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LASSA FEVER PREPAREDNESS SURVEY: EVALUATING HEALTHCARE WORKERS' KNOWLEDGE, ATTITUDE, AND PRACTICE IN ONDO STATE, NIGERIA

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Abstract: Lassa fever, caused by the Lassa virus (LASV) and transmitted via the multimammate rat Mastomys natalensis, poses a significant public health concern. The virus, a member of the Arenaviridae family, was first identified in Nigeria in 1969, taking its name from the town of Lassa in Borno State. These rats, as hosts of LASV, can excrete the virus in their urine for extended periods and produce numerous offspring, making them a formidable reservoir.

The zoonotic nature of Lassa fever means it is primarily transmitted from animals to humans through contact with rat excreta, urine, and secretions. This mode of transmission accounts for roughly 19% of reported cases. Furthermore, human-to-human transmission, particularly through direct contact with infected bodily fluids, is a significant concern, primarily affecting caregivers and individuals in close proximity to infected individuals. Nosocomial transmission in healthcare facilities adds to the burden of this disease on the healthcare system.

This abstract emphasizes the zoonotic and human-to-human transmission of Lassa fever, highlighting its dual impact on both public health and healthcare systems.

Keywords: Lassa Fever, Lassa Virus (LASV), Multimammate Rat, Zoonotic Transmission, Nosocomial Transmission

1. Introduction

Lassa fever is a viral hemorrhagic fever caused by Lassa virus (LASV), a member of the virus family "Arenaviridae" and transmitted by the multimammate rat Mastomys natalensis (M. natalensis). The first confirmed cases of the disease were reported in Nigeria (1969).The disease was named after the town where it first occurred in Lassa, Borno State(CDC, 2014; VHFC, 2020).The host of the LASV, the multimammate rat, once infected could excrete the virus from its urine for a prolonged period and at times for the rest of their lives(CDC, 2014; Lo Iacono et al., 2015; VHFC, 2020). In addition, these rats can produce a large number of offspring frequently.

They are predominant forest dwellers but can also colonize human homes especially areas where food is stored. Lassa fever is a zoonotic disease transmitted from animal-to-human and this arises from contaminations with the excreta, urine, and other secretions of the rats(Lo Iacono et al., 2015)This has contributed to approximately 19% of all reported cases (Lo Iacono et al., 2015). Other frequently reported routes are human-to-human transmission (secondary transmission) occurring through direct contact with infected blood or bodily secretions.

This occurs mainly between individuals caring for sick patients although anyone who comes into close contact with a person carrying the virus is at risk of infection(Taiwo Ijarotimi et al., 2018). Nosocomial transmission of Lassa fever in healthcare facilities represents a significant burden on the healthcare system (VHFC, 2020).

Infection prevention and control (IPC) practices, training, and re-training of healthcare workers have been documented as important factors in controlling potential outbreaks of Lassa fever and other infectious agents within healthcare facilities(Ajayi et al., 2013). The onset of illness of Lassa fever typically comprises nonspecific signs and symptoms difficult to distinguish from many other febrile diseases. Some patients progress to severe vascular instability and multiorgan system failure, with case fatality ratios in hospitalized cases reaching about 20% (7). These unspecific signs and symptoms make it difficult to recognize and diagnose in a typical hospital setting which puts healthcare workers at great risk.

The 2017/2018 Lassa fever outbreak in Nigeria was unprecedented; heralded by an initial report of a cluster of cases and deaths among healthcare workers in a tertiary health facility by week 2 of 2018(Dan-Nwafor et al., 2019). At the end of 2018, 23 states within the country were affected by the Lassa fever outbreak. A total number of 3498 suspected cases were identified, of which 633 cases were confirmed with a case fatality ratio of 27% (171 deaths)(NCDC, 2019).Healthcare workers accounted for 7% and 5.8% of confirmed cases and deaths attributed to Lassa fever outbreak respectively, depicting substantial risk to healthcare workers. (Dan-Nwafor et al., 2019; NCDC, 2019).Ondo State is one of the states in Nigeria where Lassa fever is endemic and 25% of the confirmed cases were recorded in the state(NCDC, 2019). Although there had been pockets of studies in the country on knowledge, attitude, and practice of healthcare workers on Lassa fever, there is a need for more information to plan strategies to reduce these avoidable cases and deaths. This study assessed the knowledge, attitude, and practice of healthcare workers in the management of Lassa fever during the 2018 outbreak in Ondo state.

