Morbidity and Mortality Patterns of Lassa Fever at a Tertiary Treatment Centre in Southern Nigeria: A Five-Year Retrospective Review

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Article

Morbidity and Mortality Patterns of Lassa Fever at a Tertiary Treatment Centre in Southern Nigeria: A Five-Year Retrospective Review

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Abstract

Background: Lassa fever remains a major public health challenge in West Africa, particularly in Nigeria where recurrent outbreaks continue to place pressure on health systems. Facility-based analyses are important for understanding morbidity and mortality trends in endemic regions. **Objective:** To assess morbidity and mortality trends of Lassa fever among patients managed at Irrua Specialist Teaching Hospital over a five-year period. **Methods:** A retrospective hospital-based cross-sectional study was conducted at Irrua Specialist Teaching Hospital, Edo State, Nigeria. Case records of all patients with confirmed Lassa fever managed between January 2018 and August 2022 were reviewed. Data were extracted using a structured checklist and analysed using SPSS version 23. Descriptive statistics were used to summarise socio-demographic, clinical and outcome variables. **Results:** A total of 191 Lassa fever case records met the eligibility criteria. The estimated mean age was 26.0 ± 18.8 years, with most patients younger than 30 years. There was a slight male predominance (52.4%). Admissions peaked in 2018 (47.1%) and declined thereafter. Most patients presented within five days of symptom onset (46.1%), although 17.8% presented after more than 11 days. The most common symptoms were fever (91.1%), vomiting (50.3%), headache (46.6%), and anorexia (46.1%), while haemorrhagic manifestations were uncommon (4.7%). The overall case fatality rate was 13.6%. Most hospital admissions lasted 6–15 days. **Conclusion:** Lassa fever remains an important cause of hospital admission and mortality in Edo State. Although mortality in this cohort was within previously reported hospital-based ranges, delayed presentation and non-specific clinical features remain challenges for early diagnosis. Strengthening surveillance systems, improving early detection, and enhancing infection prevention practices are essential to reducing Lassa fever morbidity and mortality in endemic settings.

Keywords: Lassa fever; morbidity; mortality; retrospective study; Nigeria; tertiary hospital; case fatality rate

Introduction

Lassa fever is an acute viral haemorrhagic illness caused by Lassa virus (LASV), a single-stranded RNA virus in the family *Arenaviridae* that is endemic in West Africa and occasionally reported beyond the region.[1–3] The natural reservoir is the multimammate rat, *Mastomys natalensis* which commonly lives in close proximity to humans.[3] Viral shedding in rodent urine facilitates environmental contamination and subsequent human infection, often through contaminated food or household surfaces.[4] Human-to-human transmission also occurs, particularly in healthcare settings, and has been associated with nosocomial outbreaks with reported case fatality rates (CFR) as high as 36%.[5,6] Despite this potential severity, community infections are frequently mild or subclinical.[4]

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Lassa fever drew international attention following the 1969 outbreak associated with missionary nurses in northeastern Nigeria, where severe febrile illness, secondary infections among healthcare personnel and deaths prompted intensified investigation.[7–9] Subsequent laboratory work led to the first isolation of LASV in 1970, helping to establish its epidemiological link to the earlier cases and reinforcing the role of healthcare-associated transmission.[9,10] Lassa fever remains a substantial public health concern, with widely cited estimates of 300,000 to 500,000 cases annually and about 5,000 deaths each year, although higher estimates of up to three million cases per year have also been reported.[3] These figures remain uncertain because case detection is constrained by limited diagnostic access, imperfect surveillance systems and incidence clustering around areas of intensive sampling.[11]

Across endemic settings, infection patterns show demographic and geographic heterogeneity. Males have been reported to be affected slightly more than females and the age group 21 to 30 years has been described as predominantly infected.[12] The "Lassa belt" includes Guinea, Nigeria, Sierra Leone and Liberia and serological and hospital-based data have suggested a notable burden in these countries, including reports that 10 to 16% of hospital admissions in parts of Sierra Leone and Liberia were associated with the virus.[13] High-risk zones appear to align most consistently with the distribution of *Mastomys* rather than distinct ecological boundaries, with repeated activity documented in parts of Guinea, Liberia, Nigeria and Sierra Leone.[14] While exportation outside West Africa has been uncommon, imported cases have been documented in USA, UK, Germany, Japan and China, with elevated fatality risk attributed to delayed recognition and treatment in non-endemic settings.[15–19]

