

KNOWLEDGE AND FLOOD RISK PERCEPTION AMONG HOUSEHOLDS IN FLOOD-PRONE RURAL AND URBAN COMMUNITIES IN KADUNA STATE, NIGERIA

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ABSTRACT

Disasters have devastating effects on communities, especially where knowledge and perception are limited, vulnerability is high, and capacity is low. Nigeria has suffered from recurrent flood disasters, with Kaduna State among the affected regions. Household heads are important elements in flood disaster management, and their knowledge and risk perception are crucial. This study assessed household knowledge and flood risk perception among households in flood-prone rural and urban communities in Kaduna State. The comparative cross-sectional study was carried out with mixed methods of data collection among 202 households in rural communities and 202 in urban communities. Data were collected using a pretested structured questionnaire, focus group discussions and key informant interview guides. A multistage sampling technique was used to select the study respondents. The quantitative data were collected using Open Data Kit (ODK) version 1.8.1 and analyzed using SPSS version 23.0, while the qualitative data were analyzed using thematic content analysis. The mean age of the household heads in the rural communities was 39.4±12.9 years and in the urban communities 43.7±13.9 years. Although slightly better among urban households, knowledge of flood disasters and their management was poor in both community groups. However, in both rural and urban communities, the household heads had a good understanding of flood risk. Therefore, there is a need for effective flood disaster awareness and education by the relevant stakeholders for both the rural and urban communities, among others.

Keywords: Flood, Knowledge, Flood Risk perception, Households, Rural and Urban Communities, Kaduna

INTRODUCTION

Floods are the most common natural hazard, affecting more people than any other type of natural disaster (Jha et al., 2012; USODRR, 2015). In recent years, the frequency and intensity of rainfall events, flash floods and acute riverine and coastal flooding have been increasing, corresponding to more reported cases of flood disasters worldwide (Vojinović, 2015). Flood disasters are responsible for over 50% of all casualties and more than 30% of global economic losses from natural disasters (Hallegatte et al., 2013). It is estimated that the average annual number of people affected by floods will increase from 1 million in 1990 to 25 million by 2050 (Sachs, 2008).

Globally, 70 million people are exposed to floods, and more than 800 million are living in flood-prone areas. Floods are becoming

increasingly frequent worldwide and have resulted in increased global mortality, economic losses and the reversal of major developmental processes over the past two decades.

Most parts of sub-Saharan Africa (SSA) are vulnerable to flooding, with the East, South and Central regions experiencing the most frequent flood disasters, followed by West Africa (Ngoran et al., 2015). Nigeria, Burkina Faso, Chad, Ethiopia, Ghana, Senegal, Sudan, Togo, Kenya, Liberia, Mali, Niger, Rwanda, Malawi, Mozambique and Uganda are the worst hit by floods in SSA, affecting farmlands, settlements and other ecosystem services (Okayo et al., 2015; Ibrahim & Abdullahi, 2016).

Floods impact negatively on individuals, households and communities and have health, social, economic and environmental consequences. The health consequences can be classified as direct and indirect or as immediate, medium and long-term (UNISDR, 2015). From 1985 to 2014, floods affected more than 11 million people, resulting in 1,100 deaths and property damage exceeding US\$17 billion in Nigeria (Nkwunonwo, 2016).

A number of flooding events have been recorded in Kaduna over the past decade, including 1999, 2003, 2009, 2011, and September 2012, during which 178 houses and infrastructure were destroyed and many farmlands and crops were washed away (Ijigah & Akinyemi, 2015).

Knowledge and perceptions of flood disasters are crucial to modern flood risk management and the development of effective and efficient strategies (Kellens, 2013).

There is a dearth of locally relevant literature on flood knowledge and perception in the studied areas. This study will help to highlight the urban-rural divide and the development of flood management strategies in the State. It is a comparative study of knowledge and flood risk perception among households in flood-prone rural and urban communities in Kaduna State, Nigeria.

MATERIALS AND METHODS

Study setting: Kaduna State shares borders with Katsina, Zamfara, Kano, Niger, Bauchi, Plateau States and Abuja and is located between latitude 10°31' N and longitude 7°26' 25" E. There are 23 Local Government Areas (LGAs), 255 wards, and it occupies an area of approximately 48,473.2 square kilometers, with a projected population of 8,446,317 in 2018 (NPC, 2013). 14 of the 23 LGAs in the state have been classified as flood-prone (SEMA, 2017).

Study Design and population: The study was a comparative descriptive study carried out between September and November 2019.

Study population: For the quantitative component, the study population comprised household heads aged 18 years or older who had lived in the selected flood-prone communities for at least 1 year. For the qualitative component, participants were community members (male and female), community leaders from the six selected communities (one from each), and the monitoring and evaluation (M&E) officer of the Kaduna State Emergency Management Agency (SEMA). Residents who were seriously ill or had mental challenges during the study were excluded.

