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RAPID REPORTS

Infection prevention and control in a treatment centre during a Lassa fever outbreak in southeastern Nigeria - January, 2018

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Abstract

Introduction: Lassa fever (LF) is a communicable viral haemorrhagic disease. Person-to-person spread occurs by inhalation or direct contact with the bodily fluids of an infected patient. Infection Prevention and Control (IPC) is essential in healthcare facilities for the wellbeing and safety of patients, staff and visitors. Federal Teaching Hospital, Abakaliki is the designated treatment center for LF in Ebonyi State. We assessed IPC practices in this facility during the 2018 outbreak of LF involving healthcare workers.

Methods: We conducted a cross-sectional study on 135 healthcare workers selected by systematic sampling. Information on their knowledge and practice of IPC was collected using a pre-tested, semi-structured questionnaire. We classified knowledge into "good", "fair" and "poor" based on the total correct response. Those that scored ≥75% of the maximum score were classified as good, 50-74% as fair and <50% as poor. We calculated prevalence odds ratio and 95% confidence intervals of the odds ratio to determine the factors associated with good knowledge scores. We purposively sampled key units involved in the management of suspected Lassa fever cases and assessed the availability of basic IPC requirements.

Results: The mean age of the respondents was 37.6 ± 7.6 years and 75 (55.6%) were females. Fifty-seven (42.5%), 29 (21.6%) and 13 (9.9%) respondents claimed always to have gloves, running water and hand washing soaps, respectively, in their units. The proportion of respondents with good knowledge of IPC measures was 71.8%, while 58.5% and 37.8% had good knowledge of LF epidemiology and LF clinical features, respectively. Being a core health worker (OR: 3.39 95%CI: 1.38-8.32) was significantly associated with good knowledge of LF epidemiology. Being male (OR: 1.55 95%CI: 0.72-3.34) and having spent >15years in the facility (OR: 1.16 95%CI: 0.39 - 3.44) were associated with good knowledge of IPC precautionary measures. However, these associations were not statistically significant.

Conclusions: The majority of the staff had good knowledge of IPC. However, knowledge of LF epidemiology was greater among those whose roles were related to management of LF cases. We recommended more awareness on LF, IPC practices and improved supply of IPC commodities.

Keywords: Lassa fever, Outbreak, Infection Prevention and Control, Healthcare workers

Introduction

Lassa fever is a communicable acute viral haemorrhagic disease. Its primary animal host is the multi-mammate rat (*Mastomys natalensis*), an animal indigenous to most of sub-Saharan Africa and many states in Nigeria.[1] People become infected by eating rats or foods/drinks contaminated with the excreta, urine or saliva of this rat. Person-to-person spread also occurs by inhalation or direct contact with blood, vomitus, urine, saliva, feaces, throat secretions or other body fluids from affected Lassa fever patients.[2, 12]

Lassa fever is an epidemic-prone disease with an alert threshold of a single suspected case and an epidemic threshold of a single confirmed case.[3] Outbreaks of the disease have been observed in Nigeria, Liberia, Sierra Leone, Guinea and the Central African Republic, but it is believed that human infections also exist in Democratic Republic of the Congo, Mali and Senegal. The infection is endemic in West African countries and causes 300-500,000 cases annually with about 5,000 deaths.[4,5]

Humans of all age groups are at risk of Lassa virus. Persons at greater risk are those in areas of poor sanitation and health workers who do not maintain standard safety precautions when managing patients with Lassa fever. Eighty percent of cases of the disease are asymptomatic; the remaining cases take a complicated course. The fever accounts for up to one-third of deaths in hospitals within the affected regions and 10 to 16% of total cases.[2] After an incubation period of 6-21 days, an acute illness with multi-organ involvement develops. Symptoms include fever, general body weakness, headache, sore throat, pain behind the breast bone, nausea, vomiting, diarrhea and red spots. In severe cases, it may progress to facial swelling, conjunctivitis and bleeding from mouth, nose, vagina and gastrointestinal tract and then death.[5]

