



ORIGINAL ARTICLE

## Impact of Lassa Fever on the Practice and Consumption of Stored Food by University of Benin Community, in Benin City, Nigeria

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### Keywords:

Lassa fever;  
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Attitude;  
Practice

### ABSTRACT

**Background:** Lassa fever is endemic in Nigeria with a propensity for seasonal outbreaks in Benin City and is transmissible through consumption of food contaminated with infected rat secretions and excretions. The aim of the study is to determine the impact of Lassa fever on the consumption of processed snacks and food storage practices in University of Benin campuses.

**Methods:** The study enrolled staff and students of the University in a cross-sectional study of selected 600 respondents using stratified random sampling technique. Questionnaire included socio-demographics, impact of Lassa fever epidemic on the consumption of favorite processed snacks and attitude to food contaminated by rat.

**Results:** Majority, 274 (45%) were between 15-24 years, 313 (52.2%) were females and singles were 372 (62.0%). Predominant level of education was first degree 143 (23.8%) while income per month of majority of the students was below ₦20, 000.00 and above ₦80,000.00 for staff. The favorite food/snacks by many students 77(25.6%) was indomie noodles and biscuits 57(18.9%), while 73 (24.3%) staff preferred bread and 52 (17.3%) other snacks. Garri (cassava flakes) was the favorite of 88(14.6%) respondents. Many 306 (50.8%) stored food in containers, some 84 (13.9%) store in cellophane bags, while a few 41 (6.8%) in lockers. When rats nibble on their favorite food/snacks, 385 (68.9%) reported that they dispose the entire food, while 155(25.7%) cut off the eaten portion and consume the rest.

**Conclusion:** The impact of Lassa fever outbreak on consumption of contaminated processed snacks by respondents showed that majority discard their snacks when contaminated while some remove the contaminated portions and consume remaining part which could be a major health risk.

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### INTRODUCTION

Lassa fever is an acute viral hemorrhagic disease like Ebola, Lujo, and Crimean-Congo Hemorrhagic Fever (CCHF) that are sometimes associated with Bleeding. The reservoir, or host, of Lassa virus is a rodent

*Mastomys natalensis* known as the "multimammate rat"<sup>1</sup>, *M. erythroleucus* and *M. hildbrandtii* have also been proposed to be reservoirs.<sup>2,3</sup> Once infected, this rodent is able to excrete virus in urine for an extended period of time, maybe for the rest of its life. *Mastomys*

rodents breed frequently, produce large numbers of offspring, and are numerous in the savannas and forests of west, central, and east Africa.<sup>4</sup> In addition, *Mastomys* readily colonize human homes and areas where food is stored. These factors contribute to the relatively efficient spread of Lassa virus from infected rodents to humans. Transmission of Lassa virus to humans occurs through ingestion or inhalation. *Mastomys* rodents shed the virus in urine and droppings and direct contact with these materials, through touching soiled objects, eating contaminated food, or exposure to open cuts or sores, can lead to infection.<sup>5</sup> Because *Mastomys* rodents often live in and around homes and scavenge on leftover human food items or poorly stored food, direct contact transmission is common. *Mastomys* rodents are sometimes consumed as a food source and infection may occur when rodents are caught and prepared.<sup>6</sup>

The region endemic for Lassa fever appears to be growing with cases identified in Ghana and previously non-endemic areas of Sierra Leone and Nigeria.<sup>7, 8</sup> The virus is suspected to have been imported into countries where it was not previously endemic by returning travelers.<sup>9</sup> Since August, 2015 Nigeria has been experiencing a Lassa fever epidemic involving 19 states of the Federation. The Nigeria Centre for Disease Control (NCDC) reported on February 6th, 2016 that the total number of confirmed and suspected cases was 175 with a total of 101 deaths from 19 states of the Federation. The four states with the highest incidence include Bauchi, Edo, Oyo and Taraba, which account for 54% of Confirmed cases and 52% of reported deaths. Unfortunately, 4 (four) health workers had been confirmed infected with Lassa fever and 2 (two) had died.<sup>10</sup> According to NCDC there were 10 new cases, Edo state had reported 4 cases of Lassa fever in 2016, of which 3 were confirmed. It is reported that Lassa fever is

