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Data Article

Data set on Lassa fever in post-conflict Sierra Leone

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ABSTRACT

Lassa fever is a rodent-borne illness that is endemic to parts of sub-Saharan Africa, including Sierra Leone, Nigeria, and Guinea. The disease is named after the town of Lassa, Nigeria where it was discovered in 1969. This data article focuses on the epidemiology of Lassa fever in Sierra Leone following a decade-long civil war that ended in 2002. The data were collected at Kenema Government Hospital (KGH) in Kenema, Sierra Leone, which maintains the country's only Lassa fever treatment facility and a biosafety level 3 (BSL-3) laboratory. The key data set variables include Lassa fever serostatus determined using antigen (Ag), immunoglobulin M (IgM), and immunoglobulin G (IgG) ELISA diagnostic techniques; and patient demographics, survival outcome, and treatment (ribavirin) status. The individual data used to generate the graphs

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and tables in the corresponding research manuscript published in *PLOS Neglected Tropical Diseases* in 2014 and its coding guide are provided as Supplementary material (Shaffer et al., 2014) [1].

Specifications table

Subject area	Lassa fever.
More specific subject area	Lassa fever epidemiology.
Type of data	Individual records and tables.
How data was acquired	Sample collection, enzyme-linked immunosorbent assay (ELISA), clinical questionnaires.
Data format	Raw, tabulated.
Experimental factors	Blood samples for suspected cases of Lassa fever in Sierra Leone were screened using ELISA diagnostic techniques.
Experimental features	Data were based on self-presentation of subjects to Kenema Government Hospital in Kenema, Sierra Leone or one of its peripheral health units in Sierra Leone.
Data source location	Kenema Government Hospital, Kenema, Sierra Leone.
Data accessibility	Data set with individual records is included with this article via file download.
Related research article	J.G. Shaffer, D.S. Grant, J.S. Schieffelin, M.L. Boisen, A. Goba, et al., Lassa fever in post-conflict Sierra Leone, PLOS Neglected Tropical Diseases. 8 (3) (2014) e2748. https://doi:10.1371/journal.pntd.0002748.

Value of the data

- Data classify Lassa fever serostatus according to acute, recent, prior, and absence of prior exposure;
- Patient survival outcomes are included for calculating Lassa fever case fatality rates;
- Data cover Sierra Leone's post-conflict period and may be used as a benchmark for related Lassa fever research; and
- Individual data are provided to allow for linkage with other environmental or epidemiological data sets.

1. Data

The data here include clinical and laboratory outcomes captured through clinical questionnaires and human blood sample screening for Lassa virus disease at Kenema Government Hospital (KGH) in Kenema, Sierra Leone. Screening techniques included antigen (Ag), immunoglobulin M (IgM), and immunoglobulin G (IgG) ELISA. The data set contains 1740 observations collected between January 1, 2008 and December 31, 2012. Each observation corresponds to the date of first blood draw at KGH or one of its peripheral health units. The data are classified by 14 variables, including subject demographics, survival outcome, month and year of screening, Lassa fever serostatus, and treatment (ribavirin) status. The full data set includes observations for 190 acute Lassa fever exposures, 407 recent Lassa fever exposures, and 1143 observations with absence of recent Lassa exposure. Data are provided in Microsoft Excel format (version 2013; Redmond, WA). The primary limiting factor of the data is the self-reporting of the subjects who contributed blood samples.

1.1. Study site

Kenema Government Hospital (KGH) is situated in southeast Sierra Leone about 40 miles (64 km) from the Liberian border. KGH is one of 31 government hospitals in Sierra Leone and is coordinated with 788 functioning public health units (PHUs; [2]). KGH maintains the only Lassa treatment facility and Lassa fever isolation ward in Sierra Leone (and one of the few Lassa fever isolation wards in the world) and is equipped with a biosafety level 3 (BSL-3) laboratory for screening suspected cases of Lassa fever. All data for this article were captured at KGH.

