

# Challenges to the Control and Eradication of Lassa Fever Virus in Nigeria

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**Abstract** Lassa fever is a hemorrhagic viral infection prevalent in Nigeria despite interventions by the Nigeria Centre For Diseases Control and the Federal Ministry of Health. Having attained a high level of international recognition, is an emerging fast-spreading disease with the possibilities of causing epidemics. The confirmed and suspected cases of Lassa fever virus has spiraled over the last 3 years. The non-specific mode of clinical presentation also contributes to its prevalence. Rural dwellers are more susceptible to the viral diseases due to negligence, ignorance, low access to healthcare facilities, poverty and poor hygiene practices. There is need to ensure that adequate information about the diseases and ways of preventing it is made available not just to the endemic places or healthcare workers but a wide coverage of the population. Human- to- human transmission within the healthcare facility can be prevented through proper infection control trainings and provision of adequate personal protective equipment's to the health workers. Community leaders, schools, religious institutions and health education officer's needs to ensure that hygiene practices are encouraged within the rural communities. The government should ensure supply of rodenticides to reduce contamination of food by vectors (rodents of the *Mastomys Spp*). For Lassa fever virus control to be achieved, identified challenges and recommended solutions needs to be implemented by the government and agencies concerned.

**Keywords:** outbreak, prevalence, non-specific, virulence, fatality, endemic, Lassa fever, Nigeria

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## 1. Introduction

Lassa fever is a zoonotic acute hemorrhagic fever which is caused by the Lassa virus (LASV) [1]. This virus is a member of arenavirus family vectored by rats [2]. The first recorded case of Lassa fever was in 1969 at Lassa village in the northern part of Nigeria [3]. 50 years since the discovery of this virus in Nigeria, the country has not yet achieved control nor has been certified free from the virus due to its prevalence [4]. This disease has continued to spread and has become a public health menace especially among rural dwellers and health care professionals [5]. Although cases have been reported in Asia, Europe and North America, Africa has remained an endemic zone for the virus [5] Lassa fever has a high prevalence in West-Africa sub-region than other continents and subregions [6]. Its prevalence and endemicity in Nigeria could be due to fundamental encouraging conditions for the spread of rodent-borne diseases [7]. Nigeria as a West

African country has a 1% fatality rate of overall cases and 15% observed fatality cases among hospitalized patients [8]. The mortality due to Lassa fever could be linked to symptoms such as diarrhea and abdominal pains [9,10]. Prevalence of the disease is linked to access of the rodent vector to food, and illegal dumping of refuse close to living areas [11]. High virulence and fatality are major issues in Lassa fever which is further complicated by the nonspecific mode of clinical presentation [12]. Weak health care delivery system in Nigeria contributes greatly to the ineffective control of emerging and re-emerging infectious diseases. This review is aimed at exploring possible challenges to the control of Lassa fever virus in Nigeria and possible solutions to avert same.

## 2. Current Intervention

Currently, there are no available vaccine candidates for Lassa fever. In Nigeria, the minister of Health Professor Isaac Adewole by the end of 2018, made an

announcement on the approval of Ribavirin for its treatment and prophylaxis and this has been very supportive. However, the timely supportive remedies of Lassa fever include rapid rehydration, electrolytes, oxygenation and blood pressure check. A confirmation for the existing ribavirin treatment (30mg/kg loading dose accompanied by 15mg/kg every 6 hours for 4 days and then by 7.7mg/kg every 8hours for 6days) supports the full retrospective single clinical study in 1986 in Sierra Leone indicated that off-label ribavirin (1-β-D-Ribofuranosyl-1,2,4-triazole-3-carboxamide) a guanosine analogue was effective and could serve as drug treatment and the standard for Lassa fever having shown the potency to moderate the mortality of severe diseases from the scale of 55%-5% when delivered intravenously within the first 6 days after the onset of the infection [13]. Despite the increasing concerns on toxicity and specificity, ribavirin has been noted to be dynamic over a broad spectrum of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) viruses [14,15,16]. Nonetheless, since the LF symptoms are non-specific, treatment commencement is oftentimes late accompanied by unfavourable treatment effect [17].

