Assessment of the Level of Knowledge and Universal Cross-infection Control Practices against Lassa Fever among Health Workers in Sokoto, Nigeria: A Hospital Survey During Lassa Fever Outbreak in Nigeria

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Abstract

Introduction: Lassa fever (LF) is an endemic West African viral hemorrhagic fever which presents acutely and is often fatal. This study assessed the level of knowledge about LF among the health workers in Sokoto State and also examined their cross-infection control practices against LF during ongoing outbreaks in health facilities in Nigeria. Methods: Data obtained from a total of 298 health workers in five hospitals in Sokoto metropolis, Nigeria, were used for this study. The study tool was a 25-item questionnaire. Data obtained were analyzed using the SPSS version 20 Software. Results: Three-tenth of the participants were within the age bracket of 26–30 years. About 54% were men, 54.4% were nursing officers, and 75.2% of the participants had practice ≤10 years. All of the surveyed medical doctors and dentists were aware of the ongoing LF outbreak in Nigeria. All of the dentists and medical laboratory scientists surveyed accurately identified the virus as the cause of LF. Only the dentists accurately identified Mastomys natalensis rodents as the vector for LF, and its transmission from person-to-person. Less than 20% of the participants in each occupational category did not know the universal precaution measures against infections, and about 12% of the respondents wore their personal protective equipment outside the surroundings of their duty posts. It was observed that more than 50% of the participants were below 60% on a scale of 1%–100% regarding their cross-infection and control practices. Conclusion: The findings obtained from this study revealed a very low level of knowledge about LF and very poor universal cross-infection control practices against LF among the health workers in Sokoto City, Nigeria.

Keywords: Health workers, Lassa fever, Nigeria, outbreak, universal precaution measures

INTRODUCTION

Lassa fever (LF) is an endemic West African viral hemorrhagic fever which presents acutely and is often fatal.\(^1\)\(^{14}\) Annual prevalence of 300,000–500,000 LF cases is being reported in Nigeria, Guinea, and Sierra Leone with mortality rate of over 500.\(^5\)\(^{6}\) LF is a highly infectious zoonotic disease caused by Lassa virus (LASV), a member of the Arenaviridae virus family.\(^1\)\(^\text{3}\) The virus was first recognized in Nigeria in 1969.\(^7\)

The symptoms of LF during the initial phase are nonspecific, and they mimic those of many other common febrile ailments such as typhoid, flu, yellow fever, and malaria; hence, detection of the illness in infected patients during the early phase of an outbreak can be difficult.\(^1\)\(^,\)\(^8\) Transmission of the virus to humans are through contact with droppings, urine of infected rodents, and possibly through contact with the blood of infected Mastomys natalensis rodents; transmission of the virus also occurs through direct contact with infected blood or body fluids, especially in the hospital environment where there are deficient infection prevention and control measures.\(^1\)\(^,\)\(^2\)\(^,\)\(^8\)\(^9\) LASV has been linked with nosocomial outbreaks which

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result in high mortality rate; therefore, it is important that
health workers, due to their regular interaction with patients
and their body fluids, ought to have adequate information on
LASV infection.[10,11]

LF infection and outbreaks can be prevented through
isolation of infected patients, rigorous contact tracing, and
community hygiene among others. In the health-care settings,
when caring for patients, health workers should apply
universal cross infection control practices regardless of their
presumed diagnosis such as basic hand hygiene, respiratory
hygiene, and use of personal protective equipment among
others.[1] LF infection occurs very frequently in different parts
of Nigeria,[9,12-15] and currently, Nigeria is going through another
LF outbreak especially among the health workers in different
health-care facilities in the country.[16-19]

Nosocomial transmission and outbreaks among health workers
in Nigerian health-care institutions have become a cause for
concern for the health-care system. So far, there have not been
any report of confirmed outbreak of LF in Sokoto State, but due
to the increasing reports of outbreaks among health workers in
different health-care institutions within the country, the need
arises to assess the level of knowledge about LF among the
health workers in Sokoto State, and also measure their level
of preparedness against LF during ongoing outbreaks among
health workers in other health facilities in Nigeria.

**Methods**

This study was a descriptive cross-sectional survey conducted
in five hospitals in Sokoto State (two tertiary hospitals and three
secondary hospitals): Usmanu Danfodiyo University Teaching
Hospital, Federal Neuropsychiatric Hospital Kware, Specialist
hospital, Maryam Abacha Hospital for Women and Children
and Noman Children Hospital, from January to February 2018.
The study population included health workers comprising of
doctors, nurses, medical laboratory scientists, dentists, and
radiographers.

The capital of Sokoto State is Sokoto. The state is located in
the extreme northwest of Nigeria and shares a border with
Niger Republic to the north. The state is located in the dry
Sahel, and the major dialect spoken by the people of Sokoto
State is Hausa.[20]

Approval to conduct the study was officially obtained from
the State Health Research Ethics Committee, Ministry of
Health, Sokoto State, Nigeria (Ref. No: SKHREC/014/018).
Permission to collect research data were also sought from the
management of the participating hospitals.

