Journal of Epidemiological Society of Nigeria Vol. 7, No. 1 June 2024 1-12

Effectiveness of Behaviour Change Communication in Reducing Risk Factors for Lassa Fever Infection in Ebonyi State, Nigeria

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Abstract

Background: Lassa fever is a viral illness with several annual outbreaks in Nigeria, including Ebonyi State. Behaviour Change Communication has been shown to reduce the burden of communicable diseases. It is believed that its application will reduce the burden of Lassa fever in Ebonyi State. The objective of the study was to determine the effectiveness of Behaviour Change Communication in reducing the risk factors for Lassa fever infection in Ebonyi State, Nigeria.

Methods: The study design was quasi experimental and a multistage sampling technique was used. Three local government areas from the Southern Senatorial zone and two from the Northern Senatorial zone were studied as control and intervention arms respectively. An interviewer-administered questionnaire was used to collect data which was analyzed using SPSS version 20. Fisher's exact, Z-test and McNemar Chi square test statistics were used and significance level set at $P<0.05$

Results: A total of 170 respondents were recruited in each arm. The Socio-demographic characteristics in both arms were comparable. There was a statistically significant difference in the composite scores of Lassa fever risk factors between the households in the two arms post intervention (P=0.012). The reduction in the Lassa fever risk factors among individual participants post intervention was also statistically significant (P=0.013). Mud house was more associated with presence of rat at home than cement house (P=0.019).

Conclusion: Behaviour Change Communication was effective in reducing Lassa fever risk factors in Ebonyi State. It is therefore recommended for use in Lassa fever control programmes.

Key words: Behaviour Change Communication, Ebonyi State, Lassa fever, Risk Factors.

Introduction

Lassa fever is an acute viral illness which was first discovered in 1969 in Lassa village in Borno State Nigeria where the name originated.[1] It is an enveloped, bi-segmented single-stranded RNA virus which belongs to the *Arenaviridae* family of Viruses.[2.] Worldwide, an estimated two million persons are affected by the virus every year resulting in 5,000 to 10,000 deaths.[2,3,4]

The Lassa fever virus is transmitted to humans from rodents called *mastomys natalensis*, a multimammate rat which is its natural host. It is transmitted primarily through direct or indirect contact with excreta or urine of infected rodents deposited on surfaces such as floors or beds, or in food or water.[5,6] Secondary transmission occurs mainly through contacts with body fluids or droplets of the infected person. About 80% of those who become infected with Lassa fever virus have no or only mild symptoms[7]. The incubation period is about ten days, with a range of one to three weeks.[8]

Several outbreaks have been reported in various parts of the country including Ekpoma, Onitsha, Aboh-Mbaise, Lafia, Jos[9] and recently in Ebonyi, Taraba, Nasarawa, Rivers, Yobe, Edo and Ondo States.[10] In October 2023 (week 41), 7724 suspected cases of Lassa fever were reported in Nigeria with 1095 confirmed cases, 9 probable cases and 188 deaths among confirmed cases (Case Fatality Rate [CFR] of 17.2%) involving 28 states. Within the same period, Ebonyi State had 301 suspected cases with 52 as confirmed cases and 30 deaths among confirmed cases (CRF=57.7%).[11] Since the first known outbreak of Lassa fever in Ebonyi State in 2005, it has continued to occur resulting in the death of many health workers and other members of the society.[12]

Behaviour Change Communication (BCC) is a process of working with individuals, families and communities through different communication channels to promote positive health behaviours and support an environment that enables the community to maintain the positive health behaviours taken on.[13] It moves people from being aware to action.

Behaviour Change Communication has been shown to reduce the burden of communicable diseases like HIV, malaria and Ebola.[14,15] It is therefore believed that applying BCC intervention will reduce the burden of Lassa fever in Ebonyi State. Conventional messages passed through the media have been the approach of the Ebonyi State Government to reduce the burden of Lassa fever in the State which has not worked as the outbreaks have continued to occur. This study determined the effectiveness of Behaviour Change Communication in reducing the risk factors for Lassa fever in Ebonyi State, Nigeria.

