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Assessing the Awareness and Adoption of Lassa Fever Prevention Practices in Endemic States of Nigeria: Implication for Public Health Interventions

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Abstract

The knowledge and awareness of the risks associated with Lassa fever (LF) are still shallow in some endemic communities and even among some HCWs. This study aimed to evaluate the awareness and adoption of LF prevention practices in select endemic states of Nigeria vis-à-vis the public health implications. This research was a cross-sectional study with two phases: observation and desk review of other related data from study communities where situation reports from the Federal Ministry of Health and the CDC from 2012-2022 were reviewed and analysed. There was a high level of awareness (95.0%) and knowledge of the risk factors (93.7%) of LF, with gender playing a pivotal role as the females had more awareness likelihood ($p<0.05$). The age, geographical location, and socio-economic class of the respondents do not have any effect on the awareness of LF ($p>0.05$). There was no association between gender, age, and geographical location and the risk factor knowledge for LF ($p>0.05$); however, it showed that the socio-economic class directly affected the risk factors awareness ($p<0.05$). Gender should be considered in raising LF awareness, channeling effort into improving the socio-economic class of people to increase LF knowledge which will consequently reduce the devastating public health impact.

Keywords: *Awareness, Community, Endemic, Healthcare Workers, Knowledge, Lassa Fever.*

Introduction

Lassa fever (LF) is a zoonotic disease caused by the Lassa virus, a single-stranded RNA virus. Even though the virus was first described in the 1950s, it was not identified until 1969 when two missionary nurses were killed by the disease and was subsequently named after a town in the present Borno state of Nigeria, where the first case of the disease was recorded [1]. It is associated with high morbidity and mortality and has economic and health security consequences. It is endemic in West Africa, including Nigeria, which poses a significant public health challenge. LF is endemic in Nigeria and some other West African countries where the carrier of the Lassa virus, multimammate rat (*Mastomys natalensis*) abounds [2, 3]. According to Ben Uzoma, a Médecins Sans Frontières(MSF) (Doctors Without Borders) health promotion manager "Transmission of Lassa fever occurs throughout the year, but large seasonal outbreaks occur during the dry season, from December to April, when rats leave the fields to find food from other sources, such as people's houses" [4]. These infected rats deposit the virus when they pass their excreta on household foods and other items that are not properly covered. The viruses find their way into humans on consumption of such foods [3, 5].

Apart from Nigeria, other West African countries affected are Liberia, Ghana, Guinea, Mali, Benin, Togo, and Sierra Leone; however, Nigeria has the highest prevalence of the

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disease. In Nigeria, Lassa fever cases have been evidenced from 101 local government areas (LGAs), in 26 out of 36 states, including the Federal Capital Territory (FCT) in May 2023 [2]. The cases of Lassa fever keep rising and calls for increased attention and implementation of strategies that will mitigate the impact of the disease [6]. Prevention is the best approach in the control of LF. Currently, there is no vaccine for the disease, underscoring the need for increased awareness and adoption of other preventive strategies. Usuwa et al. therefore advised that there should be improved awareness and communication of the risk of Lassa fever to the communities [7]. Awareness is usually at the level of community and institutions handling the disease. This work was therefore aimed at assessing the awareness and adoption of Lassa Fever Prevention Practices in select Endemic States of Nigeria vis-à-vis its implication for Public Health Interventions.

Materials and Methods

Study Design

This research was a cross-sectional study designed to evaluate the awareness and the adoption of Lassa Fever prevention practices in select endemic states of Nigeria. The study had two phases: observation and desk review of other related data from the endemic states for Lassa fever in Nigeria. Situation reports (SiTrep) reports were reviewed in these communities' health facilities from the Federal Ministry of Health (FMOH) and the Centre for Disease Control and Prevention (CDC) from 2012 to 2022 and analysed. The second phase of the study was a cross-sectional descriptive study that involved a researcher-administered questionnaire to assess the awareness and adoption of Lassa Fever prevention practices in select endemic states of Nigeria.

The study population was made of participants from select endemic states in Nigeria studied were: Edo state, Ondo, Bauchi, Benue, Borno, and Taraba states (Figure 1).

