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Assessment of the Knowledge and Risk Factors Associated with Frequent Lassa Fever Outbreaks in Two Endemic Regions in South-South Nigeria

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ABSTRACT

Frequent outbreaks of the Lassa virus had been reported weekly in Nigeria in recent months by the Nigerian Centre for Disease Control, where 23 of the 36 states in the country recorded confirmed cases in 2019 with a fatality of 20.6%. The present research assesses the knowledge and risk factors associated with continuous outbreaks of Lassa fever in Nigeria using the inhabitants of some endemic communities in Edo state as a case study. The research was conducted using a 25-item self-administered semi-structured questionnaire to elicit responses from individuals in some Lassa fever endemic communities on basic information about the biology, epidemiology, prevention and control of the disease. Data analysis was done using the Statistical Package for Social Sciences (SPSS) Version 23.0. Overall, 122 (43.7%) of the 279 participants had good knowledge of the Lassa virus, 78 (28.0%) had fair knowledge while 79 (28.3%) had poor knowledge. Furthermore, 148 (53.0%) of the respondents knew that Lassa fever is caused by a virus while 260 (93.2%) knew that rats are the vector for the virus. Only 72 (25.8%) of participants knew the effective methods of food storage to avoid vector contact and contamination with the virus. Survey showed that there is still a dearth of knowledge and awareness of the risk factors associated with frequent outbreaks of the Lassa virus in endemic communities. There is need to intensify efforts on public health education and community mobilization to curtail future outbreaks of the disease.

Keywords: Lassa fever, viral diseases, Zoonosis, disease awareness, risk factors, mass education.

Introduction

Lassa fever or Lassa virus infection is an acute viral haemorrhagic communicable disease caused by the Arenaviridae family of virus.[1,2] The virus was first characterized in 1969 in Jos, a town in North-central Nigeria[3] but was named after a town called Lassa in Borno state, Nigeria.[1] The disease has been majorly reported in western African countries [4] such as, Sierra Leone,[5] Guinea,[6,7] Mali [8] Liberia,[9,10] and Nigeria,[11-14] where the multimammate rat (*Mastomys natalensis*) which serves as the vector is most prevalent. [13-15] However, similar to the novel coronavirus and the Ebola virus, the Lassa virus had also been imported into countries where it is not endemic, for example by travelers from Mali into UK,[16] by travelers from Liberia into Ghana,[5] and by travelers from Burkina Faso, Ghana and Côte D'Ivoire into Germany.[18] Thus, like the coronavirus (COVID-19), the Lassa virus can spread to various parts of the world if adequate health precautions and awareness are not implemented.

The Mastomys rats which is the vector of Lassa fever are naturally bush dwellers but consequent upon human activities such as loss of habitat through clearing or wildfires, the vector is left with no option than the invasion of human homes.[19,20] Transmission of the Lassa virus can occur in several ways which include man-vector-contact, man's direct contact with the faeces/urine from a vector or virus-contaminated food/materials, or man's contact with the body secretions of an infected person.[5,21]

Early signs of infection with the virus begins within 3 weeks post-infection for which travelers and pregnant women suffer the highest consequence of the disease.[22,23] Symptoms of the viral infection are fever, muscle aches, sore throat, nausea, vomiting, chest pain, abdominal pain while complications include hemorrhage from the body's orifices, convulsions, pleural effusion, ascites, cerebral oedema, adult respiratory distress syndrome, anaemia, poor renal function, coma and death.[24-27]

A report by WHO in 2019 revealed that Nigeria is endemic for Lassa fever with peak seasons between December till June.[21] In 2019, 86 local government areas (LGAs) located in 23 of the 36 states in Nigeria recorded outbreaks resulting in 167 deaths, a case fatality ratio of about 20.6%.[28] Lassa virus is still a threat to public health in Edo state and the country at large. Recent data indicates that Edo state had the highest number of confirmed cases in Nigeria, accounting for 33.0% of all confirmed cases, followed by Ondo state (32.0%) and Ebonyi state (07%).[14] Also, between 1st January and 3rd May 2020, 991 cases have been confirmed in Nigeria which have culminated in 191 deaths, representing a case fatality of 19.3%.[14] Public health reports have indicated that poor knowledge/awareness of the Lassa virus is a key factor responsible for continuous disease outbreaks which could culminate in loss of many lives within weeks if not curtailed in a timely manner.[29-33]

The study aims to provide an assessment of the knowledge of Lassa fever among residents of Ekpoma and Irrua, two Lassa virus endemic regions in Edo state, Southern Nigeria. Information so derived will provide a measure of the degree of alertness/awareness of the disease in the community and by introspection, the country at large. This will assess the effectiveness of current control programs which could serve as a guide for healthcare planners and stakeholders in the country in formulating and implementing new strategies to improve awareness of

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the virus and eventually help to curb the menace of the disease in endemic countries.