Methodology

Study Area

Ebonyi State is located in the southeast geopolitical zone of Nigeria within latitudes $5/40^0$ and 6/45'N, and longitudes $7/30^0$ and 8/28'E. It has a population of 3,027,452 with a land mass of about $5,535KM^2$ most of which is rural.[16] The State has 13 local government areas and is divided into North, South and Central senatorial zones.[16] Most of the inhabitants are farmers. There are two tertiary hospitals including a Virology Centre for Lassa fever management, 13 general hospitals and 670 primary health facilities in the State.[16]

Study design and study population

The study design was quasi experimental involving quantitative method of data collection at pre and post intervention conducted within a three months period. The study population were household heads or their representatives and individuals aged ≥ 18 years who had resided in the State for at least 5 years. Therefore, all household heads or their representatives and individuals aged 18 years and above who had been residing in the community for at least 5 years and gave consent were included in the study. Excluded were household heads or their representatives and individuals aged 18 years and above who were ill at the time of the study.

Sample Size Determination

The formula for sample size calculation for comparison between two groups[17] was used as shown below:

$$n = \frac{2\,(Z\alpha + Z_{1-\beta})^2 p(1-P)}{(P_1 - P_2)^2}$$

Where n= minimum sample size
$Z\alpha$ =Two sided percentage point of the standard normal distribution at required significance level (α = 0.05) = 1.96
$Z_{1-}\beta$ = one sided percentage point of the standard normal distribution at 80% power =0.84
$P_{1=}$ Proportion of households with Lassa fever preventive practice (Households who were able to prevent rat from having access to their home for 6 months) from previous study[18] which is 3.9%
$P_{2=}$ Expected number of households with Lassa fever preventive practice (Households who were able to prevent rat from having access to their home for 3 months) post intervention =13.9%

$$P = \text{pooled prevalence} = \frac{P_1 + P_2}{2}$$

P_1-P_2 =Difference in proportion of events in two groups (pre and post intervention).
Substituting

$$n = 2\frac{[(1.96 + 0.84)^2\ 0.89(0.11)}{(0.1)^2} = 153$$

Allowing for a 10% attrition the sample size became 153/0.9 =170 in each arm

Sampling technique
Multistage sampling technique was employed in selecting study participants.

Stage 1: Two senatorial zones out of the three senatorial zones in the State were selected using simple random sampling method (balloting). The zones selected were the Northern and Southern senatorial zones of the State. Then, using balloting between north and south, the Northern Senatorial zone of the State was randomized into the intervention arm while the Southern Senatorial zone became the control arm.

Stage 2: Using simple random sampling (balloting), three LGAs were selected from the five LGAs in the Southern Senatorial zone and two LGAs from the four LGAs in the Northern Senatorial zone

Stage 3: By simple random sampling (balloting), one political ward from the wards in each of the selected LGAs in the South zone were selected making it three wards. Also, one ward each from the wards in each of the selected LGAs in the North zone, making it two wards.

Stage 4: Using simple random sampling, one community was selected out of the communities from each of the five selected political wards in the third stage above (Southern Zone: Amasiri community in Afikpo North, Oso Edda community in Afikpo South and Oshiri community in Onicha. Northern zone: Izzi Unuhu community in Abakaliki and Igbeagu community in Izzi).

Stage 5|: In the three selected communities in the south in stage four above, a total of five settlements were selected using a simple random sampling technique (Ezi-Idam Ali settlement in Amasiri, Ndiokpo and Ndiuche settlements in Oso Edda, Amofia and Ufuezokwor settlements in Oshiri). Also, in the two selected communities in the north, a total of 5 settlements were selected using a simple random sampling technique (Achara and Onuofia settlements in Izzi Unuhu and Amuzu, Ndigwe and Ndiukabi settlements in Igbeagu).

