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Perceived public alarm and comprehension of risk communication messages about Lassa fever in Nigeria: a gauge of the risk communication model

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Introduction: Lassa fever constitutes a threat to the public health system in Nigeria with the reoccurring annual epidemics and its attendant risk communication intervention challenges.

Objective: This study examined the influence of public alarm (if any) on respondents' comprehension of risk communication messages about the most common host of the Lassa virus, modes of transmission, risk factors, and protective measures for Lassa fever. The risk communication model (mental noise hypothesis) served as the benchmark for measuring respondents' perceptions in the most endemic states in Nigeria.

Method: The study adopted a quantitative approach, using the survey method. Data for this study were collected from 653 respondents through a structured questionnaire. Respondents were selected through a multi-stage sampling technique. Frequency tables were used to profile the respondents' characteristics and key variables while regression coefficients were used to draw inferences.

Results: The study found a high level of perceived public alarm among the respondents but maximum attention was paid to risk communication messages amid the high level of anxiety. Knowledge of the common Lassa virus-host, modes of transmission, risk factors, and risk reduction measures was adequate irrespective of the high level of perceived public alarm. Public alarm significantly influenced audience comprehension of the risk information about Lassa fever in Ebonyi and Ondo at r^2 = 0.040 and 0.076, at $p < 0.05$ but not in Edo state at r^2 = 0.010, at $p > 0.05$.

Conclusion: The authors conclude that devoting adequate attention to outbreak communication messages amid a high level of anxiety could lead to improved knowledge of infectious diseases.

KEYWORDS

Lassa fever, Nigeria, message comprehension, outbreak communication, public alarm, preventive measures, risk communication, risk communication model

Introduction

The significance of information in public health cannot be over-emphasized as innumerable health challenges threaten the human race. Diseases assume various modes according to individuals' physiological makeup and lifestyle. More so, since outbreaks of epidemics and pandemic diseases (Yellow fever, Cholera, Flu, Ebola, Lassa fever, and others) continue to threaten humanity, quality and accessible information

has become a necessity for health decision-making. Therefore, the mass media play a key role as the principal purveyor of information regarding disease outbreak at the community, national and global echelons. Often, they serve as intermediaries between public health agencies and the masses during public health emergencies (Kott and Limaye, 2016). In brief, the World Health Organization (WHO) says that the media can help the public access basic facts and information, stimulate adequate knowledge of protective measures against infections, reliable treatment, and care for those affected by illnesses, and clarify rumors and misinformation which often result from disease outbreaks (WHO, 2018). Therefore, an outbreak of infectious disease, such as the Lassa fever epidemic, is eminently newsworthy because awareness and public persuasion for the adoption of specific risk reduction behaviors is critical to the disease containment.

The mass media have remained a veritable means of disseminating health risk information due to their capability to reach a mass and diversified audience within a short time (Okorie et al., 2014; Okorie and Namtira, 2017; Ben-Enukora et al., 2019a,b). Accordingly, the mass media help to expand the audience reach in public health risk communication. They have an edge over the face-to-face interpersonal health communication approaches that take longer time, require a lot of human resources, and are limited to a selected audience at a time.

Studies have also complimented the mass media as the most prominent information channel in the amplification of risks (Coleman, 1993; Perko, 2012; WHO, 2013; Huang, 2020). Therefore, using the mass media in health risk communication essentially entails disseminating information about the underlying causes of maladies, potential risks, the degree of concern they demand, and the necessary risk reduction behaviors to be taken (Ben-Enukora et al., 2022). Consequently, quality and accessible information on public health emergencies provide ample evidence for the public to understand the level of risk posed by diseases and the requisite non-pharmaceutical measures that can limit the chances of infection.

Moreover, research has shown that the medium of risk communication influences individuals' processing of risk information (Manno et al., 2018). Thus, public knowledge and perception of health risks as well as subsequent behaviors toward health risks are shaped by the mass media. Additionally, intended and unintended biases, as well as misinterpretation, and misrepresentation of facts by the mass media during risk communication activities could mislead the audience, particularly in the case of a contagion such as Lassa fever.

Lassa fever is a well-known Neglected Tropical Diseases (NTDs) that is prevalent in Nigeria (Ben-Enukora et al., 2022; Dalhat et al., 2022). The media briefings and public enlightenment campaigns by disease prevention agencies have highlighted the Lassa fever epidemic in Nigeria as a unique threat particularly to people residing in unhygienic environment (Ben-Enukora et al., 2020). Besides, the outbreak risk information often include information about the disease vector, transmission routes and risk factors, number of suspected and confirmed patients, fatality figures, and response activities such as contact tracing, isolation of victims, and expansion of testing and treatment capacity.