2. Methods

A cross-sectional study adopting the use of a pre-tested semi-structured questionnaire to collect information from consenting healthcare workers in three health facilities (2 secondary and 1 tertiary) at the peak of the 2018 Lassa fever outbreak in Ondo State. The cadre of healthcare workersinclude doctors, nurses (registered and auxiliary), laboratory scientists, and pharmacists.

Data collected includes-demographics, knowledge of Lassa fever, case management, prevention, and attitude of healthcare workers to infection control practices. The questionnaires were self-administered. Overall knowledge of Lassa fever was assessed with an aggregate of 7 points (ever heard of Lassa fever, correct knowledge of cause and vector, modes of transmission, incubation period, symptoms, if vaccine existed, and knowledge of drug").These were graded as either good knowledge (5-7 points) or poor knowledge(≤4points).Also, the overall attitude of healthcare workers towards Lassa fever was assessed with an aggregate of 5points (accept posting to Lassa fever ward, Lassa fever should be managed by only specifically trained personnel, think that government and facility management are doing enough to protect staff from getting infected with Lassa fever, willingness to be trained to manage and attend to Lassa fever patients), these were assessed as "Positive" attitude (4-5points) or "Negative" attitude(≤ 3 points). Data were summarized with the use of descriptive statistics; categorized variables were presented with the use of counts and proportions while means and standard deviation were computed for continuous variables. Chi-square test was used to test for the association between categorical variables (Fisher's exact test was used for variables with an estimated value of less than 5). Logistic regression was used to determine the predictors/ drivers of knowledge, attitudes, and prevention practices. All analyses were at 95% confidence interval and $P<0.05$ level of significance.

Ethical approval was obtained from the Nigerian Institute of Medical Research Institutional Review Board (NIMR IRB). Permission was obtained both from the Ondo State Ministry of Health and the

management of the participating health facilities. The questionnaires were administered anonymously in the health facilities and confidentiality was assured.

3. Results

A Total number of 85 respondents were included in the analysis with two respondents excluded due to their designation (administrative staff). The majority of respondents were in public health facilities (82.4%), females (61.2%), and had tertiary education (81.2%). Laboratory technologists (34.1%) and Nurses (22.4%) accounted for the majority of respondents. (Table1).

Table 1: Socio-demographic Characteristics of Respondents

Characteristics	Frequency (%)
Age Mean (±SD)	32.7 (±8.9)
Sex	
Male	33(38.8)
Female	52(61.2)
Marital Status	
Married	44(53.6)
Single/Widowed	38(46.4)
Level of Education	
Secondary	8(9.4)
Tertiary	77(90.6)
Designation	
Lab Technologist	29(34.1)
Nurse	19(22.4)
Medical Doctor	12(14.1)
Nurse Assistant	12(14.1)
Pharmacist	11(12.9)
Dental Therapist	1(1.2)
Types of Facility	
Public	70(82.4)
Private	15(17.6)

A significant proportion of healthcare workers (95.3% each) were aware of Lassa virus and rats being the cause and vector of Lassa fever. In addition, unprotected contact with infected body fluids (89.4%) was the commonest nosocomial route of transmission recorded. In contrast, more than a quarter of respondents (25.9%) reported transmission of the virus through mosquitoes. Overall, 75 (88.2%) of respondents had good knowledge of Lassa fever (Table 2).

Table 2: Knowledge of respondent son Lassa fever

Variable	Frequency (%)
Cause of Lassa Fever	
Virus	81(95.3)
Bacteria	3(3.5)
Protozoa	1(1.2)

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Vector of Lassa Fever	
Rats	81(95.3)
Mosquito	3(3.5)
Arthropod ticks	1(1.2)
Modes of transmission of Lassa Fever	
Contact with infected Persons	68(80.0)
Consumption of contaminated food	61(71.8)
Spreading food uncovered on ground/surfaces	60(70.6)
Handling corpses	59(69.4)
Hunting rodents	52(61.2)
Contaminated utensils	52(61.2)
Unprotected sex with carrier	47(55.3)
Mosquito bite	22(25.9)
Commonest modes of transmission within healthcare settings	
Unprotected contact with infected body fluids	76(89.4)
Contaminated medical equipment for procedures	54(63.5)
Inappropriate disposal of waste	51(60.0)
Improper handling of beddings	44(51.8)

A majority of respondents correctly identified the incubation period (76.5%), non-availability of vaccines (72.9%), and use of Ribavirin (78.8%) in the management of Lassa fever. The most common symptoms associated with Lassa fever were fever unresponsive to antimalarials and antibiotics (75.3%) and bleeding from the orifice (69.4%). Polymerase chain reaction (62.4%) and ELISA (30.6%) were the most common methods of diagnosis mentioned by respondents. (Table 3)

