

# Factors associated with a confirmed Lassa fever outbreak in Eguare community of Esan West, Edo State, Nigeria: January-March, 2019

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## ABSTRACT

**Introduction:** Lassa fever disease is endemic in Edo State, Nigeria. A national upsurge in Lassa fever cases and death occurred in January 2019, with Eguare community in Esan West Local Government Area, Edo State having an unusual increase in number of reported cases. We investigated the outbreak to determine factors associated with being a confirmed Lassa fever case and the health seeking behaviour of the community members. **Methods:** We conducted an unmatched 1:4 case control study. We defined a confirmed case-patient as any person from Eguare community with febrile illness and PCR positive for Lassa fever between January and March, 2019; and control as anyone from Eguare community without febrile illness within the same period. Structured questionnaire was used to obtain data on exposures from both cases and controls. Univariate and bivariate analysis was done and confidence level set at 95%. **Results:** A total of 10 case-patients and 40 controls were recruited. The mean age of case-patients was 45.8years  $\pm$  15.2 and controls 35.6years  $\pm$  14.6. Forty percent of case-patients and 52.5% of controls were females. Having contact with suspected case-patients and having dumpsites close to homes ( $p < 0.01$ ) were associated with Lassa fever infection among case-patient. Eighty-six percent of the respondents would report at health facility if presented with febrile illness. **Conclusion:** Avoiding contact with a suspected Lassa fever case-patients and improved waste management system may prevent and interrupt the spread of Lassa fever virus.

## KEYWORDS

Lassa fever, associated factors, dumpsite, Nigeria

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## Introduction

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In West Africa, it is reported that about 300,000 - 400,000 cases of Lassa fever occur annually with approximately 5000 deaths [1]. Nigeria experiences annual recurrent outbreaks in different states with varying levels of morbidity and mortality. In 2008, Nigeria experienced its largest ever reported outbreak of Lassa fever with 23 out of 36 States affected.

In recent times, there have been reports of confirmed cases in some states in Nigeria, including Anambra, Gombe, Nasarawa, Ogun, Ebonyi, Bauchi, Taraba, Plateau, Rivers, Imo, Kogi, Ondo, Edo, Cross river and Borno states especially during the dry season. Majority of the deaths recorded in Nigeria so far have been among the youths, health personnel and pregnant women [1]. Edo State, is the leading hotspot State for reported cases of Lassa fever in Nigeria. The Nigeria Centre for Disease Control (NCDC) was notified of the outbreaks. A Rapid Response Team (RRT) was deployed to Edo and other high burden States. Within the first week of 2019, 57 suspected cases were reported with 25 confirmed and 32 negatives with 7 deaths (CFR, 28.0%) [2-4].

In Edo State, Lassa fever is endemic, and outbreaks are not unusual with mortality ranging from 15-25% [3,5]. Epidemic summary and description of cases as at March 2019 from Edo State showed Esako West, Esan West and Esan North East LGAs had the highest burden of Lassa fever cases. Previous reports have also demonstrated high prevalence of Lassa in these 3 LGAs [6-7].

Eguare community in Esan West LGA has the highest burden of Lassa fever cases from the LGAs and contributes more than 70% of cases reported in this LGA. The reason(s) for this burden are unclear. We conducted this study to determine the risk factors associated with high burden of Lassa fever and assess the health seeking behaviour of members of Eguare community.

## Methods

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We conducted an unmatched case control study in households with confirmed Lassa fever cases in Eguare community between January - March, 2019. Our study setting was Eguare community. It shares

borders with Ughele, Ihumudumu, Emuhi and Egoros (all these communities have also recorded cases within the time of this study). Eguare has an estimated total population of 31,500 [8,9]; with children under five years having a population of 1,260 and women of child bearing age, a population of 6,930. The community has one functional primary health care centre, one secondary health facility and seven private hospitals. The main occupation of inhabitants is trading.

A total of 10 cases and 40 neighbourhood controls were selected. We reviewed all case investigation forms (CIFs) and line-list of cases from the state to validate the 10 positive cases from Eguare community. We defined a confirmed case as any person from Eguare community with Lassa fever PCR positive result from January to March 2019 and a control as any person from Eguare community without febrile illness within the same period of time.

An interviewer-administered structured questionnaire was used to obtain socio-demographic and possible exposure variables, and health seeking behaviour from both case-patients and controls after obtaining informed consent. The domains captured in the questionnaire include; environment, human and reservoir associated risk factors.