Sample size calculation: The desired minimum sample size for the quantitative component was calculated using the formula for comparative studies shown below (Arif et al., 2014)

$$n = \frac{2(Z\alpha + Z\beta)^2 [P_1(1 - P_1) + P_2(1 - P_2)]}{(P_1 - P_2)} \quad (1)$$

Where n= desired minimum sample size; Z_α = Standard normal deviate at 95% confidence interval = 1.96; Z_β = Standard deviate at 80% power = 0.84; P_1 = Flood disaster preparedness in an urban area = 24.4% (Asheneke et al., 2017); P_2 = Flood disaster preparedness in a rural area = 9% (Mukanganisa, 2011). The calculated minimum sample size (n) was 184, and with a 10% non-response rate, it became 184 + 18 = 202 per arm. That is, a minimum of 202 heads of household in the flood-prone rural communities and 202 in the flood-prone urban communities in Kaduna State were administered the household questionnaire.

Sampling technique: A multistage sampling technique was used to select the participants for the quantitative component.

Stage 1 - Selection of Local Government Areas: The identified flood-prone LGAs in the state were compiled and classified into rural and urban. Simple random sampling via balloting was used to select one of the seven rural LGAs, and Soba was chosen. Kaduna North was also selected from the list of the 7 urban LGAs by balloting.

Stage 2 – Selection of communities: From the list of 6 communities in Soba LGA, 3 were selected by balloting: Garu, Takalafiya and Soba police station. Similarly, from the list of 6 communities in Kaduna North LGA, three were selected using simple random sampling by balloting: Ungwan Rimi, Kabala and Abubakar Kigo New Extension.

Stage 3 – Selection of houses: Houses in the selected rural and urban communities were selected using systematic sampling, after generating a sampling frame based on the number of houses in each community and a calculated sampling interval of 3 for both cases. The houses in the selected rural and urban communities were separately listed and numbered to create the sampling frames for each community.

The 202 houses selected across the three rural communities were allotted in proportion to each community's size. The sampling interval was calculated by dividing the total number of houses in the communities by 202. The index house was selected using a random number table from numbers within the sampling interval. The next was obtained by adding the sampling interval to the index house number, and this continued until the required sample size was attained.

Stage 4 - Selection of respondents: In the selected houses, all the household heads were identified, and those who met the eligibility criteria were recruited into the study. When there was more than one eligible household head, one was selected for the interview by

balloting.

The study instruments were a questionnaire for the quantitative survey and an observational checklist, FGD and KII guides for the qualitative component.

For the qualitative component, eight female and eight male community members were purposively selected in each of the six selected communities for the female and male FGDs, respectively, making a total of 12 FGDs. For the KIIs, the community leader in each of the six selected communities (3 rural and 3 urban) and the M&E officer of SEMA were interviewed, for a total of 7 KIIs.

The questionnaire was structured, interviewer-administered and contained mainly closed-ended questions adapted from other studies (Mukanganisa, 2011; Asheneke et al., 2017) to fit the objectives of the study.

To ascertain validity and reliability, relevant adjustments were made to the data collection instruments; 10% of the sample was pretested in Sabon Gari and Giwa LGAs of Kaduna, representing urban and rural LGAs, respectively. The questionnaire was constructed using Open Data Kit (ODK) version 1.8.1, adapted from the ODK training guide.

Interview guides were used for the FGD and KII. Both guides were designed by the researchers and pretested in Sabon Gari and Giwa LGAs. The FGD and KII were complementary.

The male and female participants in the FGD were residents of their respective flood-affected communities. Their general characteristics included living there for at least one year and being able to communicate in Hausa or English. The community leaders for the KII were those who had been saddled with leadership responsibilities, had been staying there for at least 1 year, and could communicate in Hausa or English. The M and E officer from Kaduna SEMA has been in that position for about 3 years and is a graduate.

A total of 12 FGDs were conducted across the 6 selected communities (one male and one female FGD in each community). Each session lasted 45-60 minutes, and the language for the discussion was English and Hausa depending on the community. The principal researcher was the moderator of the sessions, while 2 others served as the note-taker and the operator of the digital recorder, after obtaining permission to record the discussions. In each case, the FGD venues were jointly decided by the participants and the researchers. The FGDs were subsequently transcribed.

Six KIIs with community leaders in the 6 selected communities and one KII with the monitoring and evaluation officer of SEMA were conducted. The developed pre-tested KII guides were used. A researcher served as a moderator, while 2 others served as the note-taker and operator of the digital recorder. The languages for the KIIs were English and Hausa, depending on the community, and each session lasted 45- 60 minutes.