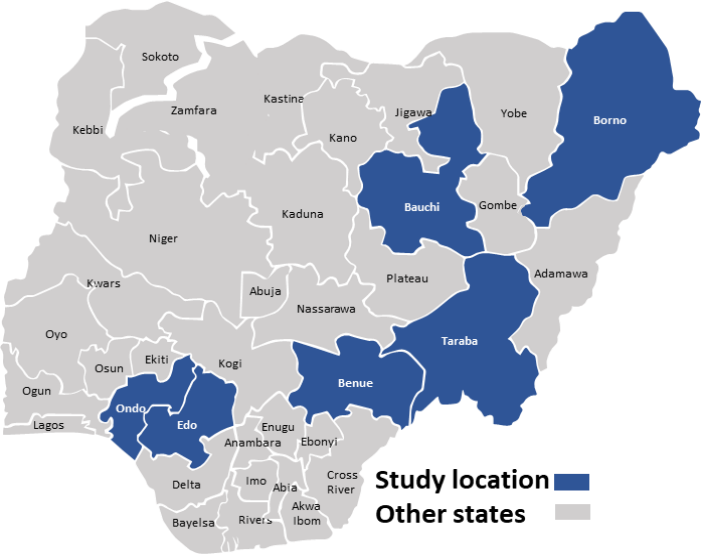

Figure 1. Map Showing Study Location in Nigeria Adapted from Map Chart

Since the data for the study was collected in two parts (data extraction and interview), only the data of populations in endemic states and health workers in healthcare facilities from January 2012 to December 2022 were extracted. Similarly, all key populations aged 18 years and above in households in the endemic states were included in the interviews. Both genders were included to ensure gender equity. However, participants <18 years, sick participants and health workers less than 2 weeks old in their employment in the health facilities were excluded.

Sampling Technique

Secondary data from all the endemic states were used. Using SPSS. The data obtained were transcribed and thematically analyzed. The sampling was done on the assumption that the prevalence of Lassa fever is 15% [8] and at 95% confidence interval of + 0.05 and -0.05, the sample size was determined as follows:

$$Sample\ size\ (n) = z^2\ X\ P\ X\ (1 - P)/e^2$$

Where;
z = z-score
e = margin of error
P = population proportion

The margin is error was 0.05, the z-score at 95% confidence was 1.96 and the population proportion was 0.15.

$$Sample\ size\ (n) = 1.96^2 X\ 0.15\ X\ (1 - 0.15)/0.05^2$$

$$Sample\ size\ (n) = 3.8416\ X\ 0.15\ X\ (1 - 0.15)/0.05^2$$

$$Sample\ size\ (n) = 0.57624\ X\ 0.85//0.05^2$$

$$Sample\ size\ (n) = 0.48980/0.05^2$$

$$Sample\ size\ (n) = 195.9$$

From the calculation n was rounded up to 196.

To make provision for drop out, extra 20% of the sample was added (39). Therefore, the final sample size, n was 235. The questionnaire was rounded up to 300 to make provision for the pilot survey.

Data Collection and Analysis

Data were collected online via the use of Google Forms. Information collected included socio-demographic information, gender, educational level, type of meat consumed, level of awareness of Lassa fever, awareness of risk factors, and preventive practices including sanitation practices. A Microsoft Excel data abstraction template was used for data extraction from the secondary data from health workers, households, and FMOH. Two trained abstractors conducted the data extraction and reviews. The completeness, clarity, and consistency of data were properly checked. Two trained research assistants administered a structured questionnaire to clients/participants to collect socio-support data.

The extracted data were exported into IBM-SPSS version 25.0 for analysis. Descriptive statistics were performed, presenting outcomes as frequency tables, percentages, bar charts. Pearson's chi-square test was also used to compare variable proportions. Univariate and multivariate logistics regression tests were performed to determine the factors for hesitancy, setting p-values below 0.05 as significant.

