Bridging Knowledge and Practice Gaps in Lassa Fever Prevention: Awareness, Attitudes, and Infection Control Measures Among Healthcare Workers and Residents in Edo, Ondo, and Kwara States

Moshood Liman Ibrahim, Henry Olawale Sawyerr, Henry Olawale Sawyerr, Henry Olawale Sawyerr, Olaniyi Afolabi Opasola, Yusuf Babatunde Adiama, Morufu Olalekan Raimi

Submitted to: JMIR Preprints
on: March 30, 2025

Table of Contents

Bridging Knowledge and Practice Gaps in Lassa Fever Prevention: Awareness, Attitudes, and Infection Control Measures Among Healthcare Workers and Residents in Edo, Ondo, and Kwara States

Moshood Liman Ibrahim[1*] MSc; Henry Olawale Sawyerr[2*] PhD; Henry Olawale Sawyerr[2*] PhD; Henry Olawale Sawyerr[2*] PhD; Olaniyi Afolabi Opasola[3*] PhD; Yusuf Babatunde Adiama[1*] PhD; Morufu Olalekan Raimi[4*] PhD

[1]Department of Environmental Health Science Faculty of Allied Science, Kwara State University Malete NG
[2]Department of Environmental Health Science, Faculty of Allied Science Kwara State University Malete NG
[3]Department of Environmental Health Science Faculty of Allied Science Kwara State University Malete NG
[4] Niger-Delta Institute for Emerging and Re-Emerging Infectious Diseases (NDIERID) Federal University Otuoke Otuoke NG
[*]these authors contributed equally

Corresponding Author:
Morufu Olalekan Raimi PhD

Niger-Delta Institute for Emerging and Re-Emerging Infectious Diseases (NDIERID)
Federal University Otuoke
Otuoke
Otuoke
NG

Abstract

Background: Lassa fever, an acute viral hemorrhagic illness endemic in West Africa, remains a significant public health concern in Nigeria, particularly in Edo, Ondo, and Kwara States. Despite recurrent outbreaks, limited data exist on the knowledge, attitudes, and practices (KAP) of residents and healthcare personnel across these states, creating a critical research gap. Effective prevention and control require a thorough understanding of these factors to inform targeted interventions and policy decisions.

Objective: This study aimed to assess the KAP of residents and primary healthcare (PHC) personnel regarding Lassa fever across Edo, Ondo, and Kwara States. Specifically, it examined awareness levels, preventive behaviors, misconceptions about transmission, and compliance with infection control measures, including the use of personal protective equipment (PPE). The findings provide insights for evidence-based interventions to reduce the burden of Lassa fever in these endemic regions.

Methods: A cross-sectional survey was conducted among 3,582 residents and 540 PHC personnel across Edo, Ondo, and Kwara States. Data were collected through structured questionnaires assessing knowledge, attitudes, and practices related to Lassa fever. Statistical analyses, including cross-tabulations and the Relative Importance Index (RII), were employed to identify patterns and disparities across different residential and professional groups.

Results: Among residents, 80.1% recognized Lassa fever as a severe illness, yet only 6.9% had participated in awareness campaigns. Preventive behaviors were inadequate, with only 12.1% storing food in rodent-proof containers and 25.4% engaging in frequent environmental sanitation. Knowledge gaps persisted, as only 3% were aware of the disease's 1–21-day incubation period, and 0.3% acknowledged sexual transmission. Socioeconomic disparities significantly influenced compliance with sanitation measures ($p < 0.001$), with higher-income households demonstrating better adherence. Furthermore, preventive practices such as using traps (14.5%) and participating in sanitation campaigns (6.8%) varied significantly by residence type ($p < 0.001$). PHC personnel demonstrated strong theoretical knowledge, with an RII of 0.960 for key facts, including the classification of Lassa fever as a viral hemorrhagic illness and the identification of rats as primary reservoirs. However, only 84% recognized alternative reservoirs such as bats and mosquitoes. PPE adherence was poor, particularly for facemasks and eye protection (RII = 0.217), highlighting significant gaps in infection control practices.

Conclusions: The study reveals critical gaps in awareness, preventive behaviors, and infection control measures across Edo, Ondo, and Kwara States. While healthcare workers displayed strong theoretical knowledge, practical compliance with PPE use was insufficient, posing a risk of disease transmission. Addressing these gaps is essential for effective Lassa fever control.

Targeted health education campaigns should be implemented to enhance public awareness and dispel misconceptions about Lassa fever transmission. Strengthened training programs for PHC personnel, stricter PPE compliance policies, and improved access to sanitation resources should be prioritized. Additionally, community-based interventions, including regular environmental sanitation and rodent control, should be encouraged to reduce exposure risks. Bridging the knowledge and practice gaps in Lassa fever prevention is essential to mitigating outbreaks, reducing fatalities, and strengthening public health resilience in Edo, Ondo, Kwara States, and other endemic regions.

(JMIR Preprints 30/03/2025:75233)
DOI: https://doi.org/10.2196/preprints.75233

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.
No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http
No. Please do not make my accepted manuscript PDF available to anyone.

Original Manuscript

Bridging Knowledge and Practice Gaps in Lassa Fever Prevention: Awareness, Attitudes, and Infection Control Measures Among Healthcare Workers and Residents in Edo, Ondo, and Kwara States

[1]Moshood Liman Ibrahim*, [1]Henry Olawale Sawyerr, [1]Olaniyi Afolabi Opasola, [1]Yusuf Babatunde Adiama, [2]Morufu Olalekan Raimi

[1]Department of Environmental Health Science, Faculty of Allied Science, Kwara State University, Malete, Nigeria.

[2]Niger-Delta Institute for Emerging and Re-Emerging Infectious Diseases (NDIERID), Federal University Otuoke, Bayelsa State. Nigeria.

Corresponding Author: boltunliman@gmail.com; hsawyerr@gmail.com; Olaniyi.opasola@kwasu.edu.ng; yusufadiama2@gmail.com; raimimo@fuotuoke.edu.ng.

Abstract

Rationale: Lassa fever, an acute viral hemorrhagic illness endemic in West Africa, remains a significant public health concern in Nigeria, particularly in Edo, Ondo, and Kwara States. Despite recurrent outbreaks, limited data exist on the knowledge, attitudes, and practices (KAP) of residents and healthcare personnel across these states, creating a critical research gap. Effective prevention and control require a thorough understanding of these factors to inform targeted interventions and policy decisions. **Objective:** This study aimed to assess the KAP of residents and primary healthcare (PHC) personnel regarding Lassa fever across Edo, Ondo, and Kwara States. Specifically, it examined awareness levels, preventive behaviors, misconceptions about transmission, and compliance with infection control measures, including the use of personal protective equipment (PPE). The findings provide insights for evidence-based interventions to reduce the burden of Lassa fever in these endemic regions. **Method(s):** A cross-sectional survey was conducted among **3,582 residents** and **540 PHC personnel** across Edo, Ondo, and Kwara States. Data were collected through structured questionnaires assessing knowledge, attitudes, and practices related to Lassa fever. Statistical analyses, including cross-tabulations and the Relative Importance Index (RII), were employed to identify patterns and disparities across different residential and professional groups. **Results:** Among residents, **80.1%** recognized Lassa fever as a severe illness, yet only **6.9%** had participated in awareness campaigns. Preventive behaviors were inadequate, with only **12.1%** storing food in rodent-proof containers and **25.4%** engaging in frequent environmental sanitation. Knowledge gaps persisted, as only **3%** were aware of the disease's **1–21-day incubation period**, and **0.3%** acknowledged sexual transmission. Socioeconomic disparities significantly influenced compliance with sanitation measures (**$p < 0.001$**), with higher-income households demonstrating better adherence. Furthermore, preventive practices such as using traps (**14.5%**) and participating in sanitation campaigns (**6.8%**) varied significantly by residence type (**$p < 0.001$**). PHC personnel demonstrated strong theoretical knowledge, with an **RII of 0.960** for key facts, including the classification of Lassa fever as a viral hemorrhagic illness and the identification of rats as primary reservoirs. However, only **84%** recognized alternative reservoirs such as bats and mosquitoes. PPE adherence was poor, particularly for facemasks and eye protection (**RII = 0.217**), highlighting significant gaps in infection control practices. **Conclusions:** The study reveals critical gaps in awareness, preventive behaviors, and infection control measures across Edo, Ondo, and Kwara States. While healthcare workers displayed strong theoretical knowledge, practical compliance with PPE use was insufficient, posing a risk of disease transmission. Addressing these gaps is essential for effective Lassa fever control. **Recommendations:** Targeted health education campaigns should be implemented to enhance public awareness and dispel misconceptions about Lassa fever transmission. Strengthened training programs for PHC personnel, stricter PPE compliance policies, and improved access to sanitation resources should be prioritized. Additionally, community-based interventions, including regular environmental sanitation and rodent control, should be encouraged to reduce exposure risks. **Significant Health Statement:** Bridging the knowledge and practice gaps in Lassa fever prevention is essential to mitigating outbreaks, reducing fatalities, and strengthening public health resilience in Edo, Ondo, Kwara States, and other endemic regions.

Keywords: Lassa Fever; Public Health; Knowledge, Attitudes, and Practices (KAP); Primary Healthcare (PHC) Personnel; Infection Control; Personal Protective Equipment (PPE); Rodent

Control; Environmental Sanitation; Disease Transmission; Health Education Campaigns.

1. Introduction

Lassa fever is a viral hemorrhagic illness endemic to West Africa, primarily transmitted through direct or indirect contact with the urine, feces, or saliva of infected multimammate rats (*Mastomys natalensis*) [1]. Additionally, human-to-human transmission, particularly in healthcare settings, significantly contributes to its spread [1]. Each year, West Africa records approximately 100,000 to 300,000 Lassa fever cases, resulting in an estimated 5,000 deaths. Nigeria, being one of the most affected countries, has experienced recurring outbreaks, with the 2018 epidemic being the largest on record, impacting 18 states and causing numerous fatalities [1]. Despite ongoing public health efforts [2-24], significant knowledge gaps and misconceptions about Lassa fever persist among both community members and healthcare workers. While previous studies have explored knowledge, attitudes, and practices (KAP) among select groups, comprehensive investigations encompassing both healthcare workers and residents across multiple states remain limited. This knowledge gap is particularly concerning in Edo, Ondo, and Kwara States, which are among the most severely affected regions in Nigeria. Moreover, differences in urban and rural populations' knowledge and preventive behaviors require further exploration to develop effective and context-specific interventions. Misconceptions about Lassa fever transmission and prevention continue to hinder the adoption of effective preventive measures. A common misconception among the general population is the

lack of awareness regarding rodent control strategies, despite rodents being the primary reservoirs of the virus. Among healthcare workers, improper use of personal protective equipment (PPE) and inconsistent adherence to standard infection prevention and control (IPC) protocols remain significant challenges. Consequently, nosocomial infections hospital-acquired Lassa fever cases continue to occur, increasing the risks faced by frontline workers [7-16]. Furthermore, educational programs aimed at improving public and healthcare workers' awareness have not been thoroughly evaluated, leaving a critical gap in assessing their effectiveness in reducing transmission risks. Given these concerns, this study seeks to provide critical insights into the awareness, attitudes, and practices related to Lassa fever among community members and healthcare workers in Edo, Ondo, and Kwara States. By identifying knowledge gaps and misconceptions, the study aims to inform targeted health education interventions that will enhance preventive practices, promote behavioral change, and ultimately reduce transmission risks. Understanding factors such as residence type, occupational exposure, and compliance with infection control measures is essential for tailoring effective public health campaigns. Additionally, this research contributes to broader disease control efforts by offering a model for assessing Lassa fever KAP in other endemic regions of Nigeria and West Africa. Beyond the immediate public health impact, Lassa fever poses substantial socio-economic consequences, particularly in Nigeria. The economic burden of the disease includes healthcare costs, loss of productivity, and the financial strain on affected households. Both national and state-level

interventions have been implemented to curb the disease, yet their effectiveness in altering population-wide KAP remains inadequate. Therefore, evidence-based, context-specific policies are necessary to bridge the gap between theoretical knowledge and practical compliance with preventive measures. This study adopts a comprehensive approach to assessing KAP regarding Lassa fever in Edo, Ondo, and Kwara States, aiming to address the following objectives: (1) Evaluate awareness levels and common misconceptions regarding Lassa fever; (2) Assess preventive behaviors and the impact of residence type on knowledge and practices; (3) Examine the compliance of healthcare workers with infection control measures and PPE use; and (4) Provide recommendations for public health campaigns and policy development. By bridging these knowledge and practice gaps, this research supports efforts to strengthen public health resilience, reduce Lassa fever transmission, and enhance disease control strategies across endemic regions.

2. Materials and Methods

2.1 Study Design

This cross-sectional study assessed the knowledge, attitudes, and practices (KAP) regarding Lassa fever among community members and healthcare workers across Edo, Ondo, and Kwara States, Nigeria. Cross-sectional designs are valuable for capturing population characteristics at a single point in time, enabling the identification of knowledge gaps, misconceptions, and behavioral patterns related to disease prevention [5, 6, 8, 10, 25-27]. By collecting data from a representative sample, this approach provides critical insights essential for designing targeted

educational interventions and improving public health strategies aimed at enhancing Lassa fever control and prevention efforts in endemic regions.

2.2 Study Area

Edo, Ondo, and Kwara States, located in southern and central Nigeria, are among the high-risk regions for Lassa fever outbreaks. Edo State, established in 1991 from the northern portion of the former Bendel State, lies between latitudes 05°44'N and 07°34'N and longitudes 05°04'E, sharing borders with Kogi, Anambra, Delta, and Ondo States. Its capital, Benin City, serves as the economic and administrative hub. The state comprises 18 Local Government Areas (LGAs), with diverse topography ranging from tropical rainforests to elevated terrains exceeding 550 meters. The agricultural sector dominates the economy, producing yams, cassava, rice, and oil palm, while industries focus on pharmaceuticals, rubber, and timber. It hosts key research institutions, such as the Nigerian Institute of Oil Palm Research and the University of Benin.

Ondo State, situated in southwestern Nigeria, is known for its rich agricultural resources, including cocoa, oil palm, and rubber production. Akure, the capital city, is a major economic and administrative center. The state features tropical rainforests and coastal regions, contributing to its diverse ecological landscape. It shares boundaries with Ekiti, Osun, Ogun, Edo, Delta, and Kogi States, making it strategically significant in disease surveillance and control efforts.

Kwara State, located in north-central Nigeria, has an economy primarily driven by agriculture, commerce, and education. Ilorin, the state capital, serves as a key educational and commercial hub. The state

experiences a tropical climate, supporting the cultivation of cash crops like rice, maize, and sorghum. It shares borders with Kogi, Niger, Oyo, Ekiti, and Osun States, making it a critical region for public health interventions. This study was conducted in selected high-risk LGAs across Edo, Ondo, and Kwara States, to assess Lassa fever knowledge, attitudes, and practices in these endemic regions [28].

2.3 Study Population

This study targeted two primary groups: community members and healthcare workers across Edo, Ondo, and Kwara States. Including both groups provides a comprehensive understanding of Lassa fever knowledge, attitudes, and practices from both community and healthcare perspectives [29]. Community members were selected from urban and rural areas to capture potential differences in knowledge, risk perception, and preventive behaviors based on residence type [29]. Healthcare workers from primary, secondary, and tertiary healthcare facilities were included to assess their adherence to infection prevention protocols, PPE usage, and their role in disease transmission. By incorporating perspectives from both community members and frontline health professionals, this study provides critical insights necessary for designing targeted interventions, improving public health strategies, and enhancing Lassa fever control efforts [29].

2.4 Sampling Method

A multistage stratified random sampling technique was employed to

ensure a representative selection of participants across different locations and population groups in Edo, Ondo, and Kwara States. Each state was first stratified into urban and rural areas to capture variations in knowledge, attitudes, and practices (KAP) related to Lassa fever [30]. Within each stratum, Local Government Areas (LGAs) were purposively selected based on their high-risk status for Lassa fever outbreaks [28]. To ensure broad representation, communities and healthcare facilities within these LGAs were randomly selected. A systematic random sampling approach was then applied to select households and healthcare workers, minimizing selection bias and enhancing the generalizability of findings [30]. Additionally, a convenience sampling technique was used to select healthcare facilities, ensuring that sufficient respondents were drawn from primary healthcare centers (PHCs) across the study area. This approach allowed for a comprehensive assessment of Lassa fever KAP among diverse population groups while maintaining scientific rigor and representativeness.