endemic in 13 out of the 18 Local Government Areas in Edo State.<sup>11</sup>

Socio cultural factors determine to a large extent the transmission and persistence of infections. Edo state is a rainforest area with the traditional practice of subsistence farming involving bush burning during the dry season resulting in the migration of rats from their natural habitat to human dwellings. The socio-cultural risk of human contact consists in practice of gaming, eating food contaminated with excretions and secretions (urine and faeces) of rats infected with Lassa fever virus. In Benin City, the determinants of epidemiological distribution, sero-prevalence and outbreaks of Lassa fever include poverty, low educational level, deficiencies in home technologies, high demographic density, and rural living.<sup>12, 13</sup> However, educational attainment, income, and occupational status are indicators of an individual's socioeconomic status that determines type of housing, clothes and nutrition he or she can afford.<sup>14</sup> According to Case and Paxson, higher incomes can be associated with healthier behaviours.<sup>15</sup> Rat infestation is both a health risk and a source of economic loss because of the possibility of destroying properties and transmitting zoonotic diseases. These occur in many places where hygiene practices are low thereby providing harborage for the rats.

Reduction of risk of exposure to Lassa fever, through appropriate behavioral change, in the context of improved housekeeping; safe food processing /storage practices, environmental sanitation; frequent clearance and safe disposal of unserviceable household goods and workplace equipment; rat-proofing of human habitats and occupational environments is advocated. The aim of this study is to determine the impact of Lassa fever outbreak on the practice and consumption of stored processed snacks and food by staff and students of the University of Benin.

## METHODOLOGY

**Study Setting:** The study was conducted at the University of Benin (UNIBEN), Benin City, Edo state, Nigeria. The University of Benin is one of Nigeria's first generation Federal Universities with two campuses, located at Ugbowo and Ekenhuan Road in Benin City. Presently the university has about 18 Faculties and Schools. The University offers courses at various levels: Postgraduate, Undergraduate, Diploma and Certificate. The total student enrolment currently stands at over 80,000, made up of both full-time and part-time students shared among the various Faculties, with staff strength of about 8000 of academic and non-academic staff. The university has eight hostels in Ugbowo and two hostels in Ekenhuan campus with a total population of about 15,000 resident students while other students live off-campus.

**Study design:** This was a cross-sectional descriptive study of staff and students using stratified random sampling technique. The Cochran's formula<sup>16</sup> for sample size determination with a Lassa fever prevalence of 21% was applied which gave a sample size of 255. Using a 10% attrition rate, we got 285 respondents each for staff and students were required. However, a total of 600 respondents (300 staff and 300 students) were sampled to make room for non-responses (Ugbowo and Ekenhuan). Inclusion criteria were UNIBEN Students that were official residents in the hostels, academic and non-academic staff of UNIBEN. While Exclusion criteria were UNIBEN students that were squatters in the halls of residence, those in staff residence as well as contract staff of the University.

**Sampling Technique:** A stratified random sampling technique was used. Sampling frame for students was the total student population resident in all hostels (10) in both campuses. A

sampling fraction was determined by dividing the calculated sample size by the sampling frame. The sampling fraction was applied to population of students' resident in each hostel of residence to determine the effective sample size for the stratum. The number of rooms to be sampled was determined by dividing the number of rooms per hostel by the effective sample size. The selection of sampling unit (respondents) was done by balloting.

The sampling frame for staff was the total population of academics and non-academics in all Faculties/Colleges, Schools, Registry, Vice-Chancellor's Office (VCO), Bursary and Library. Effective sample size was determined by application of the sampling fraction on the population. The proportion of the effective sample allocated to the departments was determined by the staff population within that department. The sampling units were selected by balloting within the departments.