Ethical Consideration

Ethical approval to conduct this study was sought from the Federal Ministry of Health Research Ethics Committee (MOHREC) (NHREC Approval Number NHREC/01/01/2007-19/01/2024, See Appendix). Approval/grant letter was given to health facilities and the Lassa fever centre. Similarly, permission was secured from the healthcare facilities where the participants who are health workers were recruited. Informed consent was obtained from all participants. Participants were recruited voluntarily and those who wanted to leave the study were allowed without any objection. The study was conducted in line with the guidelines of public health research- autonomy, beneficence, non-maleficence and justice.

Results and Discussion

Socio-Demographics Characteristics

The results of the socio-economic characteristics of the respondents are as presented in Table 1. The study was performed in states with notable LF outbreaks- Edo, Ondo, Bauchi, Benue, Borno, and Taraba states. From our findings, Borno state was the most represented in our study (28.7%), followed by Edo (21.0%). These states were representative of the states with a high prevalence of Lassa fever across the different senatorial districts in Nigeria. In 2023, a high proportion of

confirmed cases (72%) were concentrated in three states: Ondo (32%), Edo (29%), and Bauchi (11%) [2] and these states were included in the study [2]. Benue and Taraba are bordering Cameroon where Lassa fever has also been reported while Borno is the state where the disease was first detected in Nigeria.

In our study, there was a marginal difference between the male and female respondents (55.7 vs 44.3%). From the gender distribution of the respondents, the marginal difference between the two genders (male and female) would ensure a balance of information gathering from the response and remove any form of gender bias, validating the outcome of the research (Table 3). Lobato et al. opine that there is a strong difference between male and female participants regarding social influences on the decision to participate in clinical research [9]. More so, according to Thelwall et al., women and men have different preferences for methods of data collection, where women often opt for qualitative methods while men prefer quantitative methods [10]. This underscores the need for parity in the choice of participants in public health research. A systematic review in 2021 showed that the age group mainly affected by Lassa fever is 21 to 40 years, occurring more in males in comparison to females (1:0.8) [11]. However, a recent situation report from NCDC showed that the predominant age group affected is 21-30 years (Range: 1 to 98 years) [12]. The age group of the respondents in this study 21-40 years (75.3% of respondents) is in tandem with the age group mostly affected by Lassa fever according to previous reports. Even though most of the responses came from the age group 21-40, the responses from other age brackets should not be discounted. Johns Hopkins Medicine suggests that clinical research should include people of different ages and genders to increase the credibility of research outcomes in terms of efficacy and safety to the populace [13].

Concerning the educational level of the participants, it showed that the majority of the participants were educated, with at least 90% having higher education (Table 3), with nearly 90% belonging to middle to high socio-economic class (Figure 2). Authors have divergent views on the impact of the level of education of the participants in predicting the overall outcome of a research. Scanlon et al. argue that educational level is not strongly predictive of research participation; however, for many other researchers, more educated and richer people are more likely to participate in research surveys [14, 15].

In this study, the majority of the respondents (66%) live in urban centres. Although some authors argue that Lassa fever is a rural disease due to the favourable conditions therein [16, 17], the trends are changing now. Recent studies reveal that there is a shift in the occurrence of Lassa fever from rural to urban settings. This highlights the need for increased surveillance of the disease in urban areas, and prioritise control in urban centres too [18]. Moreover, there is an increase in rural-urban migration, causing a dramatic increase in the population in the urban centres. Increased population densities in urban centres may enhance human-to-human transmission and impact the distribution of rodent reservoirs. It is therefore important that in the implementation of strategies for Lassa fever control, the centres must be factored in as well as the rural areas.

