Nigerian Journal of Health Promotion
ISSN: 0995-3895
Vol 17, 2024
HEPRAN

Flood Risk Preparedness Among Community Dwellers in Plateau State, Nigeria

*[1]Yakubu Dauda Izang, [2]Olaoluwa Samson Agbaje

[1]Department of Disease Control and Immunization, Plateau State Primary Health Care Board, Jos
[2]Department of Human Kinetics and Health Education, University of Nigeria, Nsukka

*Corresponding author: Email: bobbyizang@gmail.com, Phone: 08036787812

Abstract

The study investigated flood risk preparedness among community-dwelling adults in Plateau State, Nigeria. Three specific objectives with three corresponding research questions and two null hypotheses guided the study. The study adopted the mixed-methods research design. The population for the study comprised 3,206,531 community-dwellers in Plateau State. The sample size for the study consisted of 810 community-dwelling adults and 23 staff of the State Emergency Management Agency (SEMA) in Plateau State. The Flood Risk Preparedness Questionnaire (FRPQ) and In-depth Interview Guide on Flood Risk Preparedness (IDGFRP) were used for data collection. Face validity of the two instruments (FRPQ and IDGFRP) were established by seven experts. Four experts were selected from Human Kinetics and Health Education, one expert from Science Education (Measurement and Evaluation Unit) and two from the Department of Geo-informatics and Survey, all of the University of Nigeria, Nsukka, Enugu State. The reliability of coefficients (internal consistency) of Sections B and C of the FRPQ were determined using the Cronbach's alpha. The reliability of coefficients of .96 and .83 were obtained for sections B and C, respectively. Mean and standard deviation were 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 Statistical Package for the Social Sciences version 25 (SPSS vs. 25) and Atlas.ti version 22 were used for the analysis of quantitative and qualitative data, respectively. The quantitative and qualitative findings were interpreted and integrated. The quantitative findings showed that community-dwelling adults were prepared for flood risks to a moderate extent ($\bar{x}$ = 2.61, SD = 0.70). Additionally, there were significant differences in the level of flood risk preparedness among community-dwelling adults in Plateau State based on education level, $F(3,786) = 7.838$, $P = 0.000$ and income level $F(3,786) = 3.987$, $P = 0.008$. The qualitative findings also indicated that the level of flood risk preparedness among them was suboptimal. Based on the study's findings, it was recommended, among others, that flood risk preparedness education campaigns should be intensified at the community levels to improve community-dwelling adults' flood risk preparedness levels in Plateau State.

Keywords: Flood, Risk, Flood risk, Preparedness, 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 preparedness 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 (WHO, 2020; United States Department of Labour [USDL], 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. 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 flood as a body of water covering dry land. Additionally, floods are caused by heavy precipitation, severe winds over water, unusually high tides, tsunamis, or failure of dams, levees, retention ponds, or other structures that contain the water. During rain or snow, some water is retained in ponds or soil, some is absorbed by grass and vegetation, some evaporates, and the rest travels over the land as surface run-off (Halmarson, 2015). Floods, which are mostly caused by heavy rainfall, rapid snowmelt, or a storm surge from a tropical cyclone or tsunami in coastal areas, can cause widespread devastation, resulting in loss of life and damages to personal property and critical public health infrastructure (United States Department of Labour [USDL], 2020; Federal Emergency Management Agency [FEMA], 2020).

The effects of flood disasters can be grouped into primary and secondary or long-term effects. The direct impact of flooding includes loss of life and damage to buildings and other structures, including bridges, sewerage systems, roadways, and canals. Furthermore, studies (Werner, Hunter & Bates, 2016; Bratkovich & Burban, 2017) have observed that flooding has a direct effect on power transmission and power generation resulting in total loss of power supply, loss of drinking water treatment and water supply resulting in loss of drinking water or severe water contamination, and loss of sewage disposal facilities. There may be increased chances of an outbreak of water-borne diseases such as typhoid, giardia, cryptosporidium, and cholera, due to lack of clean water combined with human sewage in the flood waters.

The secondary or long-term effects of flooding may include economic hardship due to a temporary decline in tourism, rebuilding costs, or food shortages. The impact of flooding on its victims may consist of psychological damage, particularly where deaths, serious injuries, and property loss occur (Wemer et al., 2016). There may be increased cases of indoor mold growth resulting in adverse respiratory symptoms and other health problems (Peters, 2015; Brown & Chanson, 2016). Thus, flood exposure is associated with several risks to man, animals, built and natural environment.