The study tool was a 25-item questionnaire. Simple random
sampling technique was used in the participants’ selection
for this study. The minimum sample size for this study
(\( n = 102 \)) was determined using the Leslie formula for study
population <10,000 at an LF knowledge rate of 92.8% derived
from a previous study conducted among health workers
in Taraba State, Nigeria.[21] A total of 355 health workers
were approached at their duty posts for this study, 25 health
workers declined to participate for various reasons such as: not
interested in participating, too busy to participate, and cannot
participate if not given any incentives. Consenting health
workers completed a pretested and adjusted self-administered
questionnaire drafted in English that assessed participants’
general knowledge, control, and emergency preparedness
against LF. The respondents were allowed to fill the
questionnaire at their convenience and retrieved within
2 working days. Of a total of 330 questionnaires that were
given to the participants at their various duty posts, only 298
were returned. Two improperly filled questionnaires were
rejected.

Data were analyzed using the SPSS version 20 software (IBM).
The frequency distribution of all variables was determined, and
comparisons between variables were done using the Chi-square
test with a \( P < 0.05 \) set to be the level of statistical significance.
Results obtained were presented using tables.

**Results**

About three-tenth (29.5%) of the participants were within the
age bracket of 26–30 years. About 54% were men, 54.4%
were nursing officers, and majority of the participants had
practice \( \leq 10 \) years (75.2%) [Table 1].

| Characteristics | Frequency (%) |
|-----------------|---------------|
| Age (years)     |               |
| \( \leq 20 \)    | 6 (2.0)       |
| 21-25           | 33 (11.1)     |
| 26-30           | 88 (29.5)     |
| 31-35           | 76 (25.5)     |
| 36-40           | 45 (15.1)     |
| 41-45           | 27 (9.1)      |
| 46-50           | 12 (4.0)      |
| >50             | 9 (3.0)       |
| Not specified   | 2 (0.7)       |

| Gender          |               |
|-----------------|---------------|
| Male            | 161 (54.0)    |
| Female          | 135 (45.3)    |

| Profession      |               |
|-----------------|---------------|
| Nurse           | 162 (54.4)    |
| Medical doctor  | 76 (25.5)     |
| Medical laboratory scientist | 37 (12.4) |
| Dentist         | 15 (5.0)      |
| Radiographer    | 8 (2.7)       |

| Year(s) of practice | Frequency (%) |
|---------------------|---------------|
| \( \leq 10 \)       | 224 (75.2)    |
| >10                 | 72 (24.2)     |
| Not specified       | 2 (0.7)       |
medical laboratory scientists surveyed were accurately able to identify virus as the cause of LF, in contrast to the participants from the other occupations ($P = 0.233$, df $= 20$). Interestingly, of all the occupational categories surveyed only the dentists were able to accurately identify *M. natalensis* rodents as the vector for LF ($P = 0.671$, $df = 12$) and knew that LF can be transmitted from person-person ($P = 0.128$, $df = 8$). It is worthy to note that a range of 12%–50% of the nurses, medical doctors, medical laboratory scientists, dentists, and radiographers surveyed in this study considered that it is not possible for a person to be infected with LF and still not show any symptoms ($P < 0.0001$, df $= 8$) [Table 2].

The four most common symptoms of LF known to the participants were: fever, headache, vomiting, and hemorrhage [Table 3].

Amidst other findings in Table 4, it is notable that the three most frequently stated methods by which LF can be prevented in the community were: community health education, environmental sanitation, and proper food storage.

Most of the surveyed participants (86.1%) considered themselves to be at risk of being infected with LF due to their roles as health workers ($P = 0.098$, df $= 8$). Furthermore, <20% of all the participants in each occupational category did not know the universal precaution measures against infections ($P = 0.006$, df $= 8$), although 56.6% of the participants always sanitized their hands after coming in contact with a patient at their duty post, 55.7% always wore hand gloves when handling patients at their duty posts, more than half of the participants (68.1%) always changed their hand gloves between cares of different patients, yet only 20% always put on facemask when handling patients at their duty post. Although the majority of the respondents always wore hand gloves when handling patients’ blood, body fluids, or materials, yet <40% of the participants always wore protective clothing when caring for their patients at their duty posts. About 12% of the respondents wore their personal protective clothing outside their duty posts, more than half (60%) did not have a special wardrobe where their hospital wears could be kept, and more than 10% borrowed hospital wears from their colleagues [Table 5].

It is interesting to also note that, when the participants were asked to self-rate on a scale of 1%–100% regarding their cross-infection and control practices, more than 50% of the participants were below 60% on the personal rating scale for the prevention of cross-infection, and <30% of the participants were prepared for LF outbreak in their healthcare facilities based on their cross-infection prevention and control practices [Table 6].