Materials and Methods

Study area

This study was carried out in Esan West and Esan Central Local Government Areas (LGAs) of Edo state, Nigeria with headquarters in Ekpoma and Irrua, respectively, in September 2019. The geographical coordinates of Ekpoma and Irrua communities lie between latitude 6^0 45'N, longitude 6^0 08'E and latitude 6.739^0N, longitude 6.219^0E, respectively. These areas are endemic for Lassa fever with the highest number of reported cases in these districts according to a recent report.[14,28] Esan West occupies a land mass of 502 km^2 with a population of 147,655 while Esan Central has a landmass of 253km^2 with a population of 137,900.[34] The occupations of the inhabitants are mainly farmers, civil servants, students, artisans and traders. Basic amenities, such as pipe-borne water, electricity and good roads, are inadequate or nonexistent.

Study population

The Study population included individuals and households in Esan West and Esan Central LGA. Participants were randomly selected and structured to represent all facets of the communities in terms of age groups, gender, occupation and educational and social status. These consisted of primary and secondary school children, students in higher institutions, traders, farmers, artisans, healthcare workers in private and government owned primary health care facilities; such as doctors, nurses, laboratory personnel, who are directly involved in clinical patient care or specimen collection.

Sample size

The sample size was determined using the Cochran's formula,[35] $n = (z^2pq/\delta^2)$ considered appropriate for large populations given the population size of the study areas. Where n = minimum sample size, Z = Given Z value (1.96), P = Percentage of population with knowledge of Lassa fever (17.2%), q = 1 – p, ∂ = acceptable margin of error (5%). A sample size of 219 was obtained using this formula. Furthermore, a 30% non-response rate was added to boost the sample size and make up for poorly filled questionnaire. Thus, a total sample size of 285 was obtained.

Data collection

The study was conducted, and data analyzed and reported according to the recommendations laid out by the International Committee of Medical Journal Editors (ICMJE) (www.icmje.org). Data were collected using a self-administered, semi-structured questionnaire. The questionnaires were administered to 300 participants who gave consent for the study. However, data from 279 respondents who provided completely filled-in questionnaires were analyzed and reported herein. Efforts were made to capture individuals from different sections of the community based on their socio-demographic characteristics. The questionnaires consisted of closed ended questions with varying options and captured information on socio-demographic variables, knowledge, risk factors and practices associated with the continuous outbreaks of Lassa fever in both communities. Knowledge of Lassa fever and risk factors were assessed based on the individual responses to questions on the epidemiology and control of the disease. The questionnaire also assessed individual risk of exposure as well as household risk of exposure.

Statistical analysis

The recovered questionnaires were carefully examined for correctness and completeness, coded and entered into Microsoft Excel (2016). Data analysis was done using the Statistical Package for Social Sciences (SPSS) Version 23.0. The results of the analysis were presented in tables showing frequencies, percentages and chi square test of significance. The knowledge of Lassa fever was determined from a total score of four (4) questions in the questionnaire used to assess the knowledge of Lassa fever and each question was awarded 1 mark. A total score of between 3 – 4 out of 4 indicated good knowledge, 2 – moderate knowledge and 0 – 1 indicated poor knowledge. Test of association between demographics and knowledge of Lassa fever was done using Chi square test at 0.05 level of significance.

Ethical clearance

Ethical clearance was obtained from the ethics committees of Irrua Specialist Teaching Hospital and the University of Benin. Consent to conduct the study was also obtained from the medical directors of the health institutions, and primary health care coordinators in the Local Government Areas. Prior to the start of the study, the proposed study population was educated on the aim of the study and verbal consent was obtained from all participants. They were told that information provided will be treated as confidential and of their right to withdraw from the study any time they wish.

Results and Discussion

Socio-demographic of respondents

A total of 279 individuals gave consent to partake in the study, comprising 145 males and 134 females. Based on age-groups, 40 (14.3%) of participants were between 0-10 years, 61 (21.9%) of participants were between 11 – 20 years, 58 (20.8%) were between 21 – 30 years, 41 (14.7%) were 31 – 40 years, 39 (14.0%) were between 41-50 and 40 (14.3%) were 51 and above years old. Also, the participants fell under the following occupations: artisans 19 (6.8%), civil service 40 (14.3%), farming 35 (12.5%), students 110 (39.4%), trading 39 (14.0%) and others 36 (12.9%).