There seems to be a consensus in literature that flooding possess several risks. Schumann (2011) defined flood risk as the likelihood of dangers that floods pose to individuals, property and the natural landscape based on specific hazards and vulnerability.

High levels of flood risk preparedness are crucial in saving lives and properties of flood-prone areas. The United Nations International Strategy for Disaster Risk Reduction

(UNISDR, 2009) defined risk preparedness as the knowledge and capacities developed by the government, professional response and recovery organizations, communities, and individuals to effectively respond to and recover from the impacts of likely, imminent or current hazardous events. Risk preparedness is a program of long-term activities whose goals are to strengthen the overall capacity and capability of communities and individuals to manage all types of emergencies, including flooding, efficiently and bring about an orderly transition from relief through recovery and back to sustained development (Inter-Agency Secretariat of the International Strategy for Disaster Reduction, 2014). In a different view, the Hyogo Framework for Action (HFA) (2016) defined risk preparedness as the measures taken to prepare for and reduce the outcomes of natural disasters such as flooding and earthquakes. Also, the WHO (2020) described risk preparedness as measures designed to prevent hazards from creating risks or lessen the distribution, intensity, or severity of hazards. Such measures, according to WHO, include awareness raising, improving community health security, and relocation or protection of vulnerable populations or structures. In this study, risk preparedness refers to the actions or preparations carried out by individuals to prevent or reduce the effects of flooding. Risk preparedness aims to prevent or alleviate the effects of disaster on the vulnerable population. The benefits of risk preparedness are numerous. For instance, risk preparedness can save lives Center For Neighborhood Technology (CNT) 2014. Being prepared can protect property and get the entire population back to normalcy faster than if they were not prepared when the disaster struck.

The government agency for controlling natural disasters and associated problems at the state level in Nigeria is the State Emergency Management Agency (SEMA). The SEMA takes pre-emptive and response actions against natural disasters, including flooding in Plateau State. The State Emergency Management Agency (SEMA) workers are professionals trained in unique disaster management skills in all the states of Nigeria. The activities or operations of workers of SEMA are restricted or limited to the States where they are answerable to the state executive bodies. The SEMA oversees the management, control, and rescue of disaster-affected individuals at the state level (SEMA, 2020). Therefore, the community-dwellers in this study are individuals and SEMA workers living in Plateau State.

Certain variables or factors influence the flood risk preparedness of adults in flood-prone communities, including those in Plateau State. Studies (Brown, & Chanson, 2016; Ricardo, Hambet, & Davis, 2017; Bratkovich, & Burban, 2017; Mashab, Scarry, & Enerta, 2018; Koch, 2020) conducted on flooding among adults and emergency response workers indicated that certain variables or factors influenced their flood risk preparedness. Therefore, in this study, variables can influence flood risk preparedness of community dwellers in Plateau State. Such variables include, age, gender, education level, income level, and the number of years lived in flood-prone areas. However, the present study focused on the demographic variables of education level and years spent in flood prone areas by community dwellers in plateau state.

Brown and Chanson (2016) reported that workers with high educational qualifications are more equipped with flood prevention, control, and management skills than those with lower qualifications. The authors further reported a significant difference in the preparedness of the adverse effects of flooding on the human environment among workers of environmental protection agencies based on educational qualifications. Thus, the present study ascertained if the educational qualification of community dwellers influenced the level of flood risk preparedness in Plateau State.

The years spent in a particular area or location significantly could affect the residents' flood risk awareness and preparedness. A measurable experience is highly beneficial in responding to natural disasters (e.g., flooding) and adopting appropriate precautionary measures (Mashab, Scarry & Enerta, 2018). The authors further reported that experience was a crucial determinant in the outcome of their study on global views on flood disaster challenges. They further reported that the respondents who had adequate experiences based on the years they lived in a flood-prone area had positive perceptions of flood disasters. In contrast, those with limited years of lived experience had a negative perception. Thus, the present study sought to ascertain if the number of years lived in flood-prone areas influenced the flood risk awareness and preparedness level in Plateau State.

Purpose of the Study

The purpose of the study was to investigate flood risk preparedness among community-dwelling adults in Plateau State. Specifically, the study determined the:

1. level of flood risk preparedness among community-dwellers in Plateau State.
2. level of flood risk preparedness among community-dwellers in Plateau State based on educational level.
3. level of flood risk preparedness among community-dwellers in Plateau State based on years lived in flood prone areas.

Research Questions

The following research questions guided the study.