Data were entered into Microsoft Excel 2016 and analysed using Epi Info version 7. We summarized the data using descriptive statistics, while bivariate analysis was done to determine association between independent variables and being a confirmed Lassa fever case-patient by determining the odds ratio and 95% confidence interval. Fisher's exact test was used to determine the level of statistical significance at 5 % level of significance.

We obtained ethical consideration for the study, through the Health and Emergency Preparedness Response (HEPR) department in NCDC.

## Results

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The mean age of respondents was  $36.1 \pm 15.0$  years; while the mean ages in years of case-patients and controls were  $45.8 \pm 15.2$  and  $33.7 \pm 14.6$ , respectively. More female (52.0 %) than male were respondents. However, more male (60.0%) were case-patients than female. All the case-patients were married and about 70.0% of them were involved in

trading. Most (94.0%) of the respondents had more than primary education [Table 1](#).

Eighty percent of the case-patients had with a known suspected Lassa fever case; while only 10% of the controls reported having the same exposure. Households with persons who had contact with a known suspected case of Lassa fever were 32 times more likely to have a case of Lassa fever than those who did not have contact with a known suspected case of Lassa fever (OR = 31.5; CI = (4.44 - 405.3). Ninety percent of the case-patients lived in households with dump sites around their house; while 36.0 % of the controls had similar exposure. Households with dump sites around their vicinity were 15 times more likely to have a case of Lassa fever compared to those who do not have (OR = 15.83; CI = (1.87 - 759.36). All of the case-patients had the presence of rats in the house, while 68.0% of the controls also reported same. The difference in exposure between the case-patients and controls was however, marginal ( $p = 0.05$ ). Exposures to other factors such as having taken an injection in the last one month; living in the same house hold as someone bleeding (unnaturally) from any part of the body; participation in funeral rituals in the last one month and having bought and drank cassava flakes (garri) from the market were not significantly different between case-patients and controls [Table 2](#).

Most 48 (98.0%) of the respondents would visit a hospital facility on suspicion of Lassa fever infection; while 43 (86.0%) would visit a hospital facility should they have high fever [Table 3](#).

## Discussion

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In this study, a high literacy level was observed among the participants, with more than 90% having minimum level of education as secondary school. However, it is left to be explored if this high literacy level, translates into good knowledge of environmental cleanliness, health promotion and infectious disease prevention amongst these households.

We also observed association among persons who had contact with a known suspected case of Lassa fever disease and occurrence of Lassa fever disease. This is consistent with findings from Saka et al. [[6,10-11](#)] which supported the epidemiology of Lassa fever

disease on human to human transmission of diseases compared to primary transmission of the disease (from animal to human).

Although Asogun et. Al [[12](#)] in their study found significant association between storing food in rat proof containers and occurrence of Lassa fever, which has been a proven means of prevention against Lassa fever; our study however did not find statistically significant association between households that did not store food in rat proof container and occurrence of Lassa fever disease. However, this does not in any way negate the importance of this practice in the prevention of spread of Lassa fever. Reason for this association may be connected to the increased awareness among Nigerians, as more persons are now aware that “rat infested food stuff” is a source for Lassa fever infection; as buttressed by Saka et al. [[6](#)].

We have also demonstrated significant association between poor waste management around homes as likely cause of Lassa fever among the study. This is similar to the findings of Lo Iocono et al. [[13,14](#)] who found significant association between poor environmental hygiene and Lassa fever disease occurrence.

Furthermore, the findings from the study showed that majority of the respondents presented early for healthcare at the hospitals/health facilities in the event they suspect having Lassa fever or high fever. This was in consonance to the documentation by Pulse 2016 [[15,16](#)] which posits that Media’s focus on the role of rodents in the transmission of Lassa fever disease in addition to advocacy and community information and mobilization has helped to improve awareness, health seeking behaviour and response. From our findings, the proximity of the community to health facilities and the Lassa fever treatment centre could have also contributed to good health seeking behaviour, although this may not have any direct effect on preventing the disease.

It is important to note one major limitation of this study; which was the inadequate sample size. The study took place in an outbreak season, so the study was limited to the data available as observed in the field.

## Conclusion

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The findings of this study further support the existing body of knowledge on human to human transmission of Lassa fever as households within the study population whose occupants have had contact with a known suspected case of Lassa fever were more likely to have a case of Lassa fever disease. This underscores the need to place more emphasis on community infection prevention and control to interrupt human-to-human transmission of Lassa fever; through sustained awareness on infection prevention and control measures. Furthermore, poor environmental sanitation remains a major driver of Lassa fever outbreak as residential areas in close proximity to dumpsites in the study community are more prone to Lassa fever outbreak. Hence, locating dumpsite away from residential areas and heightened /improved environmental sanitation could prevent the community members from contacting Lassa fever disease.