The mode of ribavirin activity in LF is very imprecise thus, it proficiently inhibits the *in vitro* duplication of Lassa virus and is revealed to maintain its ability in decreasing viremia *in vivo* [14,18]. It is also found to have a protective effect on the infected cells from apoptosis (Cell-death) significantly lowering the cell markers such as the aspartate aminotransferase (AST) circulation, alternatively repressing viral transmission, viral productions and or, improving the hosts' immune response in animal models. A peak in viral load is observed in mice when treated with ribavirin characterized by extended survival of the infected cells giving rise to new viral production.

Oral ribavirin is another effective route of drug delivery in Nigeria, even though its pharmacokinetic effects are no different from the IV method. This may be as a result of the concentration of the serum which reaches the borderline inhibitory concentration (4-40µm) of ribavirin for LASV when ingested orally [19]. Furthermore, oral ribavirin has been promoted as post-exposure prophylaxis [20,21]. Reversible haemolytic anaemia and rigours are the major side effect of ribavirin when the drug is infused hurriedly [13,22,23]. Limitation of ribavirin is that there are no supporting data on its efficacy, thus, warnings and guidelines for usage vary including dosage and duration of treatment. Observational studies have shown that the patent issues and cost have in the past restricted the accessibility of ribavirin hence, as the patent expired the drug was added to the World Health Organization's list of important medicines which in turn lowered its cost significantly and increased its availability to the West African population including Nigeria. According to a prospective study on ribavirin carried out in Irrua, centred on the high number of patients with LF in Nigeria hospitals, a regimen of ribavirin different from the recommended dose approved by the WHO was developed and is referenced as "Irrua regimen" by the Irrua specialist teaching hospital (ISTH) [15]. Although the Irrua regimen included a higher and a lower total daily dosage ribavirin is usually administered once per day.

Given the implication of LF threat, the constant risk of disease spread and the absence of vaccines the WHO has listed LF as a "priority" disease and calls for an urgent need for advancement research-wise [24]. Reviewed clinical trial results have paved the way for the objective re-evaluation of LF treatment using ribavirin in accordance to already existing published papers on ribavirin for LF.

### 3. Control in Nigeria

Lassa fever case management centres are functional in 3 states; Ebonyi, Ondo and Edo states out of the 36 states in Nigeria. As a control measure in Nigeria, the healthcare workers in either of the 3 states are trained in accordance with the standard infection prevention and control (IPC) and in the use of personal preventive equipment (PPE) and above all in the management of reported cases. Also, any suspected cases and deaths reported are actively studied by the field teams ensuring an immediate follow-up [15].

Presently, three functional laboratories equipped for LF samples analysis employing the use of polymerase chain reaction (PCR) are located in Lagos, Abuja and Irrua all in Nigeria. The laboratories are working in sync to ensure adequate control of LF as the phylogenetic investigation of about 49 viruses identified during the 2018 epidemic, gave insight into the ongoing teamwork between Africa Centre of Excellence for Genomics of Infectious Disease (ACEGID), Irrua Specialist Teaching Hospital, Bernhard Nocht Institute of Tropical Medicine and Redeemer's University. Also, the WHO continues to proffer consistent treatment control through all the treatment centres and on the optimization of case reports and laboratory investigations [25]. Again, the establishment of a national Lassa fever Emergency Operations Centre (EOC) in Abuja approved by the Nigeria Centre for Disease Control continues to ensure an easy partnership with WHO [15]. A full occurrence strategy has been developed to promote surveillance in states with an active outburst of the virus while uploading the state line lists of cases to a national database known as the viral haemorrhagic fever management system. The infection of 27 healthcare workers points out the need to enhance infection prevention control practices in the hospitals and control centres for all patients irrespective of their diagnosis.