1. What is the level of flood risk preparedness among community-dwellers in Plateau State?
2. What is the level of flood risk preparedness among community-dwellers in Plateau State based on educational level?
3. What is the level of flood risk preparedness among community-dwellers in Plateau State based on years lived in flood prone areas?

Hypotheses

The following null hypotheses were postulated and tested at 0.05 level of significance.

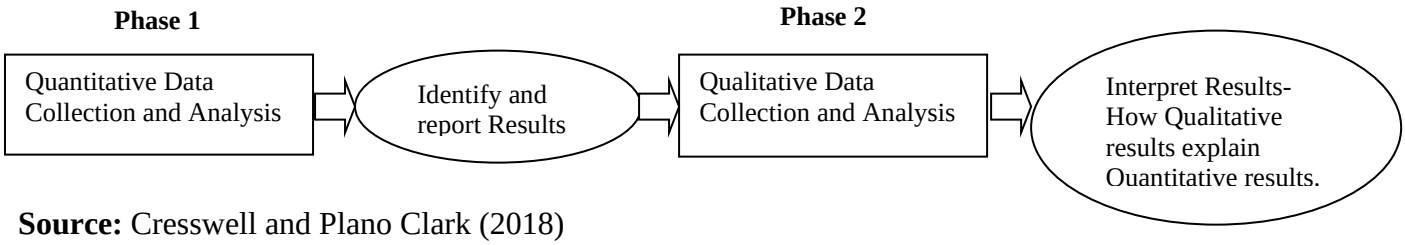
1. There is no significant difference in the level of flood risk preparedness among community-dwellers in Plateau State based on educational level.
2. There is no significant difference in the level of flood risk preparedness among community-dwellers in Plateau State based on number of years lived in flood prone areas.

Methods

The study adopted the mixed-methods research design. Cresswell and Plano Clark (2018) defined mixed-methods research design 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)

The population for the study comprised all the community-dwelling Adults in Plateau State. 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.

The multi-stage sampling procedure was adopted to select the sample. The first stage included the use of simple random sampling technique of balloting without replacement to sample ten local government areas (LGAs) out of 17 LGAs in Plateau State. In the second stage, a simple random sample technique of balloting without replacement was used to sample one community in each of the sampled ten LGAs in Plateau State. This stage produced a total of ten communities. In the third stage, convenience sampling was used to select 81 adults from the ten communities and the 23 Staff of SEMA. Thus, a total of 810 community-dwelling adults and 23 Staff of SEMA in Plateau state were selected for the study. Purposive sampling technique was used to select 30 adult participants for the in-depth interview. Therefore, the sample size for the present study was 833 respondents. Two instruments were used for this study. These include a researcher-designed questionnaire titled "Flood Risk Preparedness Questionnaire (FRPQ) and In-depth Interview Guide on Flood Risk Preparedness (IDGFRP). Three research questions and two hypothesis guided the study.The face validity of the FRPQ and IDGFRP 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 FRAPQ, 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 FRAPQ. 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 FRAPQ, respectively. According to Cohen, Manion and Morrison (2018), if the reliability index obtained is .70 and above, the instrument should be considered reliable for use in the study.

810 copies of the questionnaire were administered to the participants in their respective communities and 790 copies were retrieved given a return rate of 95 percent. The copies of the questionnaire were administered by the researchers with the help of ten trained research assistance. The qualitative data was collected from 30 participants, comprising 20 adult residents in the ten sampled communities and 10 staff of SEMA using the IDGFRAP. The interviews were audio-recorded using a tape recorded with the permission of the

interviewees. The respondents selected the location where they were interviewed. The interviews continued until saturation was reached (Streubert & Carpenter, 2010).

The correctly completed copies were coded and inputted in the Statistical Package for Social Sciences-(IBM SPSS Version 25 for Windows) for 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.

For the qualitative data, inductive thematic analysis was used. The six (6) phases of inductive thematic analysis as described by Braun and Clarke (2006) were employed. First, the data transcripts and filed notes were independently read by the researcher and an expert in qualitative data analysis severally (phase 1) and then initial codes were developed (phase 2). The codes were sorted and grouped into potential categories/themes (phase 3). The themes were expanded to cover the key dependent variables (adoption of flood risk awareness, preparedness and enhancement strategies) using the coded data. The next phase, which is phase 4, involved using a theme map to ensure consistency across the transcripts between the researcher and the expert who conducted the qualitative data analysis. Phase 5 involved assigning definition and naming of the themes and sub-themes. Phase six (6) involved using the themes to answer the research questions. All analysis decisions were made through a consensus between the researcher and the expert, and all discrepancies were discussed until consensus was achieved. Credibility, dependability, confirmability, and transferability were conducted to ensure trustworthiness (Creswell & Plano Clark, 2018). The transcribed texts, codes and themes were organized and analyzed using Atlas.ti version 22 developed by the Atlas.ti Scientific Software Development GmbH.