Stage 6: In each of the five selected settlements in the Southern zone in stage five above, 30 houses were selected using simple random sampling after house numbering. Also, 30 houses were selected in each of the five settlements in the northern zone after house numbering.

Stage 7: In the selected houses by simple random sampling in the South zone in stage six above, a total of 17 eligible households were selected. An average of a household in a house was seen in the settlements
The respondents in the households were selected as follows: Two persons in each household were interviewed (the household head and another individual) making a total of 170 participants (5x17x2). Also, of the selected houses in the Northern zone, 17 eligible households were interviewed in each of the five settlements. In each household, two persons (the household head and another adult participant) were interviewed making a total of 170 (5x17x2)

Study Instruments: A semi-structured pretested interviewer-administered paper-based questionnaire which was designed by the researchers was used to collect the data. It was of two types-household and individual questionnaires.

Study Procedure

Pre-intervention phase

The semi-structured pretested interviewer administered paper-based questionnaire was administered to the study groups in both arms (intervention and control).

The questionnaire was pretested in Idembia community in Ezza South LGA which was not part of this study.

Intervention Phase

The BCC was applied to the intervention settlements only after the pre-intervention phase. The intervention was carried out by first paying advocacy visits and sensitization on Lassa fever to the traditional rulers and other stakeholders of the communities in the intervention settlements. This was followed by community mobilization and dialogue on the need to prevent Lassa fever through changes in some socio-cultural beliefs and practices that favour Lassa fever infection transmission in their community. Leaflets on Lassa fever were distributed and posters were displayed in strategic places in the communities.

The community members selected for the study were then segmented into household heads (male and female) adult individuals. Trainings and group discussion as well as one-on-one discussions were carried out with each group. The discussion was on general knowledge on Lassa fever. Demonstrations on hygienic methods of food drying and safe storage, good housekeeping, safe disposal of waste and environmental cleanliness were carried out.

The BCC messages were developed by the researchers using the John Hopkin Bloomberg BCC tool as a guide. The trainings in the intervention group was conducted by the researchers and the research assistants. Different methods and channels of communication for health education were used including mass media-jingles in local dialects using megaphone, posters, flyers, T-shirts and caps as captured in the BCC tool guide.[19]

Post-Intervention phase

Three months after intervention phase, the same sets of questionnaire administered to study participants during the pre-intervention phase were administered to the same people in the ten settlements. The results were analyzed and compared with the pre-intervention phase. The effect of BCC was taken as the difference in risk factors of Lassa fever between the pre-intervention and post-intervention phases. The results were analyzed with SPSS version 20. For ethical consideration, the intervention was then carried out for the control group after the post intervention data collection.

Data management

The dependent variables included: knowledge on Lassa fever, evidence of presence of rat in the environment like rat seen in the house, consumption of rat by family members and burial practices. The independent variables include age, sex, location, religion, occupation, level of education, type of house etc.

Statistical analysis

The data was analyzed using SPSS version 20. Descriptive data were cross tabulated and presented in frequency tables. The Chi-square, Fisher's exact, Z-test, McNemar Chi-square test statistics were used where applicable to test for associations or differences between the variables at significance level set at $P< 0.05$.

To quantify the burden of risk factors for Lassa fever infection transmission among study participants, a composite score of the risk factors was carried out as follows: The household heads were assessed based on the 14 risk factors as contained in the questionnaire. One mark was assigned to each of the risk factors. A household is said to have low risk of Lassa fever infection if the risk factors in the household are 7(50%) or less and high risk if it is 8(>50%) or more.

Also, to quantify the risk factors for Lassa fever infection transmission among individual participants, a composite score of 8 risk factors as contained in the questionnaire were used. One mark

was awarded to each risk factor. A score of 4 or below was regarded as low risk while a score of above 4 was regarded as high risk.