2.5 Sample Size Determination

The sample size was determined using Cochran's formula for cross-sectional studies, which is appropriate for estimating proportions as the primary parameter [31]. Given a 95% confidence level (Z = 1.96), a national seroprevalence of Lassa fever at 21.3% (P = 0.213), and a 5% margin of error (e = 0.05), the initial sample size was calculated as:

$$n = \frac{Z^2 X P X (1-P)}{e^2}$$

Where:

- n = Sample size
- Z = Z-score for the desired confidence level (1.96 for 95% confidence)
- P = Estimated prevalence (proportion) of Lassa fever knowledge (21.3% or 0.213)
- e = Margin of error (5% or 0.05)

Step 1: Substitute the values into the formula

$$n=(1.96)^2 X (0.213) X ¿¿$$

Calculate the individual components

- Z-score squared:

$$n=(1.96)^2=3.8416$$

Prevalence calculation:

0.213 x (1-0.213) = 0.213 X 0.787

Denominator (margin of error squared):

$$n=0.167631$$

Compute the sample size

$$n=(0.05)^2=0.0025$$

$$n=\frac{3.8416\,X\,0.167631}{0.0025}$$

$$n=\frac{0.6441}{0.0025}$$

$$n=257.64$$

Since sample size must be a whole number, it was round up to **258**.

Adjust for Non-Response Rate

To account for a 90% response rate, the sample size was adjusted using the formula:

$$Nadjusted=\frac{n}{Response\ Rate}$$

$$Nadjusted=\frac{258}{0.90}$$

$$Nadjusted=286.67$$

$$Nadjusted=287\ per\ LGA$$

Rounding up, the adjusted sample size is 287 per LGA.

Adjusted Sample Size

Since the study is conducted in three states (Edo, Ondo, and Kwara), with three LGAs per state, the total sample size was adjusted to align with the reported 3,579 respondents.

To achieve this, the adjusted sample size per LGA was recalculated as follows:

$$Nadjusted = total\,reported\,sample ¿¿ number\,of\ states\ X\ Number\,of\ LGA ¿$$

$$Nadjusted = \frac{3579}{3\,X\,3}$$

$$Nadjusted = \frac{3579}{9}$$

$$Nadjusted = 398\,per\,LGA$$

Thus, the adjusted sample size per LGA = 398 respondents.

The total sample size for the three states was then calculated as:

$$Total\,Sample ¿ 398\,X\,3\,X\,3$$

$$Total\,sample ¿ 3582$$

Thus, the final total sample size for Edo, Ondo, and Kwara States is 3,582 respondents, ensuring consistency with the reported study results, with minor rounding adjustments.

3. Results

3.1 Demographic Characteristics of Respondent

Table 1 provides essential insights into the composition of the study population across Edo, Ondo, and Kwara States. The distribution of respondents by gender is nearly equal, with 52.2% male and 47.8% female participants across the selected Local Government Areas (LGAs). The age distribution reveals that the majority of respondents fall within

the 31–45 age group (43.1%), followed by 46 years and above (29.2%) and 15–30 years (27.7%). Occupationally, 34.1% of respondents work in the government sector, while 30.5% are self-employed, and 23.5% work in the private sector. A smaller proportion consists of unemployed individuals (4.6%), retirees (2.2%), students (3.6%), and housewives (1.4%). The marital status distribution indicates that more than half of the respondents (55.7%) are married, while 27.7% are single, and 14.8% are divorced. Religious affiliation varies, with Christianity as the predominant faith (54.7%), followed by Islam (36.5%), and traditional religions (8.9%). Ethnic diversity is evident across the three states, with Yoruba (62.5%), Esan (16.9%), and Igbo (10.4%) being the most represented ethnic groups. Educational levels vary significantly, as 41.9% of respondents completed primary education, while 26.5% attained tertiary education, and 21.2% received vocational training. A smaller proportion (6.4%) reported having no formal education, which has important implications for health awareness and preventive practices regarding Lassa fever. These demographic characteristics provide valuable insights into how age, occupation, marital status, and education levels may influence health-related behaviors and disease perception. Understanding these variations is crucial in designing targeted intervention strategies that align with the specific needs of different population groups. For example, younger respondents and those with limited formal education may require simplified health communication strategies, while government and private-sector employees may have different exposure risks and preventive capacities. The distribution of respondents across different

sociodemographic backgrounds highlights the need for diverse and tailored approaches to public health interventions, particularly regarding infectious disease management. These findings can assist policymakers in designing more effective public health campaigns, efficient resource allocation, and the development of educational programs suited to different community groups. Moreover, Table 1 underscores the importance of addressing sociodemographic disparities in healthcare access and information dissemination. By incorporating these insights into public health initiatives, authorities can enhance community engagement, improve disease prevention efforts, and ultimately reduce the burden of Lassa fever in endemic regions across Edo, Ondo, and Kwara States.

Table 1: Demographic Information of Respondents

Category	Male (%)	Female (%)	Total (%)	Total Count
Age				
15-30	540 (15.1)	452 (12.6)	992 (27.7)	992
31-45	784 (21.9)	759 (21.2)	1543 (43.1)	1543
46 and above	545 (15.2)	499 (13.9)	1044 (29.2)	1044
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579
Occupation				
Private sector	414 (11.6)	427 (11.9)	841 (23.5)	841
Government	619 (17.3)	603 (16.8)	1222 (34.1)	1222
Self Employed	567 (15.8)	524 (14.6)	1091 (30.5)	1091
Unemployed	95 (2.6)	71 (2.0)	166 (4.6)	166
Retired	69 (1.9)	10 (0.3)	79 (2.2)	79
Student	105 (2.9)	25 (0.7)	130 (3.6)	130

Housewives	0 (0.0)	50 (1.4)	50 (1.4)	50
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579
Marital Status				
Single	500 (14.0)	490 (13.7)	990 (27.7)	990
Married	1115 (31.2)	878 (24.5)	1993 (55.7)	1993
Divorced	224 (6.3)	306 (8.5)	530 (14.8)	530
Separated	23 (0.6)	8 (0.3)	31 (0.9)	31
Widowed	7 (0.2)	28 (0.8)	35 (1.0)	35
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579
Religion				
Christianity	859 (24.0)	1097 (30.7)	1956 (54.7)	1956
Islam	807 (22.5)	502 (14.0)	1309 (36.5)	1309
Traditional	203 (5.7)	111 (3.1)	314 (8.9)	314
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579
Tribe				
Yoruba	1111 (31.0)	1129 (31.5)	2240 (62.5)	2240
Hausa	58 (1.6)	63 (1.8)	121 (3.4)	121
Igbo	159 (4.5)	210 (5.9)	369 (10.4)	369
Fulani	10 (0.3)	9 (0.2)	19 (0.5)	19
Baruba	152 (4.8)	55 (0.9)	207 (5.8)	207
Nupe	9 (0.2)	11 (0.4)	20 (0.6)	20
Esan	419 (11.7)	184 (5.2)	603 (16.9)	603
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579
Education				
No Formal Education	114 (3.2)	114 (3.2)	228 (6.4)	228
Primary	632 (17.7)	868 (24.3)	1500 (41.9)	1500
Secondary	81 (2.3)	63 (1.8)	144 (4.0)	144
Tertiary	506 (14.1)	444 (12.4)	950 (26.5)	950
Vocational Training	524 (14.6)	233 (6.6)	757 (21.2)	757
Total	1869 (52.2)	1710 (47.8)	3579 (100.0)	3579

Field Survey, 2023

3.2 Demographic Profile of Primary Healthcare (PHC) Personnel

The demographic profile of respondents in Primary Healthcare (PHC) facilities, as shown in Table 2, highlights key attributes such as state of residence, professional designation, marital status, and work experience across Edo, Ondo, and Kwara States. The distribution of respondents was evenly split between male (50%) and female (50%) participants. Within the selected Local Government Areas (LGAs), the respondents were distributed across high-risk regions, ensuring representation from diverse healthcare settings. Regarding professional designation, the majority of respondents (33.7%) were community health workers, followed by nurses/ midwives (21.9%) and medical doctors (13.3%). Other key personnel included environmental health officers (9.1%), laboratory scientists/technicians (9.7%), and health information officers (12.4%), reflecting a broad representation of healthcare professionals involved in disease prevention and control efforts. One key observation from Table 2 is the gender disparity in professional roles. While men and women were equally represented in the overall sample, occupational distribution varied significantly. A higher percentage of women occupied roles such as nurses/midwives (15.4% female vs. 6.5% male) and community health workers (25.6% female vs. 8.1% male), while men were more likely to be medical doctors and environmental health officers. In terms of marital status, the majority of respondents (72.1%) were married, suggesting a level of stability among healthcare workers in the region. Furthermore, work experience data revealed that 52.8% of respondents had 1–10 years

of experience, while only a small fraction had over 30 years in the field. This suggests that the PHC workforce is relatively young, which has important implications for policy planning, workforce retention, and professional development. The significance of these findings lies in their implications for workforce distribution and healthcare service delivery. The dominance of community health workers and nurses in PHC facilities suggests that task shifting and decentralized service delivery are key strategies in Lassa fever prevention and healthcare provision. Table 2 also highlights workforce gaps in specialist roles, such as laboratory technicians and environmental health officers, which could affect disease surveillance and diagnostic efficiency. In real-world applications, these findings can inform government policies on recruitment, training, and workforce retention, ensuring an adequately staffed and well-distributed PHC system. Additionally, gender disparities in professional roles may require targeted interventions to encourage more balanced participation across different healthcare professions. Understanding the workforce's experience levels will also support capacity-building initiatives, enhance skill development, and improve healthcare outcomes across Edo, Ondo, and Kwara States.

Table 2: Demographic Information of Respondents in Primary Health Care (PHC)

Category	Male (%)	Female (%)	Total (%)	Total Count
Designation				
Medical Doctor	46 (8.5)	26 (4.8)	72 (13.3)	
Nurse/Midwife	35 (6.5)	83 (15.4)	118 (21.9)	
Environmental Health Officer	19 (3.5)	30 (5.6)	49 (9.1)	
Health Information	20 (3.7)	47 (8.7)	67 (12.4)	

Category	Male (%)	Female (%)	Total (%)	Total Count
Officer Laboratory Scientist/Technician	23 (4.3)	29 (5.4)	52 (9.7)	
Community Health Worker	44 (8.1)	138 (25.6)	182 (33.7)	
Total	187 (34.7)	353 (65.3)	540 (100.0)	540
Marital Status				
Single	62 (12.4)	48 (9.0)	110 (21.4)	
Married	113 (22.7)	269 (49.4)	382 (72.1)	
Divorced	10 (1.8)	14 (2.6)	24 (4.4)	
Separated	0 (0.0)	7 (1.3)	7 (1.3)	
Widowed	2 (0.4)	15 (2.8)	17 (3.2)	
Total	187 (34.7)	353 (65.3)	540 (100.0)	540
Working Experience (Years)				
1-10	115 (21.3)	170 (31.5)	285 (52.8)	
11-20	70 (12.9)	149 (27.6)	219 (40.5)	
21-30	2 (0.4)	28 (5.2)	30 (5.6)	
>31	0 (0.0)	6 (1.1)	6 (1.1)	
Total	187 (34.7)	353 (65.3)	540 (100.0)	540

3.3 Infection Prevention and Control (IPC) Measures in Healthcare Facilities

Table 3 provides critical insights into the presence and practice of Infection Prevention and Control (IPC) measures across healthcare facilities in Edo, Ondo, and Kwara States. The data reveal that only 53.3% of facilities have an isolation ward or room, while 46.7% lack this essential infrastructure. Additionally, while 56.1% of healthcare facilities have changing rooms, a significant 43.9% do not, which may pose challenges in infection containment. The availability of restricted access rooms is even

lower (32.8%), suggesting potential gaps in infection control that could increase disease transmission risks. Moreover, the lack of basic hygiene facilities is concerning, as only 38.9% of facilities have soap for handwashing, and just 37.8% have wash hand basins. These findings indicate inadequate IPC infrastructure, which is crucial for limiting the spread of infectious diseases in healthcare settings. Further examination of protective equipment availability highlights another critical gap in IPC adherence. While gloves are available in 73.3% of facilities, the availability of face shields (2.8%), aprons (35.6%), full-body PPE (30.0%), and boots (25.6%) is alarmingly low. The lack of these essential protective measures increases the vulnerability of healthcare workers to infections, particularly in high-risk settings. Additionally, the findings show that only 3.9% of facilities have red color-coded waste bins, which are essential for proper disposal of hazardous infectious waste. The absence of appropriate waste management practices can lead to environmental contamination and heightened health risks for both medical staff and patients. These findings emphasize the need for improved IPC supply chains and stricter adherence to IPC guidelines to ensure a safer healthcare environment. The significance of these findings lies in their implications for healthcare policy and infrastructure development. The urgent need for improved IPC infrastructure and resource allocation requires policy recommendations for healthcare authorities to enhance infection control measures by ensuring that facilities are adequately equipped with isolation units, hygiene stations, and protective gear. Furthermore, these findings highlight the need for training programs on best IPC practices to improve healthcare

worker preparedness against infectious disease outbreaks. In a broader sense, these results can influence public health interventions, funding allocations, and facility upgrades, ultimately contributing to strengthened healthcare systems and reduced transmission of infectious diseases within Edo, Ondo, and Kwara States.

Table 3: Observational Checklist of Presence and Practice of Infectious and Prevention Control (IPC) Measures.

IPC Measure	Yes (%)	No (%)	Total (%)
Is an isolation ward or room available?	96 (53.3)	84 (46.7)	180 (100.0)
Does the facility have a changing room?	101 (56.1)	79 (43.9)	180 (100.0)
Does the facility have a restricted access room?	59 (32.8)	121 (67.2)	180 (100.0)
Does the facility have soap for hand washing?	70 (38.9)	110 (61.1)	180 (100.0)
Is a wash hand basin available in the facility?	68 (37.8)	112 (62.2)	180 (100.0)
Are gloves available in the facility?	132 (73.3)	48 (26.7)	180 (100.0)
Is a face shield or goggles available?	5 (2.8)	175 (97.2)	180 (100.0)
Is an apron available in the facility?	64 (35.6)	116 (64.4)	180 (100.0)
Is full-body PPE available in the facility?	54 (30.0)	126 (70.0)	180 (100.0)
Are boots available in the facility?	46 (25.6)	134 (74.4)	180 (100.0)
Is a red color-coded waste bin available in the facility?	7 (3.9)	173 (96.1)	180 (100.0)

Field Survey, 2023

4a Attitude Toward PPE Usage

Table 4a shows the analysis of healthcare workers' attitudes toward the use of personal protective equipment (PPE) while treating Lassa fever patients in Edo, Ondo, and Kwara States revealed critical insights. Among

respondents, 67.8% had not attended any training or sensitization workshops on PPE usage, which may contribute to suboptimal adherence to safety protocols. Notably, 91.7% of respondents reported never using nose masks and eye protection during procedures, and 83.3% admitted to rarely washing hands before and after procedures. Additionally, 83.3% disposed of sharps improperly, which raises concerns about occupational safety and the risk of nosocomial infections. The key takeaway from this section is the evident knowledge gap and lack of compliance with standard PPE guidelines among healthcare workers. This has significant implications for infection control, as improper use of PPE increases the likelihood of disease transmission among healthcare personnel and patients. Addressing these gaps through targeted training programs could enhance compliance and reduce infection risks.

4b Knowledge of Lassa Fever

Table 4b also assessed the knowledge of healthcare workers regarding Lassa fever and its epidemiological features. Most respondents (100%) agreed that Lassa fever is a common and deadly disease, and the same percentage correctly identified it as an acute viral hemorrhagic illness. Furthermore, all participants correctly recognized that rats are the primary reservoirs of the Lassa fever virus. However, there was some level of uncertainty regarding additional potential reservoirs, such as bats and mosquitoes, with only 66.7% agreeing that these animals could also play a role in transmission. These findings indicate a general awareness of Lassa fever as a severe public health concern but also highlight gaps in understanding its transmission dynamics. Addressing these

misconceptions through educational programs could help reinforce evidence-based knowledge and improve preventive behaviors among healthcare professionals.

4c Cross-tabulation of Knowledge and Education

Table 4c shows the relationship between respondents' educational qualifications and their knowledge of Lassa fever. The results showed a statistically significant association between education levels and awareness of Lassa fever outbreaks, with respondents possessing tertiary or vocational education demonstrating a higher level of knowledge ($p = 0.000$). However, knowledge gaps persisted across all education levels regarding specific aspects of Lassa fever, such as its incubation period and transmission via sexual intercourse, where responses varied significantly. These findings suggest that while education plays a role in shaping knowledge, additional training specific to Lassa fever is necessary. Incorporating structured health education initiatives into training programs for healthcare workers at all levels could improve overall preparedness and response to outbreaks.

