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Knowledge of Lassa Fever and Use of Personal Protective Equipment (PPE) Among Healthcare Workers in Sir Patrick Ibrahim Yakowa Memorial Hospital (SPIYMH) Kafanchan, Kaduna State

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Background: Lassa fever is an acute viral hemorrhagic disease of public health concern causing recurrent outbreaks that often involve healthcare providers. Effective hospital infection control limits the impact of this disease. Aim: The study assessed the knowledge of Lassa fever and the use of personal protective equipment (PPE) in infection prevention and control among healthcare workers in Sir Patrick Ibrahim Yakowa memorial hospital Kafanchan. Methods: A descriptive cross-sectional research design was adopted; the target population of the study was 185 healthcare workers and a sample size of 125 were selected using Krejcie and Morgan. Data was collected with the aid of questionnaires. The collected data were analyzed by the use of descriptive statistical tools such as Percentages and mean with the aid of Statistical Package for Social Sciences version 24.0. A constant mean of 2.5 was used to ascertain the acceptance of the respondents. Results: The findings revealed that the majority of the respondents had a good knowledge of Lassa fever having a grand mean score of 3.02 by agreeing with all the statements. Data representation based on infection prevention and control (IPC) measures in the workplace shows that respondents agree that they observe IPC measures while carrying out a procedure with a grand mean of 2.61. On the other hand, the availability of PPE in the workplace is inadequate with a grand mean score of 2.30. Conclusion: Despite the good knowledge of Lassa fever among healthcare workers, there is a need for the government and the ministry of health to ensure adequate provision of personal protective equipment in the workplace to safeguard the health of its staff.

Keywords: *Lassa fever, Personal Protective Equipment, Infection Prevention*

Introduction

Lassa fever is an acute viral haemorrhagic illness caused by an arenavirus, Lassa mammarenavirus, and is considered a high-consequence infectious disease. It is endemic in West Africa (Benin, Guinea, Liberia, Nigeria, Mali, Sierra Leone, and Togo). Neighbouring countries are also at risk, as the animal reservoir for the Lassa virus, the multimammate rat, of the genus Mastomys is widely distributed across West Africa (Usuwa, Akpa, Umeokonkwo, Umoke, and Oguanuo, 2020). At present, there are an estimated 300 000 to 500 000 cases of Lassa fever annually in West Africa, with an estimated 5–10 000 deaths. Less than 20% of the cases are attributed to human-to-human transmission,

mainly in healthcare settings (Usuwa, Akpa, Umeokonkwo, Umoke, and Oguanuo, 2020).

The pathogen was identified in 1969 when nurses became infected in Lassa, Nigeria.
The virus is present in rodent excreta (e.g. urine, saliva, and respiratory secretions). Infected rodents excrete the virus in urine for an extended period and peridomestic environments where food and non-food items are poorly stored can be contaminated. Rodents can invade houses in the dry season in search of food but are also hunted as sources of meat. Infection of the Lassa virus is thought to occur through the ingestion of contaminated items or during the preparation of infected rodents for consumption (Ighedosa, Odigie, Usifo, Asemota, and Asemota, 2016). Transmission is also possible following inhalation or contact with mucous membranes of dust contaminated with rodent excreta. Human-to-human transmission may occur when infected people are symptomatic, but this is rare compared to rodent-to-human transmission. However, Asuke, Agubamah, Ibrahim, and Ovosi (2020), added that Lassa virus transmission from human to human may occur in healthcare settings when the appropriate infection prevention and control practices are not strictly followed or in the period before the patient has been diagnosed as barrier nursing does not begin until after confirmation. There is a higher risk for people performing invasive procedures on and handling the bodies of Lassa fever patients in preparation for a funeral. Staff in maternity wards are also considered to be at high risk as the Lassa virus is a significant cause of abortions in West Africa and large quantities of the virus are present in the aborted foetus and the placenta (Infection Prevention and Control Manual, 2013). There is a risk of Lassa virus transmission through substances of human origin (SoHO) during the viraemic phase; however, no such transmissions have been documented. Data are lacking on the occurrence of viremia during the incubation period or after the resolution of symptoms. However, Lassa virus RNA can be detected in urine and semen for prolonged periods (Omeh, Achinge, Echekwube, 2017)