Awareness of the outbreaks of Lassa fever

Table 1 shows that 250 (89.6%) of the 279 respondents were aware of the Lassa fever outbreak(s) in Nigeria, while 193 (70.2%) were aware of the disease in their community. Hence, it could be deduced that about 30.0% of the inhabitants aren't still aware of the virus in their communities and therefore at risk of contracting and spreading the virus to others. It is pertinent to note that ignorance remains a key factor that facilitates the continuous spread of the virus, especially in West Africa. According to recent weekly reports by the Nigerian Center for Disease Control (NCDC), there are still outbreaks of the virus in various endemic and non-endemic regions in Nigeria, indicating that there is still some level of ignorance among inhabitants of the studied communities. If experience gathered from the newly emerged COVID-19 pandemic and how it's been curtailed so far is anything to go by, then one cannot underestimate the importance of mass education and mobilization in the eradication of infectious diseases and the actualization of public health for all.

Regarding the means of awareness of the outbreaks, 151 (54.1%) indicated they were aware through television, 97 (34.8%) became aware through social media, 50 (17.9%) through newspapers and 32 (11.5%) through other means (Table 1). Findings herein revealed that television and social media represented the major mode of awareness by the respondents which could account for why some inhabitants (30.0%) aren't still aware of the Lassa virus considering that most parts of the communities aren't developed and still lack constant electricity or means of acquiring television, other electronic devices and internet services. Previous reports have indicated that television and radio are two common means of awareness of Lassa fever among residents in Izzi, Ebonyi state[36] and Ukpom, Akwa Ibom state,[37] respectively. There is need to harness other means of public enlightenment programs which will involve members of the community (person-to-person communication) in other to improve awareness of the virus.

Background knowledge of Lassa fever

Table 2 shows that 134 (48.0%) of the respondents knew that Lassa fever originated from Africa while 98 (35.1%) had no idea. 148 (53.0%) knew that Lassa fever is caused by a virus while 63 (22.6%) had no idea. Furthermore, 260 (93.2%) responded that the disease is transmitted by rats, 5 (1.8%) by bats while 13 (4.7%) had no idea of

the vector of the virus. Also, 105 (37.7%) knew the name Lassa fever is named after a town. Thus, the results showed that a good number of the respondents knew rat as the vector of the disease, while approximately half knew that Lassa fever is caused by a virus as well as that the disease originated from Africa.

Risk factors of respondents associated with contacting Lassa fever
Results in Table 3 shows that 187 (67.0%) of the respondents did not play (or interact) with animals like rats, birds, lizards, cockroaches and insects, 51 (18.3%) said they never played with animals while 41 (14.7%) agreed that they do play with animals. Furthermore, 52 (18.6%) of the participants responded that they hunted for some of the animals listed above while 176 (63.1%) do not. On frequency of washing the hands, majority of the respondents 185 (66.3%) washed frequently, 61 (21.9%) washed twice daily, 28 (10.0%) washed once daily and 5 (1.8%) said they seldomly wash their hands. Residents should be educated on the health risks involved in touching animals and encouraged to imbibe personal hygiene practices to curtail the spread of the virus.
On the methods of storing foodstuffs, 156 (55.9%) of the respondents stored their foodstuff in sack bags, 51 (18.3%) spread it on the open and bare floor and 72 (25.8%) used air-tight containers as means of food storage. Findings herein indicate very low level of awareness on the best methods of food storage in containers to avoid vector contamination with the virus. This is of utmost concern as it is a major factor that ensures the continuous spread of the Lassa virus. This poor practice predisposes them as well as families at risk of infection with the virus from consuming rat-contaminated foods. More so, these unhygienic practices could pose potential threat to an entire community or group, if contaminated food stuffs are consumed, sold or served as local delicacies to large number of persons at public functions or parties. Local food stuffs like garri (processed cassava), fruits, dried fish and meat which can be eaten or consumed without further processing are particularly at risk. Hence, there is need to improve awareness on the best methods of food storage in air-tight containers and on safe food processing techniques to avoid vector contamination.

Methods of contracting/preventing Lassa fever in the community
Table 4 shows that 183 (65.6%) of the respondents indicated Lassa fever can be contracted by eating rat infested foodstuffs, 109 (39.1%) stated from urine or faeces of rat, 60 (21.5%) from contact with an infected person, 39 (14.0%) by eating "bush meat" a term which refers to meat of wild animals and 11 (3.9%) said they had no idea on the means of contacting Lassa fever.

