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Lassa Fever Awareness and Sero-positivity among Healthcare Workers in Public Facilities in an Endemic, Sub-Urban Local Government Area of Edo State, South-South, Nigeria

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Abstract: Background: Lassa fever is a viral haemorrhagic disease, endemic in West Africa, and with great potential for nosocomial spread. Objectives: The study set out to assess the knowledge and serostatus of Lassa fever among health workers in an Esan West LGA of Edo State, South-South Nigeria. **Methods:** A descriptive cross-sectional study was carried out among 150 consenting Primary health care and secondary health workers using pre-tested structured interviewer-administered questionnaires and phlebotomy for data collection. ELISA was used to assess for Lassa virus-specific IgM and IgG antibodies. **Results:** One hundred and forty-two (94.7%) respondents were aware of Lassa fever, with 50 (33.3%) of the respondents having poor knowledge, 44 (29.3%) fair knowledge, and 56 (37.3%) good knowledge. Knowledge was significantly associated with respondents' designation ($p \leq 0.001$), sex ($p = 0.02$), and age ($p = 0.01$). The prevalence of IgG was found to be 50.7%, with no IgM detected. IgG seropositivity had no significant association with demographic variables. **Conclusion:** Sensitization campaigns among health workers in government establishments are needed to bridge the gap in knowledge.
Keywords: Government-employed, Healthcare workers, Knowledge, Lassa fever, seroprevalence.

1. Introduction

Lassa fever (LF) is an acute and occasionally severe viral hemorrhagic sickness caused by Lassa virus. The virus is a member of the Arenaviridae family and its endemic in parts of West Africa, where an estimated 300,000–500,000 cases and 5000 related deaths occur yearly [1]. Transmitted by the ubiquitous and highly commensal multimammate rodent 'mastomys natalensis', [2], primary rodent – human infection occurs through the contamination of food by rodent excretions (urine and feaces) [1], where the virus is profusely excreted, by aerosol dispersion of viral particles in dust or by the ingestion of rodents, in areas where they are considered a delicacy [3].

The disease also has the capacity for person-to-person spread, particularly in health care settings [5]. This type of transmission happens when an unprotected person comes in contact with the virus in the blood, tissue, secretions, or excretions of an infected person. Thus in health care settings, a poor adherence with standard precaution in medical practice is one reason for the nosocomial spread of the virus. Hospital outbreaks have been associated with inadequate attention to standard precautions, including poorly inadequately disinfected beddings and indiscriminate disposal of contaminated waste. [4, 5, 6, and 7]. Nosocomial outbreaks are usually associated with high case fatality rates involving not only patients but also medical staff [8, 9, 10, and 11]. Therefore, early identification of infected individuals is essential for the timely implementation of barrier nursing guidelines [11].

Several years after the disease was first discovered in Nigeria, it still occurs in epidemics that have in recent years included States that hitherto did not report the disease. More and more health care workers still find themselves as victims of the disease. The non-specific presentation of the disease in the early stage makes diagnosis difficult without laboratory confirmation, and otherwise, the attending health worker maintains a high index of suspicion, mortality will remain high [12].

A high index of suspicion requires that health workers are adequately and repeatedly sensitized, with the right information on the disease. In recent times, a few state governments have organised training programmes for health workers in public service. These training, often ad-hoc in response to an outbreak, are not designed to address any gaps in knowledge identified through research, and ill-sustained.

Indeed, studies that investigate what knowledge health workers in the country have of LF country are lacking. Even in an endemic State such as Edo State, little is known of the prevalence of Lassa virus antibody at primary and secondary health care levels, which would indicate the rate of nosocomial spread of Lassa virus. Meanwhile, it is only by such information that planning and design of training programmes for health workers should be based. The study set out to investigate the knowledge and seroprevalence of LF, and associated factors among government-employed health workers in a local government that in the endemic zone of Edo State.

2. Method

2.1 Study area

The descriptive cross-sectional study was conducted in Esan West Local Government Area in Edo Central Senatorial District of Edo State, South-South, Nigeria, between August and September 2012. The Local Government has its headquarter in Ekpoma. The LGA has an estimated land mass of 502km^2 with a human population of 147,655 [13].

Most of the elementary amenities, such as electricity, piped borne water, and decent roads are either in the sorry state or in non-existence in most cases. There are twenty-three public primary health centres and two general hospitals in the local government area.

2.2 Study population

The study population for this survey was healthcare workers in government-owned secondary and primary health facilities in the Local government. The categories of healthcare workers included doctors, nurses (trained and auxiliary), and laboratory personnel.