Table 3: Knowledge of Case Management

Variables	**Frequency (%)**
Incubation period of Lassa Fever	
2 – 21 days	65(76.5)
3 – 10 days	16(18.8)
5 – 7 days	2(2.4)
All persons infected with Lassa virus show symptoms	
No	44(51.8)

Yes	35(41.2)
Most common symptoms associated with Lassa fever	
Fever, unresponsive to antimalarials or/& antibiotics	64(75.3)
Bleeding from orifice	59(69.4)
Conjunctival haemorrhage	47(55.3)
Abnormal swelling of the neck and/or face	36(42.4)
Deafness	35(41.2)
Jaundice	25(29.4)
Persistent low blood pressure	25(29.4)
Spontaneous abortion	23(27.1)
Methods of laboratory diagnosis in use	
RT-PCR	53(62.4)
ELISA	26(30.6)
Antigen detection tests	13(15.3)
Virus isolation by cell culture	14(16.5)
Rapid test kit	8(9.4)
Vaccine available to prevent Lassa fever Infection	
No	62(72.9)
Yes	17(20.0)
Drugs available for treating Lassa fever	
No	8(9.4)
Yes	77(90.6)
Name of drug for treatment of Lassa fever	
Ribavirin	67(78.8)
Cefuroxime	1(1.2)
Don't know/no response	17(20)

RT-PCR-Real time Polymerase Chain Reaction, ELISA- Enzyme-linked Immunosorbent Assay

More than 90% of the healthcare workers said that safe food storage and adequate handwashing were the most effective ways of preventing Lassa fever in the community and healthcare facilities respectively.

The precautionary measures to be taken during burials of deceased Lassa fever patient include preparing the body with care to avoid the risk of transmission (85.9%), burying as soon as possible (78.8%), the tomb must be at least 2-metre-deep (58.8%) and disinfecting vehicle after transporting body (54.1%).

Furthermore, less than 50% of respondents had Standard operating procedures (SOP)for the management of Lassa fever available at their duty post (Table 4).

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Table 4: Prevention practices of Healthcare workers

Variable	Frequency (%)
Methods of prevention of Lassa fever within the community	
Safe food storage	77(90.6)
Maintenance of a clean environment	74(87.1)
Avoidance of rodent consumption	71(83.5)
Avoid contact with blood & body fluids when caring for sick persons	70(82.4)
Good housing standards	61(71.8)
Avoidance of bush burning	45(52.9)
Precautionary measures to prevent spread of Lassa fever in healthcare facilities	
Adequate handwashing	77(90.6)
Personal protective equipment	72(84.7)
Health education	67(78.8)
Safe burial practices	67(78.8)
Isolation	59(69.4)
Safe injection practices	56(65.9)
Barrier nursing	53(62.4)
Use of dedicated equipment for each patient	51(60.0)
Precautions to be taken during burial of a deceased Lassa fever patient Prepare body with care to avoid risk of transmission	73(85.9)
Bury as soon as possible	67(78.8)
Tomb must be at least two metres deep	50(58.8)
Disinfect vehicle after transporting body	46(54.1)
Repect all cultural practices & religious beliefs of the family	23(27.1
Availability of a copy of the national guideline or any other SOP for Management of Lassa fever at their duty post	
No	41(51.8)
Yes	38(48.2)

Accepting posting to Lassa fever ward (74.1%), willingness to attend to Lassa fever patients (70.6%), and management of Lassa fever patients by specially trained personnel (82.4%) contributed to positive attitudes exhibited by the respondents. Forty-seven (55.3%) of participants were adjudged to have a positive attitude towards Lassa fever

Table 5: Attitude of healthcare workers to Lassa fever management

Variable	Frequency (%)
Acceptance of posting to Lassa fever ward	
Yes	63(74.1)

No	22(25.9)

Lassa fever should be managed by only specifically trained personnel

Yes	70(82.4)
No	15(17.7)

Willingness to be trained to manage Lassa fever patients	Yes	34(40.0)
	No	51(60.0)

Will attend to a Lassa fever patient

Yes	60(70.6)
No	25(29.1)

Do you think the government and facility management are doing enough to protect staff from getting infected with Lassa fever?