Listing out, the control measures of Lassa fever in Nigeria can be divided into 3 types. The first type focuses on the reduction and or removing the source of the infection via; isolation and confinement of positive persons, destruction of the animal pool of infection that is the causative agent which is the Mastomys rats especially, treatment and handling of water bases to reduce impurity, confirming that the food consumed and yet to be consumed are free from urine, saliva, faeces, rat poo, body fluids and rodents. There is a need to eliminate contagion of the individual by ensuring that the body fluids and excrement are correctly disposed of. The second type of control focuses on the disruption of the connection between the cause of the infection and vulnerable individuals such as chlorination of water beds, management and examination of food handlers and destruction of the rats. Finally, the third control aims to

lessen the number of susceptible individuals increasing the need to increase immunity by immunization. This includes the provision of passive immunization after an exposure to the LASV to give a brief immunity, and or active immunization to protect the public from the LASV including the host populace (rats) from the widespread of the virus. Nevertheless, the rat population are better destroyed, and multiplication stopped in both the living and business spaces. Lastly, healthcare workers should adhere strictly to precautionary measures to defeat the nosocomial spread of Lassa fever and there is a need for colossal education and awareness of the general public on the danger associated with the spread of this virus.

Strict border adherence is a control measure which should be adhered to as tourists from such LF endemic regions can transfer the disease from country to country even though this rarely occurs. It is pertinent that healthcare workers note that LF presents primarily like any other diseases causing a febrile illness such as Malaria. Accordingly, they are always recommended to practice standard safety measures, satisfying a high index of suspicion. Finally, rapid diagnostic test (RDT) need to be performed on all suspected cases of malaria and if RDT comes back negative other cause of febrile ailment including LF should be measured [25]. Accurate diagnosis and immediate treatment and control improve the probabilities of survival.

## 4. Notable Challenges

Lassa fever poses a major threat to Nigeria and other endemic countries due to its high virulence and fatality. [26,27] It is becoming more devastating daily especially with its increasing incidence in Nigeria. Despite current interventions, challenges still have hindered the control of the virus and they are as follows

### 4.1. Media Inability to Create Appropriate Awareness of the Virus

The role of the media is for the adequate dissemination of information on diseases outbreaks, its control and eradication thus it is essential however, it may also not be cost-effective if appropriate awareness is not crested [28,29]. In Nigeria, studies have revealed that Lassa fever campaigns have not been sufficient enough to impact on the behavior of rural dwellers especially those at endemic zones [1]. It means that the role played by the media in the fight against LF has not been beneficial enough as required to achieve control. There is need for adequate sensitization to prevent the spread of LF within rural areas. The Government and other organizations. Nigeria Centre for Diseases Control (NCDC), Federal Ministry of Health (FMOH) should make it a priority.

### 4.2. Poverty/Ignorance

Poverty has been associated to have contributed to the prevalence of some viral outbreaks and neglected tropical diseases [30,31]. Lassa fever is one of such viruses that affects the rural dwellers [32]. The Government should ensure that the poverty level in rural areas is reduced.

Education should also be encouraged as it would help people understand more about the importance of personal hygiene and reduced rodent contact with food. There should be a distribution of rodenticides to reduce prevalence, Better storage facilities should be encouraged.

### 4.3. Inadequate Preparedness Capacity of the Health Care Sector

Most victims of outbreaks and pandemics are the frontline health care workers and their family members. [33] Pandemics and outbreaks do affect work attitude of healthcare workers at the frontline. [34,35] This disease has a non-specific mode of presentation which prior to diagnosis can infect health workers who are often exposed to it. The exposures could be due to the lack of personal protective equipment and other vital needs [12]. There is limited support from the government on the control of LF compared to COVID-19 pandemic and Ebola outbreak. More support is needed from the government to ensure that infection control measures are put in place. This would greatly reduce laboratory transmission, transmission to other health works and human to human transmission.

## 5. Conclusion

From the review and other related papers published, it is emphatically proven that Lassa fever is an eminent vector-borne disease of public health concern in Nigeria. The epidemiological impact of this health menace cannot be overemphasized, Hence to curb the challenges hindering the control of LASV and to save citizens from the disturbing effect of the virus, these strategies stated above become imperative; team work between the NCDC, WHO, private and public institutions, national and international organizations to expedite the implementation of plans to combat the disease to avoid re-emergence. More so, fully funded suitable control and surveillance programs by the government, agencies, humanitarians and private establishments for vaccine research, case management and diagnostic purposes should be made available and accessible. The government should also keep to their legitimacy for their people to be free from poverty/ignorance of Lassa fever virus and minimize the risk of infection.

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