Results

Table 1

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

S/N	statement	$\bar{x}$	SD
1.	Cope with psychological trauma resulting from flood.	2.63	.70
2.	Safeguard your building structures against flooding by building or erecting flood proof building	2.59	.71
3.	Anticipate the onset of flooding and adopt flood prevention measures such as constructing flood retention basins	2.60	.74
4.	Store and preserve food stuff and other food items before flooding	2.56	.69
5.	Have clean drinking water and ensure proper waste treatment during flooding	2.57	.69
6.	Prevent soil erosion and concomitant sediment deposition during flooding	2.64	.74
7.	Safeguard farmlands during flooding by building dike line/embankment	2.71	.82
8.	Safeguard infrastructure such as bridge abutments, bank lines, sewer lines and sewage disposal facilities during flooding	2.68	.84
9.	Implement river and flood plain re-naturalization	2.75	.81
10.	Improve flood awareness raising, advocacy and public enlightenment	2.65	.76
11.	Maintain proper transportation network and communication system during flooding	2.63	.74
12.	Preserve agricultural products such as fruits, food items and vegetables during flooding	2.60	.74
13.	Prevent incidence of waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera may occur	2.54	.76
14.	Adhere or comply strictly with flood pre-warning system from Plateau State Emergency Management Agency (SEMA)	2.45	.77
	Grand Mean	**2.61**	**.70**

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

Guidelines for Interpreting Level of Flood Risk Preparedness

$\bar{x}$ = 1.00-1.99 (Low level of preparedness); $\bar{x}$ = 2.00-2.99 (Moderate level of preparedness); $\bar{x}$ = 3.00-3.49 (High level of preparedness); $\bar{x}$ = 3.50-4.00 (Very high level of preparedness);
Source: Researcher.

Results in Table 1 show that, community-dwelling adults moderately prepared for flood risk to a moderate extent ($\bar{x}$ =2.61, SD = 0.70).

The qualitative data show that participants adopted some proactive measures to prepare for flood risks every year. Some of the actions were innovative while others were age-long traditional practices in many communities. Some community-dwelling adults indicated that they plant native trees such as “Abiola flowers (Ruwani flowers)”, elephant grasses, constructed ditches to collect large volume of water, sandbagging, fortify their houses and build stone embankment to avert flooding in their communities. Some participants reported that the State Emergency Management Authority (SEMA) assists the people in preparing for flood risks. The participants elaborated that:

> *To prepare for flood risks ...people plant stubborn grasses or Kirikiri around their houses and farmlands. I think ...people also ...construct stone embankments around the houses to avert dangers of flood (IDI #22, Male).*
>
> *I am a SEMA worker the agency provides relief materials for flood victims. SEMA ...makes budgetary provision to prevent or prepare for flood disasters in order to assist victims of flooding (IDI #23, Female).*

In this community ...people use sandbags and plant "Abiola flowers/trees" around their farmlands and houses for protection. Also ...clearing of water drains or channels is carried out to prevent flooding in the community (IDI #12, Male)

Table 2

Mean Responses on Level of Flood Risk Preparedness among Community-Dwelling Adults in Plateau State based on Educational Level (*n* = 790)