Table 1: Awareness of the Outbreak of Lassa fever among the study population

Variable	Frequency (n = 279)	Percentage
Awareness of Lassa Fever outbreak		
Yes	250	89.6
No	29	10.4
Are you aware of the disease in your community?		
Yes	193	70.2
No	82	29.8
Means of Awareness		
Television	151	54.1
Newspaper	50	17.9
Social media	97	34.8
Others	32	11.5

Table 2: Background knowledge of Lassa fever

Variable	Frequency (n = 279)	Percentage
Where did Lassa fever originate from?		
Africa	134	48.0
Asia	12	4.3
Europe	17	6.1
South America	17	6.1
No idea	98	35.1
Lassa fever is caused by?		
Bacteria	25	9.0
Flu	37	9.7
Spirochaete	6	2.2
Virus	148	53.0
No idea	63	22.6
Lassa Fever is transmitted by?		
Bats	5	1.8
Cats	1	0.4
Rats	260	93.2
No idea	13	4.7

Table 3: Risk factors of respondents associated with Lassa fever

Variable	Frequency (n=279)	Percentage
Do you play with animals like rats, birds, lizards, cockroaches and crickets?		
Yes	41	14.7
No	187	67.0
Never	51	18.3
Do you hunt for any animals listed above		
No	176	63.1
Yes	52	18.6
Never	51	18.3
Method of storing Foodstuffs		
In a bag	156	55.9
Spreading on the floor	51	18.3
Container	72	25.8
Frequency of washing hands		
Once daily	28	10.0
Twice daily	61	21.9
Frequently	185	66.3
Never	05	1.8

On the methods of preventing the virus, 145 (52.0%) of the respondents practiced storing food in tightly closed containers, 84 (30.1%) said it is by killing the transmitting animals (vector), 122 (43.7%) said it is by practicing good food hygiene, 86 (30.8%) said by wearing protective clothing's like face mask or gloves and 135 (48.4%) chose by practicing good sanitation.

Although, a good number of the respondents knew that consuming or having contact with rat infested foodstuff is a means of contracting the virus, less than half knew that contact with infected persons or with urine and faeces of rat are other means of contracting the virus. Sadly, 3.9% of the participants are completely ignorant of the means of contracting the Lassa virus, thereby making them a health threat to other members of the community. Furthermore, knowledge on methods of prevention is still poor, as of the five practices listed, only food storage in tightly closed contains recorded awareness level above average (52.0%). Therefore, awareness on the use of hand gloves or other personal protective equipment (PPE) when dealing with suspected patients with Lassa fever, avoiding contact with the transmitting animals (especially rodents), practicing good sanitation and food hygiene such as, storage of food in air-tight containers should be improved. Importantly, the common habit of sun drying processed foods along road paths or on bare floor should be discouraged or modified by providing screen barrier/protection around the food area to prevent contacts with rats. Alternatively, other hygienic methods of food drying /processing should be introduced in endemic communities such as, the use of drying machines and other forms of heat.

Participants' knowledge on the symptoms of Lassa fever

Table 5 shows that the symptoms of Lassa fever identified by the respondents were; fever (168; 60.2%), body itch (61 ;21.9%), sore throat, (62; 22.2%), cough (59; 21.1%) and abdominal pain, (56; 20.1%). It further reveals that, 230 (82.4%) of the respondents had no idea regarding the availability of a drug for the treatment of Lassa fever while 48 (17.3) were aware.

The complications of Lassa fever highlighted by the respondents were loss of memory (9.3%) and epilepsy (15.4%). Majority of the respondents had no idea as 101 (36.2%) said no complications and 103 (36.9%) of the respondents said they do not know (Table 5).

On previous experience with the Lassa virus, a large proportion of the respondents 265 (95.0%) said they have never been diagnosed of the disease while 14 (5.0%) indicated they have had previous encounter with it.

