Kanem J Med Sci 2024; 18(1): 39-49
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ISSN 2006-4772
https://doi.org/10.36020/kjms.2024.1801.006

Original Article

Frontline Insights: An assessment of Knowledge, Attitude, Infection prevention, and control practices regarding Lassa fever among healthcare workers in Hospitals in Maiduguri, Borno State

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Abstract

Background: Lassa fever is a zoonotic, acute viral haemorrhagic fever that has accounted for the deaths of healthcare workers since 1969. During the 2018 and 2019 reported outbreaks in Nigeria, clusters of nosocomial infections were reported among health workers. They are especially at risk when adherence to infection control practices is inadequate. **Objective:** This study assessed the knowledge, attitude, and infection prevention control practices among the different cadres of healthcare workers in secondary and tertiary Hospitals in Maiduguri, Borno state. **Methodology:** A descriptive cross-sectional study using an interviewer-administered questionnaire was used. A two-stage sampling method was used to select 334 respondents by cadre and type of Hospital. The data collected were analysed using SPSS version 20. **Results:** Of the 334 respondents, the mean age was 36±11 years with 232(69.5%) being females, 205 (61.4%) Muslims, and 233(69.7%) nurses with 208 (62.3%) having <10 years of working experience. Overall, slightly below half had a good knowledge (43.4%), a good attitude was high (87.3%) and two-third had good IPC practices (61.3%). The levels of knowledge were significantly higher among doctors (χ^2=38.44;p=001) compared to other cadres in tertiary institutions (χ^2=9.70;p=.007), while prevention practices were significantly higher among medical laboratory scientists(χ^2=13.68;p=.001) in secondary institutions (χ^2=6.04;p=0.048). **Conclusion:** Health workers in secondary and tertiary Hospitals in Maiduguri, Borno state had poor knowledge, good attitude, and infection prevention practices towards Lassa fever. Healthcare institutions need to provide regular training courses and enforce strict adherence to infection prevention control practices through functional IPC committees.

Keywords: *Health workers, Infection prevention, Knowledge, Lassa fever, Practice*

Introduction

Lassa virus is a single-stranded RNA arenavirus, the causative agent of Lassa fever, an acute zoonotic viral haemorrhagic fever. This virus is predominantly transmitted by the multimammate rat (Mastomys natalensis). The first case was reported in 1969 in Lassa town, the southern part of Borno State, North-eastern Nigeria. Lassa fever's endemicity extends to various African countries, including Benin, Ghana, Nigeria, Guinea, Liberia, Mali, Sierra Leone and Togo. The disease affects around 100,000 to 300,000 persons leading to about 10-16% of hospital admission annually and causing approximately 5,000 deaths in West Africa. Outbreaks of the disease affect all ages and genders, with a notably seasonal clustering around the late rainy season and dry season.4

Human transmission occurs through direct or indirect contact with inhalation of tiny particles of contaminated excretions or ingestion of contaminated food by infected Mastomys rats. Person-to-person transmission may occur after contact with an infected person's blood, body fluids, or tissues. It is also the main mode of transmission of infection to health care workers, posing a substantial risk among those caring for Lassa fever patients, especially when Personal Protective Equipment (PPE) use is inconsistent or unavailable. Spread of the virus in

Cite this article as: Zara W. Wudiri, Fatima B. Lawan, John Bimba, Aisha Abulfathi, Shuaibu J. Yahaya, Babatunji A. Omotara; Frontline Insights: An assessment of Knowledge, Attitude, Infection prevention, and control practices regarding Lassa fever among healthcare workers in Hospitals in Maiduguri, Borno State. Kanem J Med Sci 2024; 18(1): 39-38

Received: 15th May 2023 Accepted: 11th January 2024 Published: 30th April 2024

health facilities may also occur through contaminated medical equipment.7,9,11.

The incubation period ranges from 3-21 days, with signs and symptoms at the early stage similar to other febrile illnesses, such as flu and malaria, which are also endemic in West Africa. Diagnosis relies on a high index of suspicion and laboratory confirmation using Reverse Transcription Polymerase Chain Reaction (PCR). Ribavirin stands as the preferred drug of choice, particularly when administered early in the disease course, significantly improving outcomes.2

Lassa fever is a serious threat, with a case fatality rate (CFR) of about 1%. However, among hospitalized patients with the severe form of the disease, it may surge to as high as 15%. In the third trimester of pregnancy, 80% of maternal death and or foetal loss may occur.12 Hospitalized patients, especially those with severe forms, pose a considerable risk to health care workers(HCWs) with a CFR of 31.6%. For the past fifty years in Nigeria, 3897 persons were infected with Lassa fever with 33.8% CFR and 5.4% CFR among health care workers. As of August 2022, there are about 880 confirmed cases, with 6.1% involving healthcare workers and 18.8% deaths in 25 states out of the 36 states in Nigeria. The Nigeria Centre for Disease Control (NCDC) reported that 14% of all confirmed cases were in Northeastern Nigeria.13 Borno state recorded an outbreak in March 2017 after almost five decades of being disease-free. 16

Infection, Prevention, and Control (IPC) assumes a critical role in mitigating Lassa fever outbreaks.17 Therefore, nosocomial infection may be prevented by proper infection, prevention and control IPC measures, and careful management of suspected or confirmed Lassa fever patients which is the main mode of transmission to health care workers.

Research in various regions of Nigeria has highlighted key factors contributing to hospital-acquired Lassa fever infections. A multicenter study in Northern Nigeria identified poor knowledge of the disease and inadequate infection prevention and control (IPC) practices among healthcare personnel as significant contributors.18 These findings are consistent with studies conducted in Enugu.19 However, facility-based variations in knowledge levels were observed. In tertiary institutions in Ondo and Uyo, 20,21 healthcare workers demonstrated good knowledge of Lassa fever. In contrast, nurses and community health workers in primary healthcare facilities exhibited poor knowledge and IPC practices.22 Additionally, intra-cadre variations were noted among doctors, nurses, and other healthcare worker categories.20-22

Although similar studies have been conducted in other regions of the country, however, there are limited studies, focusing on the cadre of the HCW and type of facility regarding knowledge, attitude, and IPC of Lassa fever in Borno State specifically. Hence the study aimed to assess the knowledge, attitude, and Infection Prevention Control practices among the different cadre of healthcare workers in hospitals in Maiduguri, Borno state. The findings from this research could potentially contribute to improved prevention and control strategies for Lassa fever in the region, offering hope in the face of this persistent threat.

Materials and Methods

Study area

Borno State is situated in North-Eastern Nigeria and shares a border with neighbouring countries of Niger Republic, Chad, and Cameroun. Its capital is Maiduguri and consists of different ethnic groups with Kanuri being the dominant ethnic group.23 It has a population of 4,171,104 according to the 2006 census.24 With an annual growth rate of 3.2%, the population is estimated at 6,306,709 in 2022. Maiduguri is along a longitude of 11▫ 50'N and a latitude of 13▫ 09'E. The metropolis is made up of two contiguous LGAs, Maiduguri and Jere.

The study was carried out in secondary and tertiary hospitals in Maiduguri. Jere LGA has seven public secondary health facilities and Maiduguri has four public secondary health facilities. One tertiary facility the University of Maiduguri Teaching Hospital exists in Jere. The Federal neuropsychiatric hospital is situated in Maiduguri LGA.

Study Population

The study population comprised healthcare workers in public secondary and tertiary facilities in Maiduguri.

Inclusion criteria

1. Health workers in secondary and tertiary public facilities
2. Health workers who have worked for more than one year in the facility.
3. Health workers include only doctors, nurses, and Medical Laboratory Scientists (routinely in contact with specimens from Patients).

Exclusion criteria

1. Health workers in the isolation centre of any of the selected facilities.
2. Health workers in temporary employment

Study design

The study was a descriptive cross-sectional study on the knowledge, attitude, infection prevention, and control practices regarding Lassa fever among HCWs in secondary and tertiary health care centres in Maiduguri.

Sample size estimation and Sampling.
The sample size was estimated using the Kish Leslie formula.25 The minimum sample size (n) of 384.16 was calculated using a prevalence (p) of 50% and a precision of 0.05. This was corrected for our sample population of 2530 since the population size is <10000 using Cochran's formula.26 The minimum sample size calculated was (n)=334. A two-stage sampling technique was used. In the first stage, a simple random sampling method was used to select tertiary and secondary facilities. A ballot was made to select four public hospitals in Borno State, Nigeria: The University of Maiduguri Teaching Hospital (UMTH) a tertiary hospital, State Specialist Hospital Maiduguri (SSHM), Muhammed Shuwa Memorial Hospital (MSMH) and Umaru Shehu Ultra-modern Hospital (USUMH) all secondary hospitals. In the second stage, a stratified sampling method was then used to select respondents in each facility based on cadre. Data was collected based on the proportions of health workers in each facility and by cadre.

Data collection
Data was collected using a pre-tested, semi-structured interviewer-administered questionnaire. The questionnaire consisted of four sections. Section One: Socio-demographic characteristics; Section Two: Knowledge on awareness, source of knowledge, Lassa fever aetiology, clinical symptoms, mode of transmission, treatment, and prevention; Section Three: attitude of HCW towards IPC regarding Lassa fever; Section Four: IPC practices of HCW.

Data Analysis
Data was analyzed using the Statistical Package for Social Sciences (SPSS) 20 version. Data was summarized using descriptive statistics; Sociodemographic variables were presented using frequency counts and percentages, while Pearson's Chi-square was used to test associations between knowledge, attitude, and IPC practice scores and types of facilities and health workers cadre. A p-value less than 0.05 was taken as statistically significant. Each correct response on knowledge was scored one and wrong answers scored zero. Attitude was graded by the 5-point Likert scale. Positive responses were scored 1 point. While negative and neutral responses were scored 0 points. IPC Practices of HCW were also scored based on a 3-point scale. Those that answered “always” scored 1 point, while responses of “occasionally” and “never” were scored 0 points. The percentage scores were calculated for knowledge, attitude, and practice and were categorized as 100-75%, 74- 50%, and less than 50% as good, fair, and poor respectively. 22

Ethical Considerations
Ethical approval was obtained from the Research and Ethics Committee of the University of Maiduguri Teaching Hospital. Written informed consent was acquired from all study participants. They were briefed that their participation was entirely voluntary, emphasizing the absence of any adverse consequences for declining to participate. Furthermore, participants were provided with an assurance of confidentiality measures in place to safeguard all information gathered during the study.

Results
The response rate was 334(100 %), with a third, 227(68%) of the respondents falling within the age group of 20-39 years. The mean age was 36± 11 years. Slightly above two-third of the respondents were females 232(69.5%). About two-thirds were Muslims 205 (61.4%) and almost three-quarters 250 (74.9%) of them worked in tertiary facilities. Nurses comprised 233 (69.7%) of health care workers interviewed, followed by doctors 57 (17.1%), and Medical Laboratory sciences 44(13.2%) as shown in Table 1.

All the respondents were aware of Lassa fever, with the main source of information being the hospital (47%), followed by the school (40%), and the least source of information being the media (13%). Table 2 shows a majority, 288(86.2%) of respondents identified a virus as the cause of Lassa fever; while 42(12.6%) erroneously considered the disease to be caused by a bacterium. Rodents were the vector most mentioned by 305(91.3%) respondents. Eating infected food and bush meat were mentioned as the commonest ways of contracting the disease. Slightly more than half of the health workers 168 (50.3%) correctly gave an incubation period of 3-21 days. Fever 300(89.9%) and vomiting 253(72.7%) were identified as the commonest symptoms of the disease, with 308(92.2%) stating handwashing to be a preventive measure against Lassa fever.

Table 3 reveals that the healthcare workers' attitudes towards Lassa fever prevention, were especially high proportions with positive attitudes regarding the impact training of HCW on IPC regarding Lassa Fever 316(94.6%). High proportions also had positive attitudes toward the use of rodent control measures to limit the spread of Lassa fever 310(92.8%).

Table 4 shows the IPC practices of workers. A high proportion appropriately disposed of sharps using safety boxes 260 (77.8%) and disposed of refuse properly (73.3%). Approximately two-thirds 217(64.9%) adhered to standard precautions before and after contact with patients, while 209(62.5%) ensured disinfection of the patient's environment before and after admission. However, less than half of the health workers consistently used personal protective equipment (PPE) with 161(48.2%) using gloves, 153(45.8%) wearing gloves and only 135(40.7%) using masks and eye

protection during procedures that generate splashes.

Table 5 reveals the grading scores of the level of knowledge, attitude, and IPC practices among health workers. Good knowledge was found in less than half of the respondents 145(43.4%), while the level of attitude towards infection, prevention, and control was high among 297 (87.4%). About two- third of the respondents had a good level of IPC practices(61.4%). Table 6 shows that cadres of HCWs and type of health facility were significantly associated with the knowledge of Lassa fever, (χ^2=38.44, p<0.001; χ^2=9.70; p=0.007) respectively. Doctors in tertiary hospitals exhibited the highest level of knowledge. Conversely, there was no significant association between the cadre of HCW, type of health facility, and attitude regarding Lassa fever (χ^2=8.41, P=0.077; χ^2=.577 p=0.749) respectively, however, nurses in secondary facilities had the highest attitude scores. A statistically significant association was observed between the cadre of HCW, type of facility, and IPC practices regarding Lassa fever IPC practices (χ^2= 13.68, p=0.001; χ^2=6.04, p=0.048) respectively. Medical Laboratory Scientists in secondary facilities had significantly the highest IPC scores.

Table 1: Socio-demographic characteristics of Health Care Workers in Hospitals in Maiduguri, Borno State

Variable	Frequency (n=334)	Percentage (%)
Age (years)		
20-29	116	34.7
30-39	111	33.3
40-49	43	12.8
50 and above	64	19.2
Gender		
Male	102	30.5
Female	232	69.5
Religion		
Islam	205	61.4
Christianity	129	38.6
Cadre		
Doctor	57	17.1
Nurse	233	69.7
Medical Lab Science	44	13.2
Type of Facility		
Secondary	84	25.1
Tertiary	250	74.9
Working experience (years)		
?10	208	62.3
10-19	53	15.8
20-29	47	14.1
? 30	26	7.8

Table 2: Knowledge of Causes, Symptoms, Treatment, and Prevention Of Lassa Fever among Healthcare Workers In Hospitals In Maiduguri, Borno State.

Variable	Frequency(n=334)	Percentage (%)
Cause of Lassa		
Virus	288	86.2
Bacteria	42	12.6
Don't know	4	1.2
Vector of Lassa Fever		
Insects	23	6.9
Rodent	305	91.3
Don't know	6	1.8
Incubation Period (days)		
5-10	136	40.7
3-21	168	50.3
Don't know	30	9.0
****Signs and symptoms***		
Fever	300	89.9
Vomiting	253	72.7
Myalgia	189	56.6
Palpitation	184	55.1
Bleeding	291	57.1
Cough	214	64.1
Dizziness	246	73.7
****Mode of contracting the disease***		
Contact with an infected person	266	86.2
Eating bush meat	288	71.9
Eating contaminated food	240	33.8
Respiratory Aerosol	113	22.3
Drug of choice for treatment of Lassa fever		
Amantadine	30	8.9
Ribavirin	211	63.2
Don't know	93	27.9
****Prevention measures for Lassa fever***		
Hand washing	308	92.2
Use of gloves	287	85.9
Face mask	275	79.9
Good food storage	298	89.2
Good cough etiquettes	134	40.1
Avoiding eating bush meats	306	91.6

*Multiple responses allowed

Table 3: Attitudes of Health Workers regarding Lassa fever in Hospitals in Maiduguri, Borno state

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Lassa fever is a preventable disease with a positive health-seeking behaviour	97(29)	198(59.3)	21(6.3)	16(4.8)	2(0.6)
Hospital-associated LF is preventable through the practice of IPC techniques	82(24.6)	224(67.1)	16(4.8)	8(2.4)	4(2.1)
Training of HCW on IPC regarding LF will improve the IPC practices	85(25.4)	231(69.2)	12(3.6)	3(0.9)	3(0.9)
HCWs have a role to play in the prevention and spread of LF in the community	58(17.4)	226(67.7)	28(8.4)	18(5.4)	4(1.2)
IPC practice at all-time irrespective of patient status is ideal in health facilities	73(21.9)	180(53.9)	64(19.1)	14(4.2)	3(0.9)
Patient education regarding LF can mitigate the spread of LF in the community	60(18)	234(70)	28(8.4)	8(2.4)	4(1.2)
Community education regarding LF can mitigate the spread of LF in the community	67(20.1)	213(63.8)	42(12.6)	10(2.9)	2(0.6)
Food and environmental hygiene can prevent the spread of LF	94(28.1)	210(62.9)	14(4.2)	12(3.6)	2(0.6)
Rodent control measures can limit the spread of LF	101(30.2)	209(62.6)	16(4.8)	6(1.8)	4(1.2)
Early identification/treatment can improve outcomes in case management of LF	55(16.5)	198(59.3)	59(17.7)	18(5.4)	6(1.8)
HCW effort alone can prevent LF in the community	59(17.7)	133(39.8)	31(9.3)	97(29)	12(3.6)
Government efforts can prevent LF in the community	40(11.9)	219(65.6)	46(14.8)	27(8.1)	4(1.2)
The availability of a vaccine can lower the burden of the disease	73(21.9)	199(59.6)	42(12.6)	14(4.2)	6(1.8)

Table 4: IPC practices of healthcare workers regarding Lassa Fever in Hospitals in Maiduguri, Borno State

Statements	Always	Occasionally	Never
How often do you use gloves	161(48.2)	161(48.2)	12(3.6)
How often do you wash your hands	238(71.2)	90(26.9)	6(1.9)
How often do you use gowns and boots	153(45.8)	164(49.0)	17(5.2)
How often do you dispose of sharps in a safety box	260(77.8)	66(19.7)	8(2.5)
How often do you use face mask and eye protection during procedures that generate splashes	136(40.7)	180(53.8)	18(5.5)
Have you been disposing of refuse items properly	245(73.3)	76(22.7)	13(3.9)
Have been taking standard precautions before/after contact with patients	217(64.9)	100(29.9)	17(5.2)
Do you ensure disinfection of patients' environment before and after admission	209(62.5)	92(27.5)	33(10.0)
Do you observe standard precautions while handling patient specimen	244(73.1)	77(23.1)	13(3.9)

Table 5: Overall Knowledge, Attitude, and IPC practice scores of Lassa fever among Health Care Workers regarding Lassa fever in Maiduguri, Borno State.

Variable	Good *n (%)*	Fair *n (%)*	Poor *n (%)*
Knowledge	145(43.4)	158(47.3)	31(9.3)
Attitude	297(87.4)	26(7.8)	16(4.8)
IPC Practices	205(61.4)	106(31.7)	23(6.9)

Table 6: Factors associated with Knowledge, attitude, and IPC scores of health workers in Maiduguri, Borno State.

Variable		Knowledge scores				
Cadre		**Good *n(%)***	**Fair *n(%)***	**Poor *n(%)***	χ^2	**p-value**
	Doctors	39(68.4)	11(19.3)	7(12.3)	38.44	.001*
	Nurses	101(43.3)	112(48.0)	20(8.7)		
	Medical Lab. Scientist	5(11.3)	35(79.6)	4(9.1)		
Facility type						
	Secondary	26(31.0)	52(61.9)	6(7.1)	9.70	.007*
	Tertiary	124(49.6)	107(42.8)	19(7.1)		
		Attitude Scores				
Cadre		**Good *n(%)***	**Fair *n(%)***	**Poor *n(%)***	χ^2	**p-value**
	Doctors	47(82.5)	6(10.5)	5(7.0)	8.41	.0775
	Nurses	211(90.6)	14(6.0)	8(3.4)		
	Medical Lab. Scientist	34(77.3)	6(13.6)	4(9.1)		
Facility type						
	Secondary	69(82.2)	8(9.5)	7(8.3)	0.57	.749
	Tertiary	201(80.4)	31(12.4)	18(7.2)		
		Practice Scores				
Cadre		**Good *n(%)***	**Fair *n(%)***	**Poor *n(%)***	χ^2	**p-value**
	Doctors	29(50.8)	23(40.3)	5(8.9))	13.68	.001*
	Nurses	145(62.2)	74(31.8)	14(6.0)		
	Medical Lab. Scientist	31(70.5)	9(20.5)	4(9.0)		
Facility type						
	Secondary	61(72.6)	19(22.6)	4(4.8)	6.04	.048*
	Tertiary	144(57.6)	90(36.0)	16(6.4)		

*Statistically significant

Discussion:

The resurgence of Lassa fever, a previously neglected tropical disease in Nigeria has become a significant public health challenge leading to morbidity and mortality, especially among health workers in recent times. Understanding the knowledge, attitude, and IPC practices of health workers is crucial in preventing human-to-human transmission in health facilities. The findings of our study showed that less than half of the health workers had a good knowledge score for Lassa virus disease. Although we found that the majority of them had good attitude scores only about two-thirds had good IPC practices.

Overall, less than half of the healthcare workers in this study had a good knowledge score of Lassa fever. Similarly, low levels of knowledge, prevention, and control practices were found in a multi-center study on Lassa fever in other parts of northern Nigeria and Enugu.[18,19] This is however in contrast with the findings of similar studies among health care workers in Ondo[20], Ebonyi[27], and Jos[28] with high levels of knowledge. The low level of good knowledge in our study may be due to regional variations in the endemicity of the disease. The studies in the southern region of the country had higher levels which may be due to higher prevalences of the disease with recurrent outbreaks. As a result of this, the health workers in these regions are more likely to have benefitted from awareness campaigns and targeted educational interventions on Lassa fever. It is therefore necessary to identify the specific knowledge gaps to provide adequate training.

The findings in our study also show that the knowledge of Lassa fever disease was significantly better among doctors than nurses and medical laboratory scientists (p=0.001)). There was a significant difference (p=0.007) in the knowledge among healthcare workers in the tertiary compared with secondary facilities, with the latter having half of the respondents with good knowledge scores compared with health workers in secondary health facilities. Other studies [17,27] have also alluded to doctors in tertiary institutions having better knowledge of Lassa fever. This may be because these studies were conducted in tertiary facilities which usually have doctors engaged in residency training programs. In a study in Ondo among workers in Public secondary and

primary health care facilities, the level of knowledge was higher among nurses than other cadres of health workers. However, the health workers in the study were made up of nurses, community health workers, and health assistants.[17] The notably higher level of knowledge by doctors in tertiary facilities highlights the impact of specialized training.

The majority of respondents had a fair knowledge of the epidemiological factors, such as the aetiology, clinical symptoms, mode of transmission, drug of choice for treatment, prevention, and control measures. This finding was corroborated in a study of a multi-disciplinary mix of healthcare workers in a referral treatment centre, where workers showed good knowledge of clinical symptoms, mode of transmission, and IPC measures of Lassa fever.[27] Also high scores were however reported by researchers in other studies.[17,19] Although good knowledge scores were reported on the aetiology, transmission, and IPC measures by respondents, they specifically had poor knowledge of treatment, hand hygiene, and sources of transmission of Lassa fever. [2]

A large proportion of doctors, nurses, and laboratory scientists in both secondary and tertiary facilities had good attitudes, with the nurses and health workers in secondary facilities having the best attitudes, although this was not statistically significant (p=0.775). This agrees with findings in studies in Ebonyi[27] and Jos[28] where they documented similarly high attitude scores among health workers in tertiary facilities. Likewise, high proportions of health workers in public and private facilities in Edo had high attitudes, with doctors, nurses, and medical laboratory workers showing particularly high scores.[22] However, dissimilar findings were seen in a teaching Hospital in Ondo[20] and Uyo. [21] The difference found in the Uyo study may be due to the inclusion of medical students, interns, and residents who are likely not to have had adequate experience in practice, hence the poor attitude. The preponderance of positive attitudes, particularly among nurses and health workers in secondary facilities, aligns with their frontline roles and continuous training, especially in the aftermath of the COVID-19 pandemic. This positive trend indicates a resilient healthcare workforce capable of adapting to emerging infectious disease threats.

An encouraging finding in this study was the self-reported adherence of two-thirds of respondents to IPC practices. A high proportion of health workers reported "always" adhering to specific elements of standard precautions especially; hand hygiene, disposal of sharps, and waste disposal but less than satisfactory practices were reported on the use of personal protective equipment such as the use of hand gloves, face masks, eye goggles, and boots. In a comparable study by Ukwenya et al[20] good IPC practices were reported among study respondents. Similarly good practices were reported by health workers in Ondo state during a Lassa fever outbreak.[17] It is interesting to note that compliance with the IPC practices is often high during and shortly after an outbreak of infectious disease, but when control is achieved with no further incidence the IPC practice levels return to pre-outbreak conditions.[29,30] However, many researchers observed poor IPC practices regarding Lassa fever across the country, including regions with high endemicity Edo,[22] Ondo,[19] Ebonyi.[27] Kaduna.[31] Also observed were the poorer IPC practices among workers in tertiary facilities the potential reasons may be a result of a combination of individual, systematic, and organisational factors such as insufficient training and education, inadequate supervision and monitoring, and high workload and staff burnout. The finding of good practices by medical laboratory scientists in secondary facilities reflects the strict adherence to biosafety protocol which may be an impact of focused training initiatives. These trainings on IPC have been carried out in the state by various health partners to strengthen the health system during earlier epidemics such as COVID, Cholera, and Lassa fever. The NCDC has also provided Lassa-specific training IPC during outbreaks.[32]

Notably, we however observed poor utilization of PPE. The availability and utilization of PPEs was a recurrent problem highlighted in several studies.[31,33] The non-utilization of PPEs may contribute to nosocomial transmission of the disease and may also increase the risk of community transmission. This finding highlights the need for a not only sustainable logistics system for PPEs in all health facilities in the country but also regular training and retraining on IPC to prevent nosocomial infections, especially during outbreaks of infectious diseases. Health facilities need to conduct regular audits of PPE stock levels, usage rates, and storage conditions. Also required is the establishment of a system for continuous assessment of PPE needs based on changes in the healthcare landscape and emerging infectious threats.

Conclusion

This study concludes that health workers in secondary and tertiary facilities in Maiduguri had poor knowledge, good attitudes, and IPC practices. Addressing knowledge gaps, reinforcing positive attitudes, and sustaining effective infection prevention control practices are essential components of strategies to be adopted by State and Federal healthcare managers. The Federal Ministry of Health and Borno State Ministry of Health should therefore ensure regular training of health care workers and strict enforcement of IPC practices through functional IPC committees to prevent nosocomial infections in health facilities and by extension community transmission.

Conflict of Interest
The authors declare no conflict of interest.

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