**Study instrument:** A self-administered semi-structured questionnaire that was in different sections was given to consenting respondents. The variable included socio demographics, food consumptions and food safety practices. A probability random sampling by balloting was used and questionnaires administered to selected respondents. Three hundred (300) questionnaires respectively were randomly distributed and retrieved among consenting students and staff in their rooms and offices respectively. Ethical approval was gotten from the ethics committee of University of Benin Teaching Hospital. All information obtained was kept confidential

**Data analysis:** Data were collected, entered into Microsoft Excel (Microsoft Corporation, Redmond, Washington), sorted, checked for accuracy and thereafter reloaded into SPSS (Statistical Package for Social sciences version 22) and analyzed. Specific questions to assess knowledge of respondents were obtained and

a score assigned to each correct response. The total maximum score was then obtained. Based on the total score of respondents, a scale of knowledge was developed as either good, fair or poor. Inferential analysis on the test of association between categorical variables using Chi-Square test was done

**Variable ranking:** Specific questions to assess knowledge, attitude and food consumption practices of respondents were obtained, a total score for each response was computed and each variable ranked as either good, fair or poor (knowledge) or positive or negative (attitude). Education was similarly ranked based on the highest certificate acquired by respondents. Basic education described respondents who have obtained WASSCE/GCE/NECO while higher education describes respondents who have Diploma, Bachelor of Science, Master of Science or Doctor of Philosophy holders. Young adults referred to respondents less than 24 years and adults were regarded as 25 years and above. Level of study was ranked as either fresh intake (100 level) or 200 level and above - indicating those that have been in the University environment for more than a year.

## RESULTS

Medical Science, Pharmacy and nursing students constituted the highest respondents and majority of the students 200 (66.0%) were in 100 and 200 levels of studies, 52 (17.3%) were in 300 and 400 levels, 9 (3%) students were in 500 and postgraduate students were 8 (2.7%). The academic staffs were 79 (26%) and non-academic were 204 (68%). The senior staff were 218 (72.6) while 64 (21.3) were junior staff. The age range of majority of the respondents 274 (45%) in Table 1 is between 15-24 years, 313 (52.2%) were females, the singles 372 (62.0%) were more and 559 (93.2%) were mainly Christians. The predominant level of education of the Staff was first degree

116 (38.5%) while the levels of incomes of majority of the students were below ₦20,000.00 and that of staff were above ₦80,000.00. About 156 students reside in the undergraduate halls, the non-academic staff were more and many of them were in the senior staff category as seen in Table 2. There are different sizes of rooms in the hostel and the number of students officially allocated to these rooms varies. Ninety-six (96) respondents reported that they had between 1-4 students officially allocated to their rooms, while 90 respondents had between 5-8 students and 8 respondents reported that they had more than 8 students officially allocated to their rooms. On the actual residents in the rooms, 24 (8%) respondents claimed that they had >8 students per room.

On the source of information about Lassa fever, a large number of students 104 (34.6%) and staff 190 (63.1%) first heard about it before year 2014 while their source was from radio or television as seen in Table 3. In comparing the association between respondent's level of education and knowledge of Lassa fever, 238 (79.3%) students and 59 (19.7%) staff had poor knowledge about Lassa fever respectively compared with 34 (11.3%) students and 214 (71.3%) staff with good knowledge. Similarly with age, 260 (86.7%) students and 61 (20.3%) staff also had poor knowledge. However, the level of knowledge about Lassa fever was not significantly associated with educational level and age of staff and students, respectively. On the choice of food of respondents, the favorites food or snack by many students 77 (25.6%) was indomie noodles and biscuits 57 (18.9%) while 73 (24.3%) of the staff preferred bread followed by 52 (17.3%) respondents that preferred other snacks. Garri (cassava flakes) that is one of the staple food consumed in this part of the Nigeria was the favorite of 45 (15.0%) students and 43 (14.3%) staff which 92 (15.3%) ate daily, 146 (48.5%) students and 132 (43.9%) staff ate

