

Flood Risk Awareness and Enhancement Strategies among Community Dwellers in Plateau State, Nigeria

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Abstract

The study investigated flood risk awareness and enhancement strategies among community-dwelling adults in Plateau State, Nigeria. Four specific objectives with four corresponding research questions and two null hypotheses guided the study. The study adopted mixed-methods approach. The sample size consisted of 810 community-dwelling adults and 23 staff of the State Emergency Management Agency (SEMA) in Plateau State. The Flood Risk Awareness Questionnaire (FRAQ), In-depth Interview Guide on Flood Risk Awareness (IDGFRA), and Flood Risk Awareness and Enhancement Strategies Questionnaire (FRAESQ) were used for data collection. Face validity of the two instruments (FRAQ and IDGFRA) were established by seven experts. The reliability coefficients of .96 and .83 were obtained for sections B and C, respectively. Mean and standard deviation was used to answer the research questions. Also, the null hypotheses were tested using independent samples t-test and one-way analysis of variance (ANOVA) at 0.05 level of significance and appropriate degrees of freedom. The quantitative findings showed that community-dwelling Adults were aware of flood risk to a moderate extent ($\bar{x} = 2.93$, $SD = 0.77$). There was a significant difference in the extent of flood risk awareness among community-dwelling adults in Plateau State based on age, $F(3,785) = 9.335$, $P = 0.000$. The experts considered the enhancement strategies for flood risk awareness among community-dwelling adults appropriate. Based on the study's findings, it was recommended, among others, that flood risk awareness education campaigns should be intensified at the community levels to improve community-dwelling adults' flood risk awareness levels in Plateau State.

Keywords: Flood, Risk, Awareness, Enhancement strategies, Community dwellers

Introduction

Floods are considered one of the deadliest natural disasters and major public health problems affecting diverse populations. Between 1998 and 2017, floods affected more than two billion people worldwide (United Nations [UN], 2020; World Health Organization [WHO], 2020). The significant benefits of high level of risk awareness regarding flooding, as reliable approaches to safety and survival by the populace cannot be overemphasized (WHO, 2020). Flood disasters are increasing in frequency and intensity due to climate change in many parts of the globe including Nigeria (United States Department of Labour [USDL], 2020; WHO, 2020).

In Nigeria, flood disasters have occurred in the past few years. The International Organization for Migration (IOM, 2020) reported that flooding had displaced about 15,000 people in the Northwest and North Central of Nigeria. The IOM (2020) further reported that flooding affected the states of Kaduna, Katsina, Sokoto, Plateau, and Zamfara between the 3rd and 9th of August 2020. Also, in Plateau State, about 621 homes were displaced and destroyed by flooding, killing six persons and 832 residents injured (UN, 2020; WHO, 2020).

Floods have been variously conceptualized in literature. Marc and Arretyre (2016) conceived a flood as a body of water covering dry land. The authors explained that floods could contaminate foods and drinking water, adversely affecting structures, houses, animals, and farm products and moving fertile soil away from valuable farmland.

People's awareness of the risks associated with flooding (i.e., loss of life, damage to properties, destruction of farm produces, contamination of water and increased outbreak of diseases) becomes necessary to prevent or limit the devastating effects of flood disasters in their communities. Risk awareness is defined as an assessment of the probability of a hazard and the results (most often - the negative consequences) perceived by the community dwellers or members (Becker et al., 2014; Bubeck et al., 2012).

Community dwellers' level of flood risk awareness can facilitate planning, preventing or mitigating actions in flood-prone areas. A high level of flood risk awareness enhances increased flood risk preparedness and results in maximum flood control and management (Miceli et al., 2008; Terpstra et al., 2009). Risk awareness enhances the adoption of preventive behaviours (i.e., precautionary measures/actions) against natural hazards such as flooding by the residents. High level of flood risk awareness is crucial in saving lives and properties of flood-prone areas.

The present study examined flood risk awareness and enhancement strategies among community dwellers in Plateau State. Besides flood risk awareness by the residents of flood-prone areas, adopting measures that improve their awareness for such risks is essential. In simple terms, enhancement is the act of increasing, augmenting, intensifying or improving the effectiveness or value of something (IOM, 2020). In this study, enhancement refers to improving community dwellers' flood risk awareness through proactive measures.