2.2.1 Selection criteria

Healthcare workers in fulltime employment in government health facilities in the LGA, who consented for either phlebotomy or questionnaire survey or both were enrolled for the study. Health workers absent on the days of the field surveys were excluded from the study.

2.3 Sample size

The estimated minimum sample size for the research was 181. This was obtained using the formula for descriptive study [14] with prevalence (p) as 12.3 % of Lassa fever among HCWs in Nigeria [15], z as 1.96, a 5% precision, and an assumption of non-response rate of 10%.

2.4 Sampling technique

In the Local Government Area, a list the all public health facilities within her jurisdiction was obtained from the Health Department. This comprises of both primary and secondary health facilities. On the total, there are twenty-three primary and two secondary health care facilities in this category. Using a proportionate allocation of participants, the number for each of the health facilities were determined. In each facility, respondents were recruited through a systematic sampling technique until the desired proportion was attained.

2.5 Data collection

Questionnaire survey: Structured self–administered questionnaires, which focused on the demographics and knowledge of Lassa fever was used to amass data from the participants. The knowledge component was evaluated via a set of 27 inquiries which covered questions about the agent, symptoms, the mode of transmission as well as the methods of prevention of Lassa fever at the health facility and communities. The researchers designed the questionnaire following an exhaustive literature review and consultations with connoisseurs in the field.

Blood specimen collection. Five (5) ml of blood will be collected by antecubital venipuncture under strict aseptic conditions into a sterile universal bottle, bearing the name of the community, house number, and code for the respondent. The blood sample was allowed to clot and transported to the BSL-2 facility within the Institute of Lassa Fever Research and Control (ILFRC), Irrua Specialist Teaching Hospital, Irrua, within 6 hours of collection and in a carrier with ice packs in temperature < 4^{o}C. At the facility, the presence of IgM and IgG antibodies were identified using the ELISA techniques on the centrifuged blood.

2.6 Data analysis

Codification of data was done and entered into an SPSS version 17 spreadsheet and analysed using The designation was recoded into dichotomous variables: health providers (doctors, nurses, laboratory personnel) and support staff (CHEWs, Health assistants, among others). Knowledge questions were scored and graded. A score of one (1) or zero (0) was given to appropriate or incorrect or no response, respectively. The total possible score for knowledge was 44. An aggregate score of 23 and below was graded poor knowledge, a score between 24 and 35, fair knowledge, and a score of 36 and above, useful knowledge.

Charts and frequency distribution tables were used to present the descriptive data. On the other hand, means and standard deviation, or median and inter-quartile range as appropriate for continuous variables were used. Chi-square test was used to determine associations. In the test for association, demographic variables were taken as independent while the grade of knowledge or practice of infection prevention were taken as the dependent variables. The level of significance was set at 5% (0.05). Variables significant with univariate analysis were put into a multivariate model and analysed using backward steps approach.

2.7 Ethical clearance

An institutional ethical clearance for this research was obtained. Permission was obtained from the doctors in charge of the general hospitals and the primary health care coordinator in charge of the PHCs in the LGA. All participants gave individual written informed consent following a detailed explanation of the procedure. They were however assured of confidentiality and that they are at liberty to pull out of the study whenever they wish to. There was no undue harm posed to them by their participation, save for a feeling of slight pain during needle prick for phlebotomy.

3 Results

Of the 181 questionnaires that were administered, 150 were returned properly filled accounting for a response rate of 82.9%. The mean age of study participants was 44.0 ± 11.1 years, 102 (68.0%) were females, 84 (56.0%) with the highest level of education as tertiary level, 142 (77.3%) belonged to the Christian faith, and the majority, 116 (77.3%), were married (**Table 1).**

Table 1. Socio-demographic characteristics of respondents (N = 150)

Variable	**Frequency (%)**
Type of establishment	
General hospital	62 (41.3)
Primary health centre	88 (58.7)
Age	
22-31	30(20.0)
32 -41	26 (17.3)
42 – 51	50 (33.3)
52 – 61	40 (26.7)
≥62	4 (2.7)
Sex	
Male	48 (32.0)
Female	102 (68.0)
Educational level	
Primary	33 (22.0)
Secondary	33 (22.0)
Tertiary	84 (56.0)
Marital status	
Married	116 (77.3)
Single	26 (17.3)
Separated/Widowed	8 (5.3)
Designation	
Doctor	4 (2.8)
Nurse	48 (33.8)
Lab personnel	12 (8.5)
Ward orderly	32 (21.4)
Community Health worker	26 (18.3)
*support	20 (14.0)
*Driver, Messenger, security, pharmacist, medical records attendants, clerical officer, gardener	

One hundred and forty-two (94.7%) of them had an awareness of Lassa fever, with fellow health workers being their first source of information for the majority, 96 (67.6%). Six (75.0%) of those who claimed not to have ever heard of Lassa fever were support staff ($p < 0.001$), and all were male ($p < 0.001$). Of those who were aware of the disease, the virus was correctly identified as the agent of the disease by 90 (63.4%) respondents, and the reservoir rodent by 128 (90.1%).