Knowledge of flood disaster and its management

The respondents' knowledge was assessed using 17 questions. Some questions had multiple correct answers, for a total of 50 correct responses. Responses were Yes, No and Do not know. Correct responses were awarded 1 point; No and Don't know were awarded 0 points, and if No was the correct response, it was awarded 1 point, while Yes and Don't know were awarded 0 points. Other responses scored 1, 2, 3 and 4 and more correct answers were awarded 1, 2, 3 and 4 points, respectively. Minimum and maximum scores were 0 and 50, respectively. Each respondent's score was converted to a percentage by dividing their scores by the maximum score (50) and multiplying by 100. The scores were

categorized as <49.9% (poor), 50-69.9% (fair), and ≥70% (good) (Ogboghodo et al., 2016).

$$\text{Percentage Knowledge score} = \frac{\text{Number of correct responses}}{\text{Total number of questions}} \times 100 \quad (2)$$

Flood risk perception

Respondents' flood risk perception was assessed using 15 structured questions on a 5-point Likert scale. A response of strongly agree was awarded 5, Agree 4, Neutral 3, Disagree 2 and strongly disagree 1. The lowest score was 15, and the maximum was 75. Each respondent's score was converted to a percentage by dividing the score by the maximum (75) and multiplying by 100. The mean score for flood risk perception was calculated and used to score it. A score less than the mean score was classified as poor flood risk perception, and a score equal to or greater than the mean score was classified as good flood risk perception.

Data were imported into Statistical Package for the Social Sciences (SPSS) version 23 (SPSS Inc., Chicago, Illinois, USA) and analyzed. Univariate analysis was performed on the quantitative data. For bivariate analysis, the chi-square test was used to examine the association between dependent and independent categorical variables. Statistical significance was set at a p-value of <0.05.

The audio recordings of the FGD and KII interviews were transcribed and then translated from Hausa to English. Content analysis of the transcripts was done along thematic lines. All texts were read several times and then condensed to identify statements that related to the topic of analysis. The condensed statements were categorized based on the content. The findings were then presented in narrative form as prose. The quantitative and qualitative data were triangulated.

Ethical considerations

Ethical approval to carry out the study was sought and obtained from the Health and Research Ethics Committees of Kaduna State Ministry of Health (MOH/ADM/744/Vol. 1/718). Permissions were also obtained from the LGAs and the community leaders. The benefits of the research to the communities and the state at large were explained to the respondents, and they were assured that the study would not have any harmful effects and that no member of the communities would be excluded based on his/her social status. Written informed consent was obtained from the participants, and they were informed of their rights to withdraw from the study at any time. Confidentiality was also observed.

RESULTS

Most of the respondents were aged 25-54 years. In both rural and urban communities, males and Muslims were in the majority. The majority in both rural and urban communities were married, and more than 60% of rural inhabitants were farmers/fishermen, while the majority of urban inhabitants were civil servants. More than half of the rural and urban respondents (but more in the urban) earned a monthly income of ₦18,000. Most rural inhabitants (92.6%) have lived in their communities for more than 10 years, compared with 55.4% of urban inhabitants. Less than 4% of the households in both rural and urban communities had persons with disabilities (Table 1).

Table 1: Socio-demographic characteristics of household heads in flood-prone rural and urban communities in Kaduna State

Socio-demographic characteristics	Rural (n=202) Frequency (%)	Urban (n=202) Frequency (%)	Test statistics
Age(years)			
15- 24	20 (9.9)	8 (4.0)	$\chi^2 = 13.835$ p = 0.008
25- 34	63 (31.2)	51 (25.2)	
35- 44	51 (25.2)	59 (29.2)	
45- 54	33 (16.3)	43 (21.3)	
55- 64	27 (13.4)	23 (11.4)	
≥65	8 (4.0)	18 (8.9)	
Sex			
Male	195 (96.5)	144 (71.3)	$\chi^2 = 47.688$ p = 0.001
Female	7 (3.5)	58 (28.7)	
Religion			
Christianity	2 (1.0)	53 (26.2)	$\chi^2 = 54.744$ p = 0.001
Islam	200 (99.0)	149 (73.8)	
Ethnic group			
Hausa	200 (99.0)	114 (56.4)	$\chi^2 = 133.929$ p = 0.001
Ibo	2 (1.0)	28 (13.9)	
Yoruba	0 (0)	26 (12.9)	
Others	0 (0)	34 (16.8)	
Marital status			
Single	21 (10.4)	35 (17.3)	$\chi^2 = 4.063$ p = 0.044
Married	181 (89.6)	167 (82.7)	
Educational status			
No formal	112 (55.4)	32 (15.8)	$\chi^2 = 111.640$ p = 0.001
Primary	43 (21.3)	25 (12.4)	
Secondary	39 (19.3)	71 (35.1)	
Tertiary	8 (4.0)	74 (36.6)	
Occupational status			
Unemployed	9 (4.5)	23 (11.4)	$\chi^2 = 105.848$ p = 0.001
Business	36 (17.8)	43 (21.3)	
Civil servant	96 (47.5)	10 (5.0)	
Farmer	4 (2.0)	29 (14.4)	
Fishermen	57 (28.2)	97 (48.0)	
Estimated monthly income of household head			
<₦18,000	91 (45.0)	69 (34.2)	$\chi^2 = 5.009$ p = 0.025
≥₦18,000	111 (55.0)	133 (65.8)	
Duration of stay in the community (in years)			
1-5	6 (3.0)	66 (32.7)	$\chi^2 = 75.631$ p = 0.001
6-10	9 (4.5)	24 (11.9)	
>10	187 (92.6)	112 (55.4)	
Disability			
No disability	195 (96.5)	197 (97.5)	$\chi^2 = 0.344$ p = 0.558
Has disability	7 (3.5)	5 (2.5)	