Enhancement activities for flood risk awareness can exist through strategies. Strategies are set of actions or activities formulated to accomplish specified goals. Ratnam et al. (2018) defined strategy as plans or actions to achieve a specific health goal. According to the United States Department of the Interior, Bureau of Reclamation (2017), flood risk enhancement strategies are measures taken before the impact of flooding to minimize its effects through effective planning, coordination, and appropriate techno-legal regimes.

Studies (Bratkovich, & Burbank, 2017; Brown & Chanson, 2016; Koch, 2020; Mashab et al., 2018; Ricardo et al., 2017) conducted on flooding among adults and emergency response workers indicated that certain variables or factors influenced their flood risk awareness. Therefore, in this study, variables can influence flood risk awareness of community dwellers in Plateau State. Such variables include age and gender.

A person's chronological age can influence his/her level of flood risk awareness, preparedness and adoption of flood enhancement strategies. The present study will adopt the age brackets of 18-29, 30-39, 40-49, 50 years and above. Research evidence has shown that individuals in advanced age adopt more preventive measures more than those in other age categories. In Jakarta, Indonesia, Marfai et al. (2015) reported that community-dwelling

members in advanced age showed very high responses and adopted more adaptation strategies for flooding when compared to the younger age cohorts.

Gender is one of the factors capable of influencing an adult resident's flood risk awareness. Sociologically, being a man or a woman in an environment affects survival (Bratkovich, & Burban, 2017). For instance, Bratkovich and Burban (2017) reported that male and female respondents viewed flooding differently and its effects on trees. Also, Koch (2020) reported that males were more prepared than female family members to respond effectively to flooding. Based on the above reports, the present study ascertained if gender influences the flood risk awareness level of community dwellers in Plateau State.

The study investigated flood risk awareness and enhancement strategies among community-dwelling adults in Plateau State. A total of 810 questionnaire were administered on the community-dwelling adults in Plateau. However, 790 copies of the instrument were retrieved with complete information. Specifically, the study determined the:

1. extent of flood risk awareness among community-dwellers in Plateau State;
2. extent of flood risk awareness among community-dwellers in Plateau State based on age;
3. extent of flood risk awareness among community-dwellers in Plateau State based on gender; and
4. formulated appropriate flood risk enhancement strategies for community-dwellers in Plateau State.

Research Questions

The following research questions were posed to guide the study.

1. What is the extent of flood risk awareness among community-dwellers in Plateau State?
2. What is the extent of flood risk awareness among community-dwellers in Plateau State based on age?
3. What is the extent of flood risk awareness among community-dwellers in Plateau State based on gender?
4. What are the enhancement strategies for flood risk awareness among community dwellers in Plateau State?

Hypotheses

Two null hypotheses were postulated to guide the study at $p \leq 0.05$

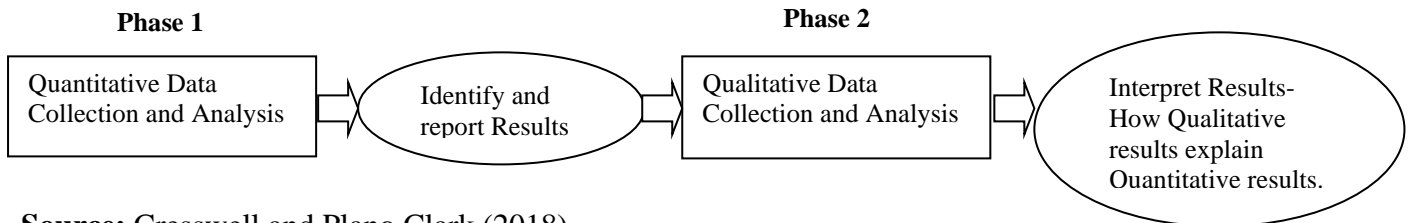
1. There is no significant difference in the extent of flood risk awareness among community-dwellers in Plateau State based on age.
2. There is no significant difference in the extent of flood risk awareness among community-dwellers in Plateau State based on gender.