Furthermore, table 5 shows that 230 (82.4%) of the respondents had no idea regarding the availability of a drug for the treatment of Lassa fever while 48 (17.3) were aware. There is need to improve knowledge on the symptoms and complications arising from infection with the Lassa virus as it will encourage residents to contact hospitals for prompt diagnosis and treatment if infected. According to reports by health experts, patients that are diagnosed early (within 6 days of disease onset) have a better chance of recovery after treatment with ribavirin than those with late diagnosis.[29,38]

Awareness/willingness to visit healthcare centers if symptoms of Lassa fever was observed

Most of the respondents (203; 72.8%) knew that there was a healthcare center in the locality, were aware that the health center is a special center for the treatment of Lassa fever (171; 61.3%) and expressed willingness to visit a health center if symptoms of the virus are observed, (202; 72.7%). However, 166 (59.5%) and 148 (53.0%) of the respondents felt the community health center and the Ministry of health respectively wasn't carrying out enough sensitization on the disease. There is need for health ministries and bodies to improve public awareness on healthcare centers and hospitals in the communities to ensure prompt diagnosis and treatment of infected persons. Also, training should be provided regularly to healthcare professionals at all levels on the precautionary methods of handling and caring for suspected patients as they are at the receiving end when an outbreak occurs. Recently, a study showing a low level of preparedness for Lassa fever among healthcare workers in Nigeria has been reported.[33] Hospitals and healthcare centers should be equipped with modern and state-of-the-art equipment to ensure prompt, easy and accurate diagnosis of the Lassa virus in endemic communities. The state of facilities for the diagnosis of Lassa fever in an endemic community in Edo state has been decried previously. [29]

Association between demographics and Knowledge of Lassa Fever

Results of chi-square test of association between the demographics and the knowledge of respondents revealed that for gender, 46.2% of the males had good knowledge, 24.1% fair knowledge and 29.7% poor knowledge (Table 6). For the females, 41.0% had good knowledge, 32.1% fair knowledge and 26.9% poor knowledge. Chi square test of association revealed that the relationship wasn't significant ($p > 0.05$, $\chi^2 = 0.334^a$) (Table 6).

For age groups, respondents aged 51 years and above had greater knowledge (62.5%) of the Lassa virus than the other age groups. Half of the participants aged 21 – 30 years had good knowledge while those in the four other age groups recorded less than 50% of the respondents with good knowledge of the Lassa virus. Chi square test of association revealed that there was a significant relationship between age group and the level of knowledge indicating that the age group of respondents had an influence on their knowledge of Lassa fever disease ($p < 0.05$, $\chi^2 = 23.127^a$) (Table 6).

Based on the occupation of the respondents, the greatest level of awareness of the Lassa virus was observed among the civil servants (60.0%), while the least was observed among the artisans (36.8%) (Table 6). With exemption to the civil servants, less than half of the respondents in all other occupations had good knowledge of the virus. The chi square test revealed that there was no significant relationship between the occupation of respondents and their level of knowledge ($p > 0.05$, $\chi^2 = 8.825^a$) (Table 6). Summarized findings assessing the level of knowledge of participants in the study area revealed that 122 of the respondents representing 43.7% had good knowledge, 78 (28.0%) had fair knowledge and 79 (28.3%) had poor knowledge about the Lassa fever virus.

Table 4: Methods of contracting/preventing Lassa fever

Methods of contracting Lassa Fever	**Frequency (n=279)**	**Percentage**
Eating bush meat	39	14.0
Rat infested foodstuffs	183	65.6
Contact with infected person	60	21.5
Urine or faeces of rat	109	39.1
No idea	11	3.9
Methods of preventing spread of Lassa Fever		
Keeping food in a tightly-closed containers	145	52.0
Killing the transmitting animals	84	30.1
Practicing good food hygiene	122	43.7
Practicing good sanitation	135	48.4
Wearing protective clothing's like face mask or gloves	86	30.8

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We recommend that public enlightenment programs be taken to all the nooks and crannies of the country using appropriate local languages, targeting especially at the less educated such as farmers, traders and artisans. Also, comprehensive studies on the biology of the vector and virus should be incorporated into the primary, secondary and university curricula in local and easy-comprehensible English languages to create more awareness of the virus.

Conclusion

Overall, survey shows that less than half of the participants had good knowledge of the Lassa virus in the studied communities. Hence, there is still a dearth of knowledge on the risk factors and methods of preventing infection among the inhabitants of Irrua and Ekpoma communities. With the reported spread of the coronavirus (COVID-19) in nearly all continents of the world, it becomes inevitable for all to be health conscious as well as imbibe hygiene practices that will not only help control the spread of the Lassa virus but other infectious diseases as well. Thus, there is need to intensify efforts on public health education, community sensitization and mobilization on the need to adopt hygienic and precautionary practices that will help curtail future outbreaks of Lassa virus. As knowledge and positive altitudinal change is key to the prevention and control of any disease, we strongly advocate for the implementation of the recommendations highlighted herein by all health stakeholders in the country as it will not only curb future outbreaks of the Lassa virus but that of the Ebola and Coronavirus (COVID-19) as well.

