

The Lassa Fever-A Threat in Covid-19

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Abstract

The Lassa fever (Haemorrhagic, zoonotic disease) was founded in the town Lassa, Nigeria in 1969th, which is transmitted by rodents. It is an endemic disease located in West Africa. Nosocomial transmission is most common where there is inadequate supply of proper equipments. 80% people with Lassa virus are asymptomatic with an incubation period of 6-12 days. Having diverse symptoms the diagnosis of Lassa fever becomes difficult however clinical features and confirmed laboratory test makes diagnosis of Lassa fever possible. Antiviral drugs can be the mode of treatment for the same.

Keywords: Haemorrhagic Fever; Lassa Fever; Nosocomial Infection; West Africa; Zoonotic Disease

Introduction

The outbreak crisis, Coronavirus Infectious Disease 2019 (COVID-19) which entered in December 2019, has now exposed its impact and changes in human and domestic animal demographics which has now affected ecosystem dynamics. Lassa fever is a viral haemorrhagic fever disease caused by Lassa virus. Taxonomically it belongs to *arenavirus* family. The holder of this virus is a rodent known as the "Multimammate rat" (*mastomys natalensis*).

Humans are infected by contact with infected animal, that's why Lassa fever called as zoonotic disease. It is an animal-borne, acute viral illness. Mastomys rodent work as carrier which is infected with Lassa virus do not become ill, but they can expel the virus in their urine and stools, for an extended long duration, may be for the rest of its life. It has been known since 50s, but first case

came in 1969, when two missionary nurses were ill cause of Lassa virus and died in the town of Lassa, Nigeria [1].

However, this zoonotic disease seems to be more pronounced in healthcare workers due to its transmission leading to the higher risk and mortality rate. Henceforth, this review article gives an insight view of its ecology, early diagnosis, awareness towards preventive measures and therapeutics.

Structure and genome of Lassa virus

The virus belongs to single-stranded and bisegmented RNA genome. Arenaviruses are pleomorphic, round, oval in shape with the diameter range from 50 – 300 nm. The surface of virion has club shaped projections with variable number of characteristic electron dense granules that represent residual, non-functional host ribosomes [2].

Epidemiology (Tables 1-3)

- According to world health organization (WHO) 2017 case study, it is endemic in Benin, Ghana, Guinea, Liberia, Mali, Sierra Leone, Togo and Nigeria. It exists in other West African countries as well [1].
- According Centers for disease control and prevention (CDC) 2015 Annually, estimated 100,000 to 300,000 people get infected, with approximately 5,000 were death, the data was noticed in 2019 [3].
- Nigeria notices that highest annual cases of Lassa fever reported between 2018 and 2020, (in 2018 633 confirmed cases are reported, 810 in 2019 and 1189 in 2020, across 29 states). In 2021(out of 54 confirmed cases 12 deaths in 8 states) [3].
- There was a 46.3% increase in confirmed cases in the year 2020 followed by 796 in the year 2019 and by 2020 the number of confirmed cases were 1165 [7].
- In the week 9th, when there was first confirmed laboratory case of COVID-19 in the early March of 2020. In Nigeria also increase the number of confirmed Lassa fever cases [6]. After increase in Lassa fever in Nigeria, COVID-19 pandemic started which resulted in Lassa fever and Covid-19 crisis [5].

- Recent outbreak in 2021, the dominant age group infected was 21 to 40 years with male to female ratio of 1:0.8. 3311 laboratory confirmed Lassa fever cases out of 20,588 suspected cases were identified from 29 states. Contact tracing was done on over 33,804 individuals with about 90% completing follow up. Case fatality rate within the period ranged from 9.3% to 29.2%. There is a sharp decline in the epidemiological trend of Lassa fever in the yearly seasonal peaks from week 1 to 13 with about 75% reduction in incidence between 2020 and 2021 [4].
- From 3 to 30 January 2022, there were 211 confirmed laboratory Lassa fever cases which included 40 deaths (Death ratio: 19%) have been reported collectively in 14 out of the 36 Nigerian states and the federal capital territory across the country [1].
- Lassa fever is endemic in Nigeria and the annual peak of Lassa fever cases are typically observed during the dry season (December-April). Thus, the number of infection is expected to rise further until the end of the dry season [1].
- Two laboratory confirmed cases and one of seeming like Lassa fever was noticed on 9 February 2022 in United Kingdom health authorities. Three cases have been confirmed and one death has been reported on 18 February [1].

Demographics	2015	2016	2017	2018	2019	2020
Age range	-	-	-	-	1~<98 years	1~<99 years
Predominant age group	-	-	-	21-40	21-40	21-30
Median age	-	-	-	32	34	30
Male to female ratio	-	-	-	1.6:1	1:1	1:0.9

Table 1: Demographics of Lassa fever.