Previous studies on public fear, public alarm, or anxiety associated with Lassa fever outbreak communication is sparse in literature, even though the disease has been a threat to the public health system in Nigeria for over seven decades. However, various studies on a related disease (the COVID-19 pandemic), have shown that the disease outbreak triggered a high level of public alarm, fear, anxiety, and depression in diverse regions across the globe (Ahmad and Murad, 2020; Alsharji, 2020; Barzilay et al., 2020; Fardin, 2020; Islam et al., 2020; Ornell et al., 2020; Ozamiz-Etxebarria et al., 2020; Qiu et al., 2020; Roy et al., 2020). Likewise the level of public alarm resulting from the Lassa fever outbreak communication and its influence on public comprehension of the risk messages should be examined to ensure an effective risk information design by interventionists.

According to the proponents of the risk communication models, the mental noise hypothesis assumes that individuals tend to become nervous upon hearing information regarding infectious diseases outbreak, and the fright situation has the tendency to severely impair their capacity to evaluate and interpret information effectively for informed decision-making (Covello et al., 2001; Covello and Milligan, 2010). Thus, mental unrest hinders people's ability to acquire, retain, and interpret information as they develop difficulty in hearing, comprehension, and recall of risk information disseminated. The model describes the effects of distress situations on the reception and processing of risk information as the proponents uphold that fear could ignite a variety of emotional discontents, especially when risks are considered uncontrollable, unpleasant, inequitable, or terrifying. Nonetheless, risk information is better comprehended and embraced where the targeted population has developed a conceptual map or mental model regarding the threat.

Therefore, this study aims to empirically investigate whether exposure to risk communication messages on Lassa fever epidemics in Nigeria causes public alarm and whether such nervousness (if any) has a significant influence on risk information comprehension. Considering the prevalence of Lassa fever in Nigeria, evaluating the influence of public alarm on audience comprehension of the outbreak communication messages is significant for improving future risk communication interventions. Based on this backdrop, the study was guided by the research question: does the public alarm resulting from Lassa fever outbreak communication interfere with audience comprehension of risk information about Lassa fever epidemics in selected endemic states?

Study hypothesis

Perceived public alarm resulting from Lassa fever outbreak communication has no significant influence on audience comprehension of the risk information about Lassa fever.

Materials and methods

The study area

The study was carried out in three states (Ebonyi, Edo, and Ondo) in Southeast, South-south, and Southwest regions in Nigeria, based on the highest number of confirmed cases of Lassa fever reported consecutively for four years [Nigeria Centre for Disease Prevention and Control (NCDC), 2017, 2018, 2019, 2020].

Research design

The cross-sectional study adopted the household survey method, using a self-designed structured questionnaire distributed through the face-to-face approach.

Sample size and sampling procedure

The study sample consisted of 663 respondents deemed statically acceptable for a finite population of over 1,000,000 at a 99% confidence level and 5% margin of error (Krejcie and Morgan, 1970; Research Advisors, 2006). The multi-stage sampling technique was used to determine the local government areas, communities, streets, and households that participated in this study. The respondents were selected from a list of eligible persons in selected households using Wimmer and Dominick (2014) matrix for selecting survey respondents. The instrument was proportionately distributed between the states according to the probability relative to their sizes (155 for Ebonyi, 248 for Edo, and 260 for Ondo state), but six hundred and fifty-three (653) valid copies of the questionnaire were used for analysis. All information obtained in the course of the study was kept confidential and used only for this research.

Data analysis

The data were sorted and arranged with IBM SPSS version 23, and the results thereof were analyzed with percentage tables possessing Likert rating scales, while the regression coefficient was used to draw inferences from the hypothesis result. The *p*-value > 0.05 was used as the benchmark for decision.

Ethical consideration

Ethical approval for this study was obtained from the Covenant University Research and Ethics Committee (Ref. number CHREC/107/2019) upon the fulfillment of standard ethical considerations. Written consent was obtained from the participants by signature or thumbprint on the informed consent form. Confidentiality of all information obtained was maintained, and the data were used solely for this research.

Results

Perceived public alarm resulting from access to Lassa fever outbreak risk communication messages

Table 1 depicts that most respondents affirmed that they always experience nervousness whenever they hear the news of the Lassa fever outbreaks. However, based on individual states, the results showed that Edo residents tend to be more nervous. The results also revealed that more than 60% of the respondents are always afraid that once someone becomes infected, it will get worse and may lead to death. Half of the respondents perceive the information about contact tracing in Lassa fever outbreak communication as worrisome. Over fifty percent of the sampled respondents believe that figures of suspected and confirmed patients, or deaths resulting from Lassa fever intensifies their fear for the disease. Remarkably, most respondents do not believe they will be infected, irrespective of the high level of public alarm expressed by the study participants.

Level of attention to risk communication messages about Lassa fever

Table 2 depicts that $> 50\%$ of the respondents disagreed that they paid less attention to risk communication messages because of fear. The finding suggests that most of the study participants devoted appropriate attention to risk information about Lassa fever even amid the high public alarm.