2. Experimental design, materials, and methods

The full data set includes 1740 observations based on the following criteria:

2.1. Inclusion criteria

- Suspected index case (the data excluded case contacts from contact tracing activities);
- Resident of Sierra Leone or referral from a peripheral health unit in Sierra Leone;
- Valid (nonnegative) optical density values for Ag and IgM ELISA based on first blood draw;
- Optical density values for positive control samples greater than the optical density values for corresponding negative control samples; and
- Nonnegative optical density values for both positive and negative control samples.

The data set includes 1740 observations for subjects with Ag and IgM ELISA serostatus outcomes, including 476 observations for subjects admitted to the KGH Lassa Ward. Admission of suspected Lassa cases was determined according to the suspected case definition for Lassa fever detailed in Shaffer et al. [1]. Demographic data were usually unavailable for subjects dying prior to hospital admission. All data were captured on clinical presentation, save for patient survival outcome and treatment (ribavirin) status. An observation summary for the full data set is shown in Table 1.

The primary outcome was Lassa fever serostatus classified into four categories as detailed by Branco et al. [3]:

- Stage 1 acute Lassa exposure: Samples testing positive according to Ag ELISA and negative according to IgM ELISA (Ag+/IgM-);
- Stage 2 acute Lassa exposure: Samples testing positive according to Ag ELISA and positive according to IgM ELISA (Ag+/IgM+);

Table 1
Full data set observation summary (n = 1740 observations).

Characteristic	*n* (% non-missing responses)
Ag/IgM serostatus	1740 (100)
IgG serostatus	1140 (66)
Admission status	1738 (100)
Age at presentation	1714 (99)
Gender	1736 (100)
District of residence	1567 (90)
Treatment status[a]	1244 (72)
Survival outcome[b]	501 (29)

[a] Administration of ribavirin therapy observed during hospitalization.
[b] Observed at hospital discharge (or following patient consultation for subjects not admitted to Kenema Government Hospital Lassa Ward).

- Recent Lassa exposure: Samples testing negative according to Ag ELISA and positive according to IgM ELISA (Ag-/IgM+); and
- Absence of recent Lassa exposure: Samples testing negative according to Ag ELISA and negative according to IgM ELISA (Ag-/IgM-).

Immunoglobulin G (IgG) ELISA testing began at KGH in 2010 to for detecting prior, long-term Lassa exposure. The methodology of the ELISA procedures (adapted from [1]) are detailed in the two subsections below [1,4].

2.2. Lassa fever recombinant antigen immunoassays at KGH

The immunoassays for these data were designed to detect Lassa virus (LASV) antigens or antibodies circulating in Sierra Leone or its surrounding countries. Confirmation studies of earlier works indicated that there are three diverse LASV lineages in Nigeria (lineages I, II, and III), but only a single lineage (IV) in Sierra Leone. Performance of the Recombinant Lassa (ReLASV) Diagnostics system versus detection of LASV viremia by reverse transcriptase polymerase chain (RT-PCR) was evaluated at KGH between 2012–2013 (unpublished data). Limits of detection and quantitation of the recombinant antigen-based Lassa fever ELISAs were applied based on the upper 95th percentile obtained with panels of sera from U.S. and Sierra Leonean donors without detectable LASV antigens or immunoglobulin M or G antibodies to LASV recombinant proteins. IgG depletion studies (protein A) demonstrated that the LASV IgM assay only detects anti-LASV IgM (not IgG) and conversely that the IgG assay has a high specificity for anti-LASV IgG. Upon initial presentation, screening with the ReLASV diagnostic assays was capable of identifying 95% of active LF cases as confirmed by RT-PCR performed at KGH, rising IgM titers or IgM to IgG seroconversion. The diagnostic assays failed to detect a low percentage ($< 5\%$) of resolving or less severe Lassa cases with low virus load that were generally associated with low mortality. Combining the nucleoprotein antigen detection (Ag-capture ELISA) with anti-LASV IgM reactivity (IgM-capture ELISA) yielded a 98% negative predictive value.

2.3. Accession number

Recombinant nucleoprotein, glycoprotein, and Z protein from lineage IV LASV Josiah strain (a Sierra Leone isolate; ADY11071) were used in the IgM and IgG-capture ELISAs [5]. These recombinant proteins were also used to immunize goats and mice for use in the ReLASV Ag-capture ELISA.