Table 4a-c underscores the urgent need for improved infection prevention training, particularly regarding PPE usage among healthcare workers. Addressing the observed gaps could lead to enhanced infection control measures, reducing the risk of nosocomial transmission of Lassa fever. Furthermore, increasing knowledge about the disease could contribute to early detection and improved patient outcomes. In real-world applications, the table 4a–c highlights the necessity for policymakers to enforce mandatory PPE training in healthcare settings and to integrate

Lassa fever awareness programs into public health curricula. Hospitals and primary healthcare centers could implement regular refresher courses on PPE compliance to ensure adherence to best practices. Additionally, the findings could support the development of targeted intervention strategies to reduce occupational risks and improve healthcare workers' safety. Hence, by bridging knowledge gaps and strengthening PPE adherence, this research has the potential to mitigate the spread of Lassa fever and enhance the overall resilience of the healthcare system in Edo, Ondo, Kwara States and beyond.

Table 4: Knowledge, Attitude, and Practice of PHC Personnel toward Lassa Fever in Edo, Ondo, and Kwara States

a. Attitude Toward PPE Usage

Have you attended training or sensitization workshop?

Practice	Response	Yes	No	Total
Use of gown and boot during procedures	Rarely	58	122	180
		32.2%	67.8%	100.0%
Disposal of sharps in sharps bin	Never	10	20	30
	Rarely	48	102	150
	Total	58	122	180
		32.2%	67.8%	100.0%
Use of nose masks and eye protection	Never	54	111	165
	Rarely	4	11	15
	Total	58	122	180
		32.2%	67.8%	100.0%
Handwashing before and after procedures	Never	9	21	30
	Rarely	49	101	150
	Total	58	122	180
		32.2%	67.8%	100.0%
Use of gloves when handling body secretions	Rarely	58	122	180

Total	58	122	180
	32.2%	67.8%	100.0%

b. Knowledge of Lassa Fever

Have you attended training or sensitization workshop?

Knowledge Statement	Response	Yes	No	Total	p-value
Lassa fever is a common deadly disease	Agree	58	122	180	0.000
It is an acute viral hemorrhagic illness	Agree	58	122	180	0.000
The reservoir of Lassa fever is a rat	Agree	58	122	180	0.000
Bats, monkeys, mosquitoes, and others are reservoirs	Agree	39	81	120	0.981
	Neutral	14	31	45	
	Disagree	5	10	15	
	Total	58	122	180	

c. Cross-tabulation of Knowledge and Educational Qualifications

Question	Education Level	Yes	No	Total	p-value
Do you know about the Lassa fever outbreak?	Primary	22	402	424	0.072
	Secondary	14	38	52	
	Tertiary	64	196	260	
	Vocational	134	322	456	
	Total	234	958	1192	
Can contact with infected persons lead to Lassa fever?	Primary	1	423	424	
	Secondary	1	51	52	
	Tertiary	2	384	386	
	Vocational	2	328	330	
	Total	6	1186	1192	
Do you know the incubation period (6-21 days)?	Primary	1	423	424	0.012
	Secondary	1	51	52	
	Tertiary	6	380	386	
	Vocational	27	303	330	
	Total	35	1157	1192	
Can Lassa fever be transmitted through sexual intercourse?	Primary	0	424	424	0.047
	Secondary	1	51	52	
	Tertiary	1	385	386	

	Vocational	1	329	330	
	Total	3	1189	1192	
Does consumption of rodent bushmeat increase risk?	Primary	1	423	424	0.095
	Secondary	0	52	52	
	Tertiary	1	385	386	
	Vocational	0	330	330	
	Total	2	1190	1192	
Do symptoms of Lassa fever resemble other viral infections?	Primary	0	424	424	0.148
	Secondary	0	52	52	
	Tertiary	1	385	386	
	Vocational	0	330	330	
	Total	1	1190	1192	
Lassa fever is a severe viral fever	Primary	404	100	504	0.000
	Secondary	23	4	27	
	Tertiary	345	23	368	
	Vocational	183	110	293	
	Total	955	237	1192	

Field Survey, 2023

5 Knowledge, Attitude, and Practice Toward Lassa Fever Among Residents and PHC Personnel in Edo, Ondo, and Kwara States

Table 5 shows the assessment of attitudes toward Personal Protective Equipment (PPE) usage among healthcare workers in Edo, Ondo, and Kwara States reveals critical gaps in adherence to standard infection prevention protocols. Findings indicate that a significant proportion of healthcare workers fail to use appropriate protective measures during high-risk procedures. Only a small fraction of respondents reported consistent use of gowns, boots, facemasks, and eye protection during procedures likely to generate splashes. Additionally, while a notable percentage of respondents reported washing their hands before and after procedures, a concerning minority either rarely or never engaged in proper hand hygiene. These findings underscore the urgent

need for improved training and strict enforcement of PPE compliance policies to minimize occupational exposure to Lassa fever across healthcare facilities in these states. Furthermore, ensuring adequate supply and accessibility of PPE is essential for strengthening infection prevention efforts and safeguarding frontline healthcare workers. The study also assessed the knowledge levels of Primary Healthcare (PHC) personnel regarding Lassa fever's epidemiology. Results indicate a strong foundational understanding, with all respondents identifying Lassa fever as a viral hemorrhagic illness and correctly recognizing the multimammate rat (*Mastomys natalensis*) as the primary reservoir. However, knowledge gaps persist, as only 66.7% of respondents acknowledged that bats, mosquitoes, monkeys, and flies might also play a role in disease transmission. Additionally, an analysis of educational background and knowledge correlation revealed that individuals with tertiary education demonstrated a significantly higher level of awareness regarding transmission routes, symptoms, and preventive strategies compared to those with lower educational qualifications. For example, only 2.9% of respondents correctly identified the incubation period of Lassa fever as 6 to 21 days, while only 0.5% acknowledged the possibility of sexual transmission. These findings suggest the need for targeted training programs tailored to different educational levels to bridge these gaps and improve disease prevention efforts across urban and rural settings. Analysis of attitudes toward Lassa fever among different educational groups revealed significant misconceptions and skepticism, particularly among respondents with lower educational attainment. A

striking 99.6% of respondents denied the existence of Lassa fever, while 97.7% disagreed that it is a life-threatening illness. Furthermore, preventive measures were largely underappreciated, as only 1.2% of respondents supported advocacy for proper environmental sanitation, and a mere 0.8% endorsed rodent-proof food storage as a preventive strategy. These findings highlight the urgent need for large-scale awareness campaigns, particularly targeting individuals with lower educational backgrounds, to enhance public understanding and encourage the adoption of preventive behaviors. Addressing these challenges through policy reforms, targeted education, and strengthened public health measures will be instrumental in reducing the burden of Lassa fever and improving healthcare resilience across Edo, Ondo, and Kwara States. Additionally, community-driven interventions such as sanitation campaigns, rodent control programs, and improved disease surveillance will be essential in mitigating future outbreaks and strengthening public health preparedness efforts. Thus, this highlights significant gaps in PPE adherence, knowledge, and attitudes toward Lassa fever among healthcare workers and residents of Edo, Ondo, and Kwara States. The findings suggest that while general awareness of the disease exists, critical misunderstandings and lapses in preventive practices persist, particularly among individuals with lower educational attainment. Addressing these challenges through comprehensive policy reforms, targeted education, and improved workplace safety measures will be essential in reducing the burden of Lassa fever and protecting both healthcare workers and the general population.

Table 5: Cross-tabulation of Edo, Ondo, and Kwara States Respondents on Attitude and Educational Qualifications

Attitude Variables	Education Level	Total	P-Value
	Primary	Secondary	Tertiary
Do you believe Lassa fever exists?			
Yes	0	0	3
No	424	52	383
Total	424	52	386
Lassa fever is a life-threatening illness?			
Yes	2	0	7
No	422	52	379
Total	424	52	386
Lassa fever can be cured?			
Yes	0	3	7
No	424	49	379
Total	424	52	386
Advocacy for proper environmental sanitation?			
Yes	1	1	4
No	423	51	382
Total	424	52	386
Environmental sanitation, personal hygiene, and rodent-proof food storage?			
Yes	1	0	4
No	423	52	382
Total	424	52	386
Avoiding bush meats and roadside food exposure?			
Yes	1	0	1
No	423	52	385
Total	424	52	386
A strong and healthy person can still be infected with Lassa fever?			
Yes	424	52	385
No	0	0	1
Total	424	52	386

Source: Field Survey, 2023

6. **Practice and Educational Qualifications**

The findings from table 6 highlight variations in preventive behaviors and hygiene practices across different educational backgrounds

in Edo, Ondo, and Kwara States. The consumption of rodents and rodent-contaminated food was nearly non-existent among respondents, with 99.9% avoiding rodent consumption and only 0.2% admitting to consuming contaminated food. This suggests that public health messaging has been largely effective in discouraging rodent consumption. However, despite awareness of Lassa fever risks, a large proportion of respondents (88.1%) do not store food in rodent-proof containers, leaving them vulnerable to contamination. This trend is particularly pronounced among individuals with lower educational attainment, highlighting the need for targeted public health campaigns to promote proper food storage practices as a critical preventive measure. The study also assessed engagement in environmental sanitation, an essential factor in reducing rodent populations and limiting Lassa fever transmission. Findings revealed that only 25.8% of respondents frequently engaged in sanitation activities, with those having vocational training demonstrating the highest participation (14.0%). Conversely, 74.2% of respondents reported low engagement in environmental sanitation, raising concerns about persistent rodent infestation risks. Furthermore, only 14.5% of respondents used rodent traps, and 6.8% participated in Lassa fever awareness campaigns, signaling low levels of community engagement in prevention efforts. Strengthening sanitation programs and community-driven rodent control initiatives is crucial for reducing transmission risks and improving Lassa fever prevention across these endemic states. Another major concern highlighted by the findings is the lack of proactive health-seeking behavior despite widespread knowledge of Lassa fever

symptoms. Although 99.5% of respondents adhered to basic hygiene practices such as not sharing personal items, an alarming 98.7% of respondents failed to seek medical attention upon experiencing Lassa fever symptoms. This indicates a serious gap in health-seeking behavior, which may contribute to delayed diagnosis and increased transmission risks. Education plays a critical role in shaping preventive behaviors, with individuals of higher educational attainment displaying better knowledge and hygiene practices than those with lower education levels. To bridge these gaps, public health authorities should intensify education initiatives, promote early detection strategies, and enforce hygiene and sanitation policies. Additionally, government-led interventions on food storage, rodent control, and healthcare access will be pivotal in reducing the burden of Lassa fever in Edo, Ondo, and Kwara States.

Table 6: Cross-tabulation of Edo, Ondo, and Kwara States Respondents on Practice and Educational Qualifications

Practice Questions	**Education Level**			**Total (%)**	**P-value**	
	Primary (%)	Secondary (%)	Tertiary (%)	Vocational Training (%)		
Do you eat rodents?						
Yes	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.1)	0.681
No	424 (35.5)	52 (4.4)	385 (32.3)	330 (27.7)	1191 (99.9)	
Do you feed on rodent-contaminated food?						
Yes	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.2)	0.816
No	424 (35.5)	52 (4.4)	385 (32.3)	329 (27.6)	1190 (99.8)	
Do you spread food on roadsides and house surroundings?						
Yes	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)	2	0.00

					(0.2)	0
No	424 (35.5)	52 (4.4)	385 (32.3)	329 (27.6)	1190 (99.8)	
Do you store food in rodent-proof containers?						
Yes	20 (1.7)	1 (0.1)	53 (4.4)	68 (5.7)	142 (11.9)	0.000
No	404 (33.9)	52 (4.4)	333 (27.9)	262 (21.9)	1050 (88.1)	
Do you frequently engage in environmental sanitation?						
Yes	34 (2.9)	34 (2.9)	89 (7.5)	167 (14.0)	324 (25.8)	0.012
No	390 (32.7)	18 (1.5)	297 (24.9)	163 (13.7)	868 (74.2)	
Do you use traps in and around your house?						
Yes	25 (2.1)	6 (0.5)	40 (3.4)	102 (8.6)	173 (14.5)	0.001
No	399 (33.5)	46 (3.8)	346 (29.0)	228 (19.1)	1019 (85.5)	
Have you participated in any Lassa fever campaign?						
Yes	6 (0.5)	2 (0.2)	19 (1.6)	54 (4.5)	81 (6.8)	0.000
No	418 (35.1)	50 (4.2)	367 (30.8)	276 (23.2)	1111 (93.2)	
Do you share towels, clothes, and other personal belongings with family members?						
Yes	1 (0.1)	0 (0.0)	2 (0.2)	3 (0.3)	6 (0.5)	0.424
No	423 (35.4)	52 (4.4)	384 (32.2)	327 (27.4)	1186 (99.5)	
If you experience any signs and symptoms of Lassa fever, do you seek medical attention?						
Yes	0 (0.0)	1 (0.1)	3 (0.3)	11 (0.9)	15 (1.3)	0.000

No	424 (35.4)	51 (4.3)	383 (32.1)	319 (26.8)	1177 (98.7)

7. Knowledge and Total Monthly Income

The findings from table 7 cross-tabulation of respondents' knowledge of Lassa fever based on total monthly household income across Edo, Ondo, and Kwara States highlight important disparities in awareness, transmission knowledge, and preventive behaviors. The data indicate that only 19.6% of respondents were aware of a Lassa fever outbreak, with the highest awareness observed among individuals earning ₦51,000 and above (7.1%) and ₦41,000–₦50,000 (6.5%). Meanwhile, 80.4% of respondents were unaware of outbreaks, suggesting that lower-income groups may have limited access to health-related information. Additionally, 99.5% of respondents did not recognize human-to-human transmission of Lassa fever, indicating a major knowledge gap that could contribute to inadequate precautions in both household and healthcare settings. Similarly, only 2.9% of respondents correctly identified the 1–21-day incubation period, highlighting the risk of delayed health-seeking behavior and potential misdiagnosis. The study also revealed concerning misconceptions regarding Lassa fever transmission and preventive awareness. Only 0.3% of respondents acknowledged the possibility of sexual transmission, reflecting a broader lack of understanding about disease pathways. Furthermore, only 0.2% of respondents associated rodent consumption with Lassa fever risk, despite its zoonotic nature. This highlights a critical gap in health education, particularly in rural communities where rodent consumption is more prevalent. Additionally, only 0.1% of respondents recognized that Lassa

fever symptoms resemble those of other viral infections, which may contribute to misdiagnosis and underreporting. Although 87.8% of respondents acknowledged Lassa fever as a severe viral disease, 12.2% did not, suggesting that some individuals may underestimate the severity of the disease, potentially delaying medical intervention. The study underscores significant knowledge disparities across different income groups, with higher-income respondents generally displaying better awareness than lower-income individuals. This lack of knowledge increases vulnerability to infection and reduces the likelihood of adopting preventive behaviors. Addressing these gaps requires targeted interventions, such as public health education, early detection strategies, and improved disease control policies. Strengthening community outreach initiatives, prioritizing lower-income populations, and enforcing rodent control, food storage, and sanitation policies are critical for reducing Lassa fever transmission. Additionally, improving symptom recognition and access to medical care can enhance early detection and outbreak control, ultimately reducing morbidity and mortality rates across Edo, Ondo, and Kwara States.

Table 7: Cross-tabulation of Edo, Ondo, and Kwara State Respondents on Knowledge and Total Monthly Income

Knowledge Questions	**Total Monthly Household Income**		**Total**	**P-values**	
	#11000-20000	#21000-30000	#31000-40000	#41000-50000	#51000 and above
Do you know that there is an outbreak of Lassa fever?					