Comprehension of Lassa fever host and transmission routes

Table 3 demonstrates that $> 90\%$ of the respondents affirmed that rat is a common host of the Lassa virus. The result implies that most respondents understand that the virus causing Lassa fever is commonly distributed through rat feces, urine and saliva contaminated foods. Likewise, the table showed adequate knowledge about the secondary transmission of the Lassa virus *via* human-to-human interaction. Additionally, $> 80\%$ of respondents know that drying food items in the sun without adequate monitoring is a potential source of rodents' contamination of foods. Notably, the respondents' opinion on this item was similar across the selected states.

Comprehension of Lassa fever preventive measures

The result in Table 4 foretells that most respondents comprehend that Lassa fever risk mitigation strategies include; nonconsumption of foods contaminated by rats and maintenance of a clean household and surroundings free of rats. Furthermore, most respondents know that disposal of household refuse far from residential areas, workplaces, and market stores prevents rat infestation and lowers the risk of Lassa virus infection.

Hypothesis result

The model summary in Table 5A indicates the extent to which the variance in the respondents' knowledge is explained by public alarm across the three selected states. R square, which is a coefficient of determination for Ebonyi, Edo, and Ondo, implies that the variance in respondents' public alarm over Lassa fever outbreak communication can only be interpreted by the variance in respondents' knowledge of Lassa fever in that order.

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TABLE 1 Distribution of respondents' opinions on whether they panic over outbreaks communication about the Lassa fever outbreaks according to each selected state.

	State			Overall number/%
	Ebonyi	Edo	Ondo	
I always panic whenever I hear the news of the Lassa fever outbreak				
Strongly agree	34	40.7	16.9	(195) 29.9
Agree	26.8	29.3	21.7	(168) 25.7
Undecided	6.5	6.9	14.6	(64) 9.8
Strongly disagree	20.3	10.6	26	(123) 18.8
Disagree	12.4	12.6	20.9	(103) 15.8
Total	100%	100%	100%	(653) 100%
I am always worried that I might be infected with Lassa fever whenever I hear the news of the Lassa fever outbreak				
Strongly agree	17	13.8	5.1	(73) 11.2
Agree	22.2	28	19.7	(153) 23.4
Undecided	21.6	20.7	18.5	(131) 20.1
Strongly disagree	20.9	19.5	29.1	(154) 23.6
Disagree	18.3	17.9	27.6	(142) 21.7
Total	100%	100%	100%	(653) 100%
One of my worries, whenever I hear the news of the Lassa fever outbreak, is that the healthcare system may not be able to handle the event of an epidemic				
Strongly agree	28.1	25.2	16.1	(146) 22.4
Agree	44.4	51.2	44.9	(153) 47.2
Undecided	13.1	18.7	15.4	(131) 16.1
Strongly disagree	5.9	1.6	14.6	(154) 7.7
Disagree	8.5	3.3	9.1	(142) 6.7
Total	100%	100%	100%	(653) 100%
Whenever I hear the news of the Lassa fever outbreak, I am always afraid that once someone becomes infected it will get worse and may lead to death				
Strongly agree	32	35	20.9	(188) 28.8
Agree	31.4	40.7	39.8	(249) 38.1
Undecided	11.1	14.2	11	(80) 12.3
Strongly disagree	15	7.3	25.2	(105) 16.1
Disagree	10.5	2.8	3.1	(31) 4.7
Total	100%	100%	100%	(653) 100%
Information on contact tracing in the news of the Lassa fever outbreak adds to my worry				
Strongly agree	20.9	17.9	14.2	(112) 17.2
Agree	34	42.7	36.6	(250) 38.3
Undecided	12.4	20.7	2.8	(77) 11.8
Strongly disagree	17	10.2	32.3	(133) 20.4
Disagree	15.7	8.5	14.2	(81) 12.4
Total	100%	100%	100%	(653) 100%
Information regarding the number of victims, confirmed cases, or deaths increases my fear				
Strongly agree	20.9	17.9	14.2	(185) 17.2
Agree	34	42.7	36.6	(189) 38.3
Undecided	12.4	20.7	2.8	(113) 11.8

(Continued)

TABLE 1 (Continued)

	State			Overall number/%
	Ebonyi	Edo	Ondo	
Strongly disagree	17	10.2	32.3	(81) 20.4
Disagree	15.7	8.5	14.2	(85) 12.4
Total	100%	100%	100%	(653) 100%

TABLE 2 Distribution of respondents' opinions on whether they pay less attention to risk communication messages as a result of fear.

Variables	State			Overall number/%
	Ebonyi	Edo	Ondo	
Strongly agree	11.1	8.9	13.4	(73) 11.2
Agree	20.9	18.3	22.8	(135) 20.7
Undecided	8.5	13.4	4.7	(58) 8.9
Strongly disagree	32	26.4	38.2	(211) 32.3
Disagree	27.5	32.9	20.9	(176) 27
Total	100%	100%	100%	(653) 100%

The regression ANOVA in Table 5B suggests that public alarm has a significant influence on audience comprehension of risk information for Lassa fever in Ebonyi and Ondo, but not in Edo state.