**Table 1: Socio-demographic characteristics of respondents**

Respondents	Students (n=300) n (%)	Staff (n = 300) n (%)
<b>Sex</b>		
Male	139 (46.2)	130 (43.2)
Female	160 (53.2)	153 (50.8)
<b>Age group (years)</b>		
15-24	268 (89.0)	6 (2.0)
25-34	23 (7.6)	112 (37.2)
35-44	5 (1.7)	109 (36.2)
45-54	1 (0.3)	50 (16.6)
>55	1 (0.3)	16 (5.3)
<b>Marital status</b>		
Single	291 (96.7)	81 (26.9)
Married	6 (2.0)	204 (67.8)
Divorced	0 (0.0)	4 (1.3)
Widowed	0 (0.0)	5 (1.7)
<b>Religion</b>		
Christian	292 (97.0)	267 (88.7)
Muslim	4 (1.3)	14 (4.7)
Traditional	1 (0.3)	5 (1.7)
<b>Highest level of Education</b>		
WASSCE/GCE/NECO	230 (76.4)	18 (6.0)
Diploma	6 (3.0)	17 (5.6)
B.Sc.	27 (9.0)	116 (38.5)
M.Sc.	4 (1.3)	91 (30.2)
PhD	1 (0.3)	29 (9.6)
Postdoctoral	1 (0.3)	2 (0.7)
<b>Residence</b>		
Undergraduate halls	159 (53)	0 (0.0)
Postgraduate halls	4 (1.3)	0 (0.0)
Staff quarters	3 (1.0)	16 (5.3)
Off campus	130 (43.2)	183 (60.8)
<b>Income per month (\$1 = ₦305.27)</b>		
<₦10,000	91 (30.2)	5 (1.7)
₦10,000 - 19,999	36 (12.0)	5 (1.7)
₦20,000 - 29,999	11 (3.7)	13 (4.3)
₦30,000 - 39,999	1 (0.3)	10 (3.3)
₦40,000 - 49,999	0 (0.0)	4 (1.3)
₦50,000 - 59,999	1 (0.3)	3 (1.0)
₦60,000 - 69,999	1 (0.3)	8 (2.7)
₦70,000 - 79,999	1 (0.3)	19 (6.3)
>₦80,000	5 (1.7)	145 (48.2)

\*Total number of responses for each variable varied somewhat from total number of respondents due to non-response.

at least once in a week. While their preferred way of consuming garri was making it into Eba (hot water garri cake) by half of the respondents 300 (50%) and many 247 (33.4%) drink it soaked in cold water. On their method of soaking, many preferred drinking straight soaking in water with other additives like sugar or groundnuts while very few 63 (10.5%) clean or purify the garri by decanting the water more than once. Majority 408 (67.7%) of the respondent consume directly the purchased garri at home without any further process.

**Table 2: Distribution of respondents in faculties and hostels**

Variables	Frequency (n=300*)	Percent
<b>Allied Faculties of Students</b>		
Medical science, Pharmacy and Nursing	60	20.0
Agriculture	8	2.7
Arts, Mass communication and Theater arts	54	18.0
Education	3	1.0
Engineering and Environmental Science	6	2.0
Law	6	2.0
Life Science and Physical Science	5	1.7
Management Science and Social Science	11	3.7
<b>Level of study of students</b>		
100 and 200	200	66.7
300 and 400	52	17.3
500 and 600	9	3.0
Postgraduate	8	2.7
<b>No of students officially allocated to their rooms in hostels</b>		
1-4	96	32.0
5-8	90	30.0
>8	8	2.7
<b>Actual no of student's residents in the rooms</b>		
1-4	75	25.0
5-8	24	8.0
>8	24	8.0
<b>Category of staff</b>		
Academic staff	76	25.3
Non academic	207	69.0
<b>Cadre of staff</b>		
Senior	218	72.6
Junior	64	21.3

\*Total number of responses for each variable varied somewhat from total number of respondents due to non-response

On the storage of their preferred snack which was bread, indomie and garri, majority 306 (68.9%) asserted that they stored them in container, some 84 (13.9%) stored in cellophane bags while a few 41 (6.8%) in lockers. When asked about what they do when they discover that rat or rodents had nibbled a portion of their favorite snacks, a great number of the respondents 385 (68.9%) reported that they dispose the entire food, while quite a number 155 (25.7%) of the