### Table 2: Knowledge of respondents about Lassa fever

| Questions                          | Response | NS ($n=162$)* | MD ($n=76$)* | ML ($n=37$)* | D ($n=15$)* | R ($n=8$)* | Total ($n=297$)* | $P$ ($\chi^2$) |
|------------------------------------|----------|---------------|--------------|--------------|-------------|------------|----------------|-------------|
| Are you aware of on-going LF outbreak in Nigeria? | Yes      | 147 (90.7)    | 76 (100.0)   | 34 (91.9)    | 15 (100.0)  | 7 (87.5)   | 279 (93.9)    | 0.052, df=4  |
|                                    | No       | 15 (9.3)      | 0 (0.0)      | 2 (13.4)     | 0 (0.0)     | 1 (12.5)   | 18 (6.1)      | 0.098, df=8  |
|                                    | Total    | 162 (100.0)   | 76 (100.0)   | 36 (100.0)   | 15 (100.0)  | 8 (100.0)  | 297 (100.0)   | 0.233, df=20 |
| LF is caused by?                     | Bacterial | 10 (6.2)      | 2 (2.6)      | 0 (0.0)      | 0 (0.0)     | 1 (12.5)   | 13 (4.4)      | 0.462. NS  |
|                                    | Fungi     | 1 (0.6)       | 1 (1.3)      | 0 (0.0)      | 0 (0.0)     | 0 (0.0)    | 2 (0.7)       | 0.671, df=4  |
|                                    | Virus     | 137 (84.6)    | 73 (9.1)     | 32 (88.9)    | 14 (93.3)   | 6 (75.0)   | 262 (88.2)    | 0.052, df=4  |
|                                    | Protozoa  | 3 (1.9)       | 0 (0.0)      | 1 (2.8)      | 0 (0.0)     | 0 (0.0)    | 4 (1.3)       | 0.233, df=20 |
|                                    | Unknown   | 3 (1.9)       | 0 (0.0)      | 0 (0.0)      | 0 (0.0)     | 1 (12.5)   | 4 (1.3)       | 0.671, df=12 |
|                                    | I do not know | 8 (4.9)     | 0 (0.0)      | 3 (8.3)      | 1 (6.7)     | 0 (0.0)    | 12 (4.0)      | 0.128, df=8  |
|                                    | Total     | 162 (100.0)   | 76 (100.0)   | 36 (100.0)   | 15 (100.0)  | 8 (100.0)  | 297 (100.0)   | <0.0001, df=8|
| LF is transmitted by?               | Flies     | 4 (2.5)       | 0 (0.0)      | 0 (0.0)      | 0 (0.0)     | 0 (0.0)    | 4 (1.3)       | 0.671, df=12 |
|                                    | Mosquitoes | 8 (4.9)       | 3 (3.9)      | 1 (2.7)      | 0 (0.0)     | 0 (0.0)    | 12 (4.0)      | 0.671, df=12 |
|                                    | Mastomys natalensis rodents | 141 (87.0) | 72 (94.7) | 33 (91.7) | 15 (100.0) | 7 (87.5) | 268 (90.2) | 0.671, df=12 |
|                                    | Do not know | 9 (5.6) | 1 (1.3) | 2 (5.6) | 0 (0.0) | 1 (12.5) | 13 (4.4) | 0.671, df=12 |
|                                    | Total     | 162 (100.0)   | 76 (100.0)   | 36 (100.0)   | 15 (100.0)  | 8 (100.0)  | 297 (100.0)   | 0.128, df=8  |
| Can LF be transmitted from person-person? | Yes | 140 (86.4)    | 72 (94.7)    | 29 (80.6)    | 15 (100.0)  | 7 (87.5)   | 263 (88.6)    | <0.0001, df=8|
|                                    | No        | 10 (6.2)      | 4 (5.3)      | 5 (13.9)     | 0 (0.0)     | 1 (12.5)   | 20 (6.7)      | 0.671, df=12 |
|                                    | Do not know | 12 (7.4) | 0 (0.0) | 2 (5.6) | 0 (0.0) | 0 (0.0) | 14 (4.7) | 0.671, df=12 |
|                                    | Total     | 162 (100.0)   | 76 (100.0)   | 36 (100.0)   | 15 (100.0)  | 8 (100.0)  | 297 (100.0)   | 0.128, df=8  |
| Can a person be infected with LF and still not show any symptom? | Yes | 46 (28.6) | 59 (78.7) | 12 (32.4) | 9 (64.3) | 2 (25.0) | 128 (43.4) | <0.0001, df=8 |
|                                    | No        | 77 (47.8) | 9 (12.0) | 15 (40.5) | 3 (21.4) | 4 (50.0) | 108 (36.6) | <0.0001, df=8 |
|                                    | I am not sure | 38 (23.6) | 7 (9.3) | 10 (27.0) | 2 (14.3) | 2 (25.0) | 59 (20.0) | <0.0001, df=8 |
|                                    | Total     | 161 (100.0)   | 75 (100.0)   | 37 (100.0)   | 14 (100.0)  | 8 (100.0)  | 295 (100.0)   | 0.671, df=12 |