Nigeria has experienced recurrent outbreaks with substantial morbidity and mortality. The 2018 outbreak affected 18 states and was described as the largest recorded at the time, with escalating suspected and confirmed cases during the early months of the year. [20] In 2019 and 2020, Nigeria recorded further large burdens of confirmed infections with notable CFRs.[5,20] Beyond community transmission from rodent exposure, healthcare-associated transmission remains a critical concern where infection prevention and control and personal protective equipment are inadequate, and spread via contaminated medical equipment, including reused needles, has been described.[4,5,21] The incubation period is typically 7 to 21 days and although most infections are asymptomatic or mild, severe disease can occur with multi-system involvement and complications including hypotension, bleeding, pregnancy loss and hearing impairment. [1,12,22–24] Clinical differentiation from other febrile illnesses and viral haemorrhagic fevers can be difficult, though certain clinical feature combinations may improve specificity.[1] Mortality is concentrated among severe cases and hospitalised patients, with approximately 15 to 20% of hospitalised individuals reported to die.[1,25]

Beyond acute illness, Lassa fever is associated with important long-term sequelae among survivors. Sensorineural hearing loss is the most commonly documented complication and may occur in up to one-third of survivors, often becoming permanent and contributing significantly to long-term disability and reduced quality of life.[22,23] Other reported sequelae include balance disorders, chronic fatigue and psychosocial consequences associated with prolonged recovery.[22] These complications contribute to the overall disease burden and highlight the importance of early diagnosis and supportive care to minimise irreversible outcomes.

At present, prevention of Lassa fever relies largely on environmental control, community education and infection prevention practices in healthcare settings, as no licensed vaccine is yet widely available for routine use. However, several vaccine candidates are under development, including recombinant viral-vector and DNA-based vaccines that have shown promising immunogenicity and protective efficacy in preclinical and early clinical studies.[5,26] Continued progress in vaccine research represents a critical component of long-term Lassa fever control strategies, particularly in endemic countries where recurrent outbreaks place sustained pressure on health systems.[5]

Despite decades of recognition, major gaps persist in the completeness and reliability of outbreak trend data, limiting effective control and resource allocation. In Nigeria, reports indicate

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under-reporting, misclassification and fluctuating CFRs over time, with a disproportionate burden repeatedly observed in Edo and Ondo States which have been described as epicentres during multiple outbreak years.[5,27] These challenges underscore the need for localised, facility-based analyses that can provide more granular insight into evolving morbidity and mortality patterns within high-burden settings.

Accordingly, this study assesses the morbidity and mortality trend of Lassa fever at the Institute of Viral and Emergent Pathogen Control and Research (IVEPCR) in Irrua Specialist Teaching Hospital (ISTH), with a focus on the period 2017 to 2021. By updating local surveillance evidence and describing patterns of disease outcomes, this work aims to strengthen understanding of Lassa fever burden in a key endemic referral centre and support improved prevention, clinical management and public health response.

Methods

Study setting

This study was conducted at Irrua Specialist Teaching Hospital (ISTH), located in Esan Central Local Government Area of Edo State, Nigeria. ISTH is a federal tertiary health institution established by Decree No. 92 of 1993, with clinical services commencing in May 1993. The hospital is situated along the Benin–Auchi highway, approximately 87 kilometres north of Benin City. ISTH is a major referral centre serving Edo State and neighbouring states. The hospital has over 200 bed spaces and serves as a training centre for medical and nursing professionals. ISTH also houses the Institute of Viral and Emergent Pathogen Control and Research (IVEPCR), a nationally recognised centre for the diagnosis, management and research of Lassa fever.

Study design

This study employed a retrospective hospital-based cross-sectional design.

Study period

The study reviewed Lassa fever cases managed over a five-year period from January 2018 to August 2022. Data extraction and analysis were conducted between August 2023 to January 2024

Study population

The study population consisted of case records of all patients admitted, diagnosed and managed for Lassa fever at the Lassa fever ward of ISTH during the study period.

Eligibility criteria

Inclusion criteria

- Case records of patients with confirmed Lassa fever managed between January 2017 and August 2021

Exclusion criteria

- Case records with incomplete or insufficient clinical information
- Patients with documented previous history of Lassa fever infection
- Patients with significant co-existing chronic medical illnesses unrelated to Lassa fever

Sample size determination

A total population sampling method was used. All eligible Lassa fever case records available during the study period were included in the study. Because the study involved a retrospective review of existing hospital records, no formal sample size calculation was required.

Sampling technique

A total population sampling approach was used. All eligible case records retrieved from the Lassa fever records unit during the study period were included in the analysis.

Data collection instrument

Data were extracted using a structured data extraction checklist designed for the study. Information collected included:

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- socio-demographic characteristics
- clinical presentation
- complications
- treatment outcomes
- morbidity and mortality indicators

Data analysis

Data were coded and analysed using IBM SPSS version 23.0.
Descriptive statistics were used to summarise variables:

- frequencies and percentages for categorical variables
- means and standard deviations for continuous variables

Ethical considerations

Ethical approval was obtained from the Health Research Ethics Committee of Irrua Specialist Teaching Hospital. Permission to access patient records was obtained from the Lassa fever unit and the medical records department.