**Table 3: Sources of information for student and staff**

Variables	Students (n=300*) n (%)	Staff (n=300*) n (%)
<b>When did you first hear of Lassa fever?</b>		
No response	7 (2.3)	11 (3.7)
2016	77 (25.6)	23 (7.6)
2015	88 (29.2)	55 (18.3)
2014	25 (8.3)	22 (7.3)
Before 2014	104 (34.6)	190 (63.1)
<b>How did you first hear of Lassa fever?</b>		
Radio/television	110 (36.5)	150 (49.8)
Family/friends	101 (33.6)	66 (21.9)
Internet	35 (11.6)	19 (6.3)
Campus campaign	29 (9.6)	24 (8.0)
Newspaper	20 (6.6)	31 (10.3)
No response	6 (2.0)	11 (3.7)

\*Total number of responses for each variable varied somewhat from total number of respondents due to non-response.

respondents said they cut off the eaten portion and consume the rest (Table 4). Furthermore, in comparing the association between respondent's attitude to contaminated food and knowledge of Lassa fever, two hundred and sixty-three (87.4%) students and 61 (20.3%) staff had poor knowledge about Lassa fever compared with 240 (79.7%) staff and 25 (8.3%) students with good knowledge. However, there was no significant association between economic status ( $p=0.206$ ), knowledge of Lassa fever ( $p=0.078$ ), choice of food ( $p=0.088$ ) and attitude towards contaminated food for students while there was significant association between economic status and attitude towards contaminated food for staff ( $p=0.007$ ) as seen in Table 5

## DISCUSSION

Lassa fever endemicity in Edo state and the high rate of morbidity and mortality, which is dependent on human behavior, the environment and the life cycle of the virus, requires a good knowledge of prevention and control.

**Table 4: Choice of food amongst student and staff**

Respondents	Students (n=300*) n (%)	Staff (n=300*) n (%)
<b>What is your favorite snack?</b>		
Garri	45 (15.0)	43 (14.3)
Bread	55 (18.3)	73 (24.3)
Indomie	77 (25.6)	22 (7.3)
Biscuit	57 (18.9)	46 (15.3)
Groundnuts	14 (4.7)	40 (13.3)
<b>How often do you eat garri in the past one month?</b>		
Daily	58 (19.3)	34 (11.3)
Weekly	88 (29.2)	98 (32.6)
Monthly	22 (7.3)	24 (8.0)
Rarely	91 (30.2)	77 (25.6)
Stopped eating for now	16 (5.3)	44 (14.6)
<b>How do you prefer eating your garri?</b>		
Dry	25 (8.3)	11 (3.7)
Soak in water	125 (41.5)	76 (25.2)
Make into <i>eba</i>	122 (40.5)	178 (59.1)
Others	2 (0.7)	6 (2.0)
<b>How do you soak your garri?</b>		
In water only	46 (15.3)	39 (13.0)
In water and other additives	160 (53.2)	87 (28.9)
In salt and water and decant once	36 (12.0)	65 (21.6)
In salt and water and decant more than once	20 (6.6)	43 (14.3)
<b>What do you do after purchase of garri from source?</b>		
Consume directly	207 (68.8)	201 (66.8)
Further home processing	56 (18.6)	41 (13.6)
<b>How often do you eat bread?</b>		
Daily	73 (24.3)	65 (21.6)
Weekly	120 (39.9)	117 (38.9)
Monthly	17 (5.6)	37 (12.3)
Rarely	70 (23.3)	56 (18.6)
Stopped eating for now	3 (1.0)	9 (3.0)
<b>How often do you eat indomie?</b>		
Daily	62 (20.6)	15 (5.0)
Weekly	96 (31.9)	79 (26.2)
Monthly	30 (10.0)	26 (8.6)
Rarely	79 (26.2)	143 (47.5)
Stopped eating for now	17 (5.6)	10 (3.3)
<b>How do you store your bread, garri or indomie?</b>		
In cupboard	81 (26.9)	38 (12.6)
In locker	27 (9.0)	14 (4.7)
In container	114 (37.9)	192 (63.8)
In cellophane bags	51 (16.9)	33 (11.0)
<b>What do you do when rat nibbles a portion of your favorite snack?</b>		
Eat anyway	12 (4.0)	2 (0.7)
Cut off the eaten portion	84 (27.9)	71 (23.6)
Dispose the entire food	180 (59.8)	205 (68.1)