Materials and Methods

To achieve the purpose of the present study, mixed-methods approach was adopted. Cresswell and Plano Clark (2018) defined mixed-methods approach as the integration of both quantitative and qualitative designs and methods of data collection and analysis to understand a research problem. Specifically, the present study adopted the sequential embedded mixed-methods design. This design involves a first phase of quantitative design and data collection that is accompanied by a second phase of qualitative design and data collection. Additionally,

the qualitative data play a supplemental or supportive role to the quantitative data and augments the conclusions of the quantitative data (Cresswell & Plano Clark, 2018).

Sequential Embedded Design (Two-Phase Design)



Source: Cresswell and Plano Clark (2018)

Population

The population for the study comprised all the community-dwelling Adults in Plateau State. The population of Plateau State was 3,206,531 as of time of the study (National Population Commission [NPC] & National Bureau of Statistics [NBS], 2021).

Sample Size Determination

The sample size for the study consisted of 833 respondents. The sample size comprised 810 adults and 23 SEMA workers in Plateau State. Only the adults in Plateau State were surveyed in the present study due to certain factors such as their lived experiences of flooding and the ability to narrate vividly their experiences. The sample size for the quantitative aspect of the study was determined using Leslie Kish's single population proportion formula.

Data Collection Tools and Procedure

Three instruments were used for this study. These include a researcher-designed questionnaire titled "Flood Risk Awareness Questionnaire (FRAQ) In-depth Interview Guide on Flood Risk Awareness (IDGFRA) and the "Flood Risk Awareness Enhancement Strategies Questionnaire (FRAESQ). The FRAESQ was designed based on the baseline data.

The face validity of the FRAQ and IDGFRA were established by seven experts; four experts from the Department of Human Kinetics and Health Education; one expert from the Department of Science Education (Measurement and Evaluation Unit), and two experts from the Department of Geo-informatics and Survey of University of Nigeria, Nsukka.

To determine the reliability (internal consistency) of the FRAQ, 20 copies were administered to twenty adult residents who have the same characteristics with the study population in Nassarawa State. The Cronbach Alpha statistics was used to determine the reliability coefficient of the FRAQ. Nworgu (2015) posited that Cronbach alpha statistic involves the single administration of instrument. In this study, the reliability coefficients of .96 and .83 were obtained for sections B and C of the FRAQ, respectively.

Data Analysis

Data were analyzed on item-by-item basis using mean and standard deviation for all the research questions while *t*-test and one-way analysis of variance (ANOVA) statistics were adopted to test the null hypotheses at .05 level of significance. A null hypothesis was rejected when the calculated *p*-value is less than 0.05, however, the null hypothesis was not rejected when the calculated *p*-value is greater than 0.05 level of significance. The qualitative data was collected from 30 participants comprising 20 adult residents in the ten sample communities and 10 staff of SEMA using the IDGFRAP. The inductive thematic analysis was used to analyse the qualitative data.

To determine the appropriateness of the enhancement strategies, the criterion mean was used. Thus, any item with a mean score of 2.50 and above ($\bar{x} \geq 2.50$) was considered appropriate. In contrast, any item with a mean score below 2.50 ($\bar{x} < 2.50$) was considered inappropriate. Only the enhancement strategies with a mean score of 2.50 and above were retained in the study.

Results

Table 1

Mean Responses on Extent of Flood Risk Awareness among Community-Dwelling Adults in Plateau State (*n* = 790)

S/N statement	\bar{x}	SD
1. Flooding displaces people from their homes.	2.98	.79
2. Flooding can trigger the chances of increased waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera	2.84	.74
3. Domestic and wild animals die due to flooding	2.93	.78
4. People lost their valuables and properties such as houses and cars during flooding.	2.87	.72
5. Agricultural products such as fruits, food items and vegetables are destroyed during flooding	2.90	.76
6. Flooding can lead to complete destructions of the spawning grounds for fish and other wildlife habitats	2.86	.71
7. Building such as houses, shops, offices, etc are lost due to flooding	2.89	.73
8. People lost their lives during flooding	3.06	.84
9. Transportation networks are disrupted during flooding	2.96	.77
10. Flooding destroys infrastructure such as bridge abutments, bank lines, sewer lines and sewage disposal facilities	2.97	.77
11. Flooding leads to soil erosion and concomitant sediment deposition	2.94	.78
12. Farmlands are damaged during flooding	2.96	.76
13. Flooding leads to impaired waterway navigation and hydroelectric power	2.92	.79
14. Flooding leads to total loss of clean drinking water and lack of water treatment	2.96	.77
15. Economic hardship and starvation are highest during flooding	2.99	.77
16. Flooding leads to temporary decline in tourism experiences	2.93	.79
17. Psychological trauma is very high during flooding	2.96	.75
18. Flooding leads to high growth of indoor mold resulting in adverse respiratory cases	2.81	.82
Grand Mean	2.93	.77