*X²= 0.462. NS=Nurse, MD=Medical doctor, ML=Medical laboratory scientist, D=Dentist, R=Radiographer, n=Total number of respondents in each category, df=Degree of freedom, LF=Lassa fever*
Table 3: The list of symptoms of Lassa fever known to the respondents

| Question | Symptoms | Profession of respondents |
|----------|----------|--------------------------|
|          |          | NS | MD | ML | D | R | Total |
| Can you mention 4 symptoms of LF infection? | General | Body weakness | 31 | 14 | 5 | 1 | 2 | 53 |
|          |          | Chest pain | 3 | 0 | 1 | 0 | 0 | 4 |
|          |          | Hyperthermia | 8 | 0 | 1 | 0 | 0 | 9 |
|          |          | Body pains | 12 | 4 | 2 | 1 | 0 | 19 |
|          |          | Loss of appetite | 7 | 1 | 0 | 1 | 0 | 9 |
|          |          | Malaise | 10 | 18 | 3 | 4 | 1 | 36 |
|          |          | Fever | 136 | 70 | 28 | 15 | 6 | 255 |
|          |          | Weight loss | 1 | 0 | 2 | 0 | 0 | 3 |
|          |          | Sweating | 2 | 0 | 0 | 0 | 1 | 3 |
|          |          | Edema | 1 | 1 | 0 | 0 | 1 | 3 |
|          |          | Chill | 2 | 0 | 5 | 0 | 0 | 7 |
|          |          | Cold | 2 | 0 | 0 | 0 | 0 | 2 |
|          |          | Death | 0 | 0 | 0 | 1 | 0 | 1 |
|          |          | Jaundice | 0 | 1 | 0 | 0 | 0 | 1 |
|          | Gastrointestinal | Vomiting | 66 | 16 | 14 | 5 | 4 | 105 |
|          |          | Diarrhea | 31 | 11 | 6 | 1 | 1 | 50 |
|          |          | Hematemesis | 2 | 3 | 3 | 0 | 1 | 9 |
|          |          | Sore throat | 3 | 10 | 0 | 3 | 0 | 16 |
|          |          | Oral sore | 1 | 0 | 0 | 0 | 1 | 2 |
|          |          | GI bleeding | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Abdominal pain | 9 | 3 | 1 | 0 | 1 | 14 |
|          |          | Dehydration | 7 | 0 | 0 | 1 | 0 | 8 |
|          |          | Nausea | 2 | 0 | 2 | 0 | 0 | 4 |
|          |          | Hematochezia | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Inability to swallow | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Dysentery | 3 | 0 | 0 | 0 | 0 | 3 |
|          |          | Epigastric pain | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Abdominal discomfort | 1 | 0 | 0 | 0 | 0 | 1 |
|          | Neurological | Nervousness | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Headache | 57 | 28 | 16 | 3 | 2 | 106 |
|          |          | Dizziness | 0 | 2 | 0 | 0 | 0 | 2 |
|          |          | Drowsiness | 0 | 1 | 0 | 0 | 0 | 1 |
|          |          | Loss of consciousness | 1 | 0 | 0 | 0 | 0 | 6 |
|          |          | Convulsion | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Lethargy | 2 | 0 | 0 | 0 | 0 | 2 |
|          |          | Migraine headache | 0 | 0 | 1 | 0 | 0 | 1 |
|          |          | Confusion | 2 | 0 | 0 | 0 | 0 | 2 |
|          | Respiratory | Obstruction of airway | 0 | 0 | 1 | 0 | 0 | 1 |
|          |          | Sneezing | 1 | 0 | 0 | 0 | 0 | 1 |
|          |          | Respiratory disorder | 1 | 2 | 1 | 0 | 0 | 4 |
|          |          | Dyspnea | 4 | 0 | 1 | 0 | 0 | 6 |
|          |          | Cough | 6 | 3 | 2 | 1 | 1 | 13 |
|          |          | Rhinorrhea | 2 | 4 | 0 | 0 | 0 | 6 |
|          | Hematological | Bleeding from the eye | 2 | 0 | 1 | 0 | 0 | 3 |
|          |          | Bleeding from the orifices | 46 | 24 | 3 | 7 | 0 | 80 |
|          |          | Bleeding from the ear | 2 | 1 | 0 | 0 | 0 | 3 |
|          |          | Epistasis | 13 | 9 | 4 | 1 | 1 | 28 |
|          |          | Anemia | 2 | 0 | 0 | 0 | 0 | 2 |