Ethical Consideration

Ethical approval was obtained from the Ethical Review Committee of Ebonyi State Ministry of Health (Ref N0: SMOH/ERC/41/018) and Alex Ekwueme Federal University Teaching Hospital (Ref N0:FETHA/REC/VOL.2/2018/137),

Results

There were 170 respondents among the household heads- 85 household heads in the intervention arm and 85 household heads in the control arm. There were also 170 respondents among the individual participants- 85 in the control and 85 in the intervention arms. There was no drop out among the study participants. This was made possible by repeated visits by the researcher and the assistants to the eligible households during both pre and post intervention phases until the needed study participants were seen in their homes and questionnaires administered to them.

The greater proportion of the household heads were within the age group of 21-30 years, 33(38.8%) in intervention and 29(34.1%) in the control arms. They were more females than males, most of them were farmers and a large number attended secondary school, 44(51.8%) and 38(44.7%) in the intervention and control arms respectively. Table 1.
At post intervention as shown by Table 2, 52(61.2%) of the intervention households had seen rat in their houses within the preceding three months while 65(76.5%) of the control arm had seen rats in their houses within preceding three months. The observed difference was statistically significant (P=0.046) while at pre-intervention, it was not statistically significant.

At post intervention, 75(88.2%) and 10(11.8%) of the households in the intervention arm were at low and high risk of Lassa fever infection transmission respectively. Those at the control arms were 62(72.9%) and 23(27.1) at low and high risk of Lassa fever infection transmission respectively (P=0.012). Table 3.

From Table 4, within the intervention group, at baseline, 32(37.6%) of them ate rat as a delicacy. After intervention, 13(15.3%) of them still ate rat as delicacy. The observed difference was statistically significant (P=0.003). There was observed statistically significant difference on burial practices pre and post intervention among the intervention arm (P=0.010).

Three months post intervention, 77(90.6%) and 8(9.4%) of the individual participants in the intervention arm were at low and high risk of Lassa fever infection respectively. Also at post intervention at the control arm, 65(76.5%) and 20(23.5%) of the individual participants were at low and high risk of Lassa fever infection respectively. The observed difference was statistically significant (P=0.01). Table 5

Table 1: Socio-demographic characteristics of the heads of the households

Variable	Intervention n=85 n (%)	Control n=85 n (%)	χ^2	P-Value
Age (in years)				
21-30	33 (38.8)	29 (34.1)	5.308	0.151
31-40	32 (37.6)	25 (29.4)		
41-50	17 (20)	21 (24.7)		
>50	3 (3.5)	10 (11.8)		
Sex				
Male	29 (34.1)	37 (43.5)	1.585	0.208
Female	56 (65.9)	48 (56.5)		
Occupation				
Civil Servants	12 (14.1)	15 (17.6)	3.490	0.322
Farming	41 (48.2)	35 (41.2)		
Business	31 (36.5)	30 (35.3)		
None	1 (1.2)	5 (5.9)		
Educational Status				
None	9 (10.6)	21 (24.7)	5.860	0.119
Primary	21 (24.7)	17 (20)		
Secondary	44 (51.8)	38 (44.7)		
Tertiary	11 (12.9)	9 (10.6)		
Religion				
Christianity	80 (94.1)	78 (91.8)	1.025	0.599
Traditional	4 (4.7)	4 (4.7)		
None	1 (1.2)	3 (3.5)		
Type of House				
Mud and plastered	22 (25.9)	15 (17.6)	1.726	0.631
Cement and plastered	17 (20)	19 (22.4)		
Mud and not plastered	27 (31.8)	29 (34.1)		
Cement and not plastered	19 (22.4)	22 (25.9)		