Household heads in both rural and urban communities had an average level of knowledge about the causes and impacts of flooding. However, their knowledge of flood insurance and use of

muster points was poor in both rural and urban communities, as shown in the above table (Table 2a).

The household heads' knowledge of the roles of the National Emergency Management Agency (NEMA), State Emergency Management Agency (SEMA), Local Emergency Management Committee (LEMC), and Community Emergency Response Team (CERT) in flood disasters was poor in both rural and urban communities (Table 2b).

Table 2a: Indices used to assess knowledge of flood disaster and its management among households in flood prone rural and urban communities in Kaduna State

Elements used	Rural communities n= 202 Frequency (%)	Urban communities n=202 Frequency (%)	Test Statistics Chi square P value
What do you understand by flooding?			
-Correct response	30 (14.9) 172 (85.1)	80 (39.6) 122 (60.4)	31.231 0.00001
-Don't know/Incorrect response			
What are the causes of flooding you know?			
-Don't know	30 (14.9) 60 (29.7) 50 (24.8)	4 (1.9) 40 (19.8) 45 (22.3)	40.959 0.00001
-One correct cause	40 (19.8) 22(10.9)	60 (29.7) 53 (26.2)	
-two correct causes			
-three correct causes			
-≥4 correct causes			
Do you know when flooding is likely to occur in your community?			
-Yes	140 (69.3) 62 (30.7)	190 (94.0) 12 (6.0)	41.360 0.00001
-No			
Who are the people mostly affected by flood?			
-one correct answer	90 (44.6) 57 (28.2) 35 (17.3)	57 (28.2) 70 (34.7) 45 (22.3)	11.9889 0.007421
-two correct answers	20 (9.9)	30 (14.9)	
-three correct answers			

-≥4 correct answers

What are the negative impacts of flooding?

	120 (59.4)	90 (44.6) 56 (27.7)	29.495 0.00001
-one correct answer	67 (33.1) 10 (5.0)	30 (14.9) 26 (12.9)	
-two correct answers	5 (2.5)		
-three correct answers			
-≥4 correct answers			

Are you aware of preparedness against floods (flood preparedness)?

	170 (84.2)	190 (94.1)	10.202 0.001403
-Yes	32 (15.8)	12 (5.9)	
-No			

Are you aware of any insurance against floods (flood insurance)?

	5 (2.5)	10 (5.0)	1.7309 0.1883
-Yes	197 (97.5)	192 (95.0)	
-No			

Are you aware of traditional warning signs for flooding?

	102 (50.5)	52 (25.7) 150 (74.3)	26.2338 0.00001
-Yes	100 (49.5)		
-No			

If yes to the above, what are the traditional warning signs?

	5 (4.9) 68 (66.7) 19 (18.6) 10 (9.8)	31(30.4) 10 (9.8) 6 (5.9) 5 (4.9)	60.4737 0.00001
-one correct answer			
-two correct answers			
-three correct answers			
-≥4 correct answers			

Are you aware of an

assembling point/place (muster point) in case of disaster in your	10 (5.0)	70 (34.7)	0.00001	56.1111	community? -Yes -No
	192 (95.0)	132 (65.3)			

Table 2b: Indices used to assess knowledge of flood disaster and its management among households in flood prone rural and urban communities in Kaduna State

Elements used	Rural communities (n= 202) Frequency (%)	Urban communities (n=202) Frequency (%)	Total	Test Statistics Chi square P value
Are these relevant stakeholders in flood disaster management ?				
-Don't know	160 (79.2)	100 (49.5)	260 (64.4)	54.2541
-one correct answer	35 (17.3)	45 (22.3)	80 (19.8)	0.00001
-two correct answers	5 (2.5)	42 (20.8)	47 (11.6)	
-three correct answers	1 (0.5)	10 (5.0)	11 (2.7)	
-≥4 correct answers	1(0.5)	5(2.5)	6 (1.5)	
What are the roles members of the community in flood disaster preparedness ?				
-one correct answer	100 (49.5)	65 (32.2)	(40.8)	14.0866
-two correct answers	52 (25.7)	60 (29.7)	112 (27.7)	0.00279
-three correct answers	30 (14.9)	42(20.8)	72 (17.8)	
-≥4 correct answers	20 (9.9)	35(17.3)	55 (13.6)	
What are the roles of community leaders in flood disaster preparedness ?				
-one correct answer	111(55.0)	140 (69.3)	251 (62.1)	10.2097
-two correct answers	51 (25.2)	40 (21.8)	91(22.5)	0.01687
-three correct answers	30 (14.9)	15 (7.4)	45 (11.1)	
-≥4 correct answers	10 (5.0)	7 (3.5)	17 (4.2)	