Note: \bar{x} = Arithmetic mean; SD = Standard Deviation

Guidelines for Interpreting Extent of Flood Risk Awareness

\bar{X} = 1.00-1.99 (Low extent); \bar{X} = 2.00-2.99 (Moderate extent); \bar{X} = 3.00-3.49 (High extent); \bar{X} = 3.50-4.00 (Very high extent)

Source: Researcher.

Table 1 shows that, community-dwelling adults were aware of flood risk to a moderate extent (\bar{X} = 2.93, SD = 0.77). In addition, community-dwelling adults were aware that people lost their lives during flooding to a high extent (\bar{X} = 3.06, SD = 0.84). Also, community-dwelling adults were moderately aware of flood risks such as economic hardship and starvation (\bar{X} = 2.99, SD = 0.77), displacement of people from their homes (\bar{X} = 2.98, SD = 0.79), disruption of transportation networks (\bar{X} = 2.96, SD = 0.77), destruction of infrastructure (\bar{X} = 2.97, SD = 0.77), destruction of farmlands (\bar{X} = 2.96, SD = 0.76), loss of clean drinking water and lack of water treatment during flooding (\bar{X} = 2.96, SD = 0.77).

Furthermore, the qualitative data collected via the in-depth interview guide (IIG) and analyzed using inductive thematic analysis showed that many participants were aware of flood risk to a moderate extent through their definitions or conceptualizations. However, some participants were vague in their explanation on flood risk awareness or the extent to which they were aware of flood risks. Excerpts from the interviews are presented below:

Flood risk awareness is an exposure of people and farmlands to heavy rainfall (IDI #02, Male).

Flood risk awareness is when heavy water comes ...people take actions to prevent their farm products from being destroyed by heavy water (IDI #04, Male).

Flood risk awareness is when people have information about the damage ...of water that destroys houses, farmlands and human lives in States such Taraba, Adamawa, Kogi, and Plateau (IDI #06, Male).

Table 2
Mean Responses on Extent of Flood Risk Awareness among Community-Dwelling Adults in Plateau State based on Age (n = 790)

S/N Statement	18-29 years (n=166)		30-39 years (n=235)		Age 40-49 years (n=212)		≥50 years (n=177)	
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD
1. Flooding displaces people from their homes	2.93	.91	2.85	.75	3.06	.71	3.12	.79
2. Flooding can trigger the chances of increased waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera	2.71	.76	2.71	.69	2.90	.66	3.06	.82
3. Domestic and wild animals die due to flooding	2.82	.85	2.82	.79	2.99	.71	3.12	.77
4. People lost their valuables and properties such as houses and cars during flooding	2.77	.84	2.80	.76	2.92	.64	3.01	.62
5. Agricultural products such as fruits, food items and vegetables are destroyed during flooding	2.88	.86	2.79	.82	2.95	.70	2.99	.64
6. Flooding can lead to complete destruction of the spawning grounds for fish and other wildlife habitats	2.80	.82	2.78	.76	2.88	.66	3.02	.57
7. Building such as houses, shops, offices, etc are lost due to flooding	2.85	.82	2.80	.76	2.93	.71	3.02	.64
8. People lost their lives during flooding	2.97	.92	2.94	.84	3.08	.79	3.29	.75
9. Transportation networks are disrupted during flooding	2.85	.86	2.91	.85	3.00	.67	3.07	.66
10. Flooding destroys infrastructure such as bridge abutments, bank lines, sewer lines and sewage disposal facilities	2.87	.78	2.93	.87	2.98	.70	3.10	.71
11. Flooding leads to soil erosion and concomitant sediment deposition?	2.89	.87	2.89	.82	2.92	.71	3.06	.72
12. Farmlands are damaged during flooding	2.79	.88	2.91	.82	2.96	.64	3.18	.65
13. Flooding leads to impaired waterway navigation and hydroelectric power	2.69	.89	2.88	.78	2.94	.73	3.15	.69
14. Flooding leads to total loss of clean drinking water and lack of water treatment	2.78	.86	2.92	.79	2.95	.71	3.20	.64
15. Economic hardship and starvation are highest during flooding	2.86	.88	2.92	.80	3.01	.67	3.19	.67
16. Flooding leads to temporary decline in tourism experiences	2.72	.86	2.86	.74	2.99	.76	3.14	.72
17. Psychological trauma is very high during flooding	2.77	.82	2.94	.74	3.02	.71	3.07	.72
18. Flooding leads to high growth of indoor mold resulting in adverse respiratory cases	2.64	.88	2.86	.77	2.85	.81	2.84	.82
Grand Mean	2.81	.85	2.86	.79	2.96	.71	3.09	.70