Table 1. Socio-demographic Characteristics of the Respondents

Variables	Frequency	Percent
State of Residence		
Bauchi	42	14.0
Benue	35	11.7
Borno	86	28.7

Edo	63	21.0
Ondo	40	13.3
Taraba	34	11.3
Gender		
Male	167	55.7
Female	133	44.3
Age of Respondents		
11 - 20 years	4	1.3
21 - 40 years	226	75.3
41 - 60 years	69	23.0
61 - 70 years	1	0.3
Educational Level		
Secondary Level	13	4.3
Diploma Level	44	14.3
Graduate (First Degree)	151	48.3
Post-Graduate (Masters)	84	23.7
Post-Graduate (PhD)	8	2.7
Geographic State		
Urban	199	66.0
Rural	101	34.0
Total	**300**	**100.0**

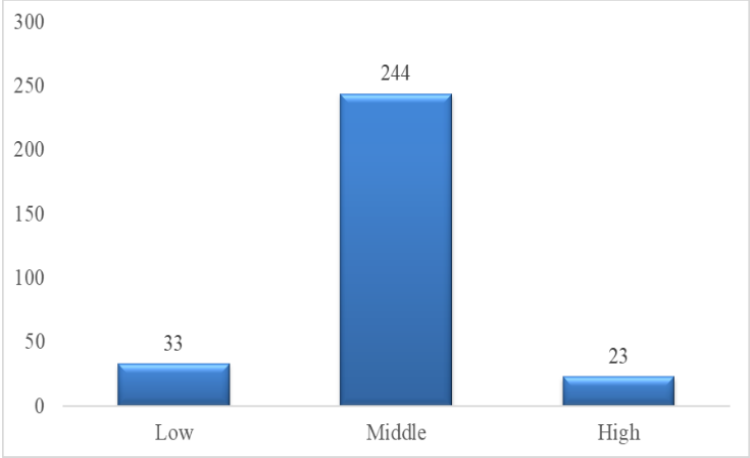

Figure 2. Socio-Economic Class

Knowledge of Factors Influencing the uptake of Standard Practices to Prevent Lassa Fever Infection

Our findings showed that there is high level of awareness of Lassa fever (95.0%) *Table 2). Awosanya reported a high knowledge and awareness of Lassa fever (74.6%) in Ibadan, Oyo State in the Lassa fever-affected community [19]. Similarly, a study conducted in Abakaliki, Ebonyi State, another endemic area, by Ossai et al. showed that the majority of the respondents (96.2%) are aware of the disease [20]. These results agree with our current findings that there is a high awareness of the disease in Lassa fever endemic areas. Gobir et al also reported a high awareness of the disease; however, their findings showed that poor knowledge of Lassa fever persists [21]. Even though there was a high awareness of the disease in Nigeria by the respondents, our findings showed a low awareness of the disease

in the communities of the respondents (40.7% awareness). On the other hand, Ukenya et al. reported that the knowledge of Lassa fever among HCWs in primary healthcare is low [22]. The poor awareness at the community level may contribute to poor control measures and uptake of the control approaches against Lassa fever, thereby having a negative implication in the interventions against Lassa fever.

Our findings show there was also a high knowledge of the risk factors for Lassa fever (93.7%) (Table 2). In some scenarios, the high level of awareness of Lassa fever is not backed up with high knowledge of the disease condition as reported by Adeomi et al [23] and corroborated by Gobir et (2020). This is in sharp contrast to our current study where there was also a high knowledge of the disease by the respondents as demonstrated in the high knowledge of the risk factors associated with Lassa fever (Table 2). According to Usuwa et al., a good knowledge of Lassa fever influences how people perceive the risk of the disease, which may ultimately impact the preventive approaches [7]. More so, Tobin et al. posit that the low knowledge of Lassa fever contributes to the transmission of the disease [24]. This underscores the importance of high knowledge of Lassa fever in the preventive approach and the uptake of the standard practices against Lassa fever.

Table 2. Knowledge of Factors Influencing the Uptake of Standard Practices to Prevent Lassa Fever Infection

Variables	Frequency	Percent
Are you aware of Lassa Fever (LF) infections in any part of Nigeria		
Yes	285	95.0
No	8	2.7
Don't know	7	2.3
Do you know the risk factors for Lassa Fever infections?		
Yes	281	93.7
No	10	3.3
Not sure	9	3.0
Do you consider Poor Hygiene as a risk factor for Lassa Fever?		
Yes	282	94.0
No	18	6.0
Do you consider eating bush meat as a risk factor for Lassa Fever?		
Yes	255	85.0
No	45	15.0
Do you consider Overcrowding as a risk factor for Lassa Fever?		
Yes	196	65.3
No	104	34.7
Do you consider poor food storage processing as a risk factor for Lassa Fever?		
Yes	283	94.3
No	17	5.7
Do you consider bush burning as a risk factor for Lassa Fever?		
Yes	190	63.3
No	110	36.7
Have you heard of Lassa fever infection in your community?		
Yes	178	40.7
No	122	59.3

