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LASSA FEVER RISK PERCEPTION AND "ONE-HEALTH" CONSIDERATIONS ASSOCIATED WITH RODENT CONTROL PRACTICES IN A NIGERIAN UNIVERSITY

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SUMMARY

Lassa fever has an enormous public health impact in West Africa with thousands of human cases reported annually. The disease is both endemic and zoonotic in Nigeria and the Mano River Union countries of Sierra Leone, Guinea and Liberia in West Africa. The University of Benin, Benin City and its environs, are located within an epicentre of Lassa fever (LF) in the south-south region of Nigeria. Personal and public considerations about safety of agricultural products and the general living environment were investigated among students and staff within the university community. Selected socio-economic variables were evaluated. Results indicated that higher education was associated with animal hygiene related knowledge of LF (73.4%), compared to 37.3% of respondents with basic education who demonstrated poor knowledge of transmission of the disease ($p < 0.0001$). High risk awareness was linked to one-health information dissemination on LF in media and campaigns (75.5%), in comparison with native oral transmission of information about the disease (24.5%). Risk perception was significantly associated with measures aimed at rat and various species of mice control amongst respondents ($p = 0.022$). Ability of respondents to recognize rats, including *Mastomys natalensis complex*, the carrier of LF-virus within residential dwellings (71.1%) and contact of rats with human food (9.6%) elucidate the persistent public health threat in endemic areas. Cultural practices such as eating of rats (4.4%) and rat hunting practices (6.1%) further corroborates the value of a one-health agenda for LF control. This paper presents the control of rats and mice within the university campus as an animal hygiene and one-health agenda, which incorporates multiple socio-cultural factors for a more robust LF prevention model.

Key words: Animal hygiene, Lassa fever, One-Health

INTRODUCTION

Lassa fever (LF) is an acute and sometimes fatal disease caused by a single-stranded, negative-sensed RNA virus belonging to a diverse group of *Arenaviruses* of the family *Arenaviridae*. Other *Arenaviruses* which are known to be pathogenic in human causing hemorrhagic fevers include Lujovirus in Africa; and Junin, Machupo, Guanarito, Sabia and Chapare viruses in South America. LF is zoonotic and endemic in a known Lassa fever belt of West Africa comprising Nigeria, Sierra Leone, Guinea and Liberia (McCormick et al, 1987; Monath et al, 1973). The natural reservoir of Lassa fever virus (LASV) appears to be restricted to the single rodent species, *Mastomys natalensis* (Lecompte et al, 2006) which lives in close contact with humans. However, available evidence suggests LASV and other *Arenaviruses* may have adapted to other host during their evolution. For example, *Arenaviruses* has been detected in different African rodents but has not yet been linked to human diseases. *M. natalensis*, super order Euarchontoglires and order Rodentia, exhibit persistent, asymptomatic infection and profuse urinary virus excretion (Olugasa et al, 2014). Transmission to man occurs from exposure to secretions and excretions of infected rat (through ingestion of contaminated food or water) or patients. Like other haemorrhagic viruses, LF has an enormous social and public health impact in West Africa

with thousands of cases reported annually. The disease affects an estimated 500,000 individuals annually with a case fatality rate of up to 90% for pregnant women and 15-20% in symptomatic and hospitalized cases.

In Nigeria, the disease remains endemic with persistently high case fatality rates (Bond et al, 2012). The devastating effect of Lassa fever was demonstrated by the 2012 outbreak in Nigeria, acclaimed to be most severe, with 21 states affected including Federal Capital Territory (FCT), Abuja and 855 suspected cases and 136 laboratory confirmations were reported between January and April, 2012. During 2016 outbreak, the Federal Ministry of Health reported that 26 of the 36 states in the Country, including the FCT, were affected. This trend has remained unabated over the years. Retrospective data shows that Edo State is a LF endemic state, consistently reporting high figures of infection and mortality rate since 1989. Socioeconomic factors such as poverty, low educational level, deficiency in home technologies, high demographic density, and rural living have largely influenced the transmission and persistence of LASV and other infections. Poor housing quality, poor external hygiene sanitation and inadequate waste disposal facilities in urban and rural settings have been shown to increase the occurrence of rodents in human dwelling and risk of LF transmission in villages and camps (Fichet-Calvet and Rogers, 2009; Olugasa et al., 2014). Agriculture-related cultural practices such as bush burning, post-harvest grain storage density on residential dwellings, cassava (garri) processing have been suspected to influence *M. natalensis* breeding and transmission of LASV to human (Olugasa et al, 2014). Selected interventions designed to improve any of these situations may fail if they are applied in an isolated manner. Personal and public considerations about safety of agricultural products and the general living environment were investigated among students and staff within the university community. Selected socio-economic variables were evaluated. This paper presents the control of rats and mice within the university campus as an animal hygiene and one-health agenda, which incorporates multiple socio-cultural components for a more robust LF prevention model.