Table 5: Knowledge on symptoms and treatment of Lassa fever

Variable	Frequency (n=279)	Percentage
Symptoms of Lassa Fever		
Fever	168	60.2
Body itch	61	21.9
Sore throat	62	22.2
Cough	59	21.1
Abdominal Pain	56	20.1
Complications of Lassa Fever		
Loss of memory	26	9.3
Epilepsy	43	15.4
No complications	101	36.2
I don't know	103	36.9
Others	07	2.5
Do you know of any Lassa fever drug available		
Yes	48	17.3
No	230	82.4

Table 6: Association between demographics and Knowledge of Lassa Fever

Variable	Knowledge of Lassa fever n (%)			Chi square χ^2	Sig
	Good	Fair	Poor		
Gender				0.334[a]	$P > 0.05$
Male	67 (46.2)	35 (24.1)	43 (29.7)		
Female	55 (41.0)	43 (32.1)	36 (26.9)		
Age group				23.127[a]	$P < 0.05$
0 – 10	08 (20.0)	15 (37.5)	17 (42.5)		
11 – 20	25 (41.0)	14 (23.0)	22 (36.1)		
21 – 30	29 (50.0)	17 (29.3)	12 (20.7)		
31 – 40	19 (46.3)	08 (19.5)	14 (34.1)		
41 – 50	16 (41.0)	13 (33.3)	10 (25.6)		
51 and above	25 (62.5)	11 (27.5)	04 (10.0)		
Occupation				8.825[a]	$P > 0.549$
Artisan	07 (36.8)	05 (26.3)	07 (36.8)		
civil servant	24 (60.0)	09 (22.5)	07 (17.5)		
Farming	16 (45.7)	11 (31.4)	08 (22.9)		
Others	15 (41.7)	13 (36.1)	08 (22.2)		
Student	44 (40.0)	29 (26.4)	37 (33.6)		
Trading	16 (41.0)	11 (28.2)	12 (30.8)		

Conflict of interest

The authors declare no conflicting interest

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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References