		Educational Level							
		NFE (n=163)		PRI. EDU (n=231)		SEC. EDU (n=176)		TER. EDU (n=220)	
S/N	Statement	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
	to what level are you prepared to:								
1.	Cope with psychological trauma resulting from flood	2.58	.71	2.45	.60	2.76	.63	2.75	.81
2.	Safeguard your building structures against flooding by building or erecting flood proof building	2.61	.71	2.45	.60	2.80	.64	2.56	.82
3.	Anticipate the onset of flooding and adopt flood prevention measures such as constructing flood retention basins	2.56	.68	2.40	.59	2.73	.71	2.72	.88
4.	Store and preserve food stuff and other food items during flooding	2.60	.67	2.48	.62	2.57	.69	2.60	.77
5.	Have clean drinking water and ensure proper waste treatment during flooding	2.61	.71	2.55	.62	2.53	.63	2.58	.81
6.	Prevent soil erosion and concomitant sediment deposition during flooding	2.53	.76	2.49	.60	2.76	.71	2.77	.84
7.	Safeguard farmlands during flooding by building dike line/embankment	2.60	.78	2.50	.68	2.94	.84	2.84	.89
8.	Safeguard infrastructure such as bridge abutments, bank lines, sewer lines and sewage disposal facilities during flooding	2.53	.77	2.46	.69	2.98	.92	2.76	.89
9.	Implement river and flood plain re-naturalization	2.50	.73	2.64	.74	3.03	.85	2.81	.85
10.	Improve flood awareness raising, advocacy and public enlightenment	2.55	.75	2.58	.76	2.78	.63	2.70	.83
11.	Maintain proper transportation network and communication system during flooding	2.52	.72	2.51	.75	2.73	.64	2.78	.79
12.	Preserve agricultural products such as fruits, food items and vegetables during flooding	2.56	.71	2.54	.77	2.58	.62	2.72	.81
13.	Prevent incidence of waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera may occur	2.60	.79	2.47	.78	2.54	.58	2.63	.87
14.	Adhere or comply strictly with flood pre-warning system from Plateau State Emergency Management Agency (SEMA)	2.42	.78	2.55	.77	2.22	.59	2.55	.86
	Grand Mean	**2.56**	**.73**	**2.51**	**.68**	**2.71**	**.69**	**2.71**	**.84**

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

Guidelines for interpreting Level of Flood Risk Preparedness

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

Source: Researcher.

Results in Table 2 show that overall, irrespective of education level, community-dwelling adults had moderate level of flood risk preparedness (TER.EDU, $\bar{x}$ =2.71, SD = 0.84; SEC.EDU, $\bar{x}$ = 2.71, SD=0.69; PRI.EDU, $\bar{x}$ = 2.51, SD=0.68; NFE, $\bar{x}$ = 2.56, SD = 0.73).

The quantitative data indicated that regardless of education level, the participants' level of flood risk preparedness was moderate. Although, the majority of the participants had primary and tertiary educations respectively, yet it seemed that education level had no obvious influence in their level of flood risk preparedness. Interestingly, the qualitative data obtained show participants adopted varying approaches and physical mechanisms in their preparedness for flood risks in the community. Three participants' experiences are indicated below:

> *People use sandbags to protect their houses and farmlands against flooding. They plant "Abiola flower/trees" around their farmlands and houses (IDI #11, Diploma Holder).*
> *People arrange stones and concrete blocks around their houses (IDI #13, NCE Holder).*
> *In this community, ...people use sandbags and plant "Abiola flowers/trees" around their farmlands and houses for protection. Also, ...clearing of water drains or channels is carried out to prevent flooding (IDI #12, Primary School Certificate Holder).*

Table 3

Mean Responses on Level of Flood Risk Preparedness among Community-Dwelling Adults in Plateau State based on Number of Years Lived in Flood Prone Areas (n= 790)

S/N	Statement	Number of Years Lived: 1-5 years (n=183) $\bar{x}$	SD	6-10 years (n=355) $\bar{x}$	SD	>11 years (n=252) $\bar{x}$	SD
1.	Cope with psychological trauma resulting from flood	2.67	.81	2.55	.69	2.71	.63
2.	Safeguard your building structures against flooding by building or erecting flood proof building	2.55	.76	2.51	.67	2.74	.69
3.	Anticipate the onset of flooding and adopt flood prevention measures such as constructing flood retention basins	2.57	.89	2.51	.65	2.74	.71
4.	Store and preserve food stuff and other food items during flooding	2.55	.82	2.52	.63	2.62	.68
5.	Have clean drinking water and ensure proper waste treatment during flooding	2.54	.83	2.52	.67	2.64	.61
6.	Prevent soil erosion and concomitant sediment deposition during flooding	2.60	.86	2.56	.71	2.77	.71
7.	Safeguard farmlands during flooding by building dike line/embankment	2.69	.91	2.62	.78	2.87	.79
8.	Safeguard infrastructure such as bridge abutments, bank. lines, sewer lines and sewage disposal facilities during flooding	2.64	.86	2.58	.81	2.84	.85
9.	Implement river and flood plain re-naturalization?	2.81	.76	2.66	.82	2.83	.83
10.	Improve flood awareness raising, advocacy and public enlightenment	2.78	.81	2.58	.76	2.66	.71
11.	Maintain proper transportation network and communication system during flooding	2.72	.80	2.52	.73	2.73	.67
12.	Preserve agricultural products such as fruits, food items and vegetables during flooding	2.74	.81	2.52	.73	2.62	.67
13.	Prevent incidence of waterborne disease outbreaks such as typhoid, giardia, cryptosporidium, and cholera may occur	2.66	.79	2.47	.76	2.54	.74
14.	Adhere or comply strictly with flood pre-warning system from Plateau State Emergency Management Agency (SEMA)	2.62	.82	2.44	.78	2.34	.69
	Grand Mean	**2.65**	**.82**	**2.54**	**.73**	**2.69**	**.71**

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

Guidelines for interpreting Level of Flood Risk Preparedness

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

Source: Researcher.