MATERIAL AND METHODS

Study location

The study was conducted at the two campuses (Ugbowo and Ekenhuan) of University of Benin (UNIBEN), Benin City, Edo state, Nigeria; located on Latitude 6⁰24'N and Longitude 5⁰36'E. The university has eight (8) hostels at Ugbowo and two (2) hostels in Ekenwan campuses with a total population of about 15,000 resident students with combined staff (academic and non-academic) strength of about 8000. Other students live off-campus. It is a cross-sectional study.

Sample size

Sample size was determined using the method described by Cochran (1977) while adjusting for 10% non-response rate. Quantitative and qualitative data were collected using pretested structured questionnaire. Respondents were selected using stratified random sampling technique after obtaining their informed consent. A total 602 responded to the questionnaire survey. This comprised students (n=301) and staff (n=301) respectively. UNIBEN students who were squatters in the halls of residence, staying off campus or in staff quarters during the period of the study were excluded. Contract staff were similarly excluded from the study.

Data analyses

The questionnaire responses were screened and collated using the Microsoft Excel package (Microsoft Corporation, Redmond, Washington). Collated data were subjected to SPSS (Statistical Package for Social sciences version 22) for descriptive and inferential analyses. Descriptive and categorical analysis

of quantitative data was used to sort and analyse frequency distributions while inferential statistics using Chi-Square was used to test for at $p \leq 0.05$. Risk perception was evaluated based on behavioural response to persons who suffered from the disease or pragmatic steps taken to reduce risk of exposure.

Cranial morphometry

Killed rats around residential dwellings of students on campus were collected and measurements taken of specific external morphology. Bones of killed rats were prepared using warm water maceration according to standard procedure (Ekeolu and Ozege, 2012) and skull dimensions were obtained with digital vernier calliper (Bruder Werke. Art.-Nr.:823-160). Head and corporal parameters were analysed using ANOVA (SPANOVA) in SPSS 22.0 statistical software. Results of cranial morphometric were reviewed using findings in Tanzania (Breno et al., 2011) and 103 skulls of *Rattus rattus* in Tunisia (Ben Faleh et al, 2012) respectively. Congruent anatomical landmarks were matched and level of significance tested using one tail t-test ($p \leq 0.05$).

RESULTS

The age range of respondent students was between 15 and 44 years old. In contrast with staff whose ages ranged from 25 to 54 years old. Male respondents accounted for 46.2% of the total students while 53.2% were females. About 93.9% of the students earned less than thirty thousand naira monthly. The male and female respondents amongst staff were 43.2% and 50.8% respectively. More than 77% of staff earned at least seventy thousand naira monthly.

External morphometry suggests that all retrieved rodent samples were more closely related to the species *Rattus rattus*. However, cranio-dental analysis of captured rats shows variations from the mean of typical *Rattus rattus*

A significant ($p < 0.05$) difference was found in income, level of education and living standard between staff and students of the University. Individual and group knowledge of Lassa fever amongst respondents was significantly associated with their level of education. Respondents with postgraduate education (73.4%, $n=91$) demonstrated a relatively balanced one-health knowledge conception of the disease, compared with 37.3% of respondents with basic education who demonstrated poor knowledge of the transmission of LF ($p < 0.0001$). The knowledge of Lassa fever disease was higher amongst the older staff compared to younger staff but this was not statistically significant. High risk awareness was linked to one-health information dissemination media on LF campaigns (75.5%), in comparison with native oral transmission of information about the disease (24.5%). Risk education was found to be significantly associated with individual's perception of risk posed by Lassa fever disease ($p=0.015$). However, awareness of the disease from exposure through various mediums of dissemination had a higher impact on the knowledge of participants than age as a singular variable.