The prevalent mode of community transmission was stated as via the ingestion of contaminated food by 108 (76.1%), and in the health facility, as the use of contaminated medical equipment by 106 (75.7%). The confirmatory test used for diagnosis was known to 36 (25.4%) respondents, and health education was the most cited mode of prevention (**Table 2).**

Table 2. Respondents' knowledge of dimensions of Lassa fever

Knowledge item	Frequency (%)
Causative Organism	90 (63.4)
Rodent reservoir of disease	128 (90.1)
Incubation period	44 (31.0)
Transmission routes in the community	
Eating contaminated food	108 (76.1)
Eating from contaminated utensils	100 (70.4)
Rodent consumption	80 (56.3)
Unprotected contact with an infected person	84 (59.2)
Spreading food uncovered in the open	94 (66.2)
unsafe Burial practices	98 (69.0)
Mode of nosocomial spread	
Use of contaminated medical equipment	106 (75.7)
Airborne spread	76 (53.5)
Poor waste management practices	94 (60.2)
Unprotected handling of soiled patient's belongings	84 (59.2)
Clinical feature	
Unresponsive febrile illness	104 (73.2)
Bleeding	90 (63.4)
Facial swelling	64 (45.0)
Confirmatory test	36 (25.4)
Prevention	
Barrier nursing	92 (64.8)
Hand hygiene	112 (78.9)
Health education	118 (83.1)
Use of disposable needles	102 (71.8)
Proper waste management	
Non-existence of a vaccine	52 (36.6)
The drug used in the treatment	64 (45.1)

Forty-two (29.6%) respondents had poor knowledge, 44(31.0%) fair knowledge, and 56 (39.4%) good knowledge the different dimensions of Lassa fever ranging from the disease agent, transmission, nosocomial spread, clinical features, treatment, and prevention. The knowledge was significantly associated with being a health service provider ($p < 0.001$) as against being support staff. Male gender ($p = 0.020$), increasing age ($p = 0.049$) and work in the general hospital ($p = 0.027$) (**Table 3)**.

Multivariate analysis left only duration of work [standardized OR 0.23, $p = 0.040$, 95% CI -0.01, 0.31] significant. Thirty-four (23.9%) of the 150 respondents, claimed to have encountered at least one person whom they suspected LF as a differential in their health facility in the past one year, of which 2 (5.9%) referred the patient for appropriate testing.

None turned out to be LF viral disease. Of the 34 respondents, nurses made up a significantly ($p < 0.001$) larger proportion with 22 (64.7%). Orderlies, Community health workers, and Laboratory personnel contributed 4 (11.8%) each.

Table 3. Factors associated with knowledge grade among respondents

variables	Grade of knowledge			Total	P value
	Poor n (%) 42 (29.6)	Fair n (%) 44 (31.0)	Good n (%) 56 (39.4)		
Age (years)					
22-31	14 (50.0)	6 (21.4)	8 (28.6)	28 (100.0)	0.049*
32-41	8 (30.8)	8 (30.8)	10 (38.5)	26 (100.0)	
42-51	16 (32.0)	14 (28.0)	20 (40.0)	50 (100.0)	
52-61	4 (10.5)	16 (42.1)	18 (47.4)	38 (100.0)	
Designation					
Support staff	4 (20.0)	10 (50.0)	6 (30.0)	20 (100.0)	0.001*
Doctor	0(0.0)	0 (0.0)	4 (100.0)	4 (100.0)	
Nurse	6 (12.5)	18 (37.5)	24 (50.0)	48 (100.0)	
Medical lab scientist	4 (33.3)	2 (16.7)	6 (50.0)	12 (100.0)	
Public health nurse	0 (0.0)	0 (0.0)	2 (100.0)	2 (100.0)	
Ward orderlies	14 (46.7)	6 (18.8)	12 (37.5)	32 (100.0)	
Community Health workers	14 (53.8)	8(30.8)	4 (15.4)	26 (100.0)	
Type of facility					
Primary Health centre	26 (31.0)	32 (38.1)	26 (31.0)	84 (100.0)	0.027*
General Hospital	16 (27.6)	12 (20.7)	30 (51.7)	58 (100.0)	
Sex					
Male	6 (15.0)	18 (45.0)	16 (40.0)	40 (100.0)	0.023*
Female	36 (35.3)	26 (25.5)	40 (39.2)	102 (100.0)	
Duration of work (years)					
0-9	34 (44.7)	20 (26.3)	22 (28.9)	76 (100.0)	0.004*
10-19	2 (10.0)	8 (40.0)	10 (50.0)	20 (100.0)	
20-29	2 (10.0)	8 (40.0)	10 (50.0)	20 (100.0)	
30-39	4 (15.4)	8 (30.8)	14 (53.8)	26 (100.0)	