The regression coefficient in Table 5C illustrates that a unit increase in public alarm leads to a decrease in knowledge in Ebonyi and Edo states. Alternatively, the beta value for Ondo state indicates that a unit increase in public alarm leads to an increase in the respondents' comprehension of Lassa fever risk information. This result implies that nervousness about the virulence of Lassa fever stimulated Ondo residents to seek more knowledge compared to Ebonyi and Edo states, probably because of their educational background.

Also, the significance values for Ebonyi and Ondo are below 0.05, indicating a statistical confidence of above 95% but, the significance value for Edo is above 0.05. This result implies that the influence of public alarm on the respondents' comprehension of Lassa fever risk information in Ebonyi and Ondo was significant but not in Edo state. The implication of this finding is that public alarm has no statistically significant influence on audience comprehension of Lassa fever risk communication messages in Ebonyi and Ondo state. Hence, adequate knowledge of Lassa fever may be significantly influenced by other factors other than anxiety resulting from the Lassa fever risk information. Consequently, the null hypothesis was rejected for Ebonyi and Ondo states, but not rejected for the Edo state. However, since the respondents from Ebonyi and Ondo states represent the majority of the sampled participants, the null hypothesis was rejected on a general note. Therefore, public alarm resulting from the Lassa fever outbreak communication has a significant influence on audience comprehension of the risk information for Lassa fever in the endemic states.

Discussion

The results of this study suggest a high level of public alarm resulting from Lassa fever outbreak communication. More so, the results show that Lassa fever is widely perceived as a killer disease. The finding confirms Talisuna et al. (2020) claim that disease outbreaks are always alarming for the public because it is often unpredictable and fraught with surprises. It also corroborates Asogun et al. (2014) report that a greater number of people experienced panic, disbelief, and fear when they heard of the Lassa fever outbreak. This result also supports the reports of fear and panic following the outbreak communication for other infectious diseases, such as Ebola, Monkeypox virus, and the COVID-19 pandemic, in various affected communities in the West African region (Bali et al., 2016; D'Agostino et al., 2017; Ajibo et al., 2018). These results confirm that confusion, fear, and uncertainty usually characterize public health emergencies (Asia-Europe Foundation, 2015).

The present study established a high level of public alarm among the female respondents compared to the male respondents folk. This aligns with Qiu et al. (2020) report that women tend to experience psychological distress more than men. The result further supports Barzilay et al. (2020) claim that females had higher COVID-19-related worries than their male counterparts. Hence, a gender-based approach could be adopted by policymakers to tackle anxiety in future outbreaks. Furthermore, public alarm is associated with younger respondents and lower educational background. Thus, age and education discrepancies in public alarm resulting from Lassa fever outbreak as found in this study could enable risk communication interventionists re-strategize risk information to reduce anxiety in future outbreaks.

Ironically, the results of this study suggest a low-risk perception regarding the chances of being infected with the Lassa virus, and older respondents showed a higher rate of poor risk perception

TABLE 3 Distribution of respondents' comprehension of Lassa virus common host and the transmission routes.

	State			Overall number/%
	Ebonyi	Edo	Ondo	
Lassa fever is transmitted by rat				
Strongly agree	45.8	49.2	65.7	(358) 54.8
Agree	48.4	43.9	34.3	(269) 41.2
undecided	5.9	6.1	0	(24) 3.7
Strongly disagree	0	0.8	0	(0) 0
Disagree	0	0	0	(2) 0.3
Total	100%	100%	100%	(653) 100%
I could contract Lassa fever by eating foods eaten by rats/polluted by rats' urine/feces				
Strongly agree	34	40.2	59.1	(301) 45.9
Agree	37.9	43.9	31.1	(245) 37.3
undecided	15.7	7.7	6.7	(60) 9.1
Strongly disagree	5.9	4.1	0.8	(21) 3.2
Disagree	6.5	4.1	2.4	(26) 4
Total	100%	100%	100%	(653) 100%
Person-to-person transmission of Lassa fever can occur through contact with the bodily fluids of an infected person				
Strongly agree	17	36.6	37	(210) 32
Agree	39.2	37.2	46.9	(271) 41.3
Undecided	30.1	20.3	12.6	(128) 19.5
Strongly disagree	9.2	1.2	2.4	(18) 2.7
Disagree	4.6	3.3	1.2	(26) 4
Total	100%	100%	100%	(653) 100%
Sun-drying of farm produce and processed foods in open spaces outside the house is a risk factor for Lassa virus				
Strongly agree	28.8	41.5	4 2.9	255 (38.9)
Agree	37.9	44.7	46.1	285 (43.6)
Undecided	9.8	8.1	3.5	44 (6.7)
Strongly disagree	11.1	2.4	3.9	36 (5.5)
Disagree	12.4	3.3	3.5	33 (5.1)
Total	100%	100%	100%	100%

than the younger respondents. Thus, the older respondents may have perceived themselves as infallible and in a less dangerous stance than the young people. This finding may be attributed to overconfidence, where people think they have more control over the risk factors. Furthermore, adequate knowledge of infectious diseases as found in this study might have induced a greater feeling of control over the threat (Zhong et al., 2021). Poor risk perception observed in this study corroborates Barzilay et al. (2020) submission that people worried less about contracting COVID-19. The finding is also consistent with Sund et al. (2017) account that more educated respondents showed lower risk perception than expected. However, the result contradicts Pasi et al. (2018) report that highly educated individuals tend to exhibit higher risk perception regarding infectious diseases than individuals with lower education. Therefore, a low-risk perception among respondents with a higher level of education calls for serious concern. Hence, empirical examination of the factors that could bring about poor risk perception among people with higher educational status could help interventionists to specifically tailor risk messages to boost their level of risk perception in future outbreak communication interventions.