Note: \bar{x} = Arithmetic mean; SD = Standard Deviation

Guidelines for Interpreting Extent of Flood Risk Awareness

\bar{x} = 1.00-1.99 (Low extent); \bar{x} = 2.00-2.99 (Moderate extent); \bar{x} = 3.00-3.49 (High extent); \bar{x} = 3.50-4.00 (Very high extent)

Results in Table 3 show that overall, community-dwelling adults aged ≥ 50 years were aware of flood risk to a high extent ($\bar{x}=3.09$, $SD=0.70$) while those aged 40-49 years ($\bar{x}=2.96$, $SD=0.71$), 30-39 years ($\bar{x}=2.86$, $SD=0.79$) and 18-29 years ($\bar{x}=2.81$, $SD=0.85$) were aware of flood risk to a moderate extent in Plateau State.

The quantitative findings showed that greater number of the participants in this study were within the ages of 30 to 49 years while lesser proportion were within the ages of 18-29 years and 50 years and above. At the community level, participants aged 50 years and above were aware of flood risks to moderate and high extent. The chronological ages of the participants seemed to influence their flood risk awareness. Interestingly, the participants for qualitative data in all the age categories, especially the SEMA workers/staff were aware of flood risk to a high and moderate extent as indicated below:

Flood risk awareness is when people have knowledge of dangers associated with flooding. The dangers include deaths of people, animals, loss of properties and farmlands (IDI #29, Male; SEMA Staff)

Flood risk awareness implies when heavy water caused by too much rains kill people, animals and destroy crops (IDI #05, Male).

Flood risk awareness means having information about the threats that flooding causes in our community. Examples of such threats or dangers include deaths of people and animals (IDI #13, Male).

Table 3
Mean Responses on Extent of Flood Risk Awareness among Community-Dwelling Adults in Plateau State based on Gender (n= 790)

S/N Statement	Gender			
	Male (n=291)		Female (n=499)	
	\bar{x}	SD	\bar{x}	SD
1. Flooding displaces people from their homes	3.11	.83	2.90	.75
2. Flooding can trigger the chances of increased waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera	2.90	.74	2.80	.74
3. Domestic and wild animals die due to flooding	3.01	.79	2.89	.78
4. People lost their valuables and properties such as houses and cars during flooding	2.92	.71	2.85	.73
5. Agricultural products such as fruits, food items and vegetables are Destroyed during flooding	3.00	.75	2.84	.76
6. Flooding can lead to complete destructions of the spawning grounds for fish and other wildlife habitats	2.91	.73	2.84	.70
7. Building such as houses, shops, offices, etc are lost due to flooding?	2.94	.73	2.87	.74
8. People lost their lives during flooding	3.17	.84	3.00	.83
9. Transportation networks are disrupted during flooding	3.02	.77	2.92	.77
10. Flooding destroys infrastructure such as bridge abutments, bank lines, sewer lines and sewage disposal facilities	3.00	.75	2.95	.79
11. Flooding leads to soil erosion and concomitant sediment deposition	3.01	.77	2.89	.79
12. Farmlands are damaged during flooding	3.04	.78	2.91	.75
13. Flooding leads to impaired waterway navigation and hydroelectric power	2.95	.74	2.90	.81
14. Flooding leads to total loss of clean drinking water and lack of water treatment	2.97	.71	2.96	.80
15. Economic hardship and starvation are highest during flooding	3.04	.69	2.97	.81
16. Flooding leads to temporary decline in tourism experiences	2.90	.72	2.95	.83
17. Psychological trauma is very high during flooding	2.92	.71	2.98	.78
18. Flooding leads to high growth of indoor mold resulting in adverse respiratory cases?	2.68	.81	2.88	.82
Grand Mean	2.97	.75	2.91	.73