Infection Prevention and Control (IPC) is a set of precautionary activities instituted to ensure cross infection or hospital-associated infection is eliminated in the health care facilities and enhance the wellbeing and safety of patients, staff, visitors. This quality standard covers preventing and controlling infection in individuals receiving care in healthcare settings. It includes preventing healthcare-associated infections that develop because of treatment or from being in a healthcare setting. Healthcare-associated infection (HCAI) are infections among patients in hospital setting that become manifest only after 48hrs of hospital stay, which are caused by pathogens acquired in healthcare settings.[7] Healthcare-associated Infection (HCAI) is a major cause of death and increased morbidity in hospitalized patients. Infection prevention and control is required to prevent the transmission of communicable diseases in all health care settings.

Reports of nosocomial transmission of LF among Nigerian HCW are gradually becoming a cause of concern. These are usually due to the absence of IPC measures or partial observance and use of same.[8] Lassa fever spread in healthcare settings can be prevented through barrier nursing of suspected and confirmed cases in an isolation area. Additionally, HCWs need to ensure they apply universal IPC measures including periodic handwashing practices as well as correct and consistent use of body personal protective wears.[9]

On the 14th January 2018, the Nigeria Centre for Disease Control (NCDC) got a report of healthcare workers (HCWs) who contracted Lassa fever following an ear, nose and throat (ENT) surgical procedure on a patient at the Federal Teaching Hospital, Abakaliki (FETHA). Among the affected HCWs, three had died and the others were on admission at the Lassa fever Research Institute, Irrua, Edo State, and Virology Center Ebonyi State for expert management. On 15th January 2018, the NCDC deployed a team comprising the Head, Health Emergency and Response of the agency as team lead assisted by graduates and residents of the Nigeria Field Epidemiology and Laboratory Training Programme to assist the Ebonyi State government in the outbreak investigation and response. As part of response activities to investigate the outbreak, we set out to assess the available facilities for and practice of infection prevention and control by health care workers in the hospital.

Methods

Study Design, Site and Sampling

We conducted a descriptive cross-sectional study among healthcare workers in a tertiary hospital designated for Lassa fever treatment. Federal Teaching Hospital, Abakaliki, is a 602-bedded hospital located in Abakaliki Local Government Area of Ebonyi State. The facility has over 4,000 staff comprising over 200 consultants in various specialties distributed across different departments. The Lassa fever treatment unit is a 27-bed facility with an isolation section dedicated for treatment of Lassa fever cases and laboratory section for Lassa fever diagnosis

Using a systematic sampling technique, we selected 135 HCWs after stratifying the health workers by their cadre. The HCWs were stratified into core HCWs and others. We classified doctors, nurses, and medical laboratory scientists as Core HCWs while others including support staff in the hospital were classified as non-core HCWs. The sample size was allocated to each cadre proportionately. The list of staff in each cadre was drawn, and the sampling interval was estimated for each cadre and used to systematically sample the required number. We assessed healthcare workers' knowledge on Lassa fever and their IPC practices using a self-administered, structured questionnaire as part of the outbreak response. We purposively sampled service delivery points to access availability of basic IPC equipment using a checklist.

Data Management

Data were analyzed with Epi-Info Statistical Software version 7.2 and summarized in proportions, tables and charts. There were ten questions that assessed knowledge of IPC. There were 18 and 10 questions each for knowledge of LF epidemiology and clinical features of LF, respectively. Each correct question attracted one mark and a wrong answer received no mark. Respondents were classified as having good knowledge if they scored ≥75% of the total scores, fair: 50-74% and poor: <50%. We examined the relationship between having good knowledge and certain sociodemographic characteristics using chi-square test. The scores were dichotomized for this analysis (fair and poor were merged together as poor). We also estimated the 95% confidence interval around the prevalence odds ratio. To

eliminate the possible effects of confounders, we modelled the factors in a logistic regression model.