answers

**What are the
roles of NEMA
in flood**

disaster	187 (92.6)	160 (79.2)	347 (85.9)	18.7978
preparedness	10 (5.0)	15 (7.4)	25 (6.2)	0.00086
?	3 (1.5)	15 (7.4)	18 (4.5)	
--Don't know	1(0.5)	10 (5.0)	11 (2.7)	
-one correct	1(0.5)	2 (0.9)	3 (0.7)	
answer				
-two correct				
answers				
-three correct				
answers				
-≥4 correct				
answers				

**What are the
roles of
Kaduna**

SEMA in flood	189 (93.6)	20 (9.9)	209 (51.7)	288.9395
disaster	5 (2.5)	157 (77.8)	162 (40.1)	0.00001
preparedness	5 (2.5)	10 (5.0)	15 (3.7)	
?	2 (0.9)	10 (5.0)	12 (3.0)	
--Don't know	1(0.5)	5 (2.5)	6 (1.5)	
-one correct				
answer				
-two correct				
answers				
-three correct				
answers				
-≥4 correct				
answers				

**What are the
roles of LEMC
in flood**

disaster	194 (96.0)	154 (76.2)	348 (86.1)	33.3613
preparedness	4 (2.0)	20 (9.9)	24 (5.9)	0.00001
?	2 (0.9)	13 (6.4)	15 (3.7)	
--Don't know	1(0.5)	10 (5.0)	11 (2.7)	
-one correct	1(0.5)	5(2.5)	6 (1.5)	
answer				
-two correct				
answers				
-three correct				
answers				
-≥4 correct				
answers				

What are the roles of CERT in flood disaster preparedness?

194 (96.0)	174(86.1)	368 (91.0)	13.6203
5 (2.5)	10 (5.0)	15 (3.7)	0.0086
1(0.5)	9 (4.5)	10 (2.5)	
1(0.5)	5 (2.5)	6 (1.5)	
--Don't know	4 (2.0)	5 (1.2)	
-one correct answer			
-two correct answers			
-three correct answers			
-≥4 correct answers			

Few respondents in the urban communities had fair knowledge (13.7%), and all in the rural communities had poor knowledge of flood disasters and their management. There was a statistically significant difference in knowledge of flood disasters and their management between households in rural and urban communities (Table 3).

Table 3: Comparison of knowledge of flood disaster and its management among households in flood-prone rural and urban communities in Kaduna State

Knowledge grade	Rural (n=202) Frequency (%)	Urban (n=202) Frequency (%)	Total
Good	0 (0.0)	0 (0.0)	0 (0)
Fair	0 (0.0)	27 (13.7)	27 (6.7)
Poor	202 (100.0)	175 (86.3)	377 (93.3)
Test statistics	Fisher exact = 26.830 df= 2 p <=0.001		

Majority of the respondents in the urban communities (50.5%) had television as their source of information while those in the rural communities had radio as their source. Others included sources such as relatives, friends and religious leaders (Figure 1).