Note: \bar{x} = Arithmetic mean; SD = Standard Deviation

Guidelines for interpreting Extent of Flood Risk Awareness

\bar{x} = 1.00-1.99 (Low extent); \bar{x} = 2.00-2.99 (Moderate extent); \bar{x} = 3.00-3.49 (High extent); \bar{x} = 3.50-4.00 (Very high extent)

Source: Researcher.

Results in Table 3 show that overall, both male (\bar{x} = 2.97, SD = 0.75) and female (\bar{x} = 2.91, SD = 0.73) community-dwelling adults were aware of flood risk to a moderate extent in Plateau State.

The qualitative findings indicated that male and female participants' extent of flood risk awareness in Plateau State did not differ. Many male and female participants in this study were aware of flood risks while some participants regardless of gender seemed not to be aware of the risks associated with flooding. In response to the question, a male and female participants exemplified here:

Flood risk awareness means that a person has knowledge ...that flooding can cause dangers to people. These include diseases such as malaria, diarrhoea, typhoid fever, cholera, and deaths (IDI #12, Male).

Flood risk awareness is when people have information about the negative effects of flooding on the people (IDI #23, Female).

Table 4

Mean and Standard Deviation on Enhancement Strategies for Flood Risk Awareness among Community-Dwelling Adults in Plateau State (n = 20)

S/N	Enhancement Strategies		\bar{x}	SD	Dec.
1.	Health educators and community health workers should implement social mobilization and inclusive advocacy programmes to improve flood risk awareness status.	3.85	.37	App	
2.	Implementation of a viable disaster prevention framework by disaster control and management experts such as SEMA and NEMA staff that focus on improving flood risk awareness level of adult residents in flood prone areas.	3.50	.61	App	
3.	Development and implementation of disaster prevention education programme by environmental health educators that emphasize high level of flood risk awareness of residents in plateau State		3.50	.76	App
4.	Introduction of effective early warning systems for sensitization and mobilization of adult residents to raise their flood risk awareness.		3.40	.61	App
5.	Reinforcement of the traditional ecological knowledge of adult residents in Plateau State by health educators, community health workers and environment health experts to improve their flood risk awareness		3.40	.68	App
6.	Advocacy programmes aimed at promoting flood risk awareness campaigns for people of different ages through public health education by health educators and environmental health experts.		3.80	.52	App
7.	Implementation of environmental health education programmes that focus on raising flood risk awareness of both male and female adults in flood-prone communities by environmental health officers (EHOs), and public health educators.		3.60	.50	App
8.	Increasing emphasis on flood forecasting and warning by the Central Water Commission (CWC) or Meteorological Department, State Irrigation/ Flood Department for all residents regardless of gender.		3.35	.59	App
9.	Involvement of residents regardless of income status in the planning and implementation of flood risk reduction programmes by the state government.		3.50	.51	App
10.	Implementation of community-based environmental health education and sensitization workshops for improving flood risk awareness of adult residents regardless of income level in flood-prone areas by SEMA staff, public health educators, EHOs		3.65	.67	App
11.	Appropriate sensitization of the residents regardless of income status on the tenets and workings of agencies in supporting victims of flood.		3.50	.61	App
12.	Promoting awareness of flood risk of adult residents regardless of number of years lived in flood prone areas through mass mobilization and enlightenment by SEMA staff, public health educators, EHOs.		3.60	.50	App
13.	Adoption of community-based flood risk awareness programme for the residents of flood prone areas.		3.55	.61	App
14.	Mass education and sensitization of the residents regarding early warning systems by SEMA staff, public health educators, EHOs.		3.75	.44	App
Cluster mean			3.57	.57	App

Note: Item $\bar{X} \geq 2.50 =$ Appropriate; Item $\bar{X} \leq 2.50 =$ Inappropriate; Cluster $\bar{X} \geq 2.50 =$ Appropriate; Cluster $\bar{X} \leq 2.50 =$ Inappropriate.