Do you know of any medicine that can protect from Lassa Fever?		
Yes	111	37.0
No	189	63.0

Chi-square Test between Socio-demographic Characteristics and Awareness Lassa Fever Infections in Nigeria

A chi-square test of independence was performed to examine the relation between gender and the awareness of Lassa fever infection. The relation between these variables was significant, Chi-Square (X^2) (1, N = 300) = 6.153, p = 0.046. Our findings showed that gender plays a significant role in the awareness of Lassa fever as females were more likely to be aware of the disease than males (p<0.05) (Table 3). Contrastingly, Denwigwe and Ngwu did not find any significant influence of gender on the attitude of youths towards the prevention of Lassa fever [25]. However, Olayinka et al. identified being male as a predictor for Lassa fever [26]. The high awareness about Lassa fever by females may be accountable for the lower risk of contracting the disease by females when compared to males. Efforts should therefore be made to increase awareness in males whose risk of contracting LASV is also high.

In the present study, the proportion of respondents who are aware of the Lassa fever infection did not differ by age category, X^2 (1, N = 300) = 0.391, p > .05 (0.999). It showed that the age of the respondents does not have a significant effect on the awareness of Lassa fever infections (Table 3). This in line with the WHO report which states that Lassa fever occurs in all age groups [27] as earlier opined by Richmond et al. [1]. Even though Lassa fever occurs in all age groups, Kernéis et al suggest that children under 10 are particular vulnerable to the disease [16]. The high predisposition of the children under 10 may not be unconnected to the poorly developed immunity in this age group [28]. It is there pertinent to implement all preventive strategies across all age group since is not a predictor of awareness of Lassa fever.

More so, our study revealed that there was no statistically significant relationship between geographical Strata and awareness of Lassa fever infection as X^2 (1, N = 300) = 1.752, p > .05 (0.416) (Table 3). In contrast, Reuben and Gyar reported that those in urban centres are more aware of Lassa fever than those in sub-urban centres [29]. The lack of difference in the level of awareness as found in our study could be due to media usage to engage the public about Lassa fever. People in the urban and rural centres have almost equal access to different forms of media especially in this era of social media where information travel faster. This means that strategies for Lassa fever control and prevention should be equally targeted at both urban and rural centres to ensure the desired outcome.

The socio-economic class of people do not have any significant effect on the level of awareness of Lassa fever (Table 3). Both the rich and the poor suffer and die from the disease, it therefore becomes pertinent that all socio-economic classes become aware of the disease for effective prevention and control, and the control strategies should target all socio-economic strata.

Table 3. Chi-Square Test between Socio-demographic Characteristics and Awareness Lassa Fever Infections in Nigeria

Variables	Are you aware of Lassa Fever (LF) infections in any part of Nigeria			Chi-Square	*p*-value
	Yes (%)	No (%)	I don't know (%)		
Respondent's Gender					
Male	154(92.2)	7(4.2)	6(3.6)	6.153	0.046*
Female	131(98.5)	1(0.8)	1(0.8)		
Age Category					
11 – 20 years	4(0.0)	0(0.0)	0(0.0)		
21 - 40 years	215(95.1)	6(2.7)	5(2.2)	0.391	0.999
41 - 60 years	65(94.2)	2(2.9)	2(2.9)		
61 - 70 years	1(100.0)	0(0.0)	0(0.0)		
Geographic Strata					
Rural	98(97.0)	1(1.0)	2(2.0)	1.752	0.416
Urban	187(94.0)	7(3.5)	5(2.5)		
Socio-Economic Class?					
Low	30(90.9)	0(0.0)	3(9.1)		
Middle	232(95.1)	8(3.3)	4(1.6)	9.454	0.051
High	23(100.0)	0(0.0)	0(0.0)		

S Statistically significant*

Chi-square Test between Socio-demographic Characteristics and Awareness of Risk Factors for Lassa Fever Infections in Nigeria

Our findings showed that there was no significant association between gender and knowledge of risk factors for Lassa fever infections (Table 4), just like there was no link between age and the knowledge of the risk factors for Lassa fever infection (p>0.05). The disease occurs in both genders and across all age groups [27]. It becomes imperative that the knowledge of the risk factors is clear to people of all ages and to both genders too.