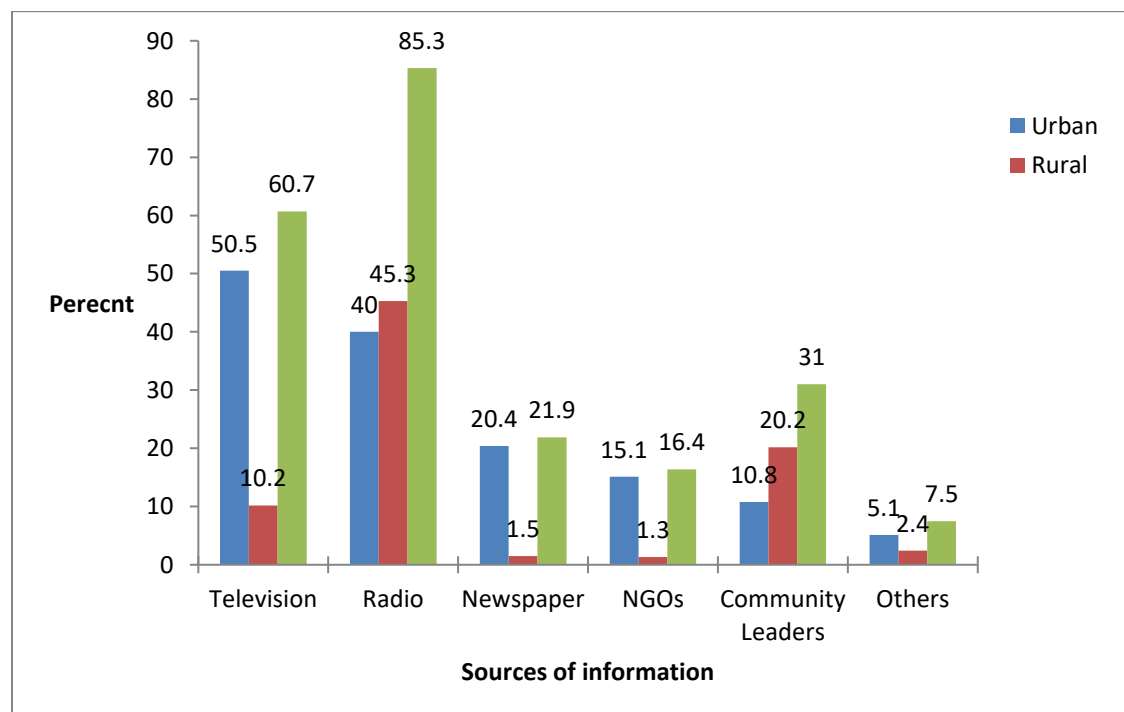


Figure 1: Comparison of sources of information on disaster and its management of the respondents in urban and rural communities in Kaduna State (n=202)

There were various perceptions of different aspects of the flood risk. Slightly more than 50% of urban community respondents strongly agreed that flooding is a natural phenomenon aggravated by human environmental activities, while only 36% of rural community respondents held the same view; this difference was statistically significant. Only 25% of respondents in urban communities strongly agreed that their households were prepared for floods, compared with 20% in rural communities (Table 4a). Only 28% and 26% of respondents in urban and rural communities,

respectively, strongly agreed that their communities were prepared for flood disasters. There was statistical significance. The majority of respondents in both rural and urban communities strongly agreed that the impact of floods will be serious for their households. Sixty-four percent and 54% of the respondents in the rural and urban communities, respectively, strongly agreed that Kaduna SEMA has not been proactive in their communities (Table 4b).

Table 4a: Assessment of flood risk perception among household heads in rural and urban communities in Kaduna State

Indices	Rural n=202 Frequency (%)	Urban n=202 Frequency (%)	Test statistics χ^2 p value
Flood preventive measures are better than relief aid			
SA	127 (62.9)	123 (60.9)	13.273
A	72 (35.6)	61 (30.2)	0.004
N	2 (1.0)	15 (7.4)	
DA	1 (0.5)	3 (1.5)	
Modern technology is the best way to solve flood problems			
SA	108 (53.5)	125 (61.9)	6.710
A	74 (36.6)	58 (28.7)	0.152
A	18 (8.9)	13 (6.4)	
N	2 (1.0)	5 (2.5)	
DA	0 (0)	1 (0.5)	
SD			
Floods are natural phenomena aggravated by human environmental activities			
SA	72 (35.6)	110 (54.5)	20.042
A	90 (44.6)	58 (28.7)	0.001
N	30 (14.9)	19 (9.4)	
DA	9 (4.5)	10 (5.0)	
SD	1 (0.5)	5 (2.5)	
Household is currently prepared against flood			
SA	41 (20.3)	51 (25.2)	3.189
A	56 (27.7)	50 (24.8)	0.527
N	17 (8.4)	18 (8.9)	
DA	54 (26.7)	43 (21.3)	
SD	34 (16.8)	40 (19.8)	
Training on use of fire extinguisher is generally necessary			
SA	126 (62.4)	109 (54.0)	9.852
SA	62 (30.7)	67 (33.2)	0.043
A	13 (6.4)	20 (9.9)	
N	0 (0)	5 (2.5)	
DA	1 (0.5)	1 (0.5)	
SD			
My households maintain an emergency contact list in case of the flood event			
SA	48 (23.8)	37 (18.3)	13.149
A	18 (8.9)	35 (17.3)	0.011
N	13 (6.4)	23 (11.4)	
DA	15 (7.4)	21 (10.4)	
SD	108 (53.5)	86 (42.6)	
Structures within my household compound are built to resist and protect against flood damage			
SA	35 (17.3)	44 (21.8)	34.717
A	24 (11.9)	50 (24.8)	0.001
N	34 (16.8)	39 (19.3)	
DA	25 (12.4)	36 (17.8)	
SD	84 (41.6)	33 (16.3)	

Key: SA (strongly agree), A (agree), N (neutral), DA (disagree), SD (strongly disagree)

Table 4b: Assessment of flood risk perception among household heads in rural and urban communities in Kaduna State