1. Frame JD, Baldwin JM, Jr, Gocke DJ Troup JM. Lassa fever, a new virus disease of man from West Africa. 1. Clinical description and pathological findings. Am J Trop Med Hyg. 1970; 19:670-676.
2. Bowen MD, Rollin PE, Ksiazek TG, Hustad HL, Bausch DG, Demby AH, Bajani MD, Peters CJ, Nichol ST. Genetic diversity among Lassa virus strains. J Virol. 2000; 74:6992–7004.
3. Buckley SM and Casals J. Lassa fever, a new virus disease of man from West Africa. Isolation and characterization of the virus. Am J Trop Med Hyg. 1970; 19:680-691.
4. Hallam HJ, Hallam S, Rodriguez SE, Barrett ADT, Beasley DWC, Chua A, Ksiazek TG, Milligan GN, Sathiyamoorthy V, Reece LM. Baseline mapping of Lassa fever virology, epidemiology and vaccine research and development. NPJ Vaccines. 2018; 20:3-11.
5. Shaffer JG, Grant DS, Schieffelin JS, Boisen ML, Goba A, Hartnett JN, Levy DC, Yenni RE, Moses LM, Fullah M, Momoh M, Fonnie M, Fonnie R, Kanneh L, Koroma VJ, Kargbo K, Ottomassathien D, Muncy IJ, Jones AB, Illick MM, Kulakosky PC, Haislip AM, Bishop CM, Elliot DH, Brown BL, Zhu H, Hastie KM, Andersen KG, Gire SK, Tabrizi S, Tariyal R, Stremlau M, Matschiner A, Sampey DB, Spence JS, Cross RW, Geisbert JB, Folarin OA, Happi CT, Pitts KR, Geske FJ, Geisbert TW, Saphire EO, Robinson JE, Wilson RB, Sabeti PC, Henderson LA, Khan SH, Bausch DG, Branco LM, Garry RF. Viral Hemorrhagic Fever Consortium. Lassa fever in post-conflict Sierra Leone. PLoS Negl Trop Dis. 2014; 8:e2748.
6. Bausch DG, Demby AH, Coulibaly M, Kanu J, Goba A, Bah A, Conde N, Wurtzel HL, Cavallaro KF, Lloyd E, Baldet FB, Cisse SD, Fofona D, Savane IK, Tolno RT, Mahy B, Wagoner KD, Ksiazek TG, Peters CJ, Rollin PE. Lassa fever in Guinea: I. Epidemiology of human disease and clinical observations. Vec Borne Zoo Dis. 2001; 1:269 – 281.
7. Kernéis, S, Koivogui L, Magassouba N, Koulemou K, Lewis R, Aplogan A, Grais RF, Guerin PJ, Fichet-Calvet E. Prevalence and risk factors of Lassa seropositivity in inhabitants of the forest region of Guinea: across-sectional study. PLoS Negl Trop Dis. 2009; 3:e548.
8. Safronetz D, Lopez JE, Sogoba N, Traore SF, Raffel SJ, Fischer ER, Ebihara H, Branco L, Garry RF, Schwan TG, Feldmann H. Detection of Lassa virus, Mali. Emerg Infect Dis. 2010; 16:1123–1126.
9. Monath TP, Mertens PE, Patton R, Moser CR, Baum JJ, Pinneo L, Gary GW, Kissling RE. A hospital epidemic of Lassa fever in Zorzor, Liberia, March-April 1972. Am J Trop Med Hyg. 1973; 22:773–779.
10. Monson MH, Frame JD, Jahrling PB, Alexander K. Endemic Lassa fever in Liberia. I. Clinical and epidemiological aspects at Curran Lutheran Hospital, Zorzor, Liberia. Trans R Soc Trop Med Hyg. 1984; 78:549–553.
11. Fichet-Calvet E and Rogers DJ. Risk maps of Lassa fever in West Africa. PLoS Negl Trop Dis. 2009; 3:e388.
12. Ehichioya DU, Hass M, Olschlager S, Becker-Ziaya B., Chukwu, COO., Coker J, Nasidi A, Ogugua OO, Gunther S. Omilabu SA. Lassa fever, Nigeria, 2005-2008. Emerg Infect Dis. 2010; 16(6):1040-1041.
13. Elsie AI, Yuki F, Oladipupo BI, Dan-Nwafor CC, Anwar A, Oboma EW, Ephraim O, Sylvanus O, Uche U, Emeka O, Olufemi A, Chukwuyem A, Ahmed AL, Emmanuel OM, Solomon FW, Clement LP, Alemu W, Chikwe I. Epidemiology and clinical features of Lassa fever outbreak in Nigeria. Emerg Infect Dis. 2019; 25(6): 1066-1074.
14. Nigerian Centre for Disease Control (NCDC 2020) Lassa fever situation report Epi Week 18: 26th April-03rd May 2020. Available from: https://ncdc.gov.ng/themes/common/files/sitreps/8d609130c4f8dbe6754d32767795c5d7.pdf. [cited 2020 May 08]
15. Raabe V and Koehler J. Laboratory diagnosis of Lassa fever. J Clin Microbiol. 2017; 55:1629–1637.
16. Atkin S, Anaraki S, Gothard P, Walsh A, Brown D, Gopal R, Hand J, Morgan D. The first case of Lassa fever imported from Mali to the United Kingdom. Euro Surveill 2009; 14(10):19145.
17. Kyei NNA, Abilba MM, Kwawu FK, Agbenohevi PG, Bonney JHK, Agbemaple TK, Nimo-Paintsil SC, Ampofo W, Ohehe S, Nyarko, EO. Imported Lassa fever: a report of 2 cases in Ghana. BMC Infect Dis. 2015; 15:217.
18. Gunther, S., Emmerich, P., Laue, T., Kuhle, O., Asper, M., Jung, A., Grewing, T., Meulen, J., Schmitz, H. Imported Lassa fever in Germany: molecular characterization of a new Lassa virus strain. *Emergency. Infectious Diseases*. 2000; **6**:466–476.
19. Monath TP, Newhouse VF, Kemp GE, Setzer HW, Cacciapuoti A. Lassa virus isolation from *Mastomys natalensis* rodents during an epidemic in Sierra Leone. Sci. 1974; 185:263–271.
20. Lecompte E, Fichet-Calvet E, Daffis S, Koulémou K, Sylla O, Kourouma F, Doré A, Soropogui B, Aniskin V, Allali B, Kouassi Kan S, Lalis A, Koivogui L, Günther S, Denys C, ter Meulen J. *Mastomys natalensis* and Lassa fever, West Africa. Emerg Infect Dis. 2006; 12:1971–1974.
21. World Health Organization (WHO). Lassa fever- Nigeria, Disease outbreak news. 2019; Available from: http://www.who.int. [cited 2019 Nov 14].
22. McCormick JB, King IJ, Webb PA, Johnson KM, O'Sullivan R, Smith ES, Trippel S, Tong TC. A case-control study of the clinical diagnosis and course of Lassa fever. J Infect Dis. 1987; 155:445-455.
23. Price ME, Fisher-Hoch SP, Craven RB, McCormick JB. A prospective study of maternal and fetal outcome in acute Lassa fever infection during pregnancy. BMJ 1988; 297:584-587.
24. McCarthy M. USA moves quickly to push biodefence research. Lancet 2002; 360:732.
25. Richmond JK and Baglole DJ. Lassa fever: epidemiology, clinical features, and social consequences. BMJ 2003; 327:1271–1275.
26. Woyessa AB, Maximore L, Keller D, Dogba J, Pajibo M, Johnson K, Saydee E, Monday J, Tuopileyi R 2nd, Mahmoud N. Lesson learned from the investigation and response of Lassa fever outbreak, Margibi County, Liberia, 2018: case report. BMC Infect Dis. 2019; 19(1):610.
27. Asogun DA, Günther S, Akpede GO, Ihekweazu C, Zumla A. Lassa fever: Epidemiology, Clinical Features, Diagnosis, Management and Prevention. Infect Dis Clin North Am. 2019; 33(4):933-951.
28. Nigerian Centre for Disease Control (NCDC). An outbreak of Lassa fever in Nigeria, week 50. 2019; Available from: http://ncdc.gov.ng/disease. [cited 2019 Dec. 28].
29. Asogun DA, Donatus IA, Jacqueline E, Ikponmwonsa O, Meike H, Martin G, Stephan O, Becker ZB, Onikepe F, Eric P, Philomena EE, Veritas EI, Eghosasere AU, Yemisi TO, Ekene BM, Osagie OO, Sylvanus AO, Mojeed M, Sylvester OA, Odigie CA, Peter I, Maxy AC, Odike SG, Kristian A, Pardis CS, Christian TH, George OA, Stephen G. Molecular diagnostic for Lassa fever at Irrua specialist teaching hospital, Nigeria: Lessons learnt from two years of laboratory operation. Plos Negl Trop Dis. 2012; 6(9):1839.
30. McCormick JB, King IJ, Webb PA, Scribner CL, Craven RB, Johnson KM, Elliott LH, Belmont-Williams R. Lassa fever. Effective therapy with ribavirin. N Engl J Med. 1986; 314:20 –26.
31. Nnennaya AA, Chinedu GN, Ben NA, Benson NO and Elizabeth U. Containing a Lassa fever epidemic in a resource-limited setting: Outbreak description and lessons