Another source of worry found in this study is the figures of suspected and confirmed Lassa fever patients, and fatality cases resulting from the disease. This result is expected as some respondents who reside in the affected communities probably have been in contact with Lassa fever patients or their close contacts. The finding aligns with Gentili et al. (2020) report that the high number of cases of Tuberculosis in Italy was the utmost concern of the respondents. It also corroborates Ahmad and Murad (2020) finding that information regarding the number of infections and

TABLE 4 Distribution of respondents' comprehension of Lassa fever preventive measures.

	State			Overall number/%
	Ebonyi	Edo	Ondo	
Maintaining a clean environment with no rats can reduce the risk of Lassa fever in the community				
Strongly agree	29.4	29.7	52.8	(257) 38.6
Agree	48.4	48.4	42.5	(301) 46.1
Undecided	17	15.4	3.1	(72) 11
Strongly disagree	2.6	3.7	1.2	(16) 2.5
Disagree	2.6	2.8	0.4	(12) 1.8
Total	100%	100%	100%	(653) 100%
When people stop eating foods eaten by rats or polluted by rats' blood/stool/urine/saliva, the risk of Lassa fever infection can be reduced				
Strongly agree	39.2	36.2	59.1	(299) 45.8
Agree	42.5	53.7	35.8	(288) 44.1
Undecided	8.5	7.7	1.2	(35) 5.4
Strongly disagree	5.2	2	0.4	(14) 2.1
Disagree	4.6	0.4	3.5	(17) 2.6
Total	100%	100%	100%	(653) 100%
Disposal of refuse far away from my house/office/shop is a good practice for Lassa fever prevention				
Strongly agree	30.7	34.6	42.5	(240) 36.8
Agree	45.8	49.6	50.4	(320) 49
Undecided	17	13.4	5.9	(74) 11.3
Strongly disagree	4.6	1.2	0.8	(12) 1.8
Disagree	2	1.2	0.4	(7) 1.1
Total	100%	100%	100%	(653) 100%

TABLE 5A Regression model summary illustrating the influence of perceived panic on knowledge of Lassa fever.

States	Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate
Ebonyi	1	0.199[b]	0.040	0.033	0.54755
Edo	1	0.100[b]	0.010	0.006	0.48460
Ondo	1	0.275[b]	0.076	0.072	0.38482

[a]Dependent variable, knowledge.
[b]Predictors: (constant), panic.

deaths recorded in the recent COVID-19 outbreak caused fear and panic in Iraqi Kurdistan. The "negative" information can be unintentionally magnified and the resultant effect could be detrimental emotional responses and social outrage (Covello et al., 2001; Covello and Milligan, 2010). In essence, it could lead to negative information dominance, when a greater value is placed on the negative outcomes against the precautionary measures. To guard against this scenario, counterbalance of the "negative messages" (number of victims and deaths) with a larger emphasis on positive or solution-oriented messages should be the hallmark of risk communication interventions.

More so, this study found that a high level of concern about Lassa fever may have propelled the residents to pay more attention to the outbreak communication messages to obtain knowledge on how to protect themselves, thereby resulting in adequate understanding and recall of the risk information regarding the common host of the Lassa virus, the transmission routes and the risk reduction measures. However, the regression coefficients in Tables 5B, C show that public alarm has a significant influence on the knowledge of the Lassa virus host, transmission routes, and risk factors in Ebonyi and Ondo but not in the Edo state. Consequently, the null hypothesis was rejected for Ebonyi and Ondo states, but not rejected for the Edo state. This result suggests that the residents of Edo state may have developed a conceptual map or mental model that enabled them to withstand the interference of anxiety in the comprehension and recall of Lassa fever risk communication messages. Thus, a reduction in the level of public alarm would probably lead to a higher level of message comprehension among

TABLE 5B Regression ANOVA illustrating the influence of perceived panic on knowledge of Lassa fever.

State	Model		Sum of squares	df	Mean square	F	Sig.
Ebonyi	1	Regression	1.873	1	1.873	6.247	0.014[b]
		Residual	45.272	151	0.300		
		Total	47.145	152			
Edo	1	Regression	0.576	1	0.576	2.453	0.119[b]
		Residual	57.301	244	0.235		
		Total	57.877	245			
Ondo	1	Regression	3.057	1	3.057	20.646	0.000[b]
		Residual	37.317	252	0.148		
		Total	40.375	253			

[a]Dependent variable: knowledge.
[b]Predictors: (constant), panic.