Table 2: Between group comparison of Lassa fever risk factors in the household

	Pre-intervention				Post-intervention			
Variable	**Intervention n=85 n (%)**	**Control n=85 n (%)**	**χ^2**	**P-value**	**Intervention n=85 n (%)**	**Control n=85 n (%)**	**χ^2**	**P-value**
Ever seen rat in the household within the last 3 months								
Yes	67 (78.8)	75 (88.2)	2.736	0.147	52 (61.2)	65 (76.5)	4.633	0.046*
No	18 (21.2))	10 (11.8)			33 (38.8)	20 (23.5)		
Ever see rat faeces in the household								
Yes	60 (70.6)	66 (77.6)	1.104	0.381	59 (69.4)	66 (77.6)	1.481	0.297
No	25 (29.4)	19 (22.4)			26 (30.6)	19 (22.4)		
Presence of hole/s in the house								
Yes	41 (48.2)	48 (56.5)	1.156	0.357	27 (31.8)	56 (65.9)	19.799	<0.001*
No	44 (51.8))	37 (43.5)			58 (68.2)	29 (34.1)		
Eating of rat in the household								
Yes	6 (7.1)	10 (11.8)	1.104	0.432	1 (1.2)	7 (8.2)	4.722	0.064FT
No	79 (92.9)	75 (88.2)			84 (98.8)	78 (91.8)		
Food grains Preservation in the household								
In bag	66 (77.6)	65 (76.5)	0.033	1.000	39 (45.9)	65 (76.5)	16.742	<0.001*
In plastic or metal container with cover	19 (22.4)	20 (23.5)			46 (54.1)	20 (23.5)		

Table 3: Between group comparison of the composite scores of risk factors for Lassa fever infection in the households

	Pre-intervention				Post-intervention			
Variable	**Intervention**	**Control**	**χ^2**	**P-value**	**Intervention**	**Control**	**χ^2**	**P-value**
	n=85 n (%)	**n=85 n (%)**			**n=85 n (%)**	**n=85 n (%)**		
Low risk	56 (65.9)	59 (69.4)	0.242	0.623	75 (88.2)	62 (72.9)	6.355	*0.012
High risk	29 (34.1)	26 (30.6)			10 (11.8)	23 (27.1)		

* Statistically significant

Table 4: Within group comparison of risk factors of Lassa fever among Individual participants

	Intervention Group				Control Group			
Variable	**Before n=85 n (%)**	**After n=85 n (%)**	**χ^2**	**P-value**	**Before n=85 n (%)**	**After n=85 n (%)**	**χ^2**	**P-value**
Ever hunted for rat								
Yes	31 (36.5)	32 (37.6)	0.382	1.000	20 (23.5)	25 (29.4)	5.340	0.427
No	54 (63.5)	53 (62.4)			65 (76.5)	60 (70.6)		
Ever bitten by rat								
Yes	15 (17.6)	15 (17.6)	3.084	1.000	19 (22.4)	19 (22.4)	1.200	1.000
No	70 (82.4)	70 (82.4)			66 (77.6)	66 (77.6)		
Eating of rat								
Yes	32 (37.6)	13 (15.3)	0.309	0.003*	25 (29.4)	23 (27.1)	0.168	0.868
No	53 (62.4)	72 (84.7)			60 (70.6)	62 (72.9)		
Ever drank porridge garri								
Yes	71 (83.5)	76 (89.4)	0.210	0.383	74 (87.1)	72 (84.7)	0.081	0.824
No	14 (16.5)	9 (10.6)			11(12.9)	13 (15.3)		
Ever been operated by quacks								
Yes	2 (2.4)	3 (3.6)	0.075	1.000	6 (7.1)	6 (7.1)	0.490	1.000
No	83 (97.6)	82 (96.5)			79 (92.9)	79 (92.9)		
Preference for injection								
Yes	22 (25.9)	14 (16.5)	1.175	0.215	32 (37.6)	24 (28.2)	0.230	0.243
No	63 (74.1)	71 (83.5)			53 (62.4)	61 (71.8)		
Touch, bath or stay with corpse								
Touch corpse only	2 (2.4)	1 (1.2)	21.774	0.010*	0	1 (1.2)	8.400	0.210
Stay overnight with corpse	6 (7.1)	6 (7.1)			10 (11.8)	10 (11.8)		
Bath corpse	22 (25.9)	20 (23.5)			27 (31.8	24 (28.2)		
None	55 (64.7)	58 (68.2)			48 (56.5)	50 (58.8)		

*Statistical significance

Table 5: Between group comparison of the composite scores of the risk factors for Lassa fever infection among individual participants.