Contact tracing	2015-2016	2017	2018	2019	2020	26 September 2021
Cumulative	2504	Nil	9643	9379	10,118	2160
Under follow-up	1942	-	421	405	3	141
Complete follow-up	562	-	9089	8894	10,014	2002
Symptomatic contacts	0	-	118	144	172	15
Positive contacts	0	-	38	68	57	10
Lost to follow-up	-	-	15	120	44	7

Table 2: Lassa fever contact tracing from January 2015 to 26 September 2021.

Reporting period	Suspected cases	Confirmed cases(N1)	Probable cases(N2)	Case fatality in N1+N2(%)	States affected
January-December 2015	430	2525	-	40(9.3%)	15
January-December 2016	921	109	-	119(12.9%)	29
January-December 2017	733	143	-	71(9.7%)	29
January-December 2018	3498	633	20	191(29.2%)	23
January-December 2019	5057	833	19		23
January-December 2020	6791	1189	14	244(20.5%)	27
1 January-26 September 2021(week24)	3158	379	3	77(20.2%)	14

Table 3: NCDC yearly summary of Lassa fever cases from 2015 to 26 September 2021.

NCDC: Nigeria Center for Disease Control; FMOH: Federal Ministry of Health

Mode of transmission

Rodent hole are located in human house and areas, where preserve all food. The mode of transmission is most commonly through ingestion or inhalational route. It can also occur by touching solid objects, eating contaminated food or exposure to open cuts or sores.

Infection occur if human inhales small particles in the air polluted with infected rodent excretion. Sweeping one of reason behind infection occurrence through aerosol or airborne.

In accordance with NCDC (2016), inter person transmission may occur after exposure to virus in the blood, tissue, secretion or excretion of a Lassa virus infected individual [8]. Routine contact does not spread virus. Person-to-person transmission is quite common in health care settings (called nosocomial transmission) where proper personal protective equipment (PPE) is unavailable or not in use. Lassa virus may also spread by using contaminated medical equipment such as re use of infected needles. It can also spread through infected bodily fluids such as blood, serum or semen [2].

Incubation period

The incubation period is 6-21days of Lassa fever. About 80% of people who become infected with Lassa virus have no symptoms. 1 in 5 infections result in severe disease, where the virus affects several organs such as liver, spleen and kidney [1].

Clinical features

It is seen amongst all the ages and in both the genders.

- **Mild to moderate cases:** Initially the disease starts with fever, weakness and malaise. Headache, sore throat, muscle pain, chest pain, nausea, diarrhea, vomiting, cough, maculopapular rashes in light skin toned people and abdominal pain may follow. In many cases facial swelling, Fluid in lung cavity, Low blood pressure and Neurological issues, such as deafness, tremors and encephalitis were notified [2,8].
- **Severe cases:** Bleeding from the mouth, epistaxis, gastrointestinal bleeding may occur, therefore it is categorized under viral haemorrhagic fever. Presence of protein may be seen in urine. At later stages tremor, disorientation, coma may be seen. 25% of patients may suffer from deafness. After 1-3 months hearing returns partially within 14 days in fatal cases death may occur [2].

It is particularly dangerous for women in the third trimester of pregnancy. Spontaneous loss of pregnancy occurs in around 95 percent.

There are various clinical stages of Lassa fever on the basis of duration (Table 4).

Complications

There are various complications as mucosal bleeding (17%), sensorineural hearing deficit (4%), pleural effusion (3%), and pericardial effusion (2%) [9].

The commonest interval between onset of symptoms and discharge was 17 days (half of the patients were in hospital for 10

Stage (DAYS)	Symptoms
1 (1-3)	General weakness and malaise. High fever, >39°C, constant with peaks of 40-41°C
2 (4-7)	Sore throat (with white exudative patches) very common; headache; back, chest, side, or abdominal pain; conjunctivitis; nausea and vomiting; diarrhoea; productive cough; proteinuria; low blood pressure (systolic <100 mm Hg); anaemia
3 (After 7)	Facial oedema; convulsions; mucosal bleeding (mouth, nose, eyes); internal bleeding; confusion or disorientation
4 (After 14)	Coma and death

Table 4: Clinical Stages on the basis of Duration.

days) and between onset and death was five days (half died within two days of admission).

