This study sought to review and document recent trends in Lassa related mortality in Plateau State.
Methodology: We targeted the State Ministry of Health (SMoH) and tertiary hospitals in the State. Ethical approval was obtained from the SMoH and Plateau State Specialist Hospital (PSSH), Jos. Data on Lassa fever cases was obtained from the targeted health institutions and analysed using simple percentages.
Results: Fifty nine suspected cases were reported within the period under review (2012-2014). Majority 48(81.3%) were from Northern Plateau, 5 (8.5%) from Central Plateau, 2(3.4%) from Southern Plateau while 4(6.8%) were from States bordering Plateau. Percentage mortality of cases in 2012, 2013 and 2014 stood at 70.0% (7/10), 36.4% (8/22) and 18.5% (5/27) respectively.

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Discussion: Although reported cases are on the rise, prompt administration of ribavirin by experienced health care workers may be responsible for the decline in mortality over the years. Improvement on intervention strategies, training, diagnostic facilities should continue to be prioritized.

Keywords: Lassa fever; Nigeria; mortality.

1. INTRODUCTION

Lassa fever (LF) is an acute viral haemorrhagic disease that is caused by Lassa fever virus belonging to the genus arenavirus [1]. The name is derived from Lassa, a town in North-eastern Nigeria where the index case was identified. It is a zoonotic disease, with a rodent, *Mastomys natalensis*, as the reservoir [2]. The infection is endemic in West Africa with 300,000–500,000 cases and approximately 5,000 deaths reported annually [3]. It has ready been established that the virus is transmitted by contact with the faeces or urine of rodents accessing grain stores in residences although human-to-human transmission also occur via contact with infected blood and body fluids [4]. Given the disease's high incidence rate, it remains a major problem in the African region [5]. Outbreaks of the disease have been recorded in Nigeria, Liberia, Sierra Leone, Guinea and Central Africa but it is believed that human infections also exist in Democratic Republic of Congo, Mali, and Senegal [6].

In Nigeria, the index case was reported in 1969. Since then, LF cases have been reported with increasing frequency and spread. In the 1970s and 1980s, reported cases pointed to the existence of 3 Lassa endemic regions in Nigeria. These included the northern region around Lassa town in Borno State; the central region around Jos, Plateau State and the southern region around Onitsha, Anambra State [6,7]. Between 2004 and 2008, states including Edo, Ebonyi, Federal Capital Territory and Plateau reported more laboratory confirmed cases [8]. By 2009, Adewuyi et al. [9], reported an epidemic of Lassa virus in Abuja, near Plateau State where 5 deaths were recorded from 12 suspected cases. However, the epidemic assumed a higher dimension in early 2012 where the Federal Ministry of Health in Nigeria alerted the World Health Organisation of outbreaks in 19 out of 36 states including Plateau State. 108 were confirmed Lassa positive out of which 70 died [10]. By the end of 2012, Nigeria had reported widespread outbreaks in 23 out of 36 States, Plateau State inclusive. Altogether, a total of 1723 suspected cases including 112 deaths were reported in 2012 [10].

Since the first reported case in Jos, Plateau State in the early 70s, the state has experienced sporadic outbreaks of the virus [6,7]. Unfortunately, only a few of these outbreaks have been thoroughly investigated or reported. It is therefore the thrust of this study to access available data on the disease from appropriate health authorities for the purpose of analysis and publication of relevant findings.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Plateau State, Nigeria. Plateau State is located in the middle belt area of Nigeria. It has an area of 26,899 square kilometres with an estimated population of about four million people. It is located between latitude 80°24'N and longitude 80°32' and 100°38' east. It is a plateau with altitude ranges from around 1,200 meters (about 4000 feet) to a peak of 1,829 metres above sea level [11]. Politically, it is divided into 3 zones namely: Northern Plateau, Central Plateau and Southern Plateau as shown in Fig. 1.

2.2 Targeted Health Facilities, Patient Group and Data Retrieval Process

We designed a study to survey tertiary health institutions and the State Ministry of Health (SMoH) in Plateau State. We retrieved relevant data on reported LF cases between January, 2012 and July, 2014. We sought for ethical approval from the Institutional Review Boards (IRBs) to carry out the survey. Patients were traced using hospital medical data based on those that were on treatment or had been treated for LF in the facilities within the period under review. The information was tracked from the Medical Records Departments of the targeted health institutions.