Ethical considerations

The study was conducted in response to a national emergency following an outbreak of Lassa fever. Nigeria Centre for Disease Control (NCDC) gave clearance and official letter of co-operation to the Ebonyi State Ministry of Health and the Management of FETHA. All participants were duly informed of the objectives of the study and oral consent obtained. Participants were free to completely refuse or reject to be a part of the study. Confidentiality was maintained throughout the study as respondents' names were not recorded.

Results

A total of 135 HCWs were sampled, with a mean age of 37.6 ± 7.6 years. There were 75 (55.6%) females. The mean number of years of professional practice was 10.9 ± 7.5 years. Most (40.0%) of the respondents belong to the age group 30-39 years while about 28.9% of the HCWs have had 6-10 years of professional practice (Table I). Nurses and midwives constituted 43% of the respondents (Figure I). Among the respondents, 71.9% had good knowledge of IPC precautionary measures, 58.5% had good knowledge of LF epidemiology, and 37.8% had good knowledge of LF clinical features (Table II). None of the factors assessed in this study were significantly associated with knowledge of IPC precautionary measures (Table III). Being a core health care worker (Nurses, Doctors, Medical Laboratory Scientists) (OR = 3.39; CI = 1.38 - 8.32) was significantly associated with having good knowledge of LF epidemiology (Table IV). The majority of healthcare workers wash their hands both before and after contact with patients. However, about 25% of HCWs interviewed still do not wash their hands after patient contact (Figure II).

More than 50% of persons interviewed claimed that gloves are sometimes available in their units, while face masks are always available to only 28% of the HCWs interviewed (Table V). Hand cleansing materials are not always available to HCWs at service delivery points as shown in Table VI. Running water is only sometimes available in about 64.2%, while about 43% of the sites assessed never have soap. Hospital wards, where patients are admitted and nursed, accounted for about 46% of the sites assessed in FETHA for facility assessment as shown in Table VII. Most (77.3%) of the sites assessed had liquid soap, while about 55% had running water from improvised tap for handwashing. However, running tap water into a sink was only present in about 37% of the sites. None of the sites assessed had a colour-coded waste bin.

Table I. Socio-demographic characteristics of respondents

Variable	Frequency	Percentage (%)
Age (years)		
<30	20	14.8
30-39	54	40.0
40-49	40	29.6
≥ 50	10	7.4
Missing	11	8.2
Gender		
Female	75	55.6
Male	60	44.4
Years of Experience		
1-5	35	25.9
6-10	39	28.9
11-15	27	20.0
16-20	21	15.6
21-25	3	2.2
26-30	5	3.7
> 30	2	1.5
Missing	3	2.2

Table II. Respondents knowledge about precautionary Infection Prevention and Control measures, Lassa fever epidemiology and clinical features at FETHA, Abakaliki, 2018

Variable	**Knowledge Status**			
	Good (%)	Fair (%)	Poor (%)	**Mean score**
IPC preparedness	97 (71.9)	38 (28.1)	-	7.9 ± 1.1
LF epidemiology	79 (58.5)	47 (34.8)	9 (6.7)	13.5 ± 3.1
LF clinical features	51 (37.8)	68 (50.4)	16 (11.9)	10.5 ± 2.3

Figure I. Distribution of Healthcare Workers Assessed at Federal Teaching Hospital, Abakaliki, January, 2018