2.4. Serostatus break points

The serostatus break points were based on the optical density values for a set negative (for Lassa) control samples. Specifically, indeterminate and positive classifications were set at 1.5 and 2.5 standard deviations (respectively) above the average of the optical density values over a group of negative (for Lassa) control samples. The break points were calculated by calendar year to account for environmental changes and technological advancements. Indeterminate serostatus classifications were ultimately considered as absent of Lassa exposure (Ag-/IgM-) for the final data set.

2.5. Calculation of case fatality rates

Survival outcome was measured at hospital discharge or following patient consultation for subjects not admitted to KGH. Those survival outcomes for subjects transferred from the KGH Lassa Ward to other hospital units were considered as unknown. To illustrate the use of the survival outcome data included with this article, case fatality rates (CFRs) for Lassa fever over the data collection period are shown in Table 2.

Conservatively estimating the CFRs among acute Lassa fever exposures by considering the missing outcome responses as hospital discharges yields a CFR of 57.3% ($n = 109/190$). Omitting the unknown survival outcomes from the calculation yields a CFR of 69.0% ($n = 109/158$). The survival outcome data included with this article likely underestimate patient mortality as subjects were occasionally

Table 2
Case fatality rates by serostatus and year of clinical presentation.

Serostatus/outcome[a]	2008 (*N* = 85)	2009 (*N* = 103)	2010 (*N* = 447)	2011 (*N* = 575)	2012 (*N* = 530)	Overall (*N* = 1740)	*p* value[b]
Ag+/IgM+-							
Died	5 (33)	8 (47)	21 (60)	41 (58)	34 (65)	109 (57)	.266
Discharged	4 (27)	6 (35)	7 (20)	20 (28)	12 (23)	49 (26)	
Unknown	6 (40)	3 (18)	7 (20)	10 (14)	6 (12)	32 (17)	
Ag-/IgM+-							
Died	2 (11)	1 (9)	8 (15)	18 (13)	17 (9)	46 (11)	< .001
Discharged	13 (72)	7 (64)	25 (45)	21 (15)	49 (26)	115 (28)	
Unknown	3 (17)	3 (27)	22 (40)	98 (72)	120 (65)	246 (61)	
Ag-/IgM-							
Died	4 (8)	2 (3)	31 (9)	21 (6)	7 (2)	65 (6)	< .001
Discharged	7 (13)	9 (12)	67 (19)	18 (5)	16 (6)	117 (10)	
Unknown	41 (79)	64 (85)	259 (72)	328 (89)	269 (92)	961 (84)	

[a] Ag+/IgM- = Samples testing positive according to Ag ELISA and negative according to IgM ELISA (Stage 1 acute Lassa exposure); Ag+/IgM+ = Samples testing positive according to Ag ELISA and positive according to IgM ELISA (Stage 2 acute Lassa exposure); Ag-/IgM+ = Samples testing negative according to Ag ELISA and positive according to IgM ELISA (recent Lassa exposure); Ag-/IgM- = Samples testing negative according to both Ag and IgM ELISA (absence of recent Lassa exposure). Outcome = patient survival outcome. Survival outcome observed at hospital discharge (or following patient consultation for subjects not admitted to Kenema Government Hospital Lassa Ward).

[b] Pearson's Chi-Square Test comparing case fatality rates over year of clinical presentation.

transferred from the KGH Lassa Ward to other hospital units and their survival outcomes were considered as unknown. It was common for death to occur in patients discharged against medical advice, which were considered here as typical hospital discharges. Data following hospital discharge were usually unavailable and considered as unknown.

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Disclosure

The Viral Hemorrhagic Fever Consortium (vhfc.org) is a partnership of academic and industry scientists who are developing diagnostics, therapeutics and vaccines for Lassa fever and other severe diseases. Tulane University and various industry partners have filed United States and foreign patent applications on behalf of the consortium for several of these technologies. If commercial products are developed, consortium members may receive royalties or profits. The authors MLB, LMB, and RFG are current employees or affiliates of Zalgen Labs, LLC. This does not alter our adherence to Data in Brief policies on sharing data and materials.

Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2019.01.021.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2019.01.021.

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