learned from Abakaliki, Nigeria. Int J Infect Dis. 2013; 17(11):1011-1016.
32. Reuben CR and Gyar SD. Knowledge, attitudes and practices of Lassa fever in and around Lafia, Central Nigeria. Int J Pub Health Epidemiol Res. 2016; 2:14-19.
33. Ndu AC, Kassy WC, Ochie CN, Arinze-Onyia SU, Okeke TA, Aguwa EN, Okwor TJ, Chinawa A. Knowledge, Misperceptions, Preparedness, and Barriers towards Lassa Fever Control among Health Care Workers in a Tertiary Institution in Enugu, Nigeria. J HealthCare Poor Underserved. 2019; 30(3):1151-1164.
34. National Population Commission (NPC). Population and Housing Census Facts and Figures 2006. Available from: http://www.population.gov.ng/factssandfigures [cited on 2008 Nov 06].
35. Cochran WG. Sampling technique (3rd ed.) New York: John Wiley and Sons, 1977.
36. Nwonwu EU, Alo C, Una AF, Madubueze UC, Eze I, Ogbonnaya LU, Akamike IC. Knowledge of Lassa fever and its determinants among traders in Izzi community in South East Nigeria. Arch Curr Res Int. 2018; 13(4):1-9.
37. Ekanem AM, Mbaba EM, Monday HA, Ekwere TA, Akwaowo CD, Akpaneko EI, Umoh JS and Akwaowo, U. S. Knowledge and prevention of Lassa fever among adults in a rural community in Southern Nigeria. J Med Per. 2018; 3(7):395-399.
38. Bausch DG, Hadi CM, Khan SH, Lertora JJ. Review of the literature and proposed guidelines for the use of oral ribavirin as postexposure prophylaxis for Lassa fever. Clin Infect Dis. 2010; 51:1435–1441.