Results

A total of 191 Lassa fever case records met the eligibility criteria and were included in the analysis. The age distribution showed that the largest proportion of patients were children aged 1–10 years (45, 23.6%), followed by those aged 10–20 years (42, 22.0%) and 20–30 years (38, 19.9%). Fewer cases were observed in older age groups, with patients aged 50 years and above accounting for less than 15% of the study population. There was a slight male predominance, with 100 males (52.4%) compared with 91 females (47.6%). Regarding employment status, the majority of patients were employed (76, 39.8%), followed by self-employed individuals (66, 34.6%), while 49 (25.7%) were unemployed. Most admissions occurred in 2018 (90, 47.1%), followed by 2019 (48, 25.1%) and 2020 (36, 18.8%). Fewer cases were recorded in 2021 (11, 5.8%) and 2022 (6, 3.1%), indicating a decline in admissions towards the end of the study period (Table 1).

Table 1. Sociodemographic characteristics of patients with Lassa fever (n = 191).

Variables	Category	n(%)
Age group (years)	1-10	45(23.6%)
	10-20	42(22.0)
	20-30	38(19.9)
	30-40	30(15.7)
	40-50	12(6.3)
	50-60	9(4.7)
	60-70	8(4.2)
	70-80	7(3.7)
Mean±SD	26.0 ± 18.8	
Gender	Male	100(52.4)
	Female	91(47.6)
Employment status	Unemployed	49(25.7)
	Self-employed	66(34.6)
	Employed	76(39.8)
Year of admission	2018	90(47.1)
	2019	48(25.1)
	2020	36(18.8)
	2021	11(5.8)
	2022	6(3.1)

According to Table 2, out of the 191 patients included in the study, only 13 (6.8%) had Lassa fever with documented comorbid conditions, while the majority (178, 93.2%) had no reported

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comorbidity. Regarding duration of hospitalisation, most patients were admitted for 11–15 days (65, 34.0%), followed by 6–10 days (56, 29.3%). Fewer patients stayed 1–5 days (10.5%) or more than 20 days (11.0%). Nearly half of the patients (88, 46.1%) presented within 1–5 days of symptom onset, while 69 (36.1%) presented between 6–10 days, and 34 (17.8%) presented after 11 days or more, indicating that delayed presentation still occurred in a notable proportion of cases. The overall case fatality rate was 13.6% (26 deaths) among admitted patients.

Table 2. Clinical characteristics of patients with Lassa fever (n = 191).

Variable	Categories	n(%)
Lassa fever with comorbidities	Yes	13(6.8)
	No	178(93.2)
Duration of hospital admission (days)	1-5	20(10.5)
	6-10	56(29.3)
	11-15	65(34.0)
	16-20	29(15.2)
	>20	21(11.0)
Duration before presentation (days)	1-5	88(46.1)
	6-10	69(36.1)
	>11	34(17.8)
Outcome	Death	26(13.6)
	Survived	165 (86.4)

Regarding Table 3, fever was the most common presenting symptom, occurring in 174 patients (174, 91.1%). Gastrointestinal and constitutional symptoms were also frequently reported, including vomiting (96, 50.3%), headache (89, 46.6%) and anorexia (88, 46.1%). Less than one-third of patients presented with malaise (54, 28.3%) or diarrhoea (53, 27.7%). Overt haemorrhagic manifestation, such as bleeding from body orifices, was relatively uncommon, occurring in 9 patients (9, 4.7%).

Table 3. Common presenting symptoms among patients with Lassa fever (n = 191).

Symptom	n(%)
Fever	174(91.1)
Malaise	54(28.3)
Diarrhoea	53(27.7)
Vomiting	96(50.3)
Bleeding from orifices	9(4.7)
Headache	89(46.6)
Anorexia	88(46.1)

Discussion

This study examined trends in Lassa fever morbidity and mortality at Irrua Specialist Teaching Hospital over a five-year period and provides facility-level evidence from one of the major referral centres for Lassa fever management in Nigeria. A total of 191 confirmed cases met the eligibility criteria. The findings demonstrate a predominance of younger patients, a slight male predominance, largely non-specific clinical presentations and a case fatality rate comparable to previously reported hospital-based estimates.