In the same vein, where the inhabitants live do not affect their knowledge of the risk factors for Lassa fever. The risk factors for Lassa fever are usually higher in places where *Mastomys*, the LASV carrier rodent abound, especially in communities with poor sanitation or crowded living conditions [27]. These conditions can be found in both rural and urban settings, putting both the urban and rural equally at risk. It is there important to equally apply strategies of communicating the risk factors in both urban and rural centres.

However, for the socio-economic class, a Chi-square test of independence performed to examine the relation between socio-economic class and the knowledge of the risk factors associated with Lassa fever infection showed that the relation between these variables was significant, Chi-Square (X^2) (1, N = 300) = 10.107, p = 0.039. This showed that the socio-economic class is directly proportional to the awareness of the risk factors for Lassa fever (Table 4). Socio-economic class had been reported as a positive predictor for peoples' health status [30-32]. This implies that closing or improving the socio-economic class disparity can improve the awareness of Lassa fever and ultimately improve the uptake of the tools for its control and prevention.

Usuwa et al. opine that a good knowledge of Lassa fever infection and its risk factors is remarkably linked to high perceived susceptibility to the disease [7]. This underscores the need for a good knowledge of the risk factors to enhance the proper implementation of strategies for Lassa fever control and to get the desired public health outcome.

Table 4. Chi-Square Test between Socio-demographic Characteristics and Awareness of Risk Factors for Lassa Fever Infections in Nigeria

Variables	Do you know the risk factors for Lassa Fever infections			Chi Square	P-Value
	Yes (%)	No (%)	Not sure (%)		
Respondent's Gender					
Male	156(93.4)	6(3.6)	5(3.0)	6.153	0.961
Female	125(94.0)	4(3.0)	4(3.0)		
Age Category					
11 – 20 years	3(75.0)	0(0.0)	1(25.0)		
21 - 40 years	210(92.9)	8(3.5)	8(3.5)	9.261	0.159
41 - 60 years	67(97.1)	2(2.9)	0(0.0)		
61 - 70 years	1(100.0)	0(0.0)	0(0.0)		
Geographic Strata					
Rural	95(94.1)	3(3.0)	3(3.0)	0.063	0.969
Urban	186(93.5)	7(3.5)	6(3.0)		
Socio-Economic Class?					
Low	28(84.8)	4(12.1)	1(3.0)		
Middle	230(94.3)	6(2.5)	8(3.3)	10.107	0.039*
High	23(100.0)	0(0.0)	0(0.0)		

S Statistically significant*

Study Limitations

The study only covered six states in Nigeria out of the 36 states. Even though these states have records of Lassa fever infection, there may be unique of some states that may have been captured in the six states studied. More so, no state was selected from South West, South East, and North West Nigeria. Nigeria has six geopolitical zones with their respective diversities. Inclusion of at least a state from each zone would have made the data mote robust.

Conclusion

Even though there is high level of awareness and knowledge of the risk factors of Lassa fever, there is a gender disparity in the level of awareness of the disease, where the females are more aware than the male counterparts. More so, the socio-economic class of people directly influence their knowledge of the disease. Other confounding factors like age and geographic location have no impact on the level of awareness and knowledge of the risk factors for LF. Therefore, gender should be considered in raising awareness for Lassa fever and efforts should be channelled in raising the socio-economic class of people to increase knowledge of Lassa fever and consequently reduce the devastating public health implications of the disease. Factors that influence the awareness and knowledge of the risk of LF should be duly considered in rolling out strategies for the prevention and control of Lassa fever.

Conflict of Interest

The authors declare no conflict of interest.

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