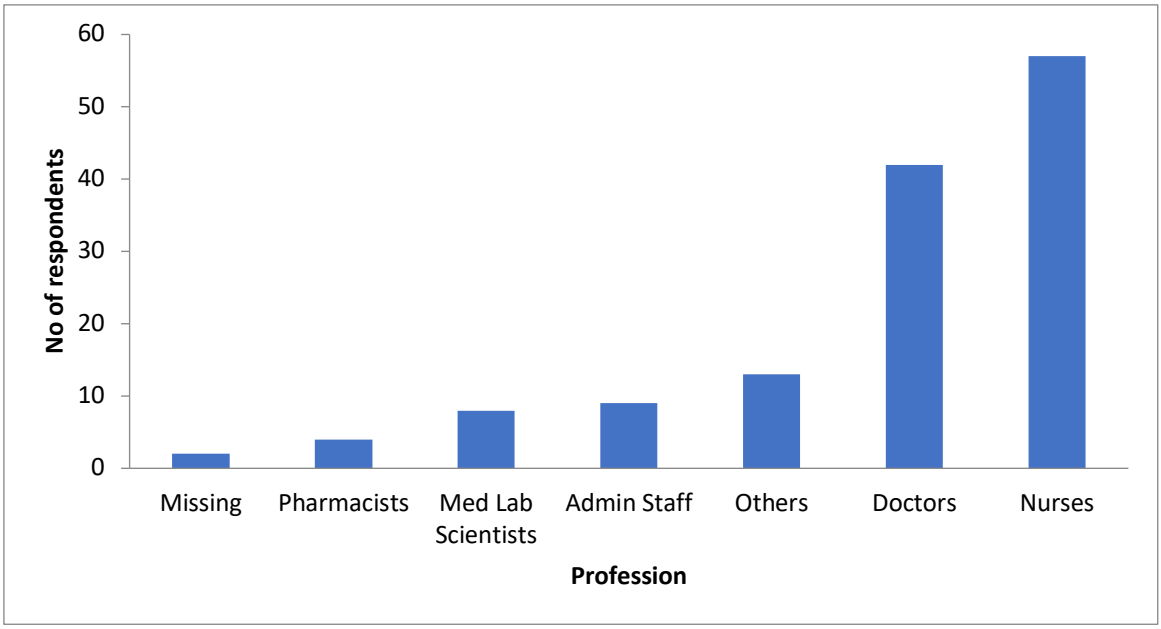

Table III. Factors associated with knowledge of infection, prevention and control precautionary measures among respondents in Federal Teaching Hospital, Abakaliki, 2018

Variables	Knowledge score		OR (95% CI)	p-value
	Good (%)	Insufficient (%)		
Age (yrs)				
≤40	64 (73.6)	23 (26.4)	1.26 (0.58-2.74)	0.552
>40	33 (68.8)	15 (31.2)		
Gender				
Male	51 (73.9)	18 (26.1)	1.23 (0.58-2.61)	0.586
Female	46 (69.7)	20 (30.3)		
Profession				
Core HCWs	82 (73.9)	29 (26.1)	1.70 (0.67-4.23)	0.261
Others	15 (62.5)	9 (37.5)		
Previous Lf Outbreak Experience				
Yes	82 (71.3)	33 (28.7)	0.83 (0.28-2.46)	0.734
No	15 (75.0)	5 (25.0)		
Duration of employment (yrs)				
≥10	43 (69.4)	19 (30.6)	0.78 (0.37-1.65)	0.520
<10	55 (74.3)	19 (25.7)		

Table IV. Factors Associated with Good Knowledge of Lassa fever Epidemiology among respondents in Federal Teaching Hospital, Abakaliki, 2018

Variables		Knowledge score		OR (CI)	p-value
		Good (%)	Poor (%)		
Age (yrs)	≤40	48 (55.2)	39 (44.8)		
	>40	31 (64.6)	17 (35.4)	0.67 (0.33-1.39)	0.288
Sex	Male	40 (58.0)	29 (42.0)		
	Female	39 (59.1)	27 (40.9)	0.95 (0.48-1.89)	0.895
Profession	Core HCWs	70 (64.2)	39 (35.8)		
	Others	9 (34.6)	17 (65.4)	3.39 (1.38-8.32)	0.0059*
Previous Lf Outbreak Experience	Yes	65 (56.5)	50 (43.5)		
	No	14 (70.0)	6 (30.0)	0.56 (0.19-1.55)	0.258
Duration of employment (yrs)	≥10	34 (55.7)	27 (44.3)		
	<10	45 (60.8)	29 (39.2)	0.6 (0.41-1.61)	0.551