Results in Table 3 show that overall, regardless of number of years lived in flood prone areas, community-dwelling adults had moderate level of flood risk preparedness (1-5 years, $\bar{x}$=2.65, SD=0.82; 6-10, $\bar{x}$=2.54, SD=0.73; >11 years, $\bar{x}$=2.69, SD=0.71).

The quantitative data showed that regardless of number of years lived in flood prone areas, the participants' level of flood risk preparedness was moderate. Many of the participants had lived experiences ranged from 6-10 years and 11 years and above which clearly showed that the number of years lived in flood prone areas had limited influence in their level of flood risk preparedness in the community. Interestingly, the participants adopted varying approaches and physical mechanisms in their preparedness for flood risks in the community. Some participants' responses are indicated below:

SEMA provides relief materials for flood victims. Budgetary provision for the prevention, mitigation, control of flooding and relief packages, for victims of flooding (IDI #24, lived for seven (7) years in flood prone area).

SEMA trains first responders (LEMA/CEMA) at the community level who provide necessary interventions such as evacuation/rescue of trapped persons. Creation of local/community emergency management agency (LEMA/CEMA). Provision of flood warning systems in flood prone areas (IDI #26, lived in flood prone area for five (5) years).

Flood early warning system via community sensitization/mobilization programme. Advocacy campaigns on flood risks to promote flood risk preparedness. Collaboration with NEMA and other stakeholders in the community (IDI #27, lived in flood prone area for ten (10) years).\

Table 4

Summary of One-way ANOVA Showing Difference in the Level of Flood Risk Preparedness among Community-Dwelling Adults in Plateau State based on Education Level (n=790)

Source	Sum of Squares	df	Mean Square	*F*	p-value
Between Groups	4.030	3	1.343		
Within Groups	134.714	786	0.171	7.838	0.000
Total	138.744	789			

Note. Df= degree of freedom; *F* = F-ratio/value;
Significant at *P* <0.05.

Table 4 shows the results of one-way ANOVA conducted to examine difference in the level of flood risk preparedness among community-dwelling adults in Plateau State based on Education level. The results show that there was a significant difference in the level of flood risk preparedness among community-dwelling adults in Plateau State based on Educational level, $F(3,786) = 7.838$, $P = 0.000$. The post-hoc comparison using Scheffe's test showed that the mean score for adults with non-formal education **(**$\bar{x}$ = 1.98; SD = 0.43) was significantly different from adults with tertiary education **(**$\bar{x}$ = 2.10; SD = 0.51), secondary education **(**$\bar{x}$ = 2.11; SD = 0.36) and those with primary education **(**$\bar{x}$ = 1.95; SD = 0.35). The mean difference scores are –0.126 and -0.113 for adults with secondary education and those with tertiary education, respectively. Adults with non-formal education did not differ significantly either from those with primary, secondary and tertiary education levels. 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 level of flood risk preparedness based on Education level.

Table 5

Summary of One-way ANOVA Showing Difference in the Level of Flood Risk Preparedness among Community-Dwelling Adults in Plateau State based on Number of Years Lived in Flood Prone Areas (*n* = 790)

Source	Sum of Squares	df	Mean Square	*F*	p-value
Between Groups	2.221	2	1.111		
Within Groups	136.523	787	0.173	6.403	0.002
Total	138.744	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 level of flood risk preparedness among community-dwelling adults in Plateau State based on number of years lived in flood prone areas. The results show that there was a significant difference in the level of flood risk preparedness among community-dwelling adults in Plateau State based on number of years lived in flood prone areas, F (2,787) = 6.403, P = 0.002. The post-hoc comparison using Scheffe's test showed that the mean score for adults with 1-5 years lived experience **($\bar{x}$** = 2.06; SD = 0.510) was significantly different from adults with 6-10 years lived experience **($\bar{x}$** = 1.98; SD = 0.39), and those with ≥11 years lived experience **($\bar{x}$** = 2.09; SD = 0.38). The mean difference scores are 0.089 and -0.027 for adults with 6-10 years and those with ≥11 years lived experiences, respectively. Those with 1-5 years did not differ significantly either with those with 6-10 years, or 11 years lived experiences. 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 level of flood risk preparedness based on number of years lived in flood prone areas.