Diagnosis

Clinical diagnosis is often difficult of the Lassa fever as its symptoms are diverse and uncertain. Following test are done in the laboratory for the diagnosis of Lassa fever

- Antibody enzyme linked Immunosorbent assay (ELISA) [1].
- Reverse transcriptase polymerase chain reaction (RT-PCR) in throat, swab, serum, urine [10].
- Antigen detection test.
- Virus isolation by cell culture.
- Clinical features, epidemiological findings and confirmed laboratory test made correct diagnosis of Lassa fever possible.
- Confirmed laboratory test which involves positive IgM antibody molecular detection and virus isolation with a suspected case was indicated to be a confirmed case [11].
- AST > 150 U/L is associated with a 50% mortality.

Differential diagnosis

Lassa fever can be differentiated from other Viral haemorrhagic fever such as Ebola virus disease and from diseases which causes

fever such as Malaria, Schigellosis, Typhoid fever, Yellow fever.

Treatment

US Food and Drug Administration has not approved any anti-viral drugs for the cause. However ribavirin seems to be effective treatment for Lassa fever. Ribavirin is a broad spectrum guanosine analogue, is the advice treatment for lassa fever. Early treatment can improve its rate of survival and may reduce deaths by 90% approximately. It shows more positive results when given intravenously than orally [2].

Doses of Ribavirin orally is 500mg every 6 hours for 7-10 days while when given intravenous loading dose begins at 2.4gm followed by 1 gm every 6hrs for 10 days based on average weight of adult [10-14].

Prevention

The main focus of prevention is “community hygiene,” to control the rat population [15-18].

This includes

- Regular handwashing
- Storing foods in rodent-proof containers
- Keeping garbage away from the home
- Keeping pet cats
- Avoiding blood and other bodily fluids when caring for sick relatives
- Following safe burial procedures
- Using protective equipment in a healthcare setting, including masks and eyewear

Conclusion

Lassa fever, a haemorrhagic disease was usually transmitted by rodents but owing to delay detection and therapeutic intervention Lassa fever is considered to be life- threatening disease during COVID-19 pandemic worldwide. Henceforth, we strongly suggest the early detection and expansion of number of laboratories incapable of diagnosing Lassa fever even in remote health areas.

Bibliography

1. World health organization World Health Organization. "Lassa fever in Nigeria. Emergencies Preparedness, Response Disease Outbreak News (DONs) (2017).
2. Kumar and Clark's Clinical Medicine, 10th Edition, Elsevier (2020).
3. Centers for disease control and prevention (2015) Lassa fever (2015).
4. Nigeria centre for disease control. Lassa fever situation report (2020).
5. Epidemiological trends of Lassa fever in Nigeria from 2015-2021: A review (2021).
6. John-Ugwuanya A., *et al.* "Lassa fever and COVID-19 in Africa: a double crisis on the fragile health system". *Journal of Medical Virology* 93.10 (2021):5707.
7. Reuben RC., *et al.* "Co-epidemics: have measure against COVID-19 helped to reduce Lassa fever cases in Nigeria?" *New Microbes and New Infections* 40(2021):100851.
8. Abbas Abel Anzaku. "Current Trends of Lassa fever Outbreak in Nigeria; A Call for Global Response". *Journal of AIDS and HIV Research* 2 (2018):1.
9. McCarthy M. "USA moves quickly to push biodefence research". *Lancet* 360 (2002):732.
10. Yaro CA., *et al.* "Infection pattern, case fatality rate and spread of lassa virus in Nigeria". *BMC Infectious Diseases* 21.1 (2021)1-9.
11. Akhiwu HO., *et al.* "Lassa fever outbreak in adolescents in north central Nigeria: report of cases". *Journal of Virus Eradication* 4 (2018): 225-227.
12. Nigeria center for Disease control. An update of Lassa fever outbreak in Nigeria (2021).
13. Mofolorunsho KC. "Outbreak of Lassa fever in Nigeria: measures for prevention and control". *The Pan African Medical Journal* 23 (2016): 210.
14. Inegbenebor U., *et al.* "Prevention of Lassa fever in Nigeria". *Royal Society of Tropical Medicine and Hygiene* 104 (2009): 51-54.
15. Ilori EA., *et al.* "Epidemiologic and clinical features of lassa fever outbreak in Nigeria, January 1- May 6, 2018". *Emerging Infectious Diseases* 25 (2019): 1066-1074.
16. Okogbenin EO., *et al.* "One-year retrospective review of psychiatric consultations in Lassa fever, southern Nigeria". *Emerging Infectious Diseases* 26 (2020): 3091-3093.
17. Okokhere P., *et al.* "Clinical and laboratory predictors of Lassa fever outcome in a dedicated treatment facility in Nigeria: an observational cohort study". *Lancet Infectious Diseases* 18 (2018):684-695.
18. Harrison's Principles of Internal Medicine, 20th Edition, Elsevier 1 (2018).