Seventy five (50.0%) collected blood samples were analyzed for Lassa virus specific IgM and IgG using recombinant antibody ELISA. No sample was found to be IgM positive, while 38 (50.7%) samples were IgG positive. Seropositivity was not significantly associated with any demographic variable: gender (p = 0.680), designation (p = 0.570), duration of work (p = 0.700), age (p = 0.810), facility type (p = 0.740) and marital status (p = 0.190).

Discussion

The study showed that almost all the health workers interviewed had heard about the disease, a finding better than what was reported in studies carried out among health workers on their knowledge of Crimean Congo heamorraghic fever [16, 17, and 18]. The high level of awareness is needful considering the endemicity of the disease in the area and may be a result of the enlightenment programmes organised by the Institute of Lassa fever Research and Control, Irrua Specialist Teaching Hospital, situated in the local government area.

Good knowledge of the disease, which was lacking in more than half of the respondents is necessary to prevent misdiagnosis, allow for effective community health education, and appropriate and timely referrals. Different studies have also reported a lower proportion of proper knowledge of other viral haemorraghic fevers among health workers [16 and 19]. There were however some critical gaps in knowledge were identified in this study which includes incubation period, confirmatory test, a drug used in treatment and absence of a vaccine, and need to be emphasized in future sensitization fora for government-employed health workers. Knowledge of the incubation period is useful in differentiating the disease from other tropical febrile infections that present in a similar pattern, particularly during the early course of the illness. Confirmatory test for Lassa fever is carried out at the BSL-3 laboratory of the ILFRC, and a knowledge of the type of test will prevent delays in diagnosis and referral. Right knowledge is also necessary to prevent nosocomial spread of the disease.

The better knowledge observed among doctors in this study was also observed in a study of Crimean-congo fever [17] and is not surprising as they are the more likely to be the ones targeted in sensitization workshops. Their medical background also facilitates a better understanding of the disease. The findings of better knowledge among workers who have worked for longer duration is not surprising, as they are likely to have come across the subject over the years of working in the area and during their continuous medical education. With this in view, programmes on Lassa fever sensitization for the newly employed staff of government hospitals is justified. Nurses reported coming across cases they suspected to be LF more frequently than other staff because they are the ones most commonly found at the primary health care centres. They are often the health care providers the patient first meets on coming to these facilities. Interestingly, no doctor had ever suspected Lasa fever in a patient. Could this be the result of better knowledge of clinical symptoms or lower index of suspicion remains to be unraveled? Healthcare workers in secondary government facilities were better informed than those at Primary health care facilities, as the latter may receive support and facilitation in training programmes from the government.

The high prevalence of IgG found among health workers is not surprising considering the endemicity of the disease in the study area. Seroprevalence reaches values of 50% in areas of high endemicity [20]. It is possible that the observed IgG may have been community-acquired though it is still good to note that IgG has been known to persist in the blood for as long as two years. Thus there can be no linkage of present findings to a period of infection. The non-association of seropositivity with any demographic variable is also consistent with the endemicity of the disease, as the infections are known to affect all sexes, ages, and occupations. The absence of IgM shows that there is no active infection (clinical or sub-clinical) among respondents.

Conclusion

Health workers in government facilities in the study area had high awareness but lacked good knowledge of the disease with increasing duration of work and employment in general hospitals identified as predictors of good knowledge. Some gaps in knowledge were identified. Seroprevalence was found to be 50.7% with no sample found positive for IgM. We, therefore, recommend that sensitization of health workers in government employment should be sustained, be targeted involved groups identified to have knowledge deficiencies, and close gaps in the information provided through the relevant IECs.

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