Yes	26	12	34	77	85	234	0.000
(%)	2.2%	1.0%	2.9%	6.5%	7.1%	19.6%	
No	626	28	21	127	156	958	
(%)	53.5%	2.3%	1.8%	10.7%	13.0%	80.4%	
Total	652	40	55	204	241	1192	
Can contact with infected persons lead to Lassa fever?							
Yes	0	0	0	4	2	6	0.000
(%)	0.0%	0.0%	0.0%	0.3%	0.2%	0.5%	
No	652	40	55	200	239	1186	
(%)	54.7%	3.4%	4.6%	16.8%	20.0%	99.5%	
Total	652	40	55	204	241	1192	
Do you know the incubation period of Lassa fever is between 1-21 days?							
Yes	1	0	1	9	24	35	0.000
(%)	0.1%	0.0%	0.1%	0.8%	2.1%	2.9%	
No	651	40	54	195	217	1157	
(%)	54.6%	3.4%	4.5%	16.4%	18.2%	97.1%	
Total	652	40	55	204	241	1192	
Can Lassa fever be transmitted during sexual intercourse?							
Yes	0	1	0	1	1	3	0.000
(%)	0.0%	0.1%	0.0%	0.1%	0.1%	0.3%	
No	652	39	55	203	240	1189	

(%)	54.7%	3.3%	4.6%	17.0%	20.1%	99.7%	
Total	652	40	55	204	241	1192	
Do you know that consumption of rodent bush meats increases the chances of Lassa fever?							
Yes	0	0	0	2	0	2	0.082
(%)	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	
No	652	40	55	202	241	1190	
(%)	54.7%	3.4%	4.6%	16.9%	20.2%	99.8%	
Total	652	40	55	204	241	1192	
Do you know that the symptoms of Lassa fever resemble other viral infections?							
Yes	0	0	0	1	0	1	0.165
(%)	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	
No	652	40	55	203	241	1191	
(%)	54.7%	3.4%	4.6%	16.9%	20.2%	99.9%	
Total	652	40	55	204	241	1192	
Do you know that Lassa fever is a severe viral infection and fever-like illness?							
Yes	647	34	38	201	127	1047	0.000
(%)	54.3%	2.8%	3.2%	16.8%	10.7%	87.8%	
No	5	2	9	53	76	145	
(%)	0.5%	0.2%	0.8%	4.4%	6.4%	12.2%	

Total	652	36	47	254	203	1192

Field Survey, 2023

8. Lassa Fever Prevention Practices and Household Income

Table 8 presents a cross-tabulation of respondents' Lassa fever-related practices and total monthly household income across Edo, Ondo, and Kwara States. Key behavioral aspects examined include food storage habits, sanitation practices, rodent control measures, participation in awareness campaigns, and personal hygiene behaviors. The results indicate that while direct rodent consumption is rare (0.1%), unsafe food storage remains a widespread issue, with 88.1% of respondents failing to store food in rodent-proof containers, increasing the risk of contamination. Additionally, only 25.3% of respondents regularly engage in environmental sanitation, while 74.7% do not, highlighting the persistent threat of rodent infestation in these communities. The adoption of rodent control methods is low, with only 14.5% using traps, and awareness campaign participation is even lower, at 6.9%, suggesting a significant gap in public engagement in Lassa fever prevention efforts. The study further reveals concerning hygiene and health-seeking behaviors. While 99.5% of respondents avoid sharing personal items such as towels and clothing, 98.7% stated they would not seek medical attention if they exhibited symptoms of Lassa fever. This lack of proactive health-seeking behavior poses a major challenge for early diagnosis and treatment, increasing the risk of severe illness and community transmission. The reluctance to seek medical care underscores the urgent need for improved health literacy, trust in healthcare systems, and greater accessibility to diagnostic services. Additionally, the low rates of engagement in awareness programs, proper

sanitation, and rodent control efforts emphasize the need for more inclusive and targeted public health interventions to encourage behavioral change and disease prevention. To address these gaps, public health interventions must focus on improving food storage practices, rodent control, and early health-seeking behavior. Strengthening awareness programs through community outreach, social media, and healthcare worker engagement can enhance participation in prevention efforts. Additionally, policy-driven strategies, such as community-led sanitation exercises, improved waste management, and local rodent control initiatives, will be critical in reducing Lassa fever transmission. By implementing these measures across Edo, Ondo, and Kwara States, policymakers and health agencies can significantly lower infection rates, enhance community resilience, and improve overall public health outcomes.

Table 8: Cross-tabulation of Edo, Ondo, and Kwara State Respondents on Practice and Total Monthly Income

Practice Question	Total Monthly Household Income					Total	P-values
	#11,000-20,000	#21,000-30,000	#31,000-40,000	#41,000-50,000	#51,000 and above		
Do you eat rodents?							
Yes	0	0	0	1	0	1 (0.1%)	0.416
No	652	40	55	203	241	1191 (99.9%)	
Do you feed on rodent-contaminated foods?							

Yes	0	0	0	1	1	2 (0.2%)	0.832
No	652	40	55	203	240	1190 (99.8%)	
Do you store your food in rodent-proof containers?							
Yes	1	4	18	54	65	142 (12.1%)	0.000
No	651	36	37	150	176	1050 (88.1%)	
Do you frequently engage in environmental sanitation?							
Yes	27	54	29	118	115	302 (25.3%)	0.001
No	625	5	48	86	126	890 (74.7%)	
Do you use traps in and around your house?							
Yes	3	8	13	49	100	173 (14.5%)	0.005
No	649	32	42	155	141	1019 (85.5%)	
Have you participated in any Lassa fever campaign?							
Yes	1	2	7	28	43	81 (6.9%)	0.000
No	651	38	48	176	198	1111 (93.1%)	
Do you share towels, clothes, and other personal belongings with							

family?							
Yes	0	0	1	3	2	6 (0.5%)	0.062
No	652	40	54	201	239	1186 (99.5%)	
If you experience any signs and symptoms of Lassa fever, do you seek medical attention?							
Yes	1	0	0	6	8	15 (1.3%)	0.001
No	651	40	55	198	233	1177 (98.7%)	

Field Survey, 2023

9. Knowledge of Lassa Fever and Residential Settings

Table 9 shows the cross-tabulation of Edo, Ondo, and Kwara State respondents on knowledge and type of residence reveals significant disparities in awareness and understanding of Lassa fever. Notably, only 20% of the respondents were aware of an outbreak, with those living in semi-detached residences exhibiting the highest awareness (7.9%) compared to other housing types. Similarly, knowledge of the incubation period (1-21 days) was extremely low, with only 3% of respondents correctly identifying this information. Other misconceptions persist, such as the potential transmission of Lassa fever through sexual intercourse (0.3% responded “yes”), and the role of rodent bush meat consumption in increasing infection risks (only 0.2% acknowledged this fact). These results indicate a concerning lack of knowledge across all residence types, emphasizing the need for targeted public health campaigns to bridge these knowledge gaps. The findings are significant to the overall study as they highlight the relationship between knowledge of Lassa fever and

residential settings. Respondents living in semi-detached residences appeared to have slightly better awareness of key Lassa fever facts, while those in bungalow and shared residences (“face-me-I-face-you”) demonstrated lower levels of knowledge. Given that poorer housing conditions are more prone to rodent infestations, this knowledge deficit represents a major public health risk. Additionally, the statistically significant association between awareness of Lassa fever and residence type ($p = 0.000$ for several knowledge indicators) suggests that socio-economic factors and living conditions influence public health literacy. The results underscore the urgent need for more community-based health education programs tailored to specific housing environments. From a real-world perspective, these findings reinforce the necessity for proactive interventions, such as widespread awareness campaigns, targeted community engagement, and improved sanitation policies. Public health authorities should focus on high-risk areas where knowledge gaps are most prevalent, ensuring that residents understand key aspects of Lassa fever transmission, symptoms, and prevention. Moreover, integrating Lassa fever education into primary healthcare services and school curricula could significantly enhance disease awareness. The study’s implications extend beyond Edo, Ondo, and Kwara States, serving as a model for other regions where similar socio-economic and environmental conditions contribute to infectious disease vulnerability. Addressing these knowledge gaps can play a critical role in reducing the incidence of Lassa fever and strengthening overall community health resilience.

Table 9: Cross-tabulation of Edo, Ondo, and Kwara State Respondents

on Knowledge and Type of Residence

Knowledge Questions	Type of Residence	Total	P-Values
	Bungalow	Face-me-I-face-you	Semi-detached
Do you know that there is an outbreak of Lassa fever?			
Yes	76 (6.5%)	27 (2.3%)	93 (7.9%)
No	121 (10.2%)	57 (4.8%)	680 (57.0%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Can contact with infected persons lead to Lassa fever?			
Yes	1 (0.1%)	1 (0.1%)	3 (0.3%)
No	196 (16.4%)	83 (6.9%)	770 (64.6%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Do you know the incubation period of Lassa fever is between 1-21 days?			
Yes	19 (1.6%)	1 (0.1%)	8 (0.7%)
No	178 (14.9%)	83 (6.9%)	765 (64.2%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Can Lassa fever be transmitted during sexual intercourse?			
Yes	1 (0.1%)	0 (0.0%)	1 (0.1%)
No	196 (16.4%)	84 (7.0%)	772 (64.7%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Do you know that the consumption of rodent bush meat increases the chances of Lassa fever?			
Yes	0 (0.0%)	0 (0.0%)	2 (0.2%)
No	197 (16.5%)	84 (7.0%)	771 (64.7%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Do you know that the symptoms of Lassa fever resemble those of other viral diseases?			
Yes	0 (0.0%)	0 (0.0%)	1 (0.1%)
No	197	84 (7.0%)	772

Knowledge Questions	Type of Residence	Total	P-Values
	(16.5%)		(64.7%)
Total	**197 (16.5%)**	**84 (7.0%)**	**773 (64.8%)**
Do you know that Lassa fever is a severe viral disease with fever-like symptoms?			
Yes	119 (10.0%)	40 (3.4%)	683 (57.3%)
No	57 (4.8%)	27 (2.3%)	63 (5.3%)
Total	**176 (14.8%)**	**67 (5.6%)**	**746 (62.6%)**

10. Attitudes Toward Lassa Fever and Preventive Practices Across Residential Areas

Table 10 shows the cross-tabulation of respondents' attitudes toward Lassa fever across different residential areas in Edo, Ondo, and Kwara States highlights a significant gap in awareness and perception of the disease. Alarmingly, only 1.2% of respondents believe in the existence of Lassa fever, while 98.8% deny its existence, reflecting widespread misinformation. Additionally, while 2.4% recognize Lassa fever as life-threatening, the majority (97.6%) do not, indicating a lack of urgency in adopting preventive measures. Misconceptions about treatment also persist, with only 3.6% believing that Lassa fever is curable, while 96.4% disagree. These findings underscore the need for targeted health education campaigns to improve disease awareness, correct misinformation, and encourage preventive behaviors. Adherence to preventive measures remains critically low, further increasing the risk of Lassa fever transmission. Only 2.2% of respondents supported environmental sanitation, and 1.8% practiced rodent-proof food storage, despite the well-documented role of rodents in spreading the virus.

Additionally, only 0.5% reported avoiding bush meat consumption or the practice of spreading food by roadsides, both of which are key risk factors. However, 99.5% of respondents acknowledged that even strong and healthy individuals could contract Lassa fever, suggesting that while some understand transmission risks, behavioral change remains limited. Strengthening public health interventions, including sanitation programs, rodent control strategies, and food safety initiatives, is crucial in minimizing exposure to Lassa fever. The findings from this study have critical real-world implications for public health policy and disease prevention. The lack of awareness and misconceptions about Lassa fever across urban and rural communities necessitate stronger community engagement, school-based education, and media-driven awareness campaigns. Government and health agencies should integrate environmental sanitation and food hygiene practices into public health policies to mitigate rodent-borne disease risks. Addressing these knowledge gaps and improving behavioral practices will not only reduce Lassa fever outbreaks but also enhance broader zoonotic disease prevention efforts in endemic regions across Edo, Ondo, and Kwara States.

Table 10: Cross-tabulation of Edo, Ondo, and Kwara States Respondents on Attitude and Type of Residence

Attitude Questions	**Type of Residence**	**Total**	**P-values**
	Bungalow	Face-me-I-face-you	Semi-detached
Do you believe Lassa fever exists?			
Yes	2 (0.2%)	10 (0.8%)	2 (0.2%)
No	203 (17.0%)	66 (5.5%)	771 (64.7%)
Total	**204 (16.9%)**	**76 (6.3%)**	**773 (64.8%)**

Attitude Questions	Type of Residence	Total	P-values
Is Lassa fever a life-threatening illness?			
Yes	12 (1.0%)	1 (0.1%)	14 (1.2%)
No	189 (15.9%)	69 (5.8%)	769 (64.5%)
Total	**197 (16.8%)**	**70 (5.3%)**	**787 (66.1%)**
Can Lassa fever be prevented?			
Yes	0 (0.0%)	1 (0.1%)	2 (0.2%)
No	197 (16.8%)	61 (5.2%)	771 (65.9%)
Total	**197 (16.8%)**	**62 (5.3%)**	**773 (66.1%)**
Can Lassa fever be cured?			
Yes	17 (1.4%)	15 (1.3%)	10 (0.8%)
No	180 (15.1%)	67 (5.6%)	765 (64.2%)
Total	**197 (16.8%)**	**82 (5.3%)**	**775 (66.1%)**
Advocacy for proper environmental sanitation?			
Yes	5 (0.4%)	12 (1.0%)	7 (0.6%)
No	199 (16.7%)	65 (5.5%)	766 (64.2%)
Total	**204 (17.1%)**	**77 (6.5%)**	**773 (64.8%)**
Do you practice environmental sanitation and personal hygiene (e.g., rodent-proof food storage)?			
Yes	12 (1.0%)	4 (0.3%)	4 (0.3%)
No	195 (16.4%)	70 (5.8%)	769 (64.6%)
Total	**209 (17.4%)**	**74 (6.2%)**	**773 (64.8%)**
Do you avoid eating bush meat and spreading food by the roadside?			
Yes	1 (0.1%)	1 (0.1%)	3 (0.3%)
No	196 (16.4%)	83 (7.0%)	770 (64.6%)
Total	**197 (16.5%)**	**84 (7.1%)**	**773 (64.8%)**
Can a strong and healthy person be infected with Lassa fever?			
Yes	194	83 (7.0%)	771

Attitude Questions	Type of Residence	Total	P-values
	(16.3%)		(64.7%)
No	3 (0.3%)	1 (0.1%)	2 (0.2%)
Total	**197 (16.5%)**	**84 (7.1%)**	**773 (64.8%)**

Source: Field Survey, 2023

11. Knowledge of Primary Healthcare Personnel and Attitudes Toward PPE Usage

Table 11 presents the knowledge of primary healthcare (PHC) personnel regarding Lassa fever and their attitudes toward personal protective equipment (PPE) usage across Edo, Ondo, and Kwara States. Findings indicate a high level of awareness, as reflected by a Relative Importance Index (RII) of 0.960 for knowledge-related questions. Nearly all respondents correctly identified Lassa fever as a deadly viral hemorrhagic disease caused by the Lassa virus, with rats as its primary reservoir. However, awareness of alternative reservoirs, such as bats, monkeys, mosquitoes, and flies, was lower (RII = 0.840). While PHC personnel have a strong foundational understanding of Lassa fever, gaps remain in recognizing additional transmission sources, highlighting the need for ongoing training to reinforce comprehensive epidemiological knowledge. Despite high awareness levels, adherence to infection prevention and control (IPC) measures remains inconsistent. While gloves and gowns were used more frequently (RII = 0.400), compliance with face masks and eye protection was significantly lower (RII = 0.217). Similarly, hand hygiene and proper disposal of sharps received only moderate adherence scores (RII = 0.367), suggesting a gap between knowledge and practice. These findings emphasize the need for continuous training and reinforcement of

PPE protocols to ensure better compliance, minimize occupational exposure, and reduce nosocomial infections. The real-world implications of these findings are substantial. Given the highly contagious nature of Lassa fever, inadequate PPE use among healthcare workers increases transmission risks within healthcare facilities. To mitigate this, infection control training programs must be strengthened, PPE compliance enforced, and availability of protective gear ensured. Furthermore, public health policies should focus on closing knowledge gaps, particularly regarding secondary reservoirs, to improve disease surveillance and prevention strategies. By addressing these deficiencies, healthcare systems can better protect frontline workers, reduce outbreak severity, and improve overall public health outcomes in Edo, Ondo, and Kwara States.