Table 4B: Assessment of flood risk perception among household heads in rural and urban communities in Kaduna State			
Indices	Rural n=202 Frequency (%)	Urban n=202 Frequency (%)	Test statistics χ^2 p value
If flood disaster occurs in my community, the impact is likely to be serious on my household			
SA	95 (47.0)	82 (40.6)	23.479 0.001
A	87 (43.1)	72 (35.6)	
N	19 (9.4)	30 (14.9)	
DA	1 (0.5)	17 (8.4)	
SD	0 (0.0)	1 (0.5)	
Community is currently prepared against flood			
SA	52 (25.7)	57 (28.2)	26.921 0.001
A	57 (28.2)	34 (16.8)	
N	8 (4.0)	37 (18.3)	
DA	46 (22.8)	33 (16.3)	
SD	39 (19.3)	41 (20.3)	
There is a relationship between household and community flood disaster preparedness			
SA	68 (33.7)	58 (28.7)	26.095 0.001
A	49 (24.3)	27 (13.4)	
N	39 (19.3)	51 (25.2)	
DA	36 (17.8)	28 (13.9)	
SD	10 (5.0)	38 (18.8)	
I will consent to be a member of CERT			
SA	114 (56.4)	72 (35.6)	27.394 0.001
A	63 (31.2)	69 (43.2)	
N	17 (8.4)	35 (17.3)	
DA	3 (1.5)	18 (8.9)	
SD	5 (2.5)	8 (4.0)	
SEMA has not been proactive in flood related events in the community			
SA	129 (63.9)	108 (53.5)	9.104 0.059
A	37 (18.3)	52 (25.7)	
N	32 (15.8)	33 (16.3)	
DA	1 (0.5)	7 (3.5)	
SD	3 (1.5)	2 (1.0)	
There is poor coordination between the local community and SEMA			
SA	19 (9.4)	78 (38.6)	93.328 0.001
A	24 (11.9)	60 (29.7)	
A	153 (75.7)	59 (29.2)	
N	4 (2.0)	4 (2.0)	
DA	2 (1.0)	1 (0.5)	
SD			
Training on First Aid is necessary for members of community			
SA	140 (69.3)	122 (60.4)	8.252 0.083
A	48 (23.8)	60 (29.7)	
A	14 (6.9)	16 (7.9)	
N	0 (0.0)	2 (1.0)	
DA	0 (0.0)	2 (1.0)	
SD			
Community has a community disaster plan			
SA	55 (27.2)	42 (20.8)	30.143 0.001
A	51 (25.2)	29 (14.4)	
N	23 (11.4)	22 (10.9)	
DA	40 (19.8)	28 (13.9)	
SD	33 (16.3)	81 (40.1)	

The majority of respondents in both rural and urban communities

had a good perception of flood risk. There was no statistically significant difference in flood risk perception between households

in rural and urban communities (Table 5).

Table 5: Comparison of flood risk perception among households in flood-prone rural and urban communities in Kaduna State

Flood risk perception	Rural (n=202) Frequency (%)	Urban (n=202) Frequency (%)	Total
Good	102 (50.5)	111 (54.9)	213 (52.7)
Poor	100 (49.5)	91 (45.1)	191 (47.3)
Test statistics	$\chi^2 = 0.298$ =0.619	df= 1	p

Results from FGDs and KII

A respondent from Takalafiya said, “Flood is a big problem in our community and it is usually from fullness of rivers, lack or blockage of drainages. Moreover, in recent years, the occurrence has no regular pattern in the community, but it usually takes place between August and September” (Rural, FGD 2). A respondent from Kabala said, “The community has been experiencing floods at intervals of 10 years, 5 years, 2 years, but now yearly” (Urban, FGD 3). While a respondent from Ungwan Rimi said, “Flood is a big problem here, and once it is raining season, we know that we are in trouble” (Urban, FGD 5).

A respondent from Ungwan Rimi said, “Flood itself is a hazard; it only becomes a disaster when it affects lives and properties. Several lives and properties could be saved with preparedness, so prevention is better than cure” (Urban, FGD 5).

“The impact of flood in our community included health risks such as snake bites, diarrhea diseases, rashes, destruction of money kept at home, loss of animals and theft of properties by ‘Area boys’. ‘Area boys’ do swim in the night to steal properties left in the houses” (Urban, FGD 3).

“We also get information about floods through a rain gauge meter installed in the community to monitor the level/ volume of water in the river close to the community. In addition, posters with emergency phone numbers to contact in case of flooding have been provided by Christian Aid and the European Union” (Urban, FGD 5).