Table 5 (continued) Scheffe Test Showing Location of Significant Mean Differences in the Level of Flood Risk Preparedness among Adults based on Number of Years Lived in Flood Prone Areas

(I) Numbers of Years Lived	(J) Numbers of Years Lived	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1-5 years	6-10 years	.08894	.03790	.064	-.0040	.1819
	> 11 years	-.02721	.04045	.798	-.1264	.0720
6-10 years	1-5 years	-.08894	.03790	.064	-.1819	.0040
	> 11 years	-.11615*	.03431	.003	-.2003	-.0320
> 11 years	1-5 years	.02721	.04045	.798	-.0720	.1264
	6-10 years	.11615*	.03431	.003	.0320	.2003

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

Discussion

The result from table 1 revealed that community-dwelling adults were moderately prepared for flood risks with grand mean of 2.61. The finding is quite surprising and, thus, not anticipated. This is because every community-dwelling adult must have encountered flooding and unavoidable ugly experiences cum negative consequences. The residents are expected to be highly prepared for the flood risks to avert dissatisfying outcomes. This finding sets the framework for the adoption of the United Nations International Strategy for Disaster Risk Reduction (UNISDR, 2009) definition of risk preparedness as the knowledge and capacities developed by the government, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent or current hazard events or conditions. This definition upholds the collective responsibility of every community member, government, agency, and other concerned body in preparing for flooding. According to Hyogo Framework for Action (2016), measures should be taken to prepare for and reduce the outcomes of flooding and earthquakes.

Similarly, WHO (2019) asserted that these measures should be designed to prevent hazards from creating risks or lessen the distribution, intensity, or severity of hazards. Such measures, according to WHO, include awareness raising, improving community health security, and relocation or protection of vulnerable populations or structures.

Data on Table 2 showed that adults of various education levels had moderate flood risk preparedness. Also, results in Table 2 showed a significant difference in the level of flood risk preparedness among community-dwelling adults in Plateau State based on education level. The finding was not anticipated and, thus, a surprise. This is because the respondents' level of education and experiences played a more significant role in flood risk preparedness. Ideally, the community members with secondary and tertiary education levels are meant to show a very high level of flood risk preparedness compared to their counterparts with primary and non-formal education. Surprisingly, all the respondents reported a moderate level of flood risk preparedness. Also, Miceli, Sotigiu, and Settanni (2018) reported education differences in disaster preparedness and perception of flood risk in a group of people living in an alpine valley in the North of Italy.

Data on Table 3 showed that community-dwelling adults of various numbers of years who lived in flood-prone areas prepared for flood risk to a moderate level. Also, findings in Table 3 indicated that there was a significant difference in the level of flood risk preparedness among community-dwelling adults in Plateau State based on the number of years lived in flood-prone areas. These findings are quite expected and encouraging. They reflected that experiences gained in a flood-prone location remain a hallmark of preparedness for flood disasters. Although a high level of flood risk preparedness could have been better, the community members could have been entrusted with quality measures to control and avert flooding and its consequences. This finding implies that the level of encounters and damages post-flooding helps individuals better prepare for proper response to avert or alleviate flood risks. In tandem with other findings, it is already established that measurable experience is vital in responding to flooding and adopting appropriate precautionary measures (Mashab, Scarry, & Enerta, 2018). The authors further reported that experience in flood-prone areas was the primary determinant of flood risk preparedness among participants in their study. They further reported that the respondents who had good experiences based on the number of years they lived in a flood-prone area had positive perceptions of flood disaster prevention, while those with limited years of lived experience had a negative perception. Similarly, the

finding agrees with Abdulmajid (2020), who reported that living in flood-prone areas confer experiences that assisted households' preparedness for flood hazards in Nigeria.

Conclusion

The finding showed that community dwelling adults were moderately prepared for flood risk. The findings of the study provided crucial insight into the flood risk preparedness of the community dwelling adults. Thus there is a need for concerted efforts by Public Health Educators, Environmental Health Experts and other Experts to collaborate and implement education or awareness programmes that promote flood risk preparedness of adults in Plateau State, Nigeria.

Recommendations

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

1. Flood risk preparedness education campaign should be intensified at the community levels in Plateau State in order to improve their flood risk preparedness 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.

References

Abdulmajid, R. (2020). Household Preparedness to flood hazard in Nigeria. International Journal of Science, Environment and Technology, 9(3), 473-478.