Contd...
Table 3: Contd...

| Question | Symptoms | NS | MD | ML | D | R | Total |
|----------|----------|----|----|----|---|---|-------|
| Hematuria |          | 0  | 3  | 0  | 0 | 0 | 3     |
| Hemorrhage|          | 48 | 30 | 11 | 3 | 1 | 93    |
| Bleeding from the mouth |          | 6  | 0  | 0  | 0 | 0 | 6     |
| Ophthalmologic | | | | | | | |
| Redness of the eye | | 10 | 2  | 2  | 0 | 0 | 14    |
| Blurred vision |          | 0  | 0  | 1  | 0 | 0 | 1     |
| Yellowness of the eye | | 0  | 2  | 0  | 0 | 0 | 2     |
| Conjunctivitis | | 0  | 1  | 0  | 0 | 0 | 1     |
| Dermatological | | | | | | | |
| Blister | | 1  | 0  | 0  | 0 | 0 | 1     |
| Rash | | 20 | 5  | 5  | 3 | 0 | 33    |
| Itching | | 1  | 0  | 1  | 0 | 0 | 2     |
| Petechiae | | 0  | 1  | 0  | 0 | 0 | 1     |
| Cardiovascular | | | | | | | |
| Hypotension | | 0  | 2  | 0  | 0 | 0 | 2     |
| Skeletomuscular | | | | | | | |
| Myalgia | | 10 | 8  | 1  | 2 | 0 | 21    |
| Arthralgia | | 3  | 2  | 2  | 1 | 0 | 8     |
| Protraction | | 1  | 1  | 0  | 0 | 0 | 2     |
| Others | | | | | | | |
| Transmission of infection | | 1  | 0  | 0  | 0 | 0 | 1     |

NS=Nurse, MD=Medical doctor, ML=Medical laboratory scientist, D=Dentist, R=Radiographer, LF=Lassa fever

**Discussion**

This study assessed the knowledge, attitude, and practices of health workers in the five major secondary and tertiary hospitals in the North-western part of Nigeria toward LF. These health workers come in daily contact with patients, or their body fluids at their duty post, also with their other coworkers, their families, and the public; hence, these health workers could be a source of spread of this life-threatening infection. The significance of this study is that it provides unique data different from many other similar studies that have been conducted among health workers in Nigeria on their level of knowledge, and their readiness toward LF as this study openly displays the various levels of knowledge and answers recorded by the study participants.

While the majority of the respondents were aware that LF is endemic in Nigeria, some were not; this observation is similar to those from other studies conducted in Nigeria.[12,22-25] Although the result obtained in this study is not satisfactory, as every health worker is expected to be conscious so as to ensure maximum necessary precautions are observed to halt the ongoing outbreak, and be able to control it should there be any such occurrence in their health facilities.

The importance of the knowledge of a clinical practitioner about an infection such as LF especially during an outbreak cannot be overemphasized, because then only proper diagnosis, management, treatment, control, and reporting of such cases to the appropriate authority can be made. From the findings made in this study, it can be said that the knowledge of some of the survey health workers on LF was very poor.

First of all, some of the respondents did not know what the cause of LF is and what transmits it, as it was observed that some mentioned bacteria or fungi as the cause of LF and that it is transmitted by mosquitoes, nor did some know that LF can be transmitted from an infected person to another. This is vital because the respondents are actively involved in patient management; hence, deficiency in knowledge can be costly.

Interestingly, some of the respondents had improper knowledge about the clinical presentation of LF in patients, and how LF infection can be prevented in the community. It was observed that some of the participants considered sweating as a symptom of LF, immunization, and vaccination as a means of prevention. Hence, it can be said that some of these health workers do not know that there is currently no vaccination against LF.[1]

Although many of the respondents consider themselves at risk of being infected with LF due to their roles as health workers, yet many of the health workers do not comply with the universal standard precautionary measures. This result is similar to that obtained in other studies conducted among health workers in Nigeria.[26-28] For instance, some of the health workers do not always wear hand gloves when handling patients’ body fluids; some wear their protective clothing outside their duty posts; some do not always change their hand gloves between cares of different patients, and some do not have a special wardrobe where their hospital wears are kept. Hence, not only do these health workers endanger their lives, but also the lives of their patients, their colleagues, and the public. It is also interesting to note that, on a self-rating of their infection prevention and
### Table 4: The list of preventive measures against Lassa fever infection in the community known to the respondents