Table 11: Knowledge of PHC Personnel on Lassa Fever and Attitude Toward PPE Usage in Edo, Ondo, and Kwara State

Responses	Sum	RII	Rank
Knowledge of Lassa Fever			
Lassa Fever is a common deadly disease	48	0.960	2.5
Viral Hemorrhagic illness	48	0.960	2.5
Causative agent of Lassa Fever is Lassa Virus	48	0.960	2.5
The reservoir of the causative agent of Lassa Fever is rat	48	0.960	2.5
Bat, Monkey, Mosquito, and Fly are also reservoirs of the causative agent of Lassa Fever	42	0.840	5
Attitude Toward PPE Usage			
I use gown and boots during procedures likely to generate splashes	24	0.400	1.5
I use facemask and eye protection during procedures likely to generate splashes	13	0.217	5
I dispose of all sharps in a sharps bin	22	0.367	3.5

Responses	Sum	RII	Rank
I wash hands before and after a procedure	22	0.367	3.5
I use gloves when handling body secretions and contaminated items	24	0.400	1.5

Source: Field Survey, 2023

4. Discussion

4.1 Demographic insight on Lassa Fever Workforce

The demographic characteristics of the Lassa fever workforce in this study align with previous research on healthcare personnel involved in infectious disease management in Nigeria. Consistent with Aigbiremolen *et al.* [32], the study recorded a slight male predominance (52.2%), while the age distribution, with most respondents aged 31–45, corresponds to Ajayi and Nwigwe's [33] findings that middle-aged workers are more engaged in disease prevention. Additionally, occupational trends, where 34.1% of respondents were employed in the government sector, mirror Akanbi *et al.* [34], who noted better training opportunities for public-sector employees. However, the significant proportion (41.9%) with only primary education supports Ilesanmi and Omotoso's [35] claim that lower educational attainment can hinder health literacy in rural settings. Moreover, the dominance of community health workers (33.7%) and nurses (21.9%) in primary healthcare facilities aligns with Akinbode and Adebimpe's [36] recognition of their frontline role in infectious disease control, yet the gender disparity in professional roles contradicts Akinyemi and Fadipe [37], who found a more balanced gender distribution in Ondo State. Beyond workforce composition, other demographic factors further highlight systemic challenges and potential policy gaps. The

predominance of married healthcare workers (72.1%) supports Amoo and Adebayo [38], who linked marital stability with job retention in high-risk environments. Additionally, the relatively young workforce, with 52.8% having 1–10 years of experience, aligns with Bello and Afolabi [39], who emphasized gaps in Lassa fever diagnostics training among newer staff. Furthermore, the study's findings on ethnic and religious distribution, particularly the Yoruba (62.5%) and Christian (54.7%) majorities, correspond with Asogun *et al.* [40], but the underrepresentation of laboratory technicians (9.7%) contradicts Dan-Nwafor *et al.* [41], who stressed the need for more diagnostic specialists in endemic regions. The limited formal education among 6.4% of respondents reinforces Enria and Mills' [42] argument that educational gaps hinder effective health communication. Finally, the study's call for gender-balanced recruitment aligns with Iroezindu and Ofondu [43], while the low presence of environmental health officers (9.1%) contradicts Chukwuebuka and Chinenye's [44] recommendation for stronger surveillance. Collectively, these findings underscore the need for targeted workforce training and equitable resource distribution to enhance Lassa fever management in Nigeria.

4.2 Infection Prevention and Control (IPC) Measures in Healthcare Facilities

The study's findings on the inadequacy of Infection Prevention and Control (IPC) measures in healthcare facilities across Edo, Ondo, and Kwara States align with previous research highlighting persistent gaps in IPC infrastructure and practices. Ijarotimi *et al.* [45] reported that only

27.1% of health centers in Ondo State had isolation rooms, while 88.1% had water for handwashing, indicating critical deficiencies in essential IPC resources. Similarly, Ukwenya *et al.* [46] found disparities in IPC knowledge and practices among healthcare workers at the Federal Medical Centre in Owo, underscoring the need for targeted training. Furthermore, the Nigeria Centre for Disease Control and Prevention [47] emphasized the importance of standard precautions, such as proper waste disposal and environmental cleaning, to curb Lassa fever transmission. Collectively, these studies reveal a consistent pattern of inadequate IPC infrastructure, reinforcing the urgency of comprehensive improvements in Nigerian healthcare facilities. Additionally, the study's findings on the limited availability of personal protective equipment (PPE) align with research highlighting insufficient PPE supplies and training deficits. Ijarotimi *et al.* [45] noted that while gloves were widely available, only 41.6% of healthcare workers consistently had access to facemasks or shields, and just 37.4% had full PPE. Similarly, Ukwenya *et al.* [46] reported that only 52.3% of healthcare workers demonstrated adequate knowledge of Lassa fever IPC, with even fewer exhibiting proper practices, suggesting that PPE shortages are further exacerbated by inadequate training. The Nigeria Centre for Disease Control and Prevention [47] stresses that improving hand hygiene and ensuring consistent PPE access are essential for infection control. Moreover, Ijarotimi *et al.* [45] recommend establishing IPC committees at local and state levels to oversee implementation and compliance. Addressing these deficits through policy reforms and targeted interventions is crucial for

strengthening IPC measures, safeguarding healthcare workers, and reducing infectious disease transmission in Nigeria.

4.3 Healthcare Workers' Knowledge, Attitudes, and Practices on Lassa Fever Prevention: PPE Use, Disease Awareness, and the Role of Education in Nigeria

The study's finding that 67.8% of healthcare workers lacked PPE training aligns with Aigbiremolen *et al.* [32], who reported that only 42% of primary healthcare workers in Nigeria consistently used PPE for infectious disease management. Similarly, Iliyasu *et al.* [48] linked poor infection control compliance to inadequate training, emphasizing the need for structured programs. However, the study contrasts with Ijarotimi *et al.* [45], who observed higher PPE adherence (58%) during Lassa fever outbreaks in Ondo State, suggesting regional variations in compliance. Additionally, Ogoina and Onyemelukwe [49] highlighted that hospital environments contribute to transmission risks, reinforcing this study's concern over improper sharps disposal (83.3%) as a major infection hazard. These findings collectively underscore the necessity of comprehensive PPE training and stricter adherence to infection control protocols. Beyond PPE training, the study's findings on Lassa fever awareness and knowledge gaps reveal critical areas for intervention. The universal awareness (100%) of Lassa fever as a viral hemorrhagic illness aligns with Ajayi and Nwigwe [33], who reported similar knowledge levels among healthcare workers in Ebonyi State. However, the uncertainty about secondary reservoirs (66.7%) contradicts Olayemi *et al.* [50], who identified bats as potential hosts, highlighting persistent knowledge gaps.

Additionally, Akanbi *et al.* [34, 51] found misconceptions about transmission routes, mirroring this study's findings on incorrect beliefs regarding sexual transmission. The significant association between education level and Lassa fever knowledge ($p = 0.000$) corresponds with Kofoworola and Olufunmilayo [52], who noted that healthcare workers with tertiary education demonstrated better preventive practices. However, Omotowo *et al.* [53] reported that even highly educated workers had gaps in practical infection control, aligning with this study's observation of persistent deficits across education levels. Furthermore, the study's call for mandatory PPE training and awareness programs is reinforced by Bello and Afolabi [39], who found that refresher courses improved compliance in tertiary hospitals. While Akinbode and Adebimpe [36] advocated for PPE policy enforcement, Chukwuebuka and Chinenye [44] identified resistance due to discomfort, suggesting training must address practical barriers. These findings collectively emphasize the need for targeted education, sustained investment in healthcare worker safety, and systemic improvements in infection control.

4.4 Knowledge, Attitude, and Practice Toward Lassa Fever Among Residents and PHC Personnel in Edo, Ondo, and Kwara States

The study conducted in Edo, Ondo, and Kwara States revealed significant gaps in the adherence to Personal Protective Equipment (PPE) usage among healthcare workers, aligning with findings from the Federal Medical Centre, Owo [46], where only 24.2% of healthcare workers exhibited a positive attitude toward Lassa fever infection prevention and control (LFIPC), despite 77.8% demonstrating adequate preventive

practices. Similarly, a study in Kaduna State reported that less than half of healthcare providers had good knowledge of Lassa fever prevention, highlighting a disconnect between awareness and actual practice [33, 36, 37, 45, 46, 48, 52, 54, 55]. These findings collectively emphasize the need for enhanced training programs and stricter PPE compliance policies to mitigate occupational exposure to Lassa fever. Additionally, while all respondents in this study recognized the multimammate rat as the primary reservoir, only 66.7% acknowledged other potential vectors such as bats, mosquitoes, monkeys, and flies. This partial understanding is consistent with findings from the Federal Medical Centre, Owo [46], where only 52.3% of healthcare workers demonstrated appropriate LFIPC knowledge, reinforcing the necessity for targeted educational interventions. Beyond knowledge gaps, the study also identified significant misconceptions regarding Lassa fever, particularly among respondents with lower educational attainment. This aligns with research from the Federal Medical Centre, Owo [46], where only 24.2% of healthcare workers had a positive attitude toward LFIPC, despite possessing theoretical knowledge. Similarly, the Kaduna State study found that while most healthcare providers recognized their occupational risk, gaps persisted in their attitudes and preventive practices. These inconsistencies highlight the urgent need for large-scale awareness campaigns and targeted educational programs to address misconceptions and promote behavioral change across different educational levels. Strengthening knowledge through structured training and reinforcing positive attitudes toward infection control are essential to improving Lassa

fever prevention efforts in Nigeria [33, 36, 37, 45, 46, 48, 52, 54, 55].

4.5 Educational Disparities in Lassa Fever Preventive Practices: Insights from Edo, Ondo, and Kwara States

The study's findings highlight significant variations in preventive behaviors and hygiene practices across different educational backgrounds in Edo, Ondo, and Kwara States. While 99.9% of respondents avoided rodent consumption indicating effective public health messaging, 88.1% failed to store food in rodent-proof containers, exposing them to potential contamination. This issue was more pronounced among individuals with lower educational attainment, reinforcing the need for targeted public health campaigns promoting proper food storage as a preventive measure [56-68]. These observations align with Isere *et al.* [69], who identified education level as a key determinant of preventive behaviors, emphasizing the importance of tailored interventions in communities with lower education levels. Furthermore, environmental sanitation participation was notably low, with only 25.8% of respondents engaging in regular sanitation activities. Those with vocational training demonstrated the highest participation (14.0%), yet 74.2% reported minimal involvement, raising concerns about persistent rodent infestation risks. These findings mirror studies by Ogboghodo *et al.* [55] and Usuwa *et al.* [70], which documented inadequate preventive practices and low community engagement [15] in Lassa fever-endemic regions, underscoring the necessity for strengthened sanitation programs and community-driven rodent control initiatives [71-78]. Equally concerning is the lack of proactive health-seeking behavior despite widespread

knowledge of Lassa fever symptoms. Although 99.5% of respondents adhered to basic hygiene practices, such as avoiding the sharing of personal items, an alarming 98.7% did not seek medical attention upon experiencing symptoms, increasing the risk of delayed diagnosis and further transmission. Education plays a critical role in shaping health behaviors, with individuals of higher educational attainment demonstrating better knowledge and hygiene practices than those with lower education levels. This aligns with studies conducted in Ebonyi State and among university students in Benin, which found a positive correlation between higher education levels and improved Lassa fever preventive practices [33]. To bridge these gaps, public health authorities should intensify education initiatives, promote early detection strategies, and enforce hygiene and sanitation policies. Additionally, government-led interventions focusing on food storage, rodent control, and healthcare accessibility will be instrumental in mitigating Lassa fever risks in endemic states [79-85].

4.6 Socioeconomic Disparities and Knowledge Gaps in Lassa Fever Awareness and Prevention

The findings on the correlation between household income and Lassa fever awareness align with previous research highlighting socioeconomic disparities in health knowledge. Fatiregun *et al.* [86] found that while over three-quarters of respondents in Ondo State were aware of Lassa fever, only 33.3% recognized proper food cooking as a preventive measure, indicating gaps in comprehensive knowledge. Similarly, Ukwenya *et al.* [46] reported that only 52.3% of healthcare workers at the

Federal Medical Centre, Owo, had appropriate knowledge of Lassa fever infection prevention and control, suggesting that even among professionals, knowledge levels vary. These studies reinforce the need for targeted educational interventions across different socioeconomic groups to enhance awareness and preventive practices. Furthermore, the misconceptions observed in this study regarding Lassa fever transmission such as low recognition of sexual transmission and the association with rodent consumption mirror findings from a study among mothers in Edo State, where only 71.5% practiced regular handwashing and 70.8% maintained proper drainage systems despite having good knowledge of Lassa fever symptoms. The significant knowledge gaps identified in this study, particularly regarding human-to-human transmission and symptom recognition, are consistent with broader research findings [1-16]. A study on the epidemiology and risk perception of Lassa fever in Nigeria found that while 87.5% of participants had heard of the disease, only 31.79% knew it could be transmitted through contact with bodily fluids of infected persons. Moreover, Ukwenya *et al.* [46] highlighted that although 77.8% of healthcare workers demonstrated adequate preventive practices, only 52.3% had appropriate knowledge, underscoring the persistent gap between knowledge and practice. These findings emphasize the necessity for targeted public health interventions that not only disseminate information but also foster the adoption of effective preventive behaviors. To address these disparities, public health authorities must prioritize tailored educational programs, focusing on bridging knowledge-practice gaps, particularly among lower-income households and at-risk

populations.

4.7 Socioeconomic Determinants of Lassa Fever Prevention Practices and Household Income

The significant gaps in Lassa fever prevention practices among households in Edo, Ondo, and Kwara States, particularly concerning unsafe food storage, inadequate environmental sanitation, and limited participation in awareness campaigns. These findings align with research by Isere *et al.,* [69] who reported that in Ondo State, 10.6% of respondents did not store food in covered containers, and 61.9% practiced open-air drying of food items, increasing the risk of rodent contamination. Similarly, Ogboghodo *et al.* [55] found that 58.1% of residents in a rural Southern Nigerian community lacked proper food storage practices, contributing to heightened exposure to Lassa fever vectors. These studies collectively underscore the need for targeted interventions to improve household practices related to food storage and environmental sanitation [71-78]. The low adoption of rodent control measures and minimal participation in awareness campaigns observed in this study reflect findings from other regions. Akanbi *et al.* [34] reported that only 22.5% of respondents in Southern Nigeria used rodent traps, while just 15.3% participated in Lassa fever awareness programs, indicating widespread disengagement from preventive measures. Similarly, Akinyemi and Fadipe [37] observed that in Ondo State, only 30% of healthcare workers implemented effective rodent control strategies, and just 20% attended related training sessions, highlighting gaps even among health professionals. These findings emphasize the necessity of enhancing

community engagement and education on Lassa fever prevention across various Nigerian states. The reluctance to seek medical attention upon exhibiting Lassa fever symptoms, as noted in this study, mirrors trends observed in other research. Bello and Afolabi [39] found that in a North-Central Nigerian tertiary hospital, 40% of healthcare workers would delay seeking medical care due to fear of stigmatization or mistrust in the healthcare system. Similarly, Chukwuebuka and Chinenye [44] reported that in a Southeast Nigerian tertiary hospital, 35% of healthcare workers hesitated to report symptoms promptly, citing concerns about isolation and discrimination. These consistent findings highlight the urgent need to address health literacy, combat stigma, and build trust in healthcare services to facilitate early diagnosis and treatment of Lassa fever. Strengthening public health messaging and ensuring accessible, stigma-free medical care will be crucial in improving health-seeking behavior and reducing disease transmission.

4.8 Disparities in Lassa Fever Knowledge Across Residential Settings

The significant disparities in Lassa fever awareness among residents of Edo, Ondo, and Kwara States, particularly the low overall awareness (20%) and limited understanding of the incubation period (3%), are consistent with prior research highlighting gaps in knowledge across Nigerian communities. For instance, a study in Ondo State found that while 84.8% of respondents had heard of Lassa fever, only 33.3% recognized proper food preparation as a preventive measure, and 71.1% acknowledged the importance of regular handwashing [33, 36, 37, 45, 46]. Similarly, research in Osun State reported that although 79.1% of

residents were aware of the disease, just 15.4% possessed good knowledge, with media (46.3%) being the primary information source rather than health workers (21.2%) [87-92]. This aligns with findings at the Federal Medical Centre in Owo [46], where 52.3% of healthcare workers had adequate knowledge of Lassa fever infection prevention and control, yet knowledge varied significantly across professional cadres, with laboratory scientists demonstrating the highest awareness [33, 36, 37, 45]. These parallels suggest that both community and professional environments influence Lassa fever knowledge, reinforcing the need for targeted educational interventions tailored to different demographics. Additionally, the study identified widespread misconceptions, such as the belief in sexual transmission (0.3%) and the underestimation of risks associated with rodent bush meat consumption (0.2%), which are consistent with previous research highlighting persistent knowledge gaps. For example, while 80.1% of healthcare workers in Ondo State correctly identified the case definition for Lassa fever reporting, only 68.4% knew the proper reporting channels, demonstrating that even trained professionals struggle with essential aspects of disease control [93-96]. Likewise, a study in Southern Nigeria found that misconceptions about transmission routes hinder preventive behaviors, mirroring the present study’s findings on incorrect beliefs about Lassa fever risks [33, 36, 37, 45, 48]. Furthermore, research in Ebonyi State revealed that inadequate awareness influenced both preventive practices and early health-seeking behaviors, emphasizing the need for comprehensive education programs [33, 36, 37, 45, 48]. Taken together, these findings underscore the

importance of addressing misinformation through public health campaigns that integrate culturally appropriate messaging, enhance community engagement, and leverage trusted sources such as healthcare workers to improve Lassa fever awareness and prevention efforts.