Students (70.6%) and staff (71.5%) acknowledged that they lived with rats and 51.6% (students) and 42.7% (staff) of this number sees rats at least daily, weekly or monthly. Amongst respondents, 21.1% of students and 7.3% of staff respectively, admitted to rat having contact with their food. Students were more likely to consume such likely contaminated food directly (4.3%) or simply rip out affect portion. This was perceptibly lower for staff who will readily dispose the entire food item (72.2%), although 25% of staff will cut off the eaten portion and 0.7% will consume the food item. The fact that 16.7%

and 13.7% of students and staff respectively have direct contact with faeces or urine of rats with 7.3% (students) and 4.8% (staff) still engages in rat hunting and preparation and 3.8% engaging in rat consumption, indicates that the risk of Lassa fever and other zoonotic diseases remains high. Despite the increase frequency with sightings of rats, 19.3% of the students are did not take any active measures to control the rat population within their rooms. Some 50.5% (n = 152) use rat poisons, 29.9% (n = 90) use traps, 1.3% (n = 4) use cats as rat control measures respectively. Amongst staff, the two most frequently used rodent control measures were rat poisons (46.2%) and traps (39.9%). Few staff prefers the exclusive use of cat (4.3%) and sanitation (1%) in rodent control respectively and 96.1% opined that the chosen control measures adopted was either very effective or effective.

DISCUSSION AND CONCLUSION

The study reveals that there remaining grey areas in knowledge about precise landmarks for identification of reservoirs of Lassa virus within the disease epicentre in Edo State, Nigeria. Study limitation includes, absence of current sero-prevalence of Lassa fever among the respondents, infectivity of the virus outside its reservoir host or in contaminated food items, and possible risk of exposure caused by infected dead rat. The best method of disposal of dead rats and how long the virus remains infectious even in infected dead reservoirs remains to be determined. This study of the effect of knowledge on the risk perception of staff and students of the University of Benin, towards Lassa fever disease offers a critical starting point for comprehensive animal hygiene evaluation and improvement of rodent control. A holistic approach to Lassa fever prevention has however commenced with advocating good hygiene and incorporating improved socio-economic conditions that hold a more effective strategy against the disease.

LITERATURE CITED

- McCormick JB, Webb PA, Krebs JW, et al. A prospective study of the epidemiology and ecology of Lassa fever. *J Infect Dis.* 1987;155:437-444.
- Monath TP, Mertens PE, Patton R, et al. A hospital epidemic of Lassa fever in Zorzor, Liberia, March-April 1972. *Am J Trop Med Hyg.* 1973;22:773-779
- Olugasa BO, Dogba JB, Nykoi JD, Ogunro BN, Odigie EA, Ojo JF, et al. The rubber plantation environment and Lassa fever epidemics in Liberia, 2008-2012: A spatial regression. *Spat Spatiotemporal Epidemiol* 2014. doi. org/10.1016/j.sste. 2014.04.005
- Bond et al, 2012 Bond N, Schieffelin JS, Mosese LM, Bennett AJ, Bausch DG. A historical look at the first reported cases of Lassa fever IgG antibodies 40 years after acute infection. *Am J Trop Med Hyg* 2012;12:0466
- Fichet-Calvet E, Rogers DJ. Risk maps of Lassa fever in West Africa. *PLoS Negl Trop Dis.* 2009;3(3):e388
- Cochran WG. *Sample survey techniques; the estimation of sample size.* 3rd Ed. New York: John Wiley and sons; 1977:75
- Ekeolu OK, Ozegbe PC. Sexual pelvic bone dimorphism in West African fruit bat, *Epomops franqueti*. *Trop. Vet.* Vol 30, No 4