Figure II. Hand Washing Practices among healthcare workers at Federal Teaching Hospital Abakaliki, 2018

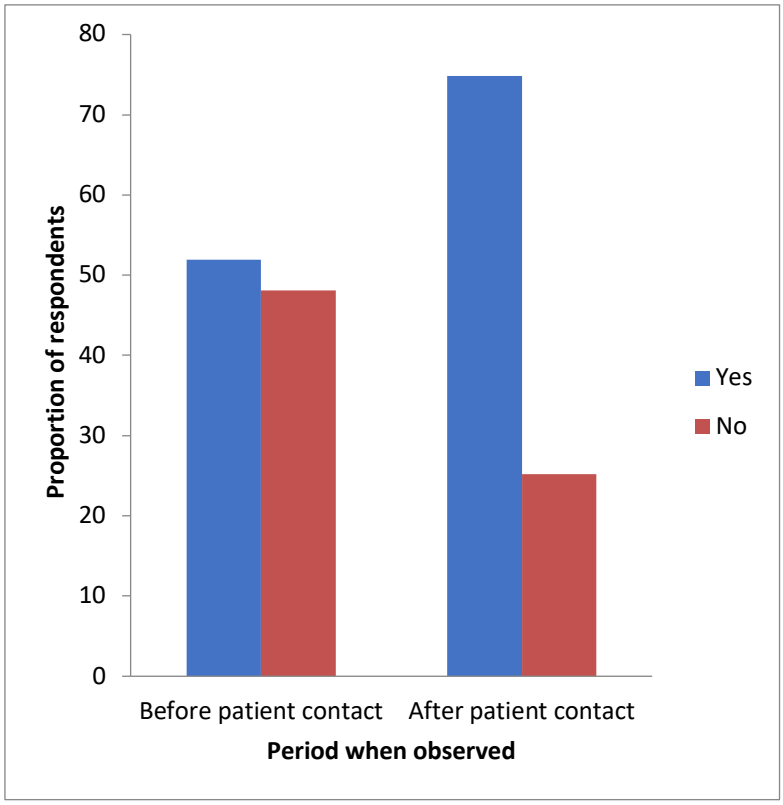

Table V. Availability of personal protective equipment at service delivery points and hand cleansing materials to healthcare workers

Variables	**Frequency (%)**		
PPEs	*Always*	*Sometimes*	*Never*
Hand Gloves	57 (42.5)	71 (53.0)	6 (4.5)
Face mask	37 (28.0)	82 (62.1)	13 (9.9)
Full body PPE	7 (5.2)	38 (28.4)	89 (66.4)
Running water	29 (21.6)	86 (64.2)	19 (14.2)
Soap	13 (9.9)	62 (47.0)	57 (43.1)
Hand Sanitizer	12 (9.0)	86 (64.7)	35 (26.3)

Table VI. Service Delivery Points assessed in Federal Teaching Hospital Abakaliki for Facility Infection Prevention and Control, 2018

Variable	**Frequency**	**Proportion**
Site		
Clinics	5	22.7
Wards	10	45.5
Other Service points	7	31.8
Department		
Accident and Emergency	2	9.1
Medical Laboratory	4	18.2
Medical	3	13.6
Obstetrics and Gynaecology	6	27.3
Paediatrics	4	18.2
Surgery	2	9.1
Pharmacy	1	4.6

Table VII. Findings from Facility Assessment for Infection Prevention and Control at Federal Teaching Hospital, Abakaliki, 2018