## Recommendations

The Local and State health ministries should intensify and improve sensitisation and awareness on community infection prevention and control in Eguare and surrounding communities. Infection prevention and control, should be strengthened in hospitals/health facilities; especially Lassa fever treatment centres by the State and supported by the Federal ministry of health. The Local Government authority should identify and designate dumping sites in the communities and ensure they are situated at far distance of about 5km away from residential areas. The Local and State Government authority should equip these dumping sites with waste treatment plants. The Local government authorities should ensure prompt evacuation of generated wastes from homes to the dumpsites.

## What is known about this topic

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- Lassa fever disease is an acute viral haemorrhagic illness caused by Lassa Virus and the Multi mammate rat; *Mastomys Natalensis*, is the only known reservoir
- Transmission is seasonal, and occurs within dry seasons except in hyper-endemic location, where cases are recorded all-round the year and primary transmission is from

animal reservoir (*Mastomys Natalensis*) to humans

- Early supportive care with rehydration and symptomatic treatment improves survival

## What this study adds

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- The secondary transmission (human-to-human), can be responsible for sustaining the spread of transmission in an outbreak, contrary to the view of primary transmission (rodent -to- human)
- Situating dumpsites at close proximity to residential areas encourages the spread of Lassa fever
- Measures to be taken to prevents human-to-human transmission of the Lassa fever disease in the communities

## Competing interests

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The authors declare that they have no competing interests.

## Authors' contributions

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Henry Uguru Ekechi conceptualized the Study, design, implemented data acquisition, drafted the initial manuscript and data analysis. Ibeneme Charles Ugochukwu implemented data acquisition and made substantial additions to initial manuscript. Ogunniyi Biodun supervised the study and made substantial revision of initial manuscript. Awosanya Emmanuel carried out data analysis and interpretation, made substantial revision of initial manuscript. Gbadebo Babatunde made substantial revision of draft manuscript. Usman Aishatu made substantial revision of draft manuscript. Balogun Muhammad Shakir made substantial revision of draft manuscript. Ameh Celestine did data analysis and interpretation, made substantial revision of initial manuscript. Okeke Lilian made substantial revision of initial manuscript. Nwafor Chioma made substantial revision of initial manuscript. Ihekweazu Chikwe supervised the overall study and made substantial revision of initial manuscript

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## Tables

**Table 1:** Socio-demographic characteristics of respondents in Eguare community, Edo State Nigeria January-March, 2019, (n=50)

**Table 2:** Factors associated with Lassa fever outbreak in Eguare, Edo State Nigeria January-March, 2019, (n=50)

**Table 3:** Health seeking behaviour of respondents Eguare, Edo State Nigeria January-March, 2019, (n=50)

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**Table 1:** Socio-demographic characteristics of respondents in Eguare community, Edo State Nigeria January-March, 2019, (n=50)

Variables	Frequency			Percentage Total (%)
	n	Case (n) (%)	Control (n) (%)	
<b>Age (years)</b>				
15-24	12	0 (0.0)	12 (100.0)	24.0
25-34	10	4 (40.0)	6 (60.0)	20.0
35-44	14	1 (7.1)	13 (92.9)	28.0
≥ 45	14	5 (35.7)	9 (64.3)	28.0
<b>Gender</b>				
Male	24	6 (25.0)	18 (75.0)	48.0
Female	26	4 (15.4)	22 (84.6)	52.0
<b>Marital status</b>				
Single	34	0 (0.0)	34 (100.0)	68.0
Married	16	10 (62.5)	6 (37.5)	32.0
<b>Educational level</b>				
Primary	3	0 (0)	3 (100)	6.0
Secondary	25	3 (12.0)	22 (88.0)	50.0
Tertiary	22	7 (31.8)	15 (68.2)	44.0
<b>Occupation</b>				
Trading	30	7 (23.0)	23 (77.0)	60.0
Civil Servant	3	2 (66.7)	1 (33.3)	6.0
Student	13	0 (0.0)	13(100.0)	26.0
Unemployed	4	1 (25.0)	3 (75.0)	8.0