| Question                                                                 | Preventive measures                                  | Profession of respondents |
|--------------------------------------------------------------------------|------------------------------------------------------|----------------------------|
| Can you mention 3 ways by which LF infection can be prevented in the community? | Adequate water supply                                | NS  MD  ML  D  R  Total    |
|                                                                          | Avoid holes in the house                             | 1   0   0   0   0   1     |
|                                                                          | Avoid contact with body fluids                       | 1   0   1   0   0   2     |
|                                                                          | Avoid body contact                                   | 4   2   1   0   0   7     |
|                                                                          | Avoid overcrowding                                   | 0   0   1   0   0   1     |
|                                                                          | Avoid hunting rat in the bush                        | 0   0   1   0   0   1     |
|                                                                          | Avoid contact with dead/alive rats                   | 6   5   2   1   1   16    |
|                                                                          | Avoid eating leftover food                           | 3   0   1   0   0   4     |
|                                                                          | Avoid keeping rodents as pets                         | 1   0   0   0   0   1     |
|                                                                          | Avoid bush burning                                   | 0   0   0   1   0   1     |
|                                                                          | Avoid sharing clothes                                | 0   0   0   0   0   2     |
|                                                                          | Avoid contact with infected persons                  | 2   0   0   0   0   2     |
|                                                                          | Avoid keeping stagnant water                         | 0   0   1   0   0   1     |
|                                                                          | Avoid rodents as source of meat                      | 4   3   2   0   0   9     |
|                                                                          | By use of antiseptics                                | 0   0   1   0   0   2     |
|                                                                          | By use of facemask                                   | 4   1   0   0   0   5     |
|                                                                          | By fumigation                                        | 2   0   0   0   0   2     |
|                                                                          | By use of insecticides                                | 2   2   0   0   0   4     |
|                                                                          | By keeping cats                                      | 0   0   1   0   0   3     |
|                                                                          | By use of hand gloves                                | 0   0   1   0   0   3     |
|                                                                          | By vaccination                                       | 0   0   1   0   0   3     |
|                                                                          | By use of pesticide                                  | 2   2   0   1   0   5     |
|                                                                          | By use of facemask                                   | 4   1   0   0   0   5     |
|                                                                          | By fumigation                                        | 2   0   0   0   0   2     |
|                                                                          | By use of insecticides                                | 2   2   0   0   0   4     |
|                                                                          | By keeping cats                                      | 1   0   0   1   0   3     |
|                                                                          | By use of hand gloves                                | 10  0   0   0   1   12    |
|                                                                          | By vaccination                                       | 0   0   1   0   0   3     |
|                                                                          | By use of pesticide                                  | 1   2   0   0   0   3     |
|                                                                          | Clearing bushes around the house                     | 8   5   0   0   0   13    |
|                                                                          | Compliance                                           | 1   0   0   0   0   1     |
|                                                                          | Clearing mosquito breading sites                     | 0   1   0   0   0   1     |
|                                                                          | Cleaning dishes                                      | 0   0   0   0   0   2     |
|                                                                          | Community health education                           | 57  32  6   5   1   101   |
|                                                                          | Disease surveillance                                 | 2   1   0   1   0   4     |
|                                                                          | Do not eat contaminated food                         | 3   0   0   0   0   3     |
|                                                                          | Do not eat undercooked rodents                       | 0   0   1   0   0   1     |
|                                                                          | Discourage sharing of sharps                         | 0   0   1   0   0   1     |
|                                                                          | Disinfect kitchen utensils                           | 0   0   0   0   0   1     |
|                                                                          | Destruction of all rodent hiding places              | 0   0   0   0   0   3     |
|                                                                          | Eating properly cooked wild meat                     | 1   1   0   0   0   3     |
|                                                                          | Early detection                                      | 16  5   2   0   2   25    |
|                                                                          | Eradicate all rodents                                 | 10  8   3   5   0   26    |
|                                                                          | Environmental sanitation                              | 56  22  6   5   2   91    |
|                                                                          | Good personal hygiene                                | 52  20  15  4   4   95    |
|                                                                          | Hand sanitization                                    | 3   0   1   0   0   4     |
|                                                                          | Inoculation                                          | 1   0   0   0   0   1     |
|                                                                          | Immunization                                         | 5   1   1   0   0   7     |
|                                                                          | Isolation of infected persons                        | 24  5   6   2   0   37    |
|                                                                          | Infection control                                    | 1   0   1   1   0   3     |
|                                                                          | Nutritional support                                  | 1   0   0   0   0   1     |
|                                                                          | No direct contact with infected animals              | 1   0   0   0   0   1     |
|                                                                          | Proper food storage method                           | 39  14  8   5   2   68    |
|                                                                          | Proper waste disposal                                | 9   3   4   0   0   16    |
|                                                                          | Proper cooking of food before consumption            | 1   0   0   0   0   1     |
|                                                                          | Proper treatment of infected persons                 | 5   1   0   1   0   7     |
|                                                                          | Proper hand wash                                     | 10  13  17  4   0   34    |
|                                                                          | Quarantine                                           | 9   4   2   1   0   16    |
|                                                                          | Regular medical check up                             | 1   0   0   0   0   1     |
|                                                                          |                                                       | Contd...
| Question | Preventive measures | Profession of respondents |
|----------|---------------------|--------------------------|
|          | NS | MD | ML | D | R | Total |
| Restrict movement to areas with outbreak | 1 | 0 | 0 | 0 | 0 | 1 |
| Rodent control with the aid of rodenticides | 25 | 23 | 8 | 4 | 3 | 63 |
| Use of standard precaution measures in the hospital | 12 | 7 | 0 | 2 | 0 | 21 |
| Use of protective equipments | 8 | 8 | 4 | 1 | 0 | 21 |
| Use of proper kitchen utensils | 2 | 0 | 1 | 0 | 0 | 3 |
| Washing hands before eating | 2 | 0 | 1 | 0 | 0 | 3 |
| Washing food before eating | 1 | 1 | 1 | 0 | 0 | 3 |