TABLE 5C Regression coefficients illustrating the influence of perceived panic on knowledge of Lassa fever.

States	Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
			B	Std. error	Beta		
Ebonyi	1	(Constant)	2.504	0.117		21.367	0.000
		Panic	−0.105	0.042	−0.199	−2.499	**0.014**
Edo	1	(Constant)	2.146	0.089		24.150	0.000
		Panic	−0.056	0.036	−0.100	−1.566	**0.119**
Ondo	1	(Constant)	1.475	0.072		20.499	0.000
		Panic	0.105	0.023	0.275	4.544	**0.000**

[a]Predictors: (constant), perceived panic.
[b]Dependent variable: knowledge.
The bold data are the *p*-values for the selected states.

the residents. Therefore, risk communication interventionists need to develop deliberate measures toward reducing public alarm during Lassa fever outbreaks to enhance better comprehension of the risk information.

The hypothesis results for Ebonyi and Ondo show that the state of high concern over the information on Lassa fever tends to severely impair the abilities of the residents in processing the risk communication messages effectively and efficiently to improve knowledge as stipulated in the assumptions of the Mental Noise Model (Covello et al., 2001; Covello and Milligan, 2010). Thus, the Mental Noise hypothesis could be used as a theoretical assumption to predict the influence of public alarm on audience comprehension of risk communication messages in some disease-endemic communities as in the case of Ebonyi and Ondo. Therefore, it is imperative that risk communication messages are tailored to reduce public alarm and improve message comprehension and recall. Visual materials with a high level of message repetitions could be employed to ensure adequate message comprehension.

Conclusion

This study found that the residents of Lassa fever endemic states in Nigeria are often frightened during the disease outbreaks. More so, maximum attention was paid to risk communication messages in the midst of a high level of anxiety. Audience comprehension of the outbreaks communication about Lassa virus vector, transmission routes, risk factors and risk reduction measures for Lassa fever was adequate, amid a high-level of public alarm. Therefore, we conclude that maximum attention to risk communication messages in the midst of a high level of anxiety could lead to improved knowledge of infectious diseases among the targeted audience. However, the influence of the public alarm on residents' comprehension of risk communication messages for Lassa fever was statistically significant in Ebonyi and Ondo but not in the Edo state.

Recommendations

To curb public alarm during Lassa fever outbreaks and its effect on comprehension of risk information among the target population, the following were recommended:

- Authorities in charge of disease containment should highlight the figures of suspected and confirmed cases of Lassa fever, and case fatality rates during epidemics, in the context of intervention and self-protection.
- The media should make deliberate attempts to avert public alarm by counter-balancing risk information with solution-oriented messages.

- More emphasis should be laid on risk factors that promote the spread of the Lassa virus during outbreaks communication.
- Risk communication messages in Ebonyi and Ondo states should be tailored to reduce public alarm and enhance messages comprehension and recall through the use of visual materials with adequate message repetitions.

Limitations of the study

Data for this study were collected during the post-epidemic phase. Studies implemented at the peak of the Lassa fever outbreak may be more appropriate in predicting the influence of public alarm on risk information comprehension. Both rural and urban residents participated in the study. Thus, the geographic distribution of the respondents may have a significant impact on the results. More so, the respondents' knowledge of Lassa fever was not verified by any cheater questions, and the Likert scale only allows the respondents to select one option for each item.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving human participants were reviewed and approved by ethical approval for this study was obtained from the Covenant University Research and Ethics Committee (Ref. number CHREC/107/2019). The patients/participants provided their written informed consent to participate in this study.

Author contributions

CB-E conceived the idea, carried out the field research, and wrote the final draft. OO and NO created the instrument, tested for reliability of the instrument, and contributed in data analysis. AE and AO contributed in data analysis and editing of the final manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Ahmad, A. R., and Murad, H. R. (2020). The impact of social media on panic during the COVID-19 Pandemic in Iraqi Kurdistan: online questionnaire study. *J. Med. Internet Res.* 22:5. doi: 10.2196/19556

Ajibo, H. T., Obi-keguna, C. N., and Ugwuoke, P. J. (2018). Monkey pox and destabilization of community life in Nigeria: Implication for social work practice. *Journal of Humanities and Social Science* 23, 79–84.