DISCUSSION

Household knowledge and flood risk perception are very important in flood management. The mean age of respondents in rural communities was 39.4 ± 12.9 years, whereas in urban communities it was 43.7 ± 13.9 years. This means that there are younger people in rural communities, similar to the study in Taraba State, where 31.4% of respondents were aged 31-40 years (Oyatayo et al., 2016). The public health importance of this finding is that these young people will be suitable for recruitment in the communities as members of the community emergency response team (CERT). They could also be used as agents of change in their communities by educating other community members once their knowledge and skills in flood disaster and its management have been improved by relevant stakeholders such as SEMA, LEMC and non-governmental organisations (NGOs), among others.

Most respondents in both rural and urban communities had poor knowledge of flood disasters and their management. However, some in the urban communities had average knowledge. This finding is different from that of a study in India (Saxena, 2016). The small proportion of respondents with fair knowledge in urban communities may be due to the activities of Christian Aid (NGO)

and the European Union in some of these communities. Knowledge of flood disasters and their management was poor among all respondents in both rural and urban communities. However, a proportion of respondents in urban communities had fair knowledge. This finding is not in line with a study in India, which reported knowledge scores of 34%, 60% and 6% for good, fair and poor, respectively (Saxena, 2016). Studies have shown that knowledge of flood disaster prevention is positively associated with preparedness for flood disasters (Ashenefe et al., 2017). The respondents in both communities had different knowledge on the different areas (such as definition of flooding, causes, most vulnerable groups, impacts and relevant stakeholders, among others in flooding) assessed, which could be used in the design of training programs for the different communities in line with the adopted Sendai framework for disaster risk reduction (UNISDR, 2015).

The respondents in both the rural and urban communities had different perceptions across the several indices assessed. The majority of those in rural communities had poor flood risk perception, while the majority of their counterparts in urban communities had good flood risk perception. This finding differs from that of a study in China, which showed that rural households had flood risk perceptions of 13.7%, 73.7% and 12.6% for high, moderate and low, respectively (Ezekwe & Nwaogu, 2018).

Even though generally the flood risk perception was high among the respondents in rural and urban communities, there were some indices, such as the need for households to maintain contact with emergency responders and have a community flood disaster plan, with poor perception that needs correction through effective education and development of skills, among others.

Several researchers have documented that understanding and improving flood risk perception has become increasingly important in modern flood risk management (Ezekwe & Nwaogu, 2018). In addition, some scholars believe that people with high flood risk perception are more likely to undertake flood risk mitigation measures than those with low flood risk perception (Delin et al., 2018). This variation could be related to respondents’ age, sex, level of education, income, among other factors (Ezekwe & Nwaogu, 2018). A study in Lagos found an association between age ($p < 0.05$) and flood risk perception (Adelekan & Asiyanbi, 2016), while a study in Pakistan found that flood risk perception was primarily influenced by ownership of a house ($p < 0.001$), education ($p < 0.001$) and past experience ($p < 0.001$) with floods (Ge et al., 2011). Education was found to have a highly significant positive correlation with flood risk perception because it could raise awareness (Ge et al., 2011). However, a study reported that more educated people had lower flood risk perception because they may have a greater sense of controllability over disasters (Kellens, 2013). Similarly, respondents with higher monthly incomes may have lower levels of risk perception (Kellens, 2013).

Respondents from Takalafiya, Kabala and Ungwan Rimi reported that flooding is a problem in their communities and is usually worse between August and September. The majority of respondents in both rural and urban communities had a high perception of flood risk, and they knew that their communities were in flood-prone areas. They also had a high level of concern for vulnerable groups in their communities, such as children, women and the elderly. Loss of property, livestock and money, collapsed houses, snake bites and scorpion stings were among the impacts of floods in their communities. A respondent from Kabala reported that the impacts of floods in their community include snake bites, destruction of

valuable, loss of animals and theft of property left in houses, among others.

The majority of the respondents in both rural and urban communities said they get information about floods from the radio, community leaders and neighbours. Other sources mentioned included television, phone (by text messages) and newspapers, among others. A respondent from Ungwan Rimi reported on the installation of a rain gauge to measure the volume of water in the river. Most respondents, especially those from rural communities, said they preferred their community leaders as their source of information on floods because other sources could fail them.

Limitations of the study: This study had limitations. We relied on self-reported willingness, which may have been biased by social desirability. The respondents were educated about the importance of the research and the need to provide sincere and accurate information. They were made to understand that the research report will be used for policy formulation.

Conclusion

Household respondents in urban communities had fair knowledge of flood disaster preparedness and management, compared with the poor knowledge among those in rural communities.

Household respondents in both rural and urban communities showed good flood risk perception, with rural counterparts slightly better than those in urban communities; however, this difference was not statistically significant. To address the limited knowledge of flood disasters and their management in both rural and urban communities, the government at both the state and local levels, along with other relevant stakeholders, should design programs to improve people's knowledge. It should be designed to address specific deficiencies regarding the roles of NEMA, SEMA, LEMC and CERT in relation to flood disasters, as well as the importance of flood insurance. To address deficiencies in people's flood risk perception, programs can also be designed at the community level to correct misconceptions.

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