Fig 1. Map of Plateau State showing the 3 major political divisions. Neonpink is Northern Plateau, lemon is Central Plateau while Pigeon blue is Southern Plateau

Source: Wikipedia, Map of Plateau State
Available:http://images.search.yahoo.com/search/images;_ylt=A0LEVxXk2T5USbYAZvpXNyoA;_ylu=X3oDMTB0bjAxNjdrBHNlYwNzYwRjb2xvA2JmMQR2dGlkA1ZJUDIyN18x?_adv_prop=image&fr=chrf-yff24&va=map+of+plateau+state

Contacted patients who consented for this survey had their appropriate clinical, diagnostic and demographic data systematically collated and analysed using simple statistical tools. Findings were presented in tables for easy interpretation. Some of the retrieved information is as contained in Table 1 below:

Table 1. Summary of case presentation and management

Clinical presentation	No of cases	Medical intervention
HGF and headache	7	Antimalarials ,antibiotics and ribavirin
HGF, headache and haemorrhage	13	FRT, ribavirin, antibiotics
HGF, sores and muscle pain	2	FRT, analgesics, antibiotics, ribavirin
Fever and sores	5	Analgesics, antimalarials, ribavirin
Abdominal pain and haemorrhage	5	FRT, antihelminths, ribavirin, antibiotics
Headache, cough and haemorrhage	10	Antibiotics, FRT, ribavirin
Sores, haemorrhage and headache	7	Antibiotics, FRT, ribavirin
HGF and haemorrhage	8	FRT, ribavirin
Haemorrhage and hydrophobia	2	FRT and ribavirin

Key: HGF- High grade fever; FRT- Fluid replacement therapy

3. RESULTS

Overall a total of 59 suspected cases were reported within the period under review (2012-2014). Forty eight (81.3%) were from Northern Plateau, 5 (8.5%) from Central Plateau, 2(3.4%) from Southern Plateau while 4(6.8%) were from Southern states bordering Plateau. Males accounted for 55.9% of the reported cases while females accounted for 44.1% (Table 2).

In terms of annual mortality, there has been increasingly few cases of infected persons dying with better clinical management of cases. There were 7 (70%) of reported cases died in 2012, 8 (36.4%) died in 2013 while 5 (18.5%) died between January and July, 2014 (Table 3).

In 2012, all 10 reported cases in Plateau State were tested for LASV RNA at Lassa Research Laboratory at Irrua Specialist Hospital, Edo State. All but one result was returned and kept in patients' folders with 3 confirmed positive giving 30% prevalence in 2012. Only 54.1% in reported cases in 2013 were tested for LASV RNA, with 22.3% receiving their test results out of which 3 were confirmed LASV RNA positive giving a prevalence of 13.6% for that year. Unfortunately, 31.8% did not have their test results in folders. Between January and July of 2014, only 5 of 27 of laboratory results were returned to patients. A total of 3 returned results were confirmed positive for Lassa virus giving a prevalence of 11.1% (Tables 4 and 5).

4. DISCUSSION

The epidemic of Lassa fever in Plateau State has existed since the early 70s. The evidence of confirmed cases in the past and those obtained from this study mean that Lassa fever has persisted in Plateau State and also spread out to other parts of Nigeria. With 81.36% of reported cases from Northern Plateau, 8.5% from Central Plateau and 3.40% from Southern Plateau, there is need for strategic prevention plan across the state since Lassa virus is highly contagious and responsible for high mortalities and morbidities [12].

Although the data from Table 2 suggests higher prevalence in Northern Plateau, Central and Southern Plateau may have limited reported cases due to lack of proximity and awareness. Northern Plateau is the seat of government as it also hosts all the tertiary health facilities and prompt reporting by these facilities would be easier.

Table 2. Lassa fever outbreaks according to location in Plateau State

	North	Centre	South	Outside	Total
Male	27 (81.8%)	3(9.1%)	1 (3.0%)	2(6.1%)	33 (55.9%)
Female	21 (80.8%)	2 (7.7%)	1 (3.8%)	2 (7.7%)	26 (44.1%)
Total	48 (81.3%)	5 (8.5%)	2 (3.4%)	4 (6.8%)	59

Table 3. Annual mortality of reported Lassa cases in Plateau State

	Dead	Alive	Total	% Mortality
Year 2012	7	3	10	70.0
Year 2013	8	14	22	36.4
Year 2014	5	22	27	18.5

Table 4. Annual distribution of laboratory confirmed cases

	Tested, result returned	Tested, result not returned	Not tested	Total
Year 2012	9 (90.0%)	1 (10.0%)	-	10
Year 2013	6 (22.3%)	7 (31.8%)	9 (40.9%)	22
Year 2014	5 (18.5%)	19 (70.4%)	3 (11.1%)	27

Table 5. Annual distribution of outcome of laboratory confirmed cases

	Positive	Negative	Unknown	% Prevalence
Year 2012	3	6	1	30.0
Year 2013	3	3	16	13.6
Year 2014	3	2	22	11.1

To improve coverage and reporting, government must ensure distribution of tertiary health facilities throughout the state and extend its surveillance to all parts of the state to get a more accurate picture of the spread of Lassa fever in the State.