Alsharji, K. E. (2020). Anxiety and depression during the COVID19 pandemic in Kuwait: the importance of physical activity. *Middle East Curr. Psychiatry* 27:60. doi: 10.1186/s43045-020-00065-6

Asia-Europe Foundation (2015). *Risk Communications for Public Health Emergencies: Bridging the National Mechanism With Healthcare Workers*. Workshop Report, Langkawi, Malaysia. Available online at: https://www.asef.org/images/docs/Langkawi%20report.pdf

Asogun, D., Tobin, E. A., Gunther, S., Happi, C., and Ikponwosa, D. (2014). Dealing with the unseen: fear and stigma in Lassa fever. *Abstract Int. J. Infect. Dis.* 21:221. doi: 10.1016/j.ijid.2014.03.881

Bali, S., Stewart, K. A., and Pate, M. A. (2016). Long shadow of fear in an epidemic: Fearonomic effects of Ebola on the private sector in Nigeria. *BMJ Glob. Health* 1:111. doi: 10.1136/bmjgh-2016-000111

Barzilay, R., Moore, T. M., Greenberg, D. M., DiDomenico, G. E., Brown, L. A., White, L. K., et al. (2020). Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for healthcare providers. *Transl. Psychiatry* 10:291. doi: 10.1038/s41398-020-00982-4

Ben-Enukora, C., Amodu, L., and Okorie, N. (2019b). Health communication and hepatitis health management: a study on the awareness and behavioural practices in Nigeria. *J. Health Manag.* 21, 313–325. doi: 10.1177/0972063419835128

Ben-Enukora, C., Oyero, O., Okorie, N., and Adesina, E. (2019a). "Risk communication and Lassa fever management in Nigeria: engaging new communication technologies for message delivery," in *34th International Business Information Management Association Conference (IBIMA)* (Milan), 7384–7392.

Ben-Enukora, C., Oyero, O., Okorie, N., Oyesomi, K., and Adeyeye, B. (2020). Effectiveness of Yoruba language radio jingles in promoting knowledge, attitude and practices regarding Lassa fever among women in Ondo State, Nigeria. *J. Public Health Africa* 11:1323. doi: 10.4081/jphia.2020.1323

Ben-Enukora, C. A., Adeyeye, B. K., Adesina, E., Ajakaiye, O. O. P., and Adekanye, O. (2022). Risk communication sources and knowledge of Lassa fever in Nigeria: an impact analysis. *Heliyon* 5:E11335. doi: 10.1016/j.heliyon.2022.e11335

Coleman, C.-L. (1993). The influence of mass media and interpersonal communication on societal and personal risk judgments. *Commun. Res.* 20, 611–628. doi: 10.1177/009365093020004006

Covello, V. T., and Milligan, P. A. (2010). *RIC 2010 Risk Communication – Principles, Tools and Techniques*. Center for Change/Risk Communication.

Available online at: https://www.nrc.gov/publicinvolve/conferencesymposia/ric/past/2010/slides/th39covellovpv.pdf (accessed April 5, 2020).

Covello, V. T., Peters, R. G., Wojtecki, J. G., and Hyde, R. C. (2001). Risk communication, the West Nile virus epidemic, and bioterrorism: responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *J. Urban Health* 78, 382–391. doi: 10.1093/jurban/78.2.382

D'Agostino, M., Mejía, F., Brooks, I., Marti, M., Novillo-Ortiz, D., and de Cosio, G. (2017). Fear on the networks: analyzing the 2014 Ebola outbreak. *Rev. Pan-Am. de Salud Públ.* 41:e134. doi: 10.26633/RPSP.2017.134

Dalhat, M. M., Olayinka, A., Meremikwu, M. M., Dan-Nwafor, C., Iniobong, A., Ntoimo, L. F., et al. (2022). Epidemiological trends of Lassa fever in Nigeria, 2018-2021. *PLoS ONE* 30:e0279467. doi: 10.1371/journal.pone.0279467

Fardin, M. A. (2020). COVID-19 and anxiety: a review of psychological impacts of infectious disease outbreaks. *Arch. Clin. Infect. Dis.* 15:e102779. doi: 10.5812/archcid.102779

Gentili, D., Bardin, A., Ros, E., Piovesan, C., Ramigni, M., Dalmanzio, and Cinquetti, S. (2020). Impact of communication measures implemented during a school tuberculosis outbreak on risk perception among parents and school staff, Italy. *Int. J. Environ. Res. Public Health* 17:911. doi: 10.3390/ijerph17030911

Huang, Q. (2020). How does news media exposure amplify publics' perceived health risks about air pollution in China? A conditional media effect approach. *Int. J. Commun.* 14, 1705–1724. Available online at: https://ijoc.org/index.php/ijoc/article/view/13603/3017

Islam, M. A., Barna, S. D., Raihan, H., Khan, M. N. A., and Hossain, M. T. (2020). Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: a webbased cross-sectional survey. *PLoS ONE* 15:e238162. doi: 10.1371/journal.pone.0238162

Kott, A., and Limaye, R. J. (2016). Delivering risk information in a dynamic information environment: framing authoritative voice in centres of disease control (CDC) and primetime broadcast news media communications during the 2014 Ebola outbreak. *Soc. Sci. Med.* 169, 42–49. doi: 10.1016/j.socscimed.2016.09.029

Krejcie, R. V., and Morgan, D. W. (1970). Determining sample size for research activities. *Educ. Psychol. Meas.* 30, 607–610. doi: 10.1177/001316447003000308

Manno, F. A. M. III, Lively, M. B., Manno, S. H. C., Cheng, S. H., and Lau, C. (2018). Health risk communication message comprehension is influenced by image inclusion. *J. Vis. Commun. Med.* 41, 157–165. doi: 10.1080/17453054.2018.1480321

Nigeria Centre for Disease Prevention and Control (NCDC) (2017). *2016/2017 Lassa Fever Outbreak Situation Report in Nigeria*. Available online at: https://ncdc.gov.ng/reports/100/2017-december-week-51 (accessed April 19, 2020).