Results in Table 4 show that the enhancement strategies for flood risk awareness among community-dwelling adults in Plateau State were considered appropriate by the experts ($\bar{x} = 3.57$; $SD = .57$).

Table 5.

Summary of One-way ANOVA Showing Difference in the Extent of Flood Risk Awareness among Community-Dwelling Adults in Plateau State based on Age ($n = 790$)

Variable	Sum of Squares	df	Mean Square	F	p-value
Between Groups	13.502	3	4.501		
Within Groups	378.078	786	0.481	9.357	0.000
Total	391.984	789			

Note. Df= degree of freedom; F= F-ratio/value

Significant at $P < 0.05$.

Table 5 shows the results of one-way ANOVA conducted to examine difference in the extent of flood risk awareness among community-dwelling adults in Plateau State based on age. The result show that there was a significant differences in the extent of flood risk awareness among community-dwelling adults in Plateau State based on age, $F(3,786) = 9.357$, $p = 0.000$. The post-hoc comparison using Scheffe’s test showed that the mean flood risk awareness score for adults aged 18-29 years ($\bar{x} = 3.61$; $SD = 0.89$) was significantly different from adults aged 40-49 years ($\bar{x} = 3.71$; $SD = 0.58$) and those aged 50 years and above ($\bar{x} = 3.97$; $SD = 0.55$). The mean difference scores are -0.203 and -0.365 for adults aged 40-49 years and those aged ≥ 50 years, respectively. Age group 20-39 years did not differ significantly from either age group 18-29 years, 40-49 years or ≥ 50 years. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected. This implies that community-dwelling adults differed in their extent of flood risk awareness based on age.

Table 5 (Continued) Scheffe Test Showing Location of Significant Mean Differences in the Extent of Flood Risk Awareness among Adults based on Age Groups

(I) Age Group	(J) Age Group	Mean Difference			95% Confidence Interval	
		(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
18-29 Years	30-39 Years	-.08170	.07052	.719	-.2793	.1159
	40-49 Years	-.20261*	.07209	.049	-.4046	-.0007
	≥ 50 Years	-.36520*	.07514	.000	-.5757	-.1547
30-39 Years	18-29 Years	.08170	.07052	.719	-.1159	.2793
	40-49 Years	-.12092	.06577	.337	-.3052	.0633
	≥ 50 Years	-.28350*	.06911	.001	-.4771	-.0899
40-49 Years	18-29 Years	.20261*	.07209	.049	.0007	.4046
	30-39 Years	.12092	.06577	.337	-.0633	.3052
	≥ 50 Years	-.16259	.07070	.153	-.3607	.0355
≥ 50 Years	18-29 Years	.36520*	.07514	.000	.1547	.5757
	30-39 Years	.28350*	.06911	.001	.0899	.4771
	40-49 Years	.16259	.07070	.153	-.0355	.3607

*. The mean difference is significant at the 0.05 level.

Table 6

Summary of Independent-Sample t-Test of Difference in the Extent of Flood Risk Awareness among Community-Dwelling Adults in Plateau State based on Gender ($n = 790$)

Variable	N	\bar{x}	SD	SEM	t-cal	df	p-val.	95% C.I.	
								LB	UB
Gender									
Male	291	3.18	0.71	0.04					
Female	499	3.74	0.71	0.03	1.564	788	0.118	-0.02	0.18

Note. \bar{x} = mean, SD = Standard deviation; S.EM = Standard error of mean; p-val. = p-value

Significant at $P < 0.05$.

Table 6 shows the results of independent-sample t-test conducted to examine difference in the mean scores on extent of flood risk awareness for males and females in Plateau State. There was no significant difference in the mean scores on extent of flood risk awareness among community-dwelling adults based on gender, $t(788) = 1.564$, $P = 0.118$. The magnitude of the difference in the mean scores (mean difference = 0.07, 95% C.I. -0.02 to 0.18) was very small. Since the p-value was greater than 0.05 level of significant, the null hypothesis was not rejected. This implies that male and female community-dwelling adults did not differ in their extent of flood risk awareness.