In a similar study on knowledge, attitude, and practice of Lassa fever virus among shop owners in 4 community markets in a military barracks in Kaduna State, Nigeria by Mbuk (2018), that mean knowledge score of Lassa fever was 11.5 out of 16. According to Sunday, Edgar, Mohammed, and Joseph, (2020) that all the respondents (100%) in their study affirmed that it was good to wash hands with soap and water as often as possible, avoid direct contact with dead rats, and undertakers should always wear protective clothing. Ejiyere *et al*, 2019, in their study on Knowledge, Attitude and Infection Prevention and Control Practices Regarding Lassa Fever among Healthcare Workers in Edo State, Nigeria said most health workers had a fair knowledge of and a good attitude, but poor IPC practices towards Lassa fever prevention and control.

The pattern of Lassa fever outbreaks in Nigeria over the years is worrisome and increasingly becoming more challenging with frequent and widening geographical spread. Lassa fever is endemic and fast becoming hyper-endemic in Nigeria. It affects the largest number of people, creating a geographical network of endemic foci encompassing a population of perhaps 180 million from Guinea to Nigeria (NCDC, 2018). Lassa fever presents signs and symptoms indistinguishable from those of febrile illnesses such as malaria and other viral haemorrhagic fevers such as Ebola. Frequent human exposure to the virus is therefore possible due to the human population explosion in the endemic area and therefore given opportunities for infection with this virus, and subsequently the disease (Olayiwola, and Bakarey, 2017). Clinical diagnosis of Lassa fever is difficult however it should be suspected in patients showing fever with temperature (≥ 38°C) not responding adequately to antimalarial and antibiotic treatments. Laboratory diagnosis by serological, cell culture, and molecular

techniques are reliable although very expensive. (Olayiwola and Bakarey, 2017).
There is currently no vaccine available for Lassa fever; hence prevention is focused on interrupting the chain of transmission. The Nigeria Centre for Disease Control (NCDC) recommends some measures the general public could take such as ensuring personal and environmental hygiene, practising frequent hand washing at all times, ensuring food items are stored in rat-proof containers to limit rodents to human interaction and early reporting of symptomatic cases to the treatment centre. Thus, the success of outbreak prevention and control is dependent on human behaviour, (Usuwa *et al*. 2020)

Lassa fever is endemic in parts of West Africa including SierraLeone**,** Liberia, Guinea, and Nigeria. However, other neighbouring countries are at risk also as the animal vector for Lassa fever multimammate rat (mastomysnatalensis) is distributed throughout the region. At present, the number of Lassa virus infections per year is estimated at 300 000 to 500 000 cases in West Africa with 5000 to 10000 deaths. Unfortunately, such estimates are crude because surveillance for the cases of the disease is not uniformly performed. (Factsheet, 2020, Usuwa *et al*., 2020).
Person-to-person transmission is common in healthcare settings (called nosocomial transmission) where proper personal protective equipment (PPE) is not available or not used. Lassa virus may be spread in contaminated medical equipment, such as reused needles, (WHO, 2018).

Nigeria, Africa's most populous nation with some 200 million people has five laboratories with the capability to diagnose Lassa fever. As of 24th January 2020, 195 confirmed cases and 29 deaths had been reported in 11 states according to NCD. (Aljazeera, 2020).

There have been several outbreaks of Lassa fever in various parts of Nigeria since it was first reported in 1969. The worst outbreak was reported in 2012 when 623 cases including 70 deaths were reported from 19 out of the 36 states. 3 doctors and 4 nurses were reported to be among the fatalities. Between August 2015 and 17 May 2016, the World health organization (WHO) was notified of 273 cases of Lassa fever from 23 states in Nigeria; these include 149 deaths of these, 10 were health care workers.

From 1st January to 9th February 2020, 472 laboratory-confirmed cases including 70 deaths (case fatality ratio=14.8%) in 26 out of 36 Nigerian states and the federal capital territory. Kaduna is one of the states with three reported cases. Fifteen confirmed cases have been reported among health care workers with one death among a confirmed case and one among a probable case (WHO, 2014). Seven doctors and five nurses have been quarantined at the Federal Medical Centre, Yola, Adamawa state following their contact with a patient diagnosed with Lassa fever, (Vanguard, 2020).