4.9 Attitudes Toward Lassa Fever and Preventive Practices Across Residential Areas

The critical lack of awareness and understanding of Lassa fever among residents in Edo, Ondo, and Kwara States, with only 1.2% acknowledging its existence and 2.4% recognizing its life-threatening nature. This widespread misinformation is consistent with previous research in Osun State, where although 79.1% of respondents had heard of Lassa fever, only 15.4% demonstrated good knowledge of the disease [33, 36, 37, 45, 48]. Similarly, a study in Ondo State found high awareness levels (84.8%) but poor understanding of preventive measures, revealing a persistent gap between awareness and comprehension [33, 36, 37, 45, 48]. This trend is further reinforced by research in Ile-Ife, Southwest Nigeria, where 59% of participants had heard of Lassa fever, yet 51% exhibited poor preventive practices [33, 36, 37, 45, 48]. Collectively, these findings underscore the persistent challenge of misinformation and the necessity for comprehensive health education campaigns tailored to different communities. Preventive practices against Lassa fever remain critically low, as evidenced by the study’s findings that only 2.2% of respondents supported environmental sanitation and a mere 1.8%

practiced rodent-proof food storage. This aligns with research in Edo State, where 59.1% of respondents demonstrated poor preventive practices, particularly regarding food storage and environmental cleanliness [33, 36, 37, 45, 48]. Moreover, a study in Bali Local Government Area, Taraba State, demonstrated that targeted health education interventions significantly improved knowledge and attitudes toward Lassa fever prevention, reinforcing the importance of structured awareness programs [33, 36, 37, 45, 48]. The reliance on mass media for information, as noted in the study, further supports findings that exposure to media-driven campaigns correlates with increased knowledge and positive attitudes toward disease prevention [33, 36, 37, 45, 48]. To effectively mitigate Lassa fever risks, public health policies must integrate environmental sanitation and food hygiene education, ensuring that preventive strategies are accessible and culturally relevant.

4.10 Knowledge and Attitudes of Primary Healthcare Personnel Toward Lassa Fever and Personal Protective Equipment Usage

The findings indicate that primary healthcare (PHC) personnel in Edo, Ondo, and Kwara States possess a high level of awareness regarding Lassa fever, with a Relative Importance Index (RII) of 0.960 for knowledge-related questions. This aligns with research conducted in Ondo State, where healthcare workers demonstrated substantial knowledge of Lassa fever, particularly its viral hemorrhagic nature and rodent transmission pathways [33, 36, 37, 45, 48, 52]. Similarly, a study in Kaduna State reported that most healthcare workers exhibited good knowledge of Lassa fever, reinforcing the widespread awareness among medical professionals

[33, 36, 37, 45, 48]. However, despite this foundational understanding, gaps persist in recognizing alternative reservoirs and transmission routes. These deficiencies mirror findings from previous studies, which suggest that knowledge alone is insufficient without continuous education and targeted training to address misconceptions and emerging risks [87-96]. Despite high awareness levels, the study reveals inconsistent adherence to infection prevention and control (IPC) measures among PHC personnel, with greater compliance in glove and gown usage (RII = 0.400) but significantly lower adherence to face masks and eye protection (RII = 0.217). This trend is consistent with findings from a study in Owo, Ondo State, where healthcare workers exhibited disparities in IPC practices, excelling in some areas while neglecting others [46, 52, 93-96]. Similarly, research in Kaduna State identified inadequate availability and utilization of personal protective equipment (PPE), leading to suboptimal IPC compliance [33, 36, 37, 45, 48]. The real-world implications of these deficiencies are critical, as studies analyzing Lassa fever outbreaks in Nigeria have reported nosocomial transmission due to poor PPE adherence, with healthcare workers often unaware of their exposure risks [97, 98]. To mitigate these risks, strengthening IPC training, enforcing PPE compliance, and ensuring the availability of protective gear are imperative measures to enhance healthcare worker safety and public health outcomes in Lassa fever-endemic regions [99-105].

5. Implications for Policy and Interventions

The findings of this study highlight critical areas requiring policy interventions to mitigate the burden of Lassa fever across Edo, Ondo, and

Kwara States. The low level of awareness among residents, particularly regarding transmission routes and preventive measures, underscores the need for enhanced public health education campaigns. Governmental and non-governmental organizations should collaborate on targeted awareness programs, ensuring that accurate information reaches all socio-economic groups, particularly vulnerable populations in overcrowded and low-income residential areas. Additionally, policies should prioritize the establishment and enforcement of environmental sanitation regulations, including proper waste disposal and rodent control measures, as these factors were identified as key determinants of Lassa fever risk. For healthcare personnel, the study revealed gaps in adherence to infection control practices, particularly in the use of personal protective equipment (PPE). Policies should mandate routine training and supervision to ensure compliance with standard infection prevention protocols. Furthermore, ensuring the availability and equitable distribution of PPE across healthcare facilities should be a policy priority. Strengthening disease surveillance systems to monitor Lassa fever outbreaks and ensuring early response mechanisms are in place will also enhance disease control efforts. To improve long-term intervention strategies, integrating Lassa fever education into community health programs and embedding it within the broader infectious disease control framework is essential. By implementing these policy measures, public health authorities can strengthen prevention efforts, enhance outbreak response, and reduce Lassa fever transmission across endemic regions in Edo, Ondo, and Kwara States.

6. Conclusion

This study provides valuable insights into the knowledge, attitudes, and practices of residents and Primary Healthcare (PHC) personnel regarding Lassa fever across Edo, Ondo, and Kwara States. While most respondents recognized the severity of the disease, gaps in awareness, preventive behaviors, and compliance with infection control measures were evident. The study also identified a strong correlation between socio-economic status and adherence to protective measures, emphasizing the need for targeted interventions that address socio-economic disparities. Furthermore, the inconsistent use of PPE among healthcare workers highlights the urgent need for capacity-building initiatives and resource allocation within the healthcare sector. Addressing these challenges requires comprehensive health education campaigns, strengthened healthcare infrastructure, and policy enforcement to enhance Lassa fever prevention and control efforts. Ensuring equitable access to protective equipment, routine training for healthcare workers, and improved disease surveillance systems will be critical in reducing transmission rates. Additionally, community-based intervention programs aimed at improving hygiene, sanitation, and rodent control can significantly lower the risk of Lassa fever outbreaks. By implementing these measures, public health authorities can enhance Lassa fever preparedness, reduce disease transmission, and improve overall public health outcomes in Edo, Ondo, and Kwara States. Strengthening collaborations between government agencies, healthcare institutions, and local communities will be vital in building a resilient healthcare system capable of mitigating future Lassa

fever outbreaks and other infectious diseases.

7. Study Limitations

Despite its contributions, this study has several limitations that should be considered. The cross-sectional design captures data at a single point in time, restricting the ability to determine causal relationships between factors such as awareness and behavioral change. Future longitudinal studies would be beneficial in assessing how knowledge and attitudes evolve over time following targeted interventions. Additionally, self-reported data may introduce bias, as respondents may overstate their knowledge or adherence to preventive measures due to social desirability. Future research should incorporate observational methodologies to validate self-reported practices and provide a more accurate representation of behaviors. Another key limitation is population representation, as certain rural communities with limited access to healthcare and information may have been underrepresented. Expanding research to these underserved areas would provide a more comprehensive understanding of the Lassa fever burden across different demographics. Furthermore, while this study sampled a diverse population, socioeconomic and infrastructural differences across Edo, Ondo, and Kwara States may influence awareness, preventive practices, and healthcare access, requiring more region-specific investigations. Future studies should focus on broadening geographic coverage, incorporating mixed-method approaches, and assessing long-term behavioral changes following public health interventions. Addressing these limitations will enhance the accuracy of findings, inform more

effective Lassa fever control strategies, and ensure that intervention programs are inclusive and equitable across Edo, Ondo, and Kwara States.

8. Recommendations

To effectively control and prevent Lassa fever outbreaks in Edo, Ondo, and Kwara States, the following recommendations are proposed:

i. **Public Health Education:** Large-scale community awareness campaigns should be implemented using radio, television, social media, and grassroots sensitization programs to ensure accurate information reaches all residents.

ii. **Improved Sanitation Policies:** Government agencies should enforce regulations on waste management, rodent control, and environmental hygiene, particularly in densely populated urban and rural settlements.

iii. **Healthcare Worker Training:** Regular workshops and refresher courses should be mandated for healthcare personnel to improve their adherence to infection control measures, including proper PPE usage and hygiene protocols.

iv. **PPE Accessibility:** Governments should ensure an adequate supply and equitable distribution of PPE across all healthcare facilities, prioritizing high-risk areas to protect frontline workers.

v. **Community-Based Interventions:** Partnerships with local organizations, schools, and religious institutions can help bridge knowledge gaps and encourage community-led sanitation and disease prevention initiatives.

vi. **Strengthening Surveillance Systems:** Active case detection and

early warning systems should be enhanced to facilitate early diagnosis, rapid response, and outbreak containment.

vii. **Socioeconomic Considerations:** Intervention programs should address financial constraints preventing low-income households from adopting preventive measures, including potential subsidies for rodent-proof storage containers and hygiene supplies.

viii. **Further Research:** Additional studies should focus on high-risk populations, particularly in rural and semi-urban areas, to provide a more detailed understanding of Lassa fever knowledge and prevention efforts, ensuring data-driven interventions.

By implementing these recommendations, public health authorities and policymakers can significantly reduce Lassa fever transmission, enhance healthcare resilience, and improve disease prevention efforts across endemic regions.

9. Health Significance

Lassa fever remains a major public health threat in Nigeria, with significant morbidity and mortality, particularly in endemic regions such as Edo, Ondo, and Kwara States. The findings of this study highlight key areas for intervention, emphasizing the need for enhanced public awareness, improved healthcare worker training, and stricter environmental sanitation policies. Strengthening disease prevention strategies through community engagement and education campaigns can significantly reduce transmission rates and improve overall health outcomes. Addressing socio-economic barriers that influence preventive behaviors is crucial for developing inclusive and effective disease control

strategies. Limited access to healthcare, misinformation, and inadequate sanitation infrastructure contribute to increased Lassa fever vulnerability, particularly in low-income and rural communities. By implementing targeted interventions that consider these socio-economic disparities, policymakers and health practitioners can create sustainable solutions to mitigate the spread of Lassa fever. Ultimately, these efforts will contribute to broader infectious disease prevention initiatives, strengthening Nigeria’s public health system and enhancing community resilience against future outbreaks. By integrating Lassa fever control measures into existing health policies, ensuring continuous healthcare worker training, and promoting environmental sanitation, public health authorities can safeguard communities and reduce the overall burden of infectious diseases. Thus, graphically it is represented (Figure 1) as:

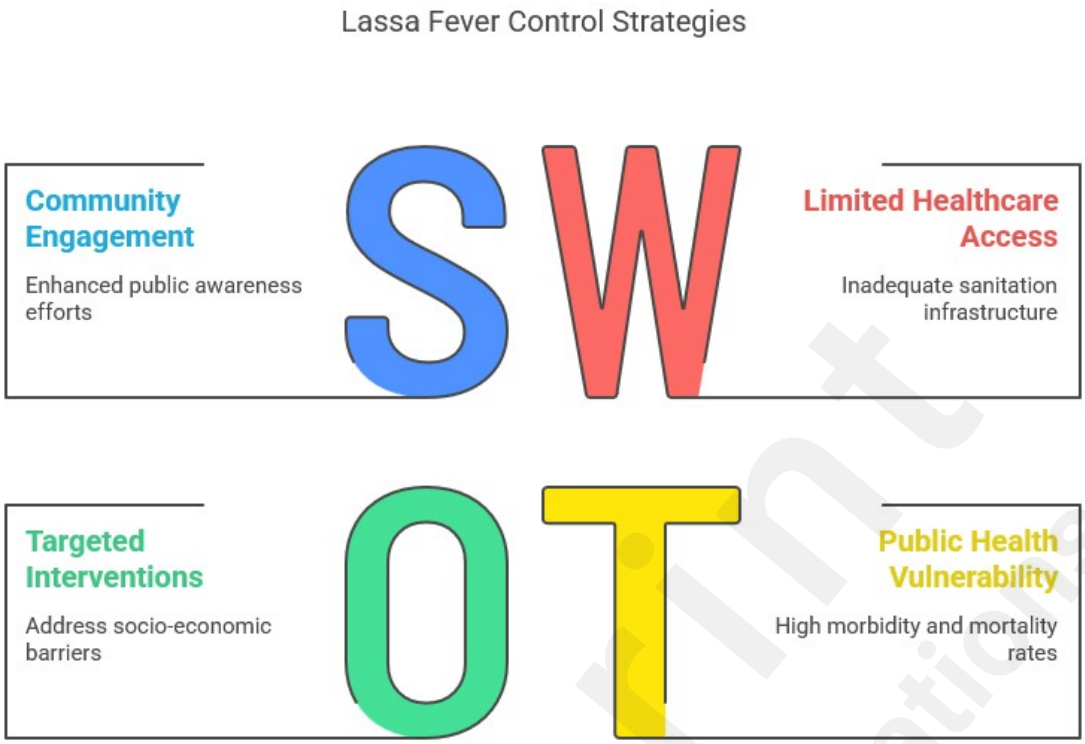

Figure 1: Lassa Fever Control Strategies

Declarations:
Clinical trial number: not applicable. Clinical trial number: not applicable

Ethics approval and consent to participate:
The ethical approval for the study was given by Kwara State University ethical committee and all the community head and head of units of health facilities gave approval for the study to be carried while inform consent form was issued to all participants where their confidentiality was assured and that the results of the study shall be used only for educational purposes (research).

Consent for publication:
All authors gave permission for publication, have reviewed and approved the final manuscript which was why aside the leading author, other authors names were included.

Availability of data and material:
All data and material used has been included in the manuscript.

Competing interests:
The authors declare that there are no any competing interests.

Funding:

No form of funding was received from both internal and external parties.

Acknowledgement
The authors acknowledge the support of the Department of Environmental Health Science, Kwara State University.