Neighbouring States of Bauchi and Kaduna accounted for 6.78% of the cases, suggesting trans-boundary circulation of the virus around the area where most of the inhabitants are farmers and hunters. By the nature of their occupation, they easily interact with *Mastomys natalensis,* the natural rodent host of the virus, which are ubiquitous in peridomestic environments, hence predisposing the people to Lassa virus infection [13]

With mortalities of 70%, 36.4% and 18.5% of reported cases in 2012, 2013 and 2014 respectively, it has further confirmed earlier reports that Jos, Plateau state is a Lassa endemic region in Nigeria [6,7]. It is encouraging that there is a decline in Lassa fever related mortalities in the State within the study period. This may be attributed to increased awareness on the disease, conscious and strategic surveillance programs and access to international aid which has led to availability of ribavirin for early administration to identified cases, a proven strategy in overcoming the epidemic [14,15]. Interestingly, within the period of this research, Ohene et al. [16] reported the first Lassa fever cases in Ghana. His report showed that two confirmed cases were infected in 2011 and survived it due to prompt medical intervention [16]. Similarly in Liberia, 184 patients that presented with febrile illness were tested for Lassa RNA genome using RT-PCR. Results confirmed that 35 of the patients had the virus giving a prevalence of 19% [17].

The data in Table 4 revealed that 31.8% and 70.4% of reported cases with laboratory tests did not have their test results returned to them in 2013 and 2014 respectively. It is important to note that the significant rise in the 'missing' or unreturned results coincided with ending of an international aid to the State for Lassa research. However, it is not clear whether the tests were done or not due to poor a failure in the tracking of logistics from sample collection to return of results since laboratory tests were done in Edo State, 733km away from Jos. The situation meant that 40.9% and 11.1% of reported cases in 2013 and 2014 respectively were not submitted for laboratory confirmatory tests thereby limiting clinician's diagnosis of Lassa fever to clinical presentations which are misleading given that Lassa fever mimics Ebola and other haemorrhagic fevers in clinical presentations [18].

The fact that there is no Lassa diagnostic centre in the state is disheartening considering the fact that since early 70s, the disease has been plaguing the state [6,7]. The only option of sending samples to Irrua Specialist hospital in Edo State increases the median time between sample collection and return of results due to distance. This indeed does not compare well with a median time of 1 day and 4 days from reception of samples to final RT-PCR and culture respectively as obtained in Liberia where the diagnostic centre is within reach [17]. Government and non-governmental organisations must look at this area critically and respond to this health emergency. This call becomes more clarion now as more emerging and re-emerging infections including Ebola disease are threatening Nigeria's public health in recent times [19]

The Plateau State government needs to go beyond intensive surveillance to establishing credible diagnostic centres for Lassa, Ebola and other haemorrhagic fevers in the State. Availability of such centres within the State will definitely address the issues of logistics failure relating to sample-result flow chain.

With the evidence of clinical and laboratory confirmed cases of Lassa fever in Plateau State since early 70s and the prevalent diagnostic infrastructural deficit on ground, now is the time for government and all health workers in the State to collectively develop a road map towards combating the disease. Awareness campaigns on Lassa and other infectious diseases should be stepped up. Health professionals should support the State in sponsoring the development of their clinical and diagnostic skills and awareness. Medical scientists must develop research questions and grant writing skills to enable them source for international support towards systematic research on Lassa and other key disease agents. Government on its part must show commitment in enhancing the diagnostic facilities in the institutions as highly infectious agents such as Lassa fever need a containment laboratory for a whole scale research [20].