The Kaduna State Commissioner for Health, Dr. Amina Baloni said that the state recorded a total of 11 suspected cases, out of which, eight were returned, seven were negative and one positive who died, while 38 people were followed up for contact. An active search is ongoing by the state to curb the spread of the disease. (Vanguard, 2020).
This study seeks to address the following research questions:
1. What is the level of knowledge of Lassa fever among health care workers in S.P.Y.M.H?
2. What IPC measures are available, and do they use them?
3. What types of PPE do they have in the facility?

Research Methods
Research Design
A descriptive cross-sectional survey design was adopted for this study, a structured questionnaire and a purposive sampling technique were used for the data collection. The questionnaire was validated by the team of researchers and presented to experts in the

field for corrections before administering it to the respondents. The target population for this study is all health care workers who care for the patients during the period of admission in the hospital, and the total number is 185 (Nurses 99, Doctors 11, laboratory scientist 21, and attendants 54). (See Table: 1 for the sampling technique). The data collected were analyzed using descriptive statistical tools such as percentages and mean with the aid of Statistical Package for Social Sciences (SPSS) version 24.0. A constant mean of 2.5 was used to ascertain the acceptance of the respondents.
The sample size was obtained using Robert (1970). It also has a tabular representation for determining the sample size of a given population which after calculating using the formula below gives the same sample size.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$ Where

S= required sample
X^2= the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)
N= population size
P= the population proportion (assumed to be 0.50) since this world provide the maximum sample size.
d= the degree of accuracy expressed is a proportion (0.05)

Therefore $S = \frac{3.841 \times 185 \times 0.50(1-050)}{(0.05)^2 (185-1) + 3.841 \times 0.50(1-0.50)}$

$S = \frac{3.841 \times 185 \times 0.50 \times 0.5}{0.0025 \times 184 + 1.9205 \times 0.5}$

$S = \frac{177.64625}{0.46 + 0.96025}$

$= \frac{177.64625}{1.42025}$

$= 125.080$

$S = 125$

From the above, my sample size is 125 from a target population of 185. Therefore, the proportionate sample size for each profession was calculated in Table 1.

Table 1: *Proportionate Sample Size for Each Profession*

Profession	**Target Population**	**Proportionate Sample Size**
Nurses	99	66.8
Doctors	11	7.4
Lab Scientist	21	14.1
Attendants	54	36.4
	185	**125**

Ethical Consideration
Permission was obtained from the Hospital authorities and consent was sought from the respondents before administering the questionnaires. Respondents were assured of the confidentiality of information provided as there is no option for a name on the questionnaire.

Results

Table 2: *Socio-Demographic Data of Respondents*

S/N	Age	Frequency (F)	Percentage (%)
1	16 - 20	10	8
2	21 – 30	29	23.2
3	31 – 40	46	36.8
4	Above 40	40	32
Total	125	100	
S/N	Gender		
1	Male	50	40
2	Female	75	60
Total	125	100	
S/N	Area of Specialization		
1	Nurses	67	53.6
2	Doctors	07	5.6
3	Lab. Scientist	14	11.12
4	Attendants	37	29.6
Total		125	100
S/N	Years Of Experience		
1	1-10years	40	32
2	11-21years	55	44
3	22-33years	30	24
Total		125	100

Table 2 above presents the socio-demographic characteristics of the respondents. The majority of the respondents 36.8% (46) are between 31-40 years, while only 8% (10) are between the ages of 16-20 years. The table also revealed that 40% (50) are males and 60% (75) are females. 53.6% (67) are nurses, 5.6% (7) are doctors, and 11.2% (14) are laboratory scientists while 29.6% (37) are attendants. Also, the majority of the respondents (44%) had 11-21 years of working experience, while only 24% had 22-33years of experience.