NS=Nurse, MD=Medical doctor, ML=Medical laboratory scientist, D=Dentist, R=Radiographer, LF=Lassa fever

| Questions | Response | NS | MD | ML | D | R | Total | P (χ²) |
|-----------|----------|----|----|----|----|----|-------|--------|
| Do you think you are at risk of being infected with LF due to your role as a health worker? | Yes | 131 (81.4) | 70 (94.6) | 30 (81.2) | 15 (100.0) | 8 (100.0) | 254 (86.1) | 0.098, df=8 |
| | No | 10 (6.2) | 3 (4.1) | 3 (8.1) | 0 (0.0) | 0 (0.0) | 16 (5.4) |
| | I am not sure | 20 (12.4) | 1 (1.4) | 4 (10.8) | 0 (0.0) | 0 (0.0) | 25 (8.5) |
| Total | 161 (100.0) | 74 (100.0) | 37 (100.0) | 15 (100.0) | 8 (100.0) | 295 (100.0) |
| Do you know what the universal precaution measures are? | Yes | 132 (81.5) | 66 (88.0) | 29 (78.4) | 15 (100.0) | 5 (62.5) | 247 (83.2) | 0.006, df=8 |
| | No | 13 (8.0) | 6 (8.0) | 7 (18.9) | 0 (0.0) | 0 (0.0) | 26 (8.8) |
| | Not sure | 17 (10.5) | 3 (4.0) | 1 (6.7) | 0 (0.0) | 3 (37.5) | 24 (8.2) |
| Total | 162 (100.0) | 75 (100.0) | 37 (100.0) | 15 (100.0) | 8 (100.0) | 297 (100.0) |
| How often do you sanitize your hands after coming in contact with a patient at your duty post? | Always | 118 (72.8) | 20 (26.7) | 22 (59.5) | 5 (33.3) | 3 (37.5) | 168 (56.6) | <0.0001, df=16 |
| | Usually | 22 (13.6) | 27 (36.0) | 8 (21.6) | 5 (33.3) | 2 (25.0) | 64 (21.5) |
| | Sometimes | 16 (9.9) | 23 (30.7) | 7 (18.9) | 5 (33.3) | 1 (12.5) | 52 (17.5) |
| | Rarely | 5 (3.1) | 5 (6.7) | 0 (0.0) | 0 (0.0) | 2 (25.0) | 12 (4.0) |
| | Never | 1 (0.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (0.3) |
| Total | 162 (100.0) | 75 (100.0) | 37 (100.0) | 15 (100.0) | 8 (100.0) | 297 (100.0) |
| How often do you change your hand gloves between cares of different patients? | Always | 119 (73.5) | 48 (64.0) | 17 (48.6) | 14 (93.3) | 3 (37.5) | 201 (68.1) | <0.0001, df=16 |
| | Usually | 16 (9.9) | 22 (29.3) | 11 (31.4) | 0 (0.0) | 3 (37.5) | 52 (17.6) |
| | Sometimes | 18 (11.1) | 4 (5.3) | 6 (17.1) | 1 (6.7) | 1 (12.5) | 30 (10.2) |
| | Rarely | 9 (5.6) | 1 (1.3) | 0 (0.0) | 0 (0.0) | 1 (12.5) | 11 (3.7) |
| | Never | 0 (0.0) | 0 (0.0) | 1 (2.9) | 0 (0.0) | 0 (0.0) | 1 (0.3) |
| Total | 162 (100.0) | 75 (100.0) | 35 (100.0) | 15 (100.0) | 8 (100.0) | 295 (100.0) |
| How often do you wear hand gloves when handling patients at your duty post? | Always | 109 (67.7) | 17 (22.7) | 28 (75.7) | 10 (66.7) | 2 (25.0) | 166 (56.1) | <0.0001, df=16 |
| | Usually | 20 (12.4) | 42 (56.0) | 6 (16.2) | 4 (26.7) | 3 (37.5) | 75 (25.3) |
| | Sometimes | 22 (13.7) | 16 (21.3) | 3 (8.1) | 1 (6.7) | 2 (25.0) | 44 (14.9) |
| | Rarely | 9 (5.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (12.5) | 10 (3.4) |
| | Never | 1 (0.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (0.3) |
| Total | 161 (100.0) | 75 (100.0) | 37 (100.0) | 15 (100.0) | 8 (100.0) | 296 (100.0) |
| How often do you wear facemask when handling patients at your duty post? | Always | 46 (28.6) | 2 (2.7) | 5 (13.9) | 6 (40.0) | 0 (0.0) | 59 (20.0) | <0.0001, df=16 |
| | Usually | 31 (19.3) | 15 (20.0) | 3 (8.3) | 5 (33.3) | 2 (25.0) | 56 (19.0) |
| | Sometimes | 70 (43.5) | 32 (42.7) | 11 (30.6) | 4 (26.7) | 4 (50.0) | 121 (41.0) |
| | Rarely | 13 (8.1) | 23 (30.7) | 13 (36.1) | 0 (0.0) | 1 (12.5) | 50 (16.9) |
| | Never | 1 (0.6) | 3 (4.0) | 4 (11.1) | 0 (0.0) | 1 (12.5) | 9 (3.1) |
| Total | 161 (100.0) | 75 (100.0) | 36 (100.0) | 15 (100.0) | 8 (100.0) | 295 (100.0) |
| How often do you wear gloves when handling patient’s body fluids or materials? | Always | 131 (80.9) | 57 (77.0) | 32 (86.8) | 13 (86.7) | 6 (75.0) | 241 (81.4) | 0.042, df=12 |
| | Usually | 9 (5.6) | 15 (20.3) | 3 (8.1) | 2 (13.3) | 2 (25.0) | 31 (10.5) |
| | Sometimes | 18 (11.1) | 2 (2.7) | 2 (5.4) | 0 (0.0) | 0 (0.0) | 22 (7.4) |
| | Rarely | 2 (1.2) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2 (0.7) |
| Total | 162 (100.0) | 74 (100.0) | 37 (100.0) | 15 (100.0) | 8 (100.0) | 296 (100.0) |