References

1. Abaya S. T, Ogoina D, Stow J, Abaye B. B, Emeka C, Raimi M. O (2024) Beyond the Epidemic: Effective Public Health Strategies in Response to Nigeria's First Lassa Fever Outbreak in a Non-Endemic Region. *JMIR Preprints*. 19/08/2024:65539. DOI: 10.2196/preprints.65539 URL: https://preprints.jmir.org/preprint/65539.
2. Raimi, O. M., Sunday, O. A., Mcfubara, K. G., Adias, T. C., Raimi, G. A., Daniel, A. A., Izah, S. C., Okoyen, E., Ogbointuwei, C., Clement, A., Godspower, A., & Funmilayo, A. A. (2022). Perspective Chapter: Applying Innovative Research as a Tool to Advance Immunization Coverage in Bayelsa State, Nigeria. In M. O. Raimi, O. A. Sunday, H. O. Sawyerr, & T. C. Adias (Eds.), Emerging Issues in Environmental Epidemiology and Its Reflection [Working Title]. IntechOpen. https://doi.org/10.5772/intechopen.106513.
3. Morufu O. R, Aziba-anyam G. R and Teddy C. A (2021) 'Silent Pandemic': Evidence-Based Environmental and Public Health Practices to Respond to the Covid-19 Crisis. *IntechOpen.* DOI: http://dx.doi.org/10.5772/intechopen.100204. ISBN 978-1-83969-144-7. https://www.intechopen.com/online-first/silent-pandemic-evidence-based-environmental-and-public-health-practices-to-respond-to-the-covid-19- Published: December 1st 2021; ISBN: 978-1-83969-144-7; Print ISBN: 978-1-83969-143-0; eBook (PDF) ISBN: 978-1-83969-145-4. Copyright year: 2021
4. Raimi M. O (2025). Peer Review Report For: Development of a Health Impact Assessment Implementation Model: Enhancing Intersectoral Approaches in Tackling Health Inequalities- A Mixed Methods Study Protocol [version 3; peer review: 2 approved, 1 approved with reservations]. *HRB Open Res* 2025, 7:14 (https://doi.org/10.21956/hrbopenres.15466.r45418). https://hrbopenresearch.org/articles/7-14/v3#referee-response-45418.
5. Kakwi J. D, Yakasai K. M, Raimi M. O, Kakwi J. D (2024) Understanding the Dynamics of COVID-19 Vaccine Uptake in Plateau State, Nigeria: Analyzing Socioeconomic, Cultural, and Communication Influences. *JMIR Preprints*. 30/12/2024:70702. DOI: 10.2196/preprints.70702. URL: https://preprints.jmir.org/ojs/index.php/preprints/preprint/70702.
6. Promise VI, Macauley T, Alabere I, Abdulraheem I, Raimi MO (2024) Closing the Gap: Assessment of Vaccination Coverage Among Under Two Children in Bayelsa State, Nigeria. *JMIR Preprints.* 29/12/2024:70671. DOI: 10.2196/preprints.70671. URL: https://preprints.jmir.org/preprint/70671.
7. Elemuwa C. O, Raimi M. O, Ainu M, Adias T. C, Ufuoma R. S, Elemuwa U. G, Oginifolunnia O. C, Rath B. A, Obermeier P. E (2024) Conquering Mpox: A Comprehensive Public Health Strategy for Addressing Mpox and Poxvirus Infections in Nigeria – Understanding Global Trends, Transmission Dynamics, and Effective Prevention and Control Measures in Nigeria. *JMIR*

Preprints. 14/10/2024:67534. DOI: 10.2196/preprints.67534. URL: https://preprints.jmir.org/preprint/67534.

8. Kakwi J. D, Yakasai K. M, Kakwi J. D, Raimi M. O (2024) Campaigning Against Vaccine Hesitancy: Evaluating the Effectiveness of Health Communication on COVID-19 Vaccination Uptake in Plateau State, Nigeria. *JMIR Preprints*. 22/09/2024:66755. DOI: 10.2196/preprints.66755 URL: https://preprints.jmir.org/preprint/66755.
9. Okechukwu C. O, Ainu M, Adias T. C, Elemuwa C. O, Rotifa S. U, Ogbointuwei C, Raimi M. O, Oweibia M, Alabo A. F, Okoyen E, Appah W. W (2024) Evaluating the Impact of Rotavirus Vaccination on Childhood Diarrhea Incidence in Bayelsa State, Nigeria: Achievements, Challenges, and Future Directions. JMIR Preprints. 27/07/2024:64822. DOI: 10.2196/preprints.64822. URL: https://preprints.jmir.org/preprint/64822.
10. Uchenna G. E, Enato E, Christopher O. E, Tochukwu D. E, Morufu O. R (2024) Pentavalent Vaccine: How Safe Is It Among Infants Accessing Immunization In Nigerian Health Facilities. medRxiv 2024.05.28.24307998; doi: https://doi.org/10.1101/2024.05.28.24307998.
11. Christopher O. E, Muyi A, Teddy C. A, Rotifa S. U, Oyeyemi A. S, Uchenna G. E, Ansa H, Oyindiepreye L. A, Akinloye B. O, Morufu O. R (2024) Transforming Primary Healthcare in Nigeria: Enhancing Universal Health Coverage through Strong and Sustainable Primary Healthcare Laboratories. Qeios. doi:10.32388/74E67L.
12. Mordecai O, Uchenna G. E, Emma A, Elemuwa T. D; Gabriel J. O; Egberipou T; Etim E. O; Christopher O. E; Morufu O. R; Anuoluwapo B (2024). Analyzing Nigeria's Journey Towards Sustainable Development Goals: A Comprehensive Review From Inception to Present. Qeios. doi:10.32388/8O5QEG.
13. Raimi M. O, Emeka C. L, Ebikapaye O, Angalabiri C, Christopher O, Atoyebi B (2021) COVID-19 Decision Impacts: Vaccine Hesitancy, its Barriers and Impact Studies: Taking Bayelsa State as an Example., 27 May 2021, PREPRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-566532/v1]
14. Morufu O. R, Aziba-anyam G. R, Teddy C. A (2021). Evidence-based Environmental and Public Health Practices to Respond to the COVID-19 Crisis, 07 May 2021, PREPRINT (Version 1) available at *Research Square* [https://doi.org/10.21203/rs.3.rs-504983/v1] https://europepmc.org/article/PPRID/PPR335534; EMSID:EMS123969.
15. Elemuwa CO, Ainu M, Adias TC, Sunday OA, Ufuoma RS, Elemuwa UG, Christopher O, Raimi M. O, Oginifolunnia O. C, Oweibia M, Ozoemena O. V, Daniel E. T (2024) Boosting community engagement: Leveraging the ward health system approach for enhanced HPV vaccination acceptance in Nigeria. [version 1; peer review: awaiting peer review]. *F1000Research* 2024, 13:1392. (https://doi.org/10.12688/f1000research.153919.1).
16. Oweibia M, Elemuwa U. G, Akpan E *et al* (2024). Analyzing Nigeria's Journey Towards Sustainable Development Goals: A Comprehensive Review From Inception To Present [version 1; peer review: awaiting peer review]. *F1000Research* 2024, 13:984 (https://doi.org/10.12688/f1000research.148020.1).
17. Dine R. D, Elkheir L. Y. M, Raimi M. O, Alemayehu M, Mohamed S. Y, Turzin

J. K, *et al.* (2024) Ten simple rules for successful and sustainable African research collaborations. *PLoS Comput Biol.* 20(6): e1012197. https://doi.org/10.1371/journal.pcbi.1012197.

18. Raimi O. M, Lucky E. C, Okoyen E, Clement A, Ogbointuwei C, *et al.* (2021) Making Better Informed, More Confident COVID-19 Decisions: Vaccine Hesitancy, Its Barriers and Impact Studies: Taking Bayelsa State as an Example. Int J Vaccine Immunizat 5(1): dx.doi. org/10.16966/2470-9948.126. https://sciforschenonline.org/journals/vaccines/IJVI126.php.
19. Morufu O. R, Ebikapaye O, Tuebi M, Aziba-anyam G. R, Adedoyin O. O, Aishat F. A, Mariam O. R, Beatrice O. J (2021) Do Weak Institutions Prolong Crises? [#ENDSARs] in the Light of the Challenges and opportunities beyond COVID-19 Pandemic and the Next Normal in Nigeria. *Communication, Society and Media.* ISSN 2576-5388 (Print) ISSN 2576-5396 (Online) Vol. 4, No. 2, DOI: https://doi.org/10.22158/csm.v4n2p1. http://www.scholink.org/ojs/index.php/csm/article/view/3790.
20. Raimi M. O & Raimi A. G (2020). The Toughest Triage in Decision Impacts: Rethinking Scientific Evidence for Environmental and Human Health Action in the Times of Concomitant Global Crises. *CPQ Medicine,* 11(1), 01-05.
21. Raimi M. O, Moses T, Okoyen E, Sawyerr H. O, Joseph B. O, Oyinlola B. O (2020) "A Beacon for Dark Times: Rethinking Scientific Evidence for Environmental and Public Health Action in the Coronavirus Diseases 2019 Era" *Medical and Research Microbiology,* Vol. 1, Issues 3.
22. Raimi M. O, Ihuoma B. A, Esther O. U, Abdulraheem A. F, Opufou T, Deinkuro N. S, Adebayo PA and Adeniji AO (2020) "Health Impact Assessment: Expanding Public Policy Tools for Promoting Sustainable Development Goals (SDGs) in Nigeria". *EC Emergency Medicine and Critical Care* 4.9 (2020).
23. Samson T. K, Ogunlaran O. M, Raimi O. M (2020); A Predictive Model for Confirmed Cases of COVID-19 in Nigeria. *European Journal of Applied Sciences*, Volume 8, No 4, Aug 2020;pp:1-10. DOI: 10.14738/aivp.84.8705. DOI: https://doi.org/10.14738/aivp.84.8705.
24. Raimi, M. O., Mcfubara, K. G., Abisoye, O. S., Ifeanyichukwu E. C., Henry S. O., & Raimi, G. A (2021) Responding to the call through Translating Science into Impact: Building an Evidence-Based Approaches to Effectively Curb Public Health Emergencies [COVID-19 Crisis]. *Global Journal of Epidemiology and Infectious Disease*, 1(1). DOI: 10.31586/gjeid.2021.010102. Retrieved from https://www.scipublications.com/journal/index.php/gjeid/article/view/72.
25. Funmilayo A. A, Robert O. T, Olalekan R. M, Okoyen E, Tuebi M (2019). A study of the context of adolescent substance use and patterns of use in yenagoa local government, Bayelsa State, Nigeria. *MOJ Addiction Medicine and Therapy.* 2019;6(1):25–32. DOI: 10.15406/mojamt.2019.06.00142.s.
26. Abdulraheem A. F. O, Olalekan R. M, Abasiekong E. M (2018) Mother and father adolescent relationships and substance use in the Niger delta: a case study of twenty-five (25) communities in Yenagoa local government of Bayelsa state, Nigeria. *Sociol Int J.* 2018;2(6):541–548. DOI: 10.15406/sij.2018.02.00097.
27. Rotifa S. U, Awotua-Efebo E. B, Owapiriba J. A, Adesina A. D, Oyeyemi A. S, Raimi AaG, Elemuwa C. O, Raimi M. O, Oginifolunnia O. C (2024) Ignoring

Reason and Evidence: Factors Influencing Learning Preferences and Modalities Among Clinical Students in a South-South Nigerian Medical School. *JMIR Preprints*. 18/06/2024:63404. DOI: 10.2196/preprints.63404. URL: https://preprints.jmir.org/preprint/63404.

28. Tambo E, Adetunde O. T and Olalubi O. A (2018). Re-emerging Lassa fever outbreaks in Nigeria: re-enforcing 'One Health' community surveillance and emergency practice. Infect Dis Poverty; 7: 37.
29. Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533-544.
30. Creswell, J. W., Poth, C. N. (2018). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (4th ed.). Sage Publications.
31. Cochran, W.G. (1963) Sampling Technique. 2nd Edition, John Wiley and Sons Inc., New York.
32. Aigbiremolen, A. O., Duru, C. B., Awunor, N. S., Abejegah, C., Abah, S. O., Asogun, D. A., & Igbinosun, E. O. (2012). Knowledge and application of infectious disease control measures among primary care workers in Nigeria: The Lassa fever example. *International Journal of Basic, Applied and Innovative Research*, 1(4), 122–129.jmwan.org.ng.
33. Ajayi, N. A., & Nwigwe, C. G. (2017). Knowledge, attitude, and practices towards Lassa fever among healthcare workers in Ebonyi State, Nigeria. *Journal of Clinical Sciences*, 14(2), 57–62.
34. Akanbi, O. A., Odaibo, G. N., & Olaleye, D. O. (2019). Knowledge and practices regarding Lassa fever in endemic areas of Southern Nigeria: Implications for control. *Journal of Infection and Public Health*, 12(6), 897–902. https://doi.org/10.1016/j.jiph.2019.03.017
35. Ilesanmi, O. S., & Omotoso, B. (2018). Awareness of Lassa fever in a rural community in South West Nigeria. *Journal of Community Medicine and Primary Health Care*, 30(2), 68–75.jmwan.org.ng.
36. Akinbode, O. G., & Adebimpe, W. O. (2020). Assessment of knowledge, attitude, and preventive practices regarding Lassa fever among primary healthcare workers in Osun State, Nigeria. *Journal of Community Health Research*, 9(3), 167–175.
37. Akinyemi, O. O., & Fadipe, O. E. (2019). Knowledge and preventive practices related to Lassa fever among healthcare workers in Ondo State, Nigeria. *Central African Journal of Public Health*, 5(1), 19–25.
38. Amoo, O. S., & Adebayo, A. M. (2021). Lassa fever awareness and prevention practices among healthcare workers in a tertiary hospital in Southwest Nigeria. *African Journal of Clinical and Experimental Microbiology*, 22(1), 21–27.
39. Bello, S., & Afolabi, O. K. (2020). Knowledge and preventive practices of Lassa fever among healthcare workers in a tertiary hospital in North-Central Nigeria. *Journal of Medicine in the Tropics*, 22(1), 17–23.
40. Asogun, D. A., Adomeh, D. I., Ehimuan, J., Odia, I., Hass, M., Gabriel, M., ... & Günther, S. (2012). Molecular diagnostics for Lassa fever at Irrua Specialist Teaching Hospital, Nigeria: Lessons learnt from two years of laboratory operation. *PLoS Neglected Tropical Diseases*, 6(9), e1839.

41. Dan-Nwafor, C. C., Furuse, Y., Ilori, E. A., Ipadeola, O., Ahmad, A., Poggensee, G., & Ihekweazu, C. (2019). Measures to control protracted large Lassa fever outbreak in Nigeria, January to April 2019. *Eurosurveillance*, 24(20), 1900272.
42. Enria, D. A., & Mills, J. N. (2020). Lassa fever in the 21st century. *Current Opinion in Infectious Diseases*, 33(5), 381–387. https://doi.org/10.1097/QCO.0000000000000662
43. Iroezindu, M. O., & Ofondu, E. O. (2018). Lassa fever: Knowledge and practices among doctors in tertiary institutions in Nigeria. *Journal of Vector Borne Diseases*, 55(2), 123–129. https://doi.org/10.4103/0972-9062.242553.
44. Chukwuebuka, O. O., & Chinenye, A. O. (2019). Knowledge, attitude, and practice of Lassa fever prevention among healthcare workers in a tertiary hospital in Southeast Nigeria. *Journal of Health Research and Reviews*, 6(2), 72–77.
45. Ijarotimi, I. T., Ilesanmi, O. S., Aderinwale, O., Abiodun-Adewusi, O., & Okon, I. M. (2018). Knowledge of Lassa fever and use of infection prevention and control facilities among healthcare workers during Lassa fever outbreak in Ondo State, Nigeria. *The Pan African Medical Journal*, 30, 56. https://doi.org/10.11604/pamj.2018.30.56.13125PMC+1PMC+1
46. Ukwenya, V. O., Fuwape, T. A., Fadahunsi, T. I., & Ilesanmi, O. S. (2021). Disparities in knowledge, attitude, and practices of infection prevention and control of Lassa fever among healthcare workers at the Federal Medical Centre, Owo, Ondo State, Nigeria. *The Pan African Medical Journal*, 38, 357. https://doi.org/10.11604/pamj.2021.38.357.26208
47. Nigeria Centre for Disease Control (NCDC). (2023). *Lassa fever situation report. Epi week 52: 26 December 2022 – 1 January 2023*. Retrieved from https://www.ncdc.gov.ng/#
48. Iliyasu, G., Dayyab, F. M., Habib, Z. G., Tiamiyu, A. B., Abubakar, S., Mijinyawa, M., & Habib, A. G. (2016). Knowledge and practices of infection control among healthcare workers in a tertiary referral center in north-western Nigeria. *Annals of African Medicine*, 15(1), 34–40. https://doi.org/10.4103/1596-3519.161724
49. Ogoina, D., & Onyemelukwe, G. C. (2009). The role of hospital environment in transmissions of Lassa fever in Jos, Nigeria. *Nigerian Medical Journal*, 50(4), 125–127.
50. Olayemi, A., Cadar, D., Magassouba, N., Obadare, A., Kourouma, F., Oyeyiola, A., ... & Fichet-Calvet, E. (2016). New hosts of the Lassa virus. *Scientific Reports*, 6, 25280. https://doi.org/10.1038/srep25280JMWAN Journal
51. Nwankwo, C., Okwor, T. J., Igbokwe, I. O., Adetunji, A. O. (2023). Evaluation of the response to the Lassa fever outbreak in Nigeria: A qualitative study. *BMC Health Services Research*, 23, 456.
52. Kofoworola, O. F., & Olufunmilayo, F. A. (2019). Knowledge, attitude, and practice of Lassa fever prevention among primary healthcare workers in Lagos State, Nigeria. *Journal of Clinical Sciences*, 16(1), 25–30.
53. Omotowo, B. I., Ochiabuto, O. M., Ndu, A. C., Oguejiofor, C. B., Ezeanosike, O. B., & Ibekwe, R. C. (2020). Knowledge, attitude, and practice of Lassa fever prevention and control among healthcare workers in a tertiary

institution in Southeast Nigeria. *Nigerian Journal of Clinical Practice*, 23(3), 336–341. https://doi.org/10.4103/njcp.njcp_511_19