Table 3: *Knowledge of Lassa fever*

S/N	Items	Agree f(%)	Strongly Agree f (%)	Disagree f(%)	Strongly Disagree f(%)	Mean	Remarks
1.	Lassa fever is an Infectious disease that affect humans and is transmitted through droplets	20 (16)	90 (72)	10 (8)	5 (4)	3.00	Accepted
2.	Lassa fever is caused by a multimammate rat who excrete the virus through urine, saliva, and excreta to man.	18 (14.4)	98 (78.4	5 (4)	4 (3.2)	3.04	Accepted
3.	Some signs of Lassa fever Include fever and vomiting.	30 (24)	70 (56)	22 (17.6)	3 (2.4)	3.02	Accepted
4.	Lassa fever is endemic in West Africa, especially In Nigeria.	12 (9.6)	103 (82.4)	3 (2.4)	7 (5.6)	2.96	Accepted
5.	Currently, there is no Vaccine for Lassa fever, It can only be treated and managed.	21 (16.8)	98 (78.4)	4 (3.2)	2 (1.6)	3.10	Accepted

6. Lassa fever can be transmitted through insect bite.	4(3.2)	6(4.8)	54(43.2)	61(48.8)	1. 6	Rejected.
Grand Mean 2.8						

Table 3 shows that respondents agreed with all the statements except item 6 which states that Lassa fever can be transmitted through insect bites with a mean score of 1.6. Respondents agreed with items 1-5 which have mean scores of 3.00, 3.04, 3.02, and 2.96 respectively; therefore, Knowledge on Lassa fever is good as shown by the grand mean score of 2.8 which is accepted.

Table 4: *Availability of IPC in Workplace.*

S/N ITEMS	Agree f (%)	Strongly agree f (%)	Disagree f (%)	Strongly Disagree f (%)	Mean	Remarks
1.Always have soap and water available for use.	41 (32.8)	77 (61.6)	6 (4.8)	1 (0.8)	3.26	Accepted
2.We have hand washbasins only.	8 (6.4)	21(16.8)	52 (41.6)	44 (35.2)	1.94	Rejected
3.There are gloves available for use always.	47(37.6)	39 (31.2)	19(15.2)	20 (16)	2.90	Accepted
4.Sharp boxes are around the corner in the ward for use.	45 (36)	67 (53.6)	9 (7.2)	4(3.2)	3.22	Accepted
5.We have an Isolation room.	37 (29.6)	72 (57.6)	11 (8.8)	5 (4)	3.12	Accepted
Grand Mean 2.61						

Table 4 revealed that respondents agreed with items 1, 3, 4, and 5 with mean scores of 3.26, 2.90, 3.22, and 3.12 respectively while item two was rejected as shown by their mean scores of 1.94, 2.46, and 2.18 respectively. Therefore, on the availability of IPC in the workplace, respondents agreed that they do observe the IPC measure while carrying out procedures with a mean score of 2.61.

Table 5: *Types and use of PPE in the Workplace*

S/N ITEMS	Agree f (%)	Strongly agree f (%)	Disagree f (%)	Strongly Disagree (%)	Mean	Remarks
1.Face mask or shield	7 (5.6)	1(40.8)	19(15.2)	48 (38.4)	2.14	Rejected
2.Always have full body PPE at last patient contact.	9 (7.5)	11 (8.8)	36 (28.8)	69 (55.2)	1.68	Rejected
3.Only face masks and gloves are available.	25 (20)	59 (47.2)	20 (16.0)	21 (16.8)	3.01	Accepted
4.We have aprons available for use.	30 (24)	75 (60)	11 (8.8)	9 (7.2)	3.01	Accepted
5. We routinely use gowns and boots during procedures likely to generate splashes.	33 (26.4)	20 (16)	45 (36)	27 (21.6)	2.47	Rejected
Grand Mean 2.30						

Table 5 shows that respondents agreed with only items three and four with a mean score of 3.01 on each. While items one, two, and five were rejected as shown by mean scores of 2.14, 1.68, 2.22, and 2.47 respectively. On the availability and the types of PPE in the workplace, the findings revealed that there is inadequate PPE as shown by the grand mean score of 2.30 which is rejected.