Nigeria Centre for Disease Prevention and Control (NCDC) (2018). *Lassa Fever Outbreak Situation Report in Nigeria*. Available online at: https://www.cdc.gov/ncezid/dhcpp/index.html (accessed April 22, 2020).

Nigeria Centre for Disease Prevention and Control (NCDC) (2019). *Lassa Fever Outbreak Situation Report in Nigeria*. Available online at: https://ncdc.gov.ng/diseases/sitreps/?cat=5andname=An%20update%20of%20Lassa%20fever%20outbreak%20in%20Nigeria (accessed April 22, 2020).

Nigeria Centre for Disease Prevention and Control (NCDC) (2020). *NCDC Lassa fever Situation Report Epi 17: 20 - 26 April 2020*. Available online at: https://reliefweb.int/report/nigeria/ncdc-lassa-fever-situation-report-epi-17-20-26-april-2020 (accessed May 17, 2020).

Okorie, N., and Namtira, B.-J. (2017). Measuring media campaigns effectiveness for environmental health for sustainable development: a study of Ebola outbreak in Lagos State, Nigeria. *J. Health Manag.* 19, 553–562. doi: 10.1177/09720634177 27619

Okorie, N., Oyesomi, K., Oyero, O., Wiliams, O. R., and Soola, E. O. (2014). Effective use of information sources for breast cancer care: interplay of mass media and interpersonal channels. *J. Afr. Res. Bus. Technol.* 3, 1–12. doi: 10.5171/2014. 152107

Ornell, F., Schuch, J. B., Sordi, A. O., and Kessler, F. H. P. (2020). Pandemic fear and CO ID-19: mental health burden and strategies. *Brazil. J. Psychiatry* 42, 232–235. doi: 10.1590/1516-4446-2020-0008

Ozamiz-Etxebarria, N., Dosil-Santamaria, M., Picaza-Gorrochategui, M., and Idoiaga-Mondragon, N. (2020). Anxiety and depression levels in the initial stage of the COVID-19 outbreak in a population sample in the northern Spain. *Cadernos de' Saúde Públ.* 36:4. doi: 10.1590/0102-311x000 54020

Pasi, H., Md Isa, Z., and Shah, S. A. (2018). Perceived risk of developing cancer in a suburban community in Malaysia. *Asian Pac. J. Cancer Prevent.* 19, 395–400. doi: 10.22034/APJCP.2018.19.2.395

Perko, T. (2012). The role of mass media and journalism in risk communication. *J. Mass Commun. J.* 2:2. doi: 10.4172/2165-7912.100 0e110

Qiu, J., Shen, B., Zhao, M., Wang, Z., Xie, B., and Xie, Y. (2020). A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *Gen. Psychiatry* 33:e100213. doi: 10.1136/gpsych-2020-100213

Research Advisors (2006). *Sample Size Table*. Available online at: https://www.research-advisors.com/tools/SampleSize.htm (accessed March 10, 2020).

Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., and Kaushal, V. (2020). Study of knowledge, attitude, anxiety and perceived mental healthcare need in Indian population during COVID-19 pandemic. *Asian J. Psychiatr.* 51:102083. doi: 10.1016/j.ajp.2020.102083

Sund, B., Svensson, M., and Andersson, H. (2017). Demographic determinants of incidence experience and risk perception: do high-risk groups accurately perceive themselves as high-risk? *J. Risk Res.* 20, 99–117. doi: 10.1080/13669877.2015. 1042499

Talisuna, A. O., Okiro, E. A., Yahaya, A. A., Stephen, M., Bonkoungou, B., Musa, E. O., et al. (2020). Spatial and temporal distribution of infectious disease epidemics, disasters and other potential public health emergencies in the World Health Organisation Africa region, 2016-2018. *Glob. Health* 16:9. doi: 10.1186/s12992-019-0540-4

WHO (2013). *Health and Environment: Communicating the Risks*. Available online at: http://www.euro.who.int/__data/assets/pdf_file/0011/233759/e96930.pdf

WHO (2018). *Managing Epidemics*. Available online at: https://www.who.int/emergencies/diseases/managing-epidemics-interactive.pdf (accessed March 03, 2020).

Wimmer, R. D., and Dominick, J. R. (2014). *Mass Media Research: An Introduction, 10th Edn*. Cengage Learning.

Zhong, Y., Liu, W., Lee, T. Y., Zhao, H., and Ji, J. (2021). Risk perception, knowledge, information sources and emotional states among COVID-19 patients in Wuhan, China. *Nurs. Outlook* 69, 13–21. doi: 10.1016/j.outlook.2020. 08.005

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