Yes	34(42.5)
No	46(57.5)

5. Discussion

Lassa fever is a zoonotic acute haemorrhagic fever endemic in West Africa. Healthcare workers are at risk of contracting Lassa fever when protective measures and proper sterilization methods are not employed. This study evaluates the knowledge, practice, and attitude of healthcare workers in Ondo state to ensure continued reduction to nosocomial transmission and better case management.

A total of 85 healthcare workers participated in the study. The majority were females (61.2%), had a tertiary level of education (81.2%), and practiced in public health facilities (82.4%). The proportion of respondents with good knowledge and a positive attitude with respect to Lassa Fever was 75 (88.2%) and 47 (55.3%) respectively. Safe food handling and adequate handwashing were identified as the most effective ways of preventing Lassa Fever.

The general knowledge of Lassa fever among healthcare workers in Ondo was high. The knowledge of Lassa fever (causative agent, mode of transmission, case definition, and management) was high in this study. This finding contrasts Ibidolapo et al study in the same state where less than 50% of the healthcare workers had good knowledge of Lassa fever (Taiwo Ijarotimi et al., 2018). Similar reports of poor knowledge were reported by Asuke et al (40%), Ireye et al (4.4%) amongst healthcare workers in other states with Lassa fever outbreak in Nigeria(Asuke et al., 2020; Ireye et al., 2019). The overall good knowledge of Lassa fever was also higher compared to reports from other endemic countries(Tobin et al., 2013).The reason for the variability in the knowledge of Lassa fever could due to the different timelines, hospital settings, and healthcare workers' cadre.

The fair rating of positive attitude in our study was lower compared to Asuke et al (84%) and Ireye et al (63.3%)(Asuke et al., 2020; Ireye et al., 2019). Our fair attitude rating in the current is a reflection of the poor government support towards the training of healthcare workers about Haemorrhagic viral

diseases including Lassa fever. The high ratings in previous studies were attributed to the private healthcare facilities settings and prevention control measures in the facilities evaluated.

Adequate handwashing and use of personal protective equipment were predominant measures at preventing nosocomial transmission of Lassa fever. The practice of Infection prevention and control remains the backbone for limiting the spread of diseases within the healthcare facilities. This is in agreement with reports by Asuke et al, Ibidolapo et al. but in contrast to previous studies done in other parts of the country with Lassa fever outbreak(Asuke et al., 2020; Taiwo Ijarotimi et al., 2018). The limitations responsible for these differences vary from the ease of availability of PPE, level of healthcare facility, and cadre of healthcare workers.

Healthcare workers in Nigeria had a share of the burden of Lassa fever disease during the 2018 outbreak accounting for 7% and 5.8% of confirmed cases and case fatalities respectively (Dan-Nwafor et al., 2019; NCDC, 2019). The healthcare workers in Ondo State had good knowledge of the causes, vector, and modes of transmission of Lassa fever. In addition, more than three-quarters of them knew the incubation period to be2-21 days and mentioned the use of ribavirin, as the drug used for patient management. This is very encouraging because correct information would be passed around on Lassa fever considering the fact that the most common source of information is from peers (62%).

This is in contrast with another study(Taiwo Ijarotimi et al., 2018)where the knowledge was just about 42%, this may be as a result of the health facilities (primary and secondary facilities) surveyed compared to our respondents who were involved in managing the Lassa fever patients during the 2018 outbreak. About 90% of respondent's demonstrated good knowledge of infection and prevention measures against Lassa fever with most of the facilities adequately equipped to prevent disease outbreaks within their facilities.

This study is similar to a 2013 study where the use of gloves as personal protection equipment was reported in about 89.8%of the healthcare workers studied(Adebayo et al., 2015). However, less than a third of respondents (27%) believe cultural and religious practices during burial rites should still be maintained. This is in contrast with the study(Tobin et al., 2013) where 86.0% of respondents did not know of any special precautions to be taken during burial of a deceased Lassa fever patient. This calls for more education on transmission routes and precautionary measures on Lassa fever. This significant improvement could have alluded to the high level of knowledge and prevention practices within our study population.

Poor attitude to Lassa fever was recorded among 45% of respondents which is in contrast to about 30% recorded among healthcare workers in a similar study(Adeomi et al., 2017). This finding buttresses the need for continuous training, re-training, and encouragement to change the orientation towards building a positive attitude in all categories of workers within our healthcare facilities.

6. Conclusion

Healthcare workers showed overall good knowledge of Lassa fever and were aware of preventive measures towards limiting community and nosocomial spread. However, there is a need for institutions to consolidate on the measures to improve a positive attitude to the care and management of Lassa fever patients.

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