Discussion

The findings in Table 1 showed that community-dwelling adults were aware of flood risks to a moderate extent. The finding aligns with the experts' definition of risk awareness as an assessment of the probability of a hazard and perceived negative consequences by the community members (Becker et al., 2014; Bubeck et al., 2012). The finding is in accordance with the findings of Terpstra et al. (2009), who reported that a high level of risk awareness increases flood risk preparedness and subsequently results in maximum flood control and management. Although flood risk awareness among adults in this study was moderate, this finding implies that if community-dwelling adults' level of flood risk awareness is improved, there will be a significant reduction in the risks of flooding in Plateau State.

Findings in Table 2 showed that community-dwelling adults aged ≥ 50 years were aware of flood risk to a high extent, while those aged 40-49 years, 30-39 years, and 18-29 years were aware of flood risks to a moderate extent in Plateau State. The findings agree with those of Marfai et al. (2015), who reported that older community-dwelling adults showed very high responses and adopted more adaptation strategies for flooding compared to the younger age cohorts in Jakarta, Indonesia. Similarly, the finding aligns with those of Hernández-Guerrero et al. (2012), who reported that the adaptation strategies in communities under precarious housing for flooding risks in the Peri-urban sector of the city of Morelia, Michoacán, México was high among older residents when compared to younger adults.

Findings in Table 3 indicated that male and female community-dwelling adults were aware of flood risks to a moderate extent in Plateau State. The findings imply that all the community dwellers, regardless of gender difference, would engage in flood-related activities since their awareness level is commendable. The finding could be attributed to specific life-changing experiences and flood encounters, which might negatively affect every community member. Thus, such a dissatisfying experience usually serves as a deterrent to individuals devoid of gender category. Following other findings, Bratkovich and Burbán (2017) reported

that the male and female respondents viewed flooding and its effects on trees differently. Similarly, Koch (2020) reported that males were more prepared than female family members to respond effectively to flooding. The discrepancies in the findings could be attributed to study locations and the type of study designs used.

The findings in Table 4 show that enhancement strategies for flood risk awareness among community-dwelling adults were considered appropriate by the experts. This finding was not surprising but anticipated. This is because the enhancement strategies for flood risk awareness among community dwellers were formed based on the baseline data and knowledge gained from an extensive literature review. Some of the strategies considered appropriate by experts include the following: implementation of social mobilization and inclusive advocacy programmes to improve flood risk awareness status by health educators and community health workers; implementation of viable disaster prevention framework by disaster control and management experts such as SEMA and NEMA staff; development and implementation of disaster prevention education programme by environmental health educators; introduction of effective early warning systems for sensitization and mobilization of adult residents; reinforcement of the traditional ecological knowledge of adult residents by health educators, community health workers and environment health experts; advocacy programmes aimed at promoting flood risk awareness campaigns for people of different ages through public health education by health educators and environmental health experts.

This finding is in line with the assertion of the United States Department of Labour (USDL, 2020) that flood risk enhancement strategies are common methods applied for flood controls, management, and prevention. In addition, FEMA (2020) also considered flood risk enhancement strategies as professionally approved approaches or measures combined to combat floods in each location.

Conclusion

The finding showed that community-dwelling adults were aware of flood risk to a moderate extent. The enhancement strategies for flood risk awareness among community-dwelling adults were deemed very appropriate by the experts. The findings of the study provided crucial insight into the flood risk awareness of the community-dwelling adults in Plateau State, which were moderate.

Recommendations

Based on the findings of the study, discussion and conclusions drawn, the following recommendations were made:

1. Flood risk awareness education campaign should be intensified at the community levels in Plateau State in order to improve their flood risk awareness status.
2. The SEMA staff in collaboration with the community members should maintain consistent supervision of the areas that are mostly affected by flooding. Such monitoring would be instrumental in monitoring the geographical as well as environmental changes in the state.
3. There is need for research funding and grants for people as well as SEMA staff in Plateau State to enable them to come up with local content and sustainable strategies for flood control, management and prevention in the state.

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