54. Isara, A. R., & Ofili, A. N. (2010). Knowledge and practice of standard precautions among health care workers in the Federal Medical Centre, Asaba, Delta State, Nigeria. *Nigerian Postgraduate Medical Journal*, 17(3), 204–209.
55. Ogboghodo, E. O., Adam, V. Y., Omuemu, V. O., & Okojie, O. H. (2019). Knowledge, attitude and preventive practices against Lassa fever among residents in a rural community in Southern Nigeria. *West African Journal of Medicine*, 36(2), 165–171.
56. Jacob O. A, Anuoluwa O. E and Raimi M. O (2023) The notorious daredevils: potential toxic levels of cyanide and heavy metals in cassava flour sold in selected markets - taken Oke Ogun Community, Oyo State as an example. *Front. Sustain. Food Syst*. 7:1165501. doi: 10.3389/fsufs.2023.1165501. http://journal.frontiersin.org/article/10.3389/fsufs.2023.1165501/full?&utm_source=Email_to_authors_&utm_medium=Email&utm_content=T1_11.5e1_author&utm_campaign=Email_publica.
57. Oshatunberu, M. A., Oladimeji, A., Sawyerr, O. H., & Raimi, M. O. (2023). Searching for What You Can't See - Evaluation of Pesticide Residues in Grain Sold at Selected Markets of Southwest Nigeria. *Current Research in Public Health*, *3*(1), 10–36. Retrieved from https://www.scipublications.com/journal/index.php/crph/article/vie w/566.
58. Asiegbu O. V, Ezekwe I. C, Raimi M. O (2022). Assessing pesticides residue in water and fish and its health implications in the Ivo river basin of South-eastern Nigeria. MOJ Public Health. 2022;11(4):136–142. DOI: 10.15406/mojph.2022.11.00390.
59. Adiama, Y. B., Sawyerr, O. H., Olaniyi, O. A., Fregene, A. F., Alabede, M., & Raimi, M. O. (2022). Assessment of Microbiological Quality of Ready to Eat Food Served in Ships Along Warri, Koko and Port Harcourt Water Ways, Nigeria. *Online Journal of Microbiological Research*, *1*(1), 1–7. Retrieved from https://www.scipublications.com/journal/index.php/ojmr/article/view/230.
60. Hussain M. I, Morufu O. R, Henry O. S (2021). Probabilistic Assessment of Self-Reported Symptoms on Farmers Health: A Case Study in Kano State for Kura Local Government Area of Nigeria. *Environmental Analysis & Ecology Studies* 9(1). EAES. 000701. 2021. DOI: 10.31031/EAES.2021.09.000701. Pp. 975- 985. ISSN: 2578-0336.
61. Hussain M. I, Morufu O. R, Henry O. S (2021) Patterns of Chemical Pesticide Use and Determinants of Self-Reported Symptoms on Farmers Health: A Case Study in Kano State for Kura Local Government Area of Nigeria. *Research on World Agricultural Economy.* Vol 2, No. 1. DOI: http://dx.doi.org/10.36956/rwae.v2i1.342.http://ojs.nassg.org/index.php/rwae/issue/view/31.
62. Hussain M. I, Morufu O. R, Henry O. S (2021) Probabilistic Assessment of Self-Reported Symptoms on Farmers Health: A Case Study in Kano State for Kura Local Government Area of Nigeria. *Research on World Agricultural Economy.* Vol 2, No. 1. DOI: http://dx.doi.org/10.36956/rwae.v2i1.336. http://ojs.nassg.org/index.php/rwae-cn/article/view/336/pdf.

63. Morufu O. R, Tonye V. O, Ogah A, Henry A. E, Abinotami W. E (2021) Articulating the effect of Pesticides Use and Sustainable Development Goals (SDGs): The Science of Improving Lives through Decision Impacts. *Research on World Agricultural Economy.* Vol 2, No. 1. DOI: http://dx.doi.org/10.36956/rwae.v2i1.347. http://ojs.nassg.org/index.php/rwae/issue/view/31
64. Morufu O. R (2021). "Self-reported Symptoms on Farmers Health and Commonly Used Pesticides Related to Exposure in Kura, Kano State, Nigeria". *Annals of Community Medicine & Public Health.* 1(1): 1002. http://www.remedypublications.com/open-access/self-reported-symptoms-on-farmers-health-and-commonly-used-pesticides-related-6595.pdf. http://www.remedypublications.com/annals-of-community-medicine-public-health-home.php.
65. Isah, H. M., Sawyerr, H. O., Raimi, M. O., Bashir, B. G., Haladu, S. & Odipe, O. E. (2020). Assessment of Commonly Used Pesticides and Frequency of Self-Reported Symptoms on Farmers Health in Kura, Kano State, Nigeria. *Journal of Education and Learning Management (JELM),* HolyKnight, vol. 1, 31-54. doi.org/10.46410/jelm.2020.1.1.05. https://holyknight.co.uk/journals/jelm-articles/.
66. Olalekan R. M, Muhammad I. H, Okoronkwo U. L, Akopjubaro E. H (2020). Assessment of safety practices and farmer's behaviors adopted when handling pesticides in rural Kano state, Nigeria. *Arts & Humanities Open Access Journal.* 2020;4(5):191–201. DOI: 10.15406/ahoaj.2020.04.00170.
67. Isah H. M, Raimi M. O, Sawyerr H. O, Odipe O. E, Bashir B. G, Suleiman H (2020) Qualitative Adverse Health Experience Associated with Pesticides Usage among Farmers from Kura, Kano State, Nigeria. *Merit Research Journal of Medicine and Medical Sciences* (ISSN: 2354-323X) Vol. 8(8) pp. 432-447, August, 2020. DOI: 10.5281/zenodo.4008682.https://meritresearchjournals.org/mms/content/2020/August/Isah%20et%20al.htm.
68. Suleiman R. M, Raimi M. O and Sawyerr H. O (2019) A Deep Dive into the Review of National Environmental Standards and Regulations Enforcement Agency (NESREA) Act. *International Research Journal of Applied Sciences.* pISSN: 2663-5577, eISSN: 2663-5585. DOI No. Irjas.2019.123.123. www.scirange.com. https://scirange.com/abstract/irjas.2019.108.125.
69. Isere, E., Fuwape, T., Famokun, G., Fagbemi, S., Fatiregun, A., Omorogbe, N., Adejugbagbe, A. and Omoju, T. (2021). Epidemiological Pattern of Lassa Fever Outbreak in Ondo State, Southwest Nigeria, 2014 to 2019. Open Journal of Epidemiology, 11, 92-100. doi: 10.4236/ojepi.2021.111009.
70. Usuwa, I. S., Akpa, C. O., Umeokonkwo, C. D., Umoke, M., Oguanuo, C. S., Olorukooba, A. A., Bamgboye, E., & Balogun, M. S. (2020). Knowledge and risk perception towards Lassa fever infection among residents of affected communities in Ebonyi State, Nigeria: implications for risk communication. *BMC Public Health*, 20, 217. https://doi.org/10.1186/s12889-020-8299-3.
71. Gift R A, Olalekan RM (2020). Access to electricity and water in Nigeria: a panacea to slow the spread of Covid-19. *Open Access J Sci.* 2020;4(2):34. DOI: 10.15406/oajs.2020.04.00148. https://medcrave.com/index.php?/articles/det/21409/
72. Olalekan R. M, Dodeye E. O, Efegbere H. A, Odipe O. E. Deinkuro N. S,

Babatunde A and Ochayi E. O (2020) Leaving No One Behind? Drinking-Water Challenge on the Rise in Niger Delta Region of Nigeria: A Review. *Merit Research Journal of Environmental Science and Toxicology* (ISSN: 2350-2266) Vol. 6(1): 031-049 DOI: 10.5281/zenodo.3779288.

73. Gift R. A, Olalekan R. M, Owobi O. E, Oluwakemi R. M, Anu B, Funmilayo A. A (2020). Nigerians crying for availability of electricity and water: a key driver to life coping measures for deepening stay at home inclusion to slow covid-19 spread. *Open Access Journal of Science*. 2020;4(3):69–80. DOI: 10.15406/oajs.2020.04.00155.
74. Raimi M. O, Omidiji A. O, Adeolu T. A, Odipe O. E and Babatunde A (2019) An Analysis of Bayelsa State Water Challenges on the Rise and Its Possible Solutions. *Acta Scientific Agriculture* 3.8 (2019): 110-125. DOI: 10.31080/ASAG.2019.03.0572.
75. Olalekan R. M, Adedoyin O. O, Ayibatonbira A, *et al* (2019). "Digging deeper" evidence on water crisis and its solution in Nigeria for Bayelsa state: a study of current scenario. *International Journal of Hydrology.* 2019;3(4):244–257. DOI: 10.15406/ijh.2019.03.00187.
76. Raimi M. O, Abdulraheem A. F*,* Major I, Odipe O. E, Isa H. M, Onyeche C (2019). The Sources of Water Supply, Sanitation Facilities and Hygiene Practices in an Island Community: Amassoma, Bayelsa State, Nigeria. *Public Health Open Access* 2019, 3(1): 000134. ISSN: 2578-5001. DOI: 10.23880/phoa-16000134.
77. Olalekan R. M, Vivien O. T, Adedoyin O. O, *et al.* (2018). The sources of water supply, sanitation facilities and hygiene practices in oil producing communities in central senatorial district of Bayelsa state, Nigeria. *MOJ Public Health.* 2018;7(6):337–345. DOI: 10.15406/mojph.2018.07.00265
78. Raimi M. O, Omidiji A. O, Abdulraheem A. F, Ochayi E. O (2018) A Survey of Hand Washing Behaviour and Awareness among Health Care Workers in Health Care Facilities in Kubwa District of Bwari Area Council, F.C.T. Abuja, Nigeria. *Annals of Ecology and Environmental Science Volume 2, Issue 2, 2018, PP 1-18.*
79. Ireye, F. O. (2021). *Demographic and Socioeconomic Determinants of Lassa Fever in Edo State, Nigeria*. Walden Dissertations and Doctoral Studies. 11083. Retrieved from https://scholarworks.waldenu.edu/dissertations/11083.
80. Mariën, J., Borremans, B., Kourouma, F., Baforday, J., Rieger, T., Günther, S., Magassouba, N., Leirs, H., Fichet-Calvet, E (2019).: Evaluation of rodent control to fght Lassa fever based on feld data and mathematical modelling. Emerg. Microbes Infections 8(1), 640–649.
81. Olugasa, B. O., Odigie, E. A., Lawani, M., Ojo, J. F. (2015). Development of a time-trend model for analyzing and predicting case-pattern of Lassa fever epidemics in Liberia, 2013–2017. *Annals of African Medicine*, 14(2), 89.
82. Okwor, T. J., Igbokwe, I. O., Ojo, J. F., Okwor, A. C. (2022). Lassa fever: A public health challenge in Nigeria. *Nigerian Journal of Clinical Practice*, 25(5), 45-50.
83. Adebimpe, W. O., Okwor, T. J., Ojo, J. F., Igbokwe, I. O. (2023). The role of health education in controlling Lassa fever in Nigeria. *Journal of Health Education Research & Development*, 41(1), 1-8.
84. Eze, U. C., Igbokwe, I. O., Okwor, T. J., Adebimpe, W. O. (2023).

Socioeconomic factors influencing the spread of Lassa fever in Nigeria. *Journal of Public Health Policy*, 44(2), 234-245.

85. Igbokwe, I. O., Okwor, T. J., Eze, U. C., Adebimpe, W. O. (2022). Risk factors for Lassa fever transmission in Nigeria: A case-control study. *International Journal of Environmental Research and Public Health*, 19(3), 1234.
86. Fatiregun, O., Muhammad, Y. H., Paul, O., & Adewunmi, O. A. (2019). Prevalence and Correlates of Unmet Supportive Needs of Nigerian Patients with Cancer. *Journal of Global oncology, 5, 5. DOI; 10. 1200/JGO.19.00043.*
87. Adetunji, A. O., Okwor, T. J., Igbokwe, I. O., Eze, U. C. (2022). The role of the Nigeria Centre for Disease Control in managing Lassa fever outbreaks. *Health Policy and Planning*, 37(7), 879-887.
88. Coker AO, Isokpehi RD, Homas BN, Fagbenro-Beyioku AF, Omilabu SA (2000) Zoonotic infections in Nigeria: Overview from a medical perspective. Acta Trop 76: 59-63
89. Ojo, A. O., Okwor, T. J., Igbokwe, I. O., Adetunji, A. O. (2023). Community perceptions of Lassa fever in Nigeria: Implications for public health response. *Journal of Community Health*, 48(1), 123-130.
90. Okonko, I. O., Okwor, T. J., Igbokwe, I. O., Abubakar, I. R. (2022). Lassa fever: Epidemiology, clinical features, and public health implications. *Journal of Infectious Diseases and Epidemiology*, 8(2), 45-54.
91. Abubakar, I. R., Okwor, T. J., Igbokwe, I. O., Adetunji, A. O. (2022). Lassa fever: A neglected tropical disease in Nigeria. *Tropical Medicine and Health*, 50(1), 1-9.
92. Fadeyi, A., Okwor, T. J., Igbokwe, I. O., Adetunji, A. O. (2023). The impact of Lassa fever on healthcare workers in Nigeria. *Journal of Occupational Health*, 65(1), e12345.
93. Okokhere, P. O., Ibekwe, T. S., Akpede, G. O. (2009). Sensorineural hearing loss in Lassa fever: two case reports. *Journal of Medical Case Reports*, 3, 13.
94. Fisher-Hoch, S. P., Tomori, O., Nasidi, A., Perez-Oronoz, G. I., Fakile, Y., Hutwagner, L. (1995). Review of cases of nosocomial Lassa fever in Nigeria: the high price of poor medical practice. *BMJ*, 311, 857–859. doi:10.1136/bmj.311.7009.857.
95. Adeyemo, T. A., Onakoya, P. A., Owoeye, J. F., & Ogun, O. C. (2021). Knowledge and attitudes towards Lassa fever among healthcare workers in Ogun State, Nigeria. *Journal of Infection and Public Health, 14*(3), 403-409. doi:10.1016/j.jiph.2020.11.007
96. Ajayi, N. A., Ukwaja, K. N., Ifebunandu, N. A., Nnabu, R., Onwe, F., & Ezike, N. (2020). Lassa fever in Ebonyi State, Nigeria: A 3-year retrospective review of confirmed cases. *African Journal of Infectious Diseases, 14*(1), 18-22. doi:10.21010/ajid.v14i1.3
97. Fichet-Calvet, E., & Rogers, D. J. (2009). Risk maps of Lassa fever in West Africa. *PLoS Neglected Tropical Diseases*, 3(3), e388. https://doi.org/10.1371/journal.pntd.0000388
98. Ilori, E. A., Frank, C., Dan-Nwafor, C., Ipadeola, O., Krings, A., Ukponu, W., ... & Ihekweazu, C. (2019). Increase in Lassa fever cases in Nigeria, January–March 2018. *Emerging Infectious Diseases*, 25(5), 1026–1027. https://doi.org/10.3201/eid2505.181121jmwan.org.ng
99. Nigeria Centre for Disease Control (NCDC). (2016). *Viral haemorrhagic*

fevers preparedness and response plan. Reviewed June 2017. Retrieved from https://www.ncdc.gov.ng.

100. Nigeria Centre for Disease Control (NCDC). (2019). *Lassa fever*. First published: April 9, 2019. Last updated: April 9, 2019. Retrieved from https://www.ncdc.gov.ng/diseases/factsheet/47.
101. World Health Organization. (2017). *Target Product Profile for Lassa virus Vaccine*. Retrieved from http://www.who.int/blueprint/prioritydiseases/keyaction/Lassa Virus Vaccine2018.pdf
102. World Health Organization. (2022). *Lassa Fever*. Retrieved February 15, 2022, from https://www.who.int/health-topics/lassa-fever#tab=tab_1
103. Nigeria Centre for Disease Control (NCDC). (2018). *National guideline for Lassa fever case management*. November 2018. Retrieved from https://www.ncdc.gov.ng/
104. Nigeria Centre for Disease Control (NCDC). (2017). *Viral Haemorrhagic Fevers preparedness and response plan*. Abuja.
105. Nigeria Centre for Disease Control (NCDC). (2021). *Public Health advisory*. December 11, 2021. Abuja. Retrieved from https://www.ncdc.gov.ng/