\*Total number of responses for each variable varied somewhat from total number of respondents due to non-response

**Table 5: Association between economic status, knowledge, choice of food and attitude to contaminated food amongst staff and students.**

Category	Variables		Attitude to contaminated food		p-value	
			Positive (%)	Negative (%)		
Student	Economic status	Low	111 (37.0)	170 (56.7)	0.206	
		Moderate	2 (0.7)	11 (3.7)		
		High	1 (0.3)	1 (0.3)		
	Knowledge	Good	5 (1.7)	20 (6.7)	0.078	
		Fair	7 (2.3)	6 (2.0)		
		Poor	105 (35.0)	158 (52.7)		
	Choice of food	Garri	18 (6.0)	27 (9.0)	0.0882	
		Bread	24 (8.0)	31(10.3)		
		Indomie	21 (7.0)	56 (18.7)		
		Biscuit	18 (6.0)	39(13.0)		
		Groundnuts	9 (3.0)	5 (1.7)		
		Others	13 (4.3)	21 (7.0)		
	Staff	Economic status	Low	23 (7.7)	76 (6.4)	0.007
			Moderate	16 (22.0)	14 (4.7)	
			High	9 (3.0)	18 (6.0)	
Knowledge		Good	8 (2.7)	34 (11.3)	0.098	
		Fair	67 (22.3)	131 (43.7)		
		Poor	15 (5.0)	46 (15.3)		
Choice of food		Garri	18 (6.0)	25 (8.3)	0.2647	
		Bread	18 (6.0)	55 (18.3)		
		Indomie	7 (2.3)	15 (5.0)		
		Biscuit	9 (3.0)	37 (12.3)		
		Groundnuts	13 (4.3)	27 (9.0)		
		Others	16 (22.0)	36 (12.0)		

\*Total number of responses for each variable varied somewhat from total number of respondents due to non-response

In this study, the knowledge of the respondents about Lassa fever virus, the prevention and control was generally poor. This is in agreement with a study carried out among primary care providers in suburban community in Edo state by Tobin et al who reported that knowledge of Lassa fever was poor for about 51 (38.9%) of their respondents.<sup>17</sup> However, in another study undertaken in Kenema among internally displaced people and eight primary health units, findings revealed a reasonable knowledge of Lassa fever, its mode of transmission, control measures, and the

seriousness of the disease.<sup>18</sup> Although the attainment of higher education should increase the acquisition of knowledge and skills that promote health behavior according to Cutler and Lleras-Muney,<sup>19</sup> this wasn't the case with the respondents studying and working in the university of Benin system with the majority having above the basic educational level. The result from the study showed that there was no significant difference between the educational level and knowledge about Lassa fever prevention. Thus we could say they were ignorant of the health risk involved. Many people may not be

fully aware of the fatality of Lassa fever, though most of the respondent claimed they first heard about it some 3 years ago and their source of information was from the news media.

In this study, many of the students earned below minimum wage which is not a living wage in the current economic reality because majority of the population earn and live below 2 dollars a day.<sup>20</sup> Income as a reflection of one's expenditure determines the state of housing, nutrition and opportunity cost. This is evident in the number of students accommodated in the hostels as shown in this study with more than 4 persons in a room which was originally designed to house 2-4 students resulting in overcrowding with possible negative effects on personal hygiene and health of the occupants. This is in consonant with a study in University of Ife by Bamigboye<sup>21</sup> on rat infestation of hostels that found out that most of the rooms are overcrowded with student's properties and belongings which now served as breeding grounds and food source for rats in the hostels.