	Frequency (%)		
IPC Variables	**Yes**	**No**	**Not Applicable**
Holden area in Unit	1 (4.6)	20 (90.8)	1 (4.6)
Changing Room	7 (31.8)	14 (63.6)	1 (4.6)
Liquid Soap	17 (77.3)	5 (22.7)	-
Running Tap-water into sink	8 (36.6)	14 (63.6)	-
Running water from improvised tap (e.g. Ebola bucket)	12 (54.6)	9 (40.8)	1 (4.6)
Sharp box container	20 (90.9)	2 (9.1)	-
Colour-coded Waste Bin	-	22 (100.0)	-
0.05% Chlorine Solution	4 (18.2)	17 (77.2)	1 (4.6)
0.1% Chlorine Solution	5 (22.7)	16 (72.7)	1 (4.6)
Heavy duty gloves	2 (9.1)	20 (90.9)	-
Apron	6 (27.3)	15 (68.1)	1 (4.6)
Boots	3 (13.6)	18 (81.8)	1 (4.6)

Discussion

This study enabled us to assess the infection prevention and control status among healthcare workers and facility preparedness at Federal Teaching Hospital, Abakaliki, a Lassa fever treatment centre in South-eastern Nigeria. This assessment was key to designing a strategy for enhancing the existing IPC program in the facility. From the assessment, a good percentage (71.9%) of hospital staff interviewed had good knowledge of IPC precautionary measures. This finding is low when compared with findings from India and Ethiopia which reported 84.2% and 95.2%, respectively.[6,7] It is however slightly higher when compared with another study ,which reported 69.0% good knowledge on infection control among HCW.[9] These observed differences may be due to study setting, sample size, professional distribution of study participants and previous participation in training programmes.

The average of respondents' knowledge of LF epidemiology and LF clinical features was less than 50%. This finding is lower than the findings in a similar study in Southwestern Nigeria where a cumulative average of 69.2% was reported.[4] This level of awareness was probably due to setting of the study, years of professional practice as well as previous knowledge and training about Lassa fever.

There exists a central incinerator in the hospital, and most of the units had sharps boxes. However, none of the units in the hospital had colour-coded waste bins. Therefore, wastes were not being segregated at service delivery points in the facility. This observance of good use of sharp boxes and poor waste segregation is similar to a study in South Africa which reported 39% inappropriate segregation of clinical and non-clinical wastes.[9]

With the exception of handwashing after attending to patients, the use of other PPEs among HCWs was low. Less than 60% and <40% of HCWs interviewed had good knowledge of LF epidemiology and LF clinical features, respectively. Considering the number of outbreaks with HCWs being vulnerable in Ebonyi State, these knowledge levels were considered low in such community. We found in this study that a good number of respondents have had training on IPC prior to the assessment even though the national IPC guidelines were not available in the facility. Our finding is much higher than the values reported in Ethiopia and Ecuador which reported 17.8% and 35.9%, respectively, as the proportion of HCW with previous training on infection prevention. [6,10]

The facility assessment showed there are infrastructure gaps in the hospital. There were no holding areas for triaging suspected cases in almost all the units in the facility. Also, there were few supplies of PPEs and improper waste management logistics. It is worth noting that total facility score for IPC assessment in FETHA was below average. Our finding is below 54.8%, as reported in a study conducted in Western region of Saudi Arabia.[11] This finding may not be far-fetched from the fact that FETHA had just started full management of LF cases in the newly constructed virology centre in the hospital.

Study Limitations

This study is institution-based and was done by an outbreak response team to guide response activities. Hence, generalization of the findings needs careful consideration.

Conclusion

In conclusion, our study revealed that there were gaps in the practice and infrastructure for infection prevention and control in FETHA. These are a threat to IPC standards and may cause healthcare workers, caregivers and even patients to be exposed to nosocomial infection. Findings from the assessment were presented to the IPC committee of the facility with recommended areas of improvement. Our findings also informed on-the-job training and mentorship and subsequently, we introduced the new national IPC guidelines to health care workers in the facility.

We recommended improved IPC and waste management systems in FETHA, viz; Increased awareness among all health workers, immediate procurement and distribution of colour-coded waste bins in all departments to enhance effective waste separation and better waste management. We also promoted continuous placement of handwashing buckets with chlorine solutions at strategic positions in the facility.

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Competing Interests

The authors have no conflict of interest to declare.

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