	Pre-intervention				Post-intervention			
Variable	**Intervention n=85 n (%)**	**Control n=85 n (%)**	**χ^2**	**P-value**	**Intervention n=85 n (%)**	**Control n=85 n (%)**	**χ^2**	**P-value**
Low risk	64 (75.3)	65 (76.5)	0.032	0.858	77 (90.6)	65 (76.5)	6.157	*0.013
High risk	21 (24.7)	20 (23.5)			8 (9.4)	20 (23.5)		

Discussion

The household heads were mostly within the age group of 21-30 years, similar to the age group in a study carried out in Lafia, Nasarawa State, Nigeria..[20] The reason for the young household heads could be due to similarity of early marriage in both States which can lead to school dropout and increase poverty**.** The household heads in both arms were mostly females, farmers and Christians and attended secondary education and mud houses were the most type of house seen in the households. These findings were similar to that conducted in Edo State.[18] The poor housing quality seen in the household was similar to the study carried out in Osogbo metropolis[21] in Osun State, south west Nigeria to assess knowledge and attitude towards rodent control in relation to prevention and control of Lassa fever in where the study concluded that there were poor housing facilities in communities. The poor housing quality seen in this study reveals high level of poverty in the study areas and the reason for persistent presence of rats in the households and therefore transmission of Lassa fever in the area. Similar demographic characteristics were seen among the individual participants in both arms.

The percentage of Lassa fever risk factors in the households and among individuals was high in both arms at baseline. A similar study in Edo State, Nigeria concluded that there was high prevalence of Lassa fever risk factors in the area.[18] The high risk factors for Lassa fever seen in the study area could be responsible for the frequent outbreaks of the disease in the area.

Three months after intervention, the proportion of households with high level of Lassa fever risk factors reduced significantly. The significant reduction in the risk factors for Lassa fever infection transmission among study participants post intervention can be attributed to the effect of BCC intervention with previous radio messages from State government as possible confounders though that would have reflected in both arms if that was the case. To ensure there was no contamination of the study population in the group, there was a considerable distance between the intervention area and control area and also, all intervention activities were within the intervention area only. There was no similar activity by other researchers in the area at the time. This is similar to the findings in a across sectional study[24] carried out in Enugu State to evaluate the effect of TB BCC intervention on knowledge and proportion of TB in which concluded that TB BCC is associated with improvement in appropriate care seeking behavoiur. The three months interval used between pre and post intervention and not a longer period was due to scarcity of fund and for convenience as the study was solely funded by researchers. At baseline, waste disposal in the households were done on daily basis by most households in both study arms. Consumption of porridge garri was

rampant as most of the individuals in both arms admitted they had ever taken porridge garri as document by a study carried out in Benin.[25] At three months after intervention, the percentage of households who had seen rats in their house within three months period among the intervention arm reduced significantly unlike the control arm. This was similar to the finding of a study carried out in Australia to reduce the population of rodents at home.[26]

After intervention, there was a statistically significant reduction in the consumption of rats in the intervention arm compared to the control arm a similar to the finding of a study carried out in Ekiti and Ondo States, Nigeria.[27] A limitation of this study is that some responses to questions were subjective but this was minimized by the researchers through observation using check list

Conclusions

There was a high prevalence of Lassa fever risk factors in the communities in Ebonyi State.
Bahaviour Change Communication was effective in reducing these risk factors

Recommendation

It is hereby recommended that Behavoiur Change Communication be employed on a large scale by government and Non-Governmental Organizations in the prevention of Lassa fever disease in Ebonyi State and other States in the Country.

Acknowledgement

All those that made this study possible, are highly appreciated.

Conflict of Interest

The authors declare no conflicts of interest.

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