The International Conference on Nutrition <sup>22</sup> defined food security as a state of affairs where all people at all times have access to safe and nutritious food to maintain a healthy and active life. The state of the economy in recent times have a great impact on food security for Nigerians where most people live below less than 2 dollars a day.<sup>20</sup> Therefore, the standard of living of students particularly maybe affected where most of them manage what they have and some even skip some meals. This definitely will affect the conservation of whatever quantity of food available. This is seen in this study where many of the respondents preserved their food in air-tight containers while others just keep theirs in lockers.

The favorite food of many of the students is "Indomie" instant noodles which is a convenient, cheap and fast food. More so, many of the students earn below N20,000.00 which in reality as a result of inflation is not sufficient for food and sundries per month, this is in agreement with a study at University of Ibadan on pattern of food consumption by Yusuf et al <sup>23</sup> where they found that income has the greatest effect on food consumption by students of tertiary institutions. It is also noted that the nutritional value of choice foods were mainly carbohydrates (indomie, biscuits, *garri* and bread) and this can lead to malnutrition as adequate balance diet is not consumed. Further, risk to public health could result when these choiced food items becomes attractant for rat and get contaminated with rat secretions and excretions and consumed when not properly stored. This is corroborated by Otemuyiwa and Adewusi<sup>24</sup> in a study of meal choice and food consumption pattern of two tertiary institutions were they found that the unhealthy eating habits of Nigerian university students seemed to be a reflection of poor funding.

However, over a quarter of the respondent's attitude to Lassa fever prevention from nibbled food source was poor where they indicated that they would cut off rodent eaten part of any snacks and consume the remaining part. This may be due to the economic situation of respondents or their ignorance of rodents to persons' mode of transmission of the virus through the consumption of contaminated food items. Although majority of the respondents consume *garri* bought directly from the market without further processing. It was noted that the form of consumption is making into "*eba*" which is *garri* porridge and is safe enough even if there had been contamination along the production

process to marketing and storage at home. Some of the respondents said that they decant the water they use in soaking *garri* to remove dirt or germs which definitely is not sufficient to remove the virus if it had been contaminated. In case of *eba* made with boiling water, if there had been any incursion of rodent's waste product, the hot boiling water would have destroyed the virus since the virus can be inactivated when heated at 56-100°C<sup>25</sup> According to Dr Alash'le G. Abimiku, a virologist, "sustained heat can help kill the Lassa fever virus. Therefore, all forms of food contaminated with rat urine and eaten without any processing with heat that kills the virus will transmit the virus. This could happen to any food that is left uncovered not only *garri*," she said. Also, the Medical and Health Workers Union of Nigeria, Lagos Branch in the peak of the epidemic campaigned said that people should stop the consumption of soaked *garri*, and suggested using it for *eba* instead because the heat it takes to make *eba* was a safeguard, heating water for at least 56° C for a period of time (30 minutes is recommended) would destroy the virus, so boiling water which is about 100°C will kill the virus.<sup>26</sup>

## Conclusion

This study found that the majority of the respondents discard their snacks when contaminated while some remove the contaminated portions and consume the remaining part which could be a major health risk for Lassa fever infection. However, there was no significant association between economic status, knowledge of Lassa fever, choice of food and attitude towards contaminated food for students while there was significant association between economic status and attitude towards contaminated food for staff.

## Recommendations

It is recommended that food consumed without further processing by heating before consumption should be discarded entirely if contaminated with any secretions, excretions or nibbled at by rat. Nevertheless, for safety of *garri* product, there should be further processing by reheating or "refrying" at home before storing in tight rat proof containers, for it to be safe for drinking or soaking in cold water. When consumed as *eba* it should be prepared with boiling water to ensure the destruction of any Lassa fever viral contaminant. When no further processing by heating is anticipated in the case of biscuits and other snacks, these food items should be well stored and proper hygiene ensured that will prevent assess of infected rat on such choiced food items, thus reduce possible risk of exposure to Lassa fever disease.

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