Bratkovich, S., & Burban, L. (2017). *Flooding and its Effects on Trees.* USDA Forest Service, Northeastern Area State and Private Forestry, St. Paul, MN.

Braun, V., Clark, V., Hayfield, N. & Terry, G. (2019). Thematic Analysis in handbook of research methods in Health Social Sciences (ed. P. Liam Puttong), pp. 843 – 860. Springer Publishers.

Brown, R., & Chanson, H. (2016). Adverse effect of flooding on human environment among workers of environmental protection agency. *International Journal of Environmental Research*, 3(12), 1166-1178.

Bubeck, P., Botzen, W.J., & Acerts, J.C. (2012). A review of risk perceptions and other factors that influence flood mitigation behaviour. *Risk analysis: an official publication of the Society for Risk Analysis*, *32*(9), 1481-1494.

Center for Neighborhood Technology (2020). The Prevalence and cause of urban flooding. Center for Neighborhood Technology, Chicago, USA.

Cohen, L., Manion, L., & Morrison, K. (2018). Research Methods in Education.

Creswell, J.W., & Plano Clark, V.L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Thousand Oaks, California (CA): SAGE Publications.

Federal Emergency Management Agency. (FEMA, 2020). *Flood Response Preparedness. Official reports of the Federal Emergency Management Agency*. www.floods.ready.gov.

Halmarson, T. (2015). Flash Flood in Tanque Verde Creek, Tucson, Arizona. *International Journal of Hydraulic Engineering, 103*(2), 184-195.

Hyogo Framework for Action (HFA: 2005–2015) (2016). *Building the Resilience of Nations and Communities to Disasters (HFA)*. Retrieved from https://www.unisdr.org/eng/hfa/hfa.htm.

Inter-Agency Secretariat of the International Strategy for Disaster Reduction. (2014). Living With Risk: A Global Review of Disaster Reduction Initiatives.

International Organization for Migration (2020). *Flood list news in Africa*. https://floodlist.com/africa/nigeria-floods-kaduna-katsina-sokoto-zamfra-august-2020.

Marc and Arretyre (2016). Flood and its effects. *International Journal of Agricultural Research and Extension*, 12(3), 233-247.

Mashab, S., Scarry, N. & Enerta, P. (2018). Global views on flood disaster challenges. *Journal of Earth Research*, 9(2), 106-112.

Miceli, R., Sotigiu, I., & Settanni, M. (2008). Disaster Preparedness and Perception of Flood Risk: A Study in an Alpine Valley in Italy. *Journal of Environmental Psychology 28*(2), 164-173.

Nworgu, B.G. (2015). *Educational Research: Basic Issues & Methodology. (3rd Ed.)*. Nsukka: University Trust Publishers.

Peters, O. (2015). *Defining Principal Types of Flooding.* Owerri: S & E Publishers Limited.

Ricardo, B., Hambet, R. & Davis, J. (2017). Turbulent Velocity and Suspended Sediment Concentration measurements in an urban environment of the Brisbane River Flood Plain at Gardens point. Journal of Metrological research, 33(3) 201-213.

State Emergency Management Agency (2020). Preparedness for effective response to disasters, State Emergency Management Agency. Retrieved from https://www.sema.gov.ng/.

Schumann, A.H. (2011). *Flood Risk Assessment and Management*. Springer publishers:

Streubert, H., & Carpenter, D. (2010). *Qualitative research in nursing: advancing the humanistic imperative*. Lippincott Williams & Wilkins: United States.

United Nation (UN, 2020). Flood List News Update in Nigeria. UN Office for the Coordination of Humanitarian Affairs.

United Nations Developmental Programme (2020). *Flood Preparedness and Response Plan.* Civil Defence Commission Guyana.

United Nations Office for Disaster Risk Reduction (UNISDR, 2009). *UNISDR Terminology on Disaster Reduction*. Geneva: United Nations. Retrieved from https://www.unisdr.org/en/terminology/UNISDR-Terminology-English.pdf.

United States Department of Labour. (USDL, 2020). *Flood Preparedness and Response.* Occupational Safety and Health Administration. Washington D.C.

Werner, M., Hunter, N., & Bates, P. (2016). Identifiability of distributed floodplain roughness values in flood extent estimation. *Journal of Hydrology, 14*(4), 139–157.

WHO (2019). Community Emergency Preparedness. A manual for Managers and Policy makes; WHO Geneva.

WHO (2020). *Flood list news update in Nigeria*. Official reports of the World Health Organization. Retrieved from https://www.who.int/health-topics/floods#tab=tab_1.