The age distribution in this study showed that most patients were younger than 30 years, with the highest proportion occurring among children aged 1–10 years. This differs slightly from earlier epidemiological reports suggesting that Lassa fever more commonly affects young adults aged 21–30 years.[27] Variations in age distribution across endemic settings may reflect differences in exposure patterns, household transmission dynamics, referral systems and healthcare-seeking

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behaviour. In endemic communities where rodent exposure occurs primarily within households, children may experience substantial exposure risk, particularly in settings with inadequate food storage and sanitation practices.[28,29]

A slight male predominance observed in this study is consistent with previous reports from endemic regions showing marginally higher infection rates among males.[27] However, the relatively small difference between sexes suggests that Lassa fever transmission in this setting is likely driven more by environmental and household exposure than by gender-specific occupational risk.

The temporal distribution of cases in this study showed that admissions peaked in 2018 and declined in subsequent years. This pattern corresponds with national surveillance reports describing the 2018 outbreak as one of the largest recorded in Nigeria.[5,20] The decline in admissions observed after 2018 may reflect improvements in surveillance, case detection, infection prevention measures or natural outbreak fluctuation. Nonetheless, under-reporting and variability in diagnostic access remain recognised challenges in interpreting Lassa fever trends across Nigeria.[11,27]

The overall case fatality rate of 13.6% observed in this study falls within the range reported for hospitalised Lassa fever patients, typically estimated at 15–25%.[1,25] Similar facility-based analyses in Nigeria have reported comparable mortality levels, although higher case fatality rates have been documented during outbreak periods when delayed presentation and severe disease are more common. Mortality in Lassa fever is strongly associated with delayed diagnosis, severity of illness, pregnancy status, and level of viraemia.[30,31] In this study, nearly one-fifth of patients presented more than 11 days after symptom onset, suggesting that delayed presentation may continue to contribute to adverse outcomes. Health system capacity and access to timely care remain critical determinants of outcomes in infectious diseases in low- and middle-income countries. Barriers such as delayed presentation, financial constraints and limited health system resources have been identified as important contributors to preventable morbidity and mortality in tertiary healthcare settings in Nigeria.[32] These structural challenges may similarly influence outcomes in Lassa fever management, particularly in endemic regions where specialised treatment centres serve large catchment populations.

The duration of hospitalisation observed in this study, with most patients admitted for 6–15 days, is consistent with the typical clinical course of hospital-managed Lassa fever, which often requires prolonged monitoring, supportive care, and antiviral therapy.[1] This admission pattern reflects the known progression of the disease, where complications frequently develop during the second week of illness.

Clinical presentation in this cohort was dominated by non-specific symptoms, particularly fever, vomiting, headache and anorexia, while overt haemorrhagic manifestations were uncommon. This pattern aligns with previous clinical descriptions of Lassa fever, which emphasise that most patients present with non-specific febrile illness rather than classical haemorrhagic features.[1] The predominance of non-specific symptoms reinforces the diagnostic challenge of distinguishing Lassa fever from other endemic febrile illnesses such as malaria, particularly in resource-limited settings where laboratory confirmation may be delayed or unavailable.[5]

Only a small proportion of patients in this study had documented comorbid conditions. This finding may reflect limitations inherent in retrospective record reviews rather than the true absence of comorbidity, as documentation of chronic illnesses is often incomplete in acute infectious disease admissions. Nevertheless, comorbid conditions remain clinically important predictors of outcome in severe viral infections and warrant further investigation in prospective studies.

The findings of this study reinforce previous reports identifying Edo State as a persistent hotspot for Lassa fever transmission in Nigeria.[20,27] The continued occurrence of hospitalised cases and measurable mortality highlights the need for sustained surveillance, early diagnosis strengthened infection prevention practices and community awareness interventions in endemic areas. In addition, long-term sequelae such as sensorineural hearing loss, which may occur in up to one-third of survivors, remain an important but under-recognised component of Lassa fever burden.[22,33]

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This study has several limitations. As a retrospective hospital-based review, it depended on the completeness and accuracy of medical records. The findings may not reflect the full community burden of Lassa fever, particularly mild or asymptomatic infections. Additionally, causal relationships between clinical variables and mortality could not be fully established due to the observational study design.

Despite these limitations, this study provides important facility-level evidence on Lassa fever morbidity and mortality trends in a major treatment centre in Nigeria. Continued strengthening of surveillance systems, early diagnostic capacity and clinical management strategies will be essential to reducing morbidity and mortality associated with Lassa fever in endemic regions.

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Availability of Data and Materials: The data supporting this study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate: Ethical approval for this study was granted by the Health Research Ethics Committee of the Irrua Specialist Teaching Hospital (ISTH). Permission was also obtained from the Department of Community Medicine, Ambrose Alli University, Ekpoma. All methods were performed in accordance with the relevant guidelines and regulations. Informed consent was obtained from all participants prior to their inclusion in the study.

Consent for Publication: Not applicable, as the study does not include any individual person's identifiable data or images.

Competing Interests: The authors declare no competing interests.

Clinical Trial Number: Not applicable.

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