<b>Table 2: Factors associated with Lassa fever outbreak in Eguare, Edo State Nigeria January-March, 2019, (n=50)</b>					
<b>Risk Factors</b>	<b>Cases (%) (n=10)</b>	<b>Control (%) (n=40)</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>	<b>p value</b>
<b>Presence of rat in your house</b>					
Yes	10 (100.0)	27 (68.0)	Undefined	Undefined	0.05
No	0 (0.0)	13 (32.0)			
<b>Direct Contact* with bush meat</b>					
Yes	6 (26.0)	17 (15.0)	2.49	0.12 – 2.02	0.48
No	4 (74.0)	23 (85.0)			
<b>Been bitten or scratched by a rodent</b>					
Yes	1 (10.0)	1 (3.0)	0.23	0.01- 4.05	0.36
No	9 (90.0)	39 (97.0)			
<b>Undergone surgical intervention in the last one month</b>					
Yes	1 (10.0)	2 (5.0)	0.47	0.04-5.82	0.50
No	9 (90.0)	38 (95.0)			
<b>Had an injection in the last one month</b>					
Yes	7 (70.0)	17 (43.0)	0.32	0.07-1.41	0.16
No	3 (30.0)	23 (57.0)			
<b>Undergone scarification in the last one month</b>					
Yes	1 (10.0)	2 (5.0)	0.47	0.04-5.82	0.50
No	9 (90.0)	38 (95.0)			

**Table 2:** Factors associated with Lassa fever outbreak in Eguare, Edo State Nigeria January-March, 2019, (n=50)

Risk Factors	Cases (%) (n=10)	Control (%) (n=40)	Odds Ratio	95% Confidence Interval	p value
<b>Lived in the same house hold as someone with jaundice</b>					
Yes	3 (30.0)	4 (10.0)	0.26	0.05 – 1.42	0.13
No	7 (70.0)	36 (90.0)			
<b>Lived in the same house hold as someone bleeding(unnaturally) from any part of the body</b>					
Yes	7 (70.0)	14 (35.0)	4.2	0.8 – 29.2	0.10
No	3 (30.0)	26 (65.0)			
<b>Lived in the same house hold as someone who died of unknown causes</b>					
Yes	1 (10.0)	0 (0.0)	Undefined	Undefined	0.20
No	9 (90.0)	40 (100.0)			
<b>Participated in funeral rituals in the last one month</b>					
Yes	1 (10.0)	12 (30.0)	3.86	0.44-33.91	0.26
No	9 (90.0)	28 (70.0)			
<b>Hospitalized or attended a health facility to visited anyone</b>					
Yes	4 (40.0)	10 (25.0)	0.50	0.12 – 2.14	0.44
No	6 (60.0)	30 (75.0)			
<b>Contact with suspected case of Lassa fever</b>					
Yes	8 (80.0)	4 (10.0)	31.5	4.44 -405.3	<0.01**
No	2 (20.0)	36 (90.0)			
<b>Bought and drank garri from the market</b>					
Yes	3 (30.0)	26 (65.0)	4.33	0.96 -19.43	.073
No	7 (70.0)	14 (35.0)			
<b>Manage waste with Covered Dustbin</b>					
Yes	1 (10.0)	3 (8.0)	0.75	0.069 – 8.09	1.00
No	9 (90.0)	37 (92.0)			
<b>Have bushes around the house</b>					
Yes	8 (80.0)	22 (55.0)	0.29	0.06 – 1.55	0.17
No	2 (20.0)	18 (45.0)			
<b>Storage of food in a rat proof container</b>					
Yes	4 (40.0)	22 (55.0)	1.75	0.43 – 7.19	0.5

**Table 2:** Factors associated with Lassa fever outbreak in Eguare, Edo State Nigeria January-March, 2019, (n=50)

Risk Factors	Cases (%) (n=10)	Control (%) (n=40)	Odds Ratio	95% Confidence Interval	p value
No	6 (60.0)	18 (45.0)			
<b>Presence of dumping sites around the house hold</b>					
Yes	9 (90.0)	14 (35.0)	15.83	1.87 – 759.36	<b>0.003**</b>
No	1 (10.0)	26 (65.0)			

**NB:** \* Hunting, sell, prepare or handling of bush meat

\*\* p values of risk factors with significant association

Due to available samples during the outbreak; the sample size was small; hence multivariate analysis was not included as they were undefined

**Table 3:** Health seeking behavior of respondents Eguare, Edo State Nigeria January-March, 2019, (n=50)

<b>Health Seeking Behaviour</b>	<b>Gender</b>	<b>Yes(%)</b>	<b>No (%)</b>
Would visit a hospital facility on suspicion of Lassa fever infection	Male	23(46.0)	1(2.0)
	Female	25(50.0)	1(2.0)
Would visit a hospital facility should they have high fever	Male	18(36.0)	6(12.0)
	Female	25(50.0)	1(2.0)