5. CONCLUSION

It is clear from our findings that Plateau State is a significant wetland for Lassa in Nigeria. It is also clear that the State is witnessing serious challenges in management of the epidemic particularly in terms of surveillance and diagnostic capabilities. This may be squarely responsible for the persistence of the scourge in the State. Government and relevant stakeholders need to consider this as a priority in quality health care delivery system. The need for a specialized diagnostic centre for Lassa and other viral haemorrhagic fevers is a necessity that should be met by relevant stakeholders.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Gunther S, Lenz O. Lassa virus. Critical Review in Clinical Laboratory Science. 2004;41:339–390.
2. McCormick JB. Lassa fever. In: Saluzzo JF, Dodet B, eds. Emergence and control of rodent-borne viral diseases. Elsevier. 1999;177–195.
3. Ogbu O, Ajuluchukwu E, Uneke CJ. Lassa fever in West African sub-region: An overview. Journal of Vector Borne Disease. 2007;44(1):1-11.
4. Dietrich W, editor. Biological resources and migration. Springer. 2004;363.
5. Joseph. A retrospective study of the epidemiology and serology of Lassa fever. Journal of Infectious Diseases. 1987; 155:437.
6. Fichet-Calvet E, Rogers DJ. Risk maps of Lassa fever in West Africa. PLoS Neglected Tropical Diseases. 2009;3:e388.
7. Bowen MD, Rollin PE, Ksiazek TG, Hustad HL, Bausch DG, et al. Genetic diversity among Lassa virus strains. Journal of Virology. 2000;74:6992–7004.
8. Ehichioya DU, Hass M, Ölschläger S, Becker-Ziaja B, Chukwu COO, Coker J, Nasidi A, Ogugua O, Günther S, Omilabu SA Lassa Fever, Nigeria, 2005–2008. Emerging Infectious Diseases. 2010;16(6): 1040-1041.
9. Adewuyi GM, Fowotade A, Adewuyi BT. Lassa fever: another infectious menace. African Journal of Clinical and Experimental Microbiology. 2009;10(3): 144-155.
10. WHO (2012). Nigeria: Lassa Fever outbreak (Situation as of 22 March, 2012)
11. Available:http://reliefweb.int/sites/reliefweb.int/files/resources/EPR-Nigeria-Lassa-Fever-Outbreak-20120322.pdf
12. Blench RM, Daniel P, Hassan Umaru. Access rights and conflict over common pool resources in three states in Nigeria. Report to Conflict Resolution Unit, World Bank; 2003.
13. Holmes GP, McCormick JB, Trock SC, Chase RA, Lewis SM, Mason CA, et al. Lassa fever in the United States. Investigation of a case and new guidelines for management. New England Journal of Medicine. 1990;323:1120-1123.
14. Keenlyside RA, McCormick JB, Webb PA, Smith E, Elliott L, Johnson KM. Case-control study of *Mastomys natalensis* and humans in Lassa virus-infected households in Sierra Leone. American Journal of Tropical Medicine and Hygiene. 1983;32:829–37.
15. Jahrling PB, Hesse RAR, Eddy GA, Johnson KM, Callis RT, Stephen EL. Lassa virus infection of rhesus monkeys: pathogenesis and treatment with ribavirin. Journal of Infectious Diseases. 1980; 141:580–589.
16. McCormick JB, King IJ, Webb PA, Scribner CL, Craven RB, Johnson KM, Elliott LH, Belmont-Williams R. Lassa fever: Effective therapy with ribavirin. New England Journal of Medicine. 1986;314:20–26.
17. Ohene SA, Dzotsi EK, Asiedu-bekoe F, Amankwa J, Sarkodie B, Adja-beng M, Thouphique AM, Ofei O, Oduro J, Atitogo D, Bonney JHK, Paintsil SCN, Ampofo W. The first cases of Lassa fever in Ghana. Ghana Medical Journal. 2012;46(3):166-170.
18. Panning M, Emmerich P, Ölschläger S, Bojenko S, Koivogui L, Marx A, Lugala PC, Günther S, Bausch DG, Drosten C. Laboratory diagnosis of Lassa fever, Liberia. Emerging Infectious Diseases. 2010;16(6).

    Available:www.cdc.gov/eid

19. Centres for Disease Control (CDC). Imported Lassa fever. New Jersey: MMWR Morbidity and Mortality Weekly Report. 2004;53(38):894–7.
20. Centres for Disease Control (CDC). Ebola in Nigeria; 2014. Available:http://wwwnc.cdc.gov/travel/notices/watch/ebola-nigeria
21. Public Health Agency of Canada. The Laboratory Biosafety Guidelines: 3rd Edition; 2004. Available:www.publichealth.gc.ca

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