Contd...

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control practices, many fell below 70%, even though majority were mindful of the fact that if caught unaware by LF outbreak in their health-care facilities they could be in danger of being infected or spreading the infection.

This study has some limitations. First, this study did not seek to know the source of awareness about LF from the respondents; second, being a hospital-based study, only those who were met at their duty posts were enlisted for the study; and third, the study did not seek to know the type of the PPE wore outside the duty post by the participants. Consequently, based on the findings, authors would like to suggest that infection control programs targeting LF are urgently required, as well as a continuing medical education with the objective of universal precautions, should be targeted at all health workers.

Table 5: Contd...

| Questions                                                                 | Response | Profession of respondents | P (χ²) |
|---------------------------------------------------------------------------|----------|---------------------------|--------|
| How often do you wear personal protective equipment when caring for patients? | Always   | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| How often do you wear personal protective equipment when caring for patients? | Usually  | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| How often do you wear personal protective equipment when caring for patients? | Sometimes | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| How often do you wear personal protective equipment when caring for patients? | Rarely   | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| How often do you wear personal protective equipment when caring for patients? | Never    | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |

*Χ²= 0.462. NS=Nurse, MD=Medical doctor, ML=Medical laboratory scientist, D=Dentist, R=Radiographer, n=Total number of respondents in each category, df=Degree of freedom, LF=Lassa fever

Table 6: Respondents readiness against Lassa fever outbreak in their health-care facilities

| Questions                                                                 | Response | Profession of respondents | P (χ²) |
|---------------------------------------------------------------------------|----------|---------------------------|--------|
| Questions                                                                 | Response | Profession of respondents | P (χ²) |
| Questions                                                                 | Response | Profession of respondents | P (χ²) |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | <10      | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | ≥10 but <30 | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | ≥30 but <60 | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | ≥60 but <90 | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | ≥90      | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |
| On a scale of 1%-100%, how would you rate your cross-infection prevention and control practices? | Total    | NS (n=162)*               |        |
|                                                                           |          | MD (n=76)*                |        |
|                                                                           |          | ML (n=37)*                |        |
|                                                                           |          | D (n=15)*                 |        |
|                                                                           |          | R (n=8)*                  |        |
|                                                                           |          | Total (n=297)*            |        |

*Χ²= 0.462. NS=Nurse, MD=Medical doctor, ML=Medical laboratory scientist, D=Dentist, R=Radiographer, n=Total number of respondents in each category, df=Degree of freedom, LF=Lassa fever

Conclusion

The findings obtained from this study reveal that there is generally a very low level of knowledge about LF and poor universal cross-infection control practices against LF among the health workers who serve as the first point of contact with possible cases of LF in Sokoto City, Nigeria.

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Conflicts of interest
There are no conflicts of interest.

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