Discussion of findings

Knowledge of Lassa fever

The finding shows that respondents agreed with all the statements that: Lassa fever is an infectious disease that affects humans and is transmitted through droplets with a mean score of 3.00. Lassa fever is caused by a multimammate rat who excrete the virus through urine, saliva, and excreta to a man with a mean score of 3.04, some signs of Lassa fever include fever and vomiting with a mean score of 3.02, and currently, there is no vaccine for Lassa fever, it can only be treated and managed, with the mean score of 3.01. These showed that knowledge of Lassa fever is very good. This agrees with a study conducted by Asuke *et al* in 2020, on knowledge, attitude, and practice toward Lassa fever prevention and control among health care providers in Sabon Gari local government area, Kaduna State, Nigeria. The findings of their study revealed that the majority of the respondents 46 (54.0%) were however aware of Lassa fever, knew that contact with the urine and faeces of rats was a major mode of transmission, knew the major symptoms of Lassa fever, and knew the causative agent to be a virus.

Availability of IPC in the Workplace

The findings revealed that respondents agreed with items 1,3,4, and 5 with mean scores of 3.26, 2.90, 3.22, and 3.12 respectively which states that they always have soap and water for use, sharp boxes are around the corner for use while item 2 was rejected mean scores of 1.94 which states that we have hand wash basins only. Therefore, on the availability of IPC in the workplace, respondents agreed that they do observe the IPC measure while carrying out procedures with a mean score of 2.61. This is in relation to the study by Alphonsus *et al*, (2019) on Knowledge, Attitude, and Infection Prevention and Control Practices Regarding Lassa Fever among Healthcare Workers in Edo State, Nigeria.

The overall level of IPC practice among respondents showed that the proportions having good, fair, and poor practices were 41.2%, 8.2%, and 50.7% respectively. Almost 70% of both doctors and nurses that participated in the study had a poor level of IPC practices. Over 80% of the CHEWs showed a good level of IPC practice while about half (50.2%) of participants in the privately-owned facility had good levels of IPC practice

Types and availability of PPE in the Workplace

The finding shows that respondents agreed with only items 3 and 4 with a mean score of 3.01 on each with the statements; only face masks and gloves available, we have aprons available for use. While items 1, 2, and 5 were rejected as shown by mean scores of 2.14, 1.68, and 2.47 respectively with statements as facemasks and shields, always have full body PPE, we routinely use gowns and boots during procedures likely to produce splashes. On the availability and the types of PPE in the workplace, the findings revealed that there is inadequate PPE as shown by the grand mean score of 2.30 which is rejected. This finding is in line with that of Archana *et al*., (2018) on personal protective equipment use among health care providers in Tamil Nadu. Among 862 HCPs who work outside the operation theatre (OT) and ICU, the appropriate use of PPE was only 156 (18.1%). It was high among doctors 109 (31.5%) followed by nurses 39 (9.3%) and technicians 8 (8.2%) which was statistically significant p=0.0001. HCPs working in OT and ICU were 423 and 183 respectively. Among HCPs working in OT, the appropriate use of gloves, mask, apron, gown, and hair cover was 100%. But the use of goggles and shoe cover was very low. The reasons for inappropriate use of PPE were non-availability 562 (78%) followed by not being aware of the importance 77 (11%). They concluded that the study showed inappropriate use and a lack of adequate knowledge of infection control practices. The study shows a good knowledge of Lassa fever. Therefore, Nurses need to insist on the availability of PPE in order to avoid being infected because Nurses are at the forefront in the care of a patient so are at risk of contracting the virus

Conclusion

Lassa fever is endemic in Nigeria, the knowledge of Lassa fever is generally good among the healthcare workers, IPC practices are fair and there is inadequate PPE in the workplace

Recommendations

1. Continued dissemination of information on Lassa fever, IPC, and PPE should be encouraged in the hospital setting through workshops and seminars in order to have up-to-date knowledge on Lassa fever.
2. The government should provide standard PPE equipment to its healthcare providers and train them on how to appropriately use them.
3. Healthcare workers should always apply standard infection prevention and control precautions when caring for patients, regardless of their presumed diagnosis. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment, and safe injection practices.

